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(54) **AN ACCESSORY FOR AN ATTACHMENT OF A MACHINE**

(57) The present invention is related to a cast accessory 1 for an attachment 100 of an excavator machine or earth working equipment, particularly suited for use along the digging edge of an excavating bucket or the like. The cast accessory 1 is configured to be locatable on a wing/-side edge 111 of the attachment 100. The accessory has one or more hidden wear indicating arrangement 4 that is configured to become visible only when the wear level of the accessory 1 reaches a threshold value. The threshold value indicates the requirement of repair or replacement to prevent damage or additional wear to the accessory 1 and/or a main structure 101 of the attachment 100.

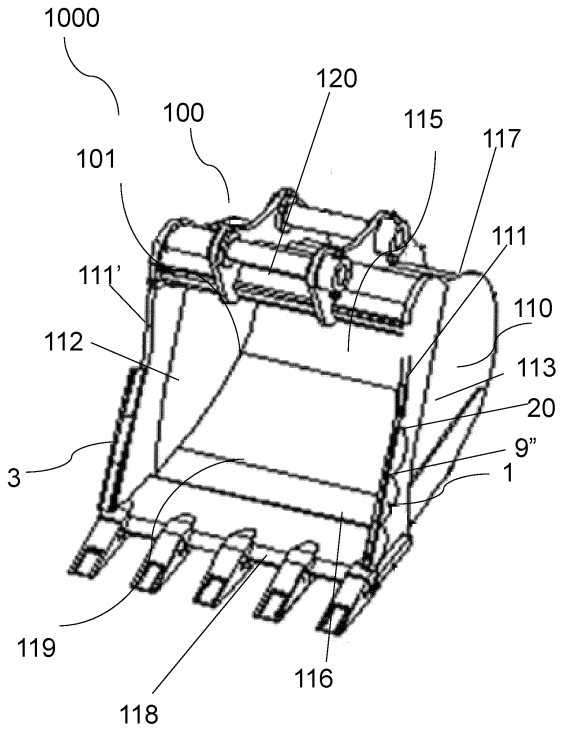

Figure 1

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Description

[0001] The present invention relates an accessory for an attachment of an excavator machine or earth working equipment, particularly suited for use along the digging edge of an excavating bucket or the like. The present invention is reliable, safe, simple to use, and/or replaced with little machine downtime.

[0002] Various mining and construction equipment, including tractors, bulldozers, backhoes, excavators, motor graders, and mining trucks or equipment, frequently use earth-working or material handling buckets and/or blades to dig, cut, scrape, pick up, move, and/or level the earth or materials being excavated or loaded. Due to constant contact with extremely abrasive materials encountered during operation, the earth-moving buckets and blades commonly sustain significant wear. It can be expensive and time-consuming to replace the buckets, blades, and other tools used by the mining and construction machinery.

[0003] Wear indicators have been used to indicate the amount/degree/level of wear in the replaceable primary ground-engaging pieces, such as the bucket edge blades, teeth, edge guards, tips, and/or other detachable or replaceable parts of excavators, loaders, and/or earth-working blades so that these parts can be repaired/-changed before failing.

[0004] To reduce the wear of the main structure of buckets/ loader buckets/digging buckets/heavy duty buckets/severe duty rock buckets of excavators some key components are attached/welded to the main structure of buckets. These components are illustrated in Figure A showing the general construction of an excavator bucket. The side wear plate SWP is used for protecting the outer surface of the sidewall SW. The bucket edge guard BEG/ side protector SP/ wing protector WP/ wing shroud WS are used for protecting the sidewall/wings W of the bucket. Similarly, the lip shroud LS (not shown) provides extra durability to the leading edge LE of the bucket. The heel shroud HS (not shown) and the wear straps WST provide longevity to lower outside bucket corner LOBC and back side BS of shell S of the bucket respectively.

[0005] The sidewall edges/wings edge SWE and leading-edge LE of the bucket are always subject to abrasive wear. This may result in severe sidewall wear and lip wear and reduce the bucket's lifespan. In order to enhance impact and wear resistance, the shrouds are used on the sidewall edges and the leading edge. These shrouds help extend the wear life of the bucket in most construction and mining applications.

[0006] Further, the available wear indicator is either installed or inserted in a hole/retainer formed in the main structure of the bucket. Some visual wear indicators are available for the teeth or heel shroud of a bucket. Some of these wear indicators are made of elastomeric material and some are made of a material different than the main structure. Further, as these are installed in the hole/-retainer and due to heavy and continuous clashing with abrasive material, there is the possibility that these indicators may split/drop from the retainer/hole prior to the right time of replacement. Thus, it makes the situation difficult to assess the accurate level of wear and the correct time for the replacement of a part. Thus, there is a requirement for a wear indicator that can assess the accurate degree of wear providing the right time for replacement/repair prior to structural damage to the components.

[0007] It is therefore an object of the present invention to overcome the above-mentioned problems.

[0008] It is an object of the present invention to provide a wear indicator that detects/assesses the accurate degree of wear.

[0009] It is an object of the present disclosure to detect the degree of wear of the shrouds before the wear/damage of sidewalls and/or leading edge of the bucket so the sidewall and /or lip of the buckets can be protected, and these shrouds can be replaced with new shrouds. This will make the buckets more durable and reduce the cost of repairing and maintenance of buckets.

[0010] It is an object of the present invention to provide a wear indicator that shows the right time of replacement/repair/maintenance.

[0011] It is an object of the present disclosure to provide a wear indicator for protecting the bucket/excavator from wear/damage.

[0012] It is also an object of the present invention to provide a wear indicator that can be used within any accessory for a machine.

SUMMARY

[0013] According to a first aspect of the invention, there is provided a cast accessory for an attachment of a machine, the cast accessory being locatable on a wing/-side edge of the attachment comprising one or more hidden wear indicating means being configurable to become visible only when the wear level of the accessory reaches a threshold value; wherein the threshold value indicates the requirement of repair or replacement to prevent damage or additional wear to the accessory and/or a main structure of the attachment.

[0014] Preferably, the accessory comprises an exterior surface subject to wear while the machine is in use; wherein the exterior surface being configurable for displaying the wear indicating means when the wear reaches the threshold value.

[0015] Preferably, the accessory with the one or more wear indicating means is formed as an integral assembly through a casting process.

[0016] Ideally, the one or more wear indicating means are at least partially or fully embedded within the accessory.

[0017] Preferably, the one or more wear indicating means are at least partially or fully embedded within the accessory at a depth corresponding to a depth in-

dicating wear sufficient to result in replacement or repair of the accessory.

[0018] Preferably, the one or more wear indicating means are at least partially or fully embedded within the accessory at a location of the accessory exposed to wear.

[0019] Ideally, the accessory comprises a main planar body formed for sitting flush to the outside surface of the wing/side edge of the side wall of the attachment.

[0020] Preferably, the accessory comprises a locating means protruding from the main planarly body for engaging with the wing/side edge of the side wall of the bucket. Advantageously, this provides a lip acting as the locating means for the accessory onto the attachment so that compressive forces do not detach the accessory from the attachment. Preferably, the one or more wear indicating means are exposed when the depth of the main planar body of the wear indicating means is worn down by 50%.

[0021] Preferably, the one or more wear indicating means are exposed when the depth of the main planar body of the wear indicating means is worn down by 60%.

[0022] Preferably, the one or more wear indicating means are exposed when the depth of the main planar body of the wear indicating means is worn down by 70%.

[0023] Preferably, the one or more wear indicating means are exposed when the depth of the main planar body of the wear indicating means is worn down by 80%.

[0024] Preferably, the one or more wear indicating means are formed/located on an interior surface of the accessory.

[0025] Ideally, the one or more wear indicating means extend from the interior surface to a plane spaced apart from the exterior surface's plane towards an interior surface.

[0026] Preferably, the wear indicating means comprises at least one recess on the accessory.

[0027] Ideally, the wear indicating means comprises at least one recess on the interior surface of the accessory.

[0028] Preferably, the at least one recess is recessed to a depth into the accessory corresponding to a depth indicating wear sufficient to result in replacement or repair of the accessory.

[0029] Ideally, the wear indicating means comprises a plurality of recesses.

[0030] Preferably, the plurality of recesses provides a visual indicating means to an operator of the vehicle that wear sufficient to result in replacement or repair of the accessory has occurred.

[0031] Ideally, the visual indicating means provides an intelligible word readable by an operator of the excavator.

[0032] Preferably, the intelligible word can be any word providing a warning to the operator of the vehicle that indicates, the wear sufficient to result in replacement or repair of the accessory has been achieved.

[0033] Preferably, the one or more wear indicating means comprise a first end, a second end and one or more sidewalls.

[0034] Preferably, the one or more sidewalls are a continuous sidewall that extends around the circumference of the wear indicating means.

[0035] Ideally, the first end is visibly located on the interior surface of the accessory.

[0036] Ideally, the first end is an open end.

[0037] Alternatively, the first end may be covered by a surface.

[0038] Alternatively, the first end is spaced apart from the interior surface and located inside the accessory.

[0039] Preferably, the one or more wear indicating means has a depth that extends from the first end to the second end towards the exterior surface of the accessory.

[0040] Preferably, the accessory comprises one or more sides.

[0041] Preferably, the one or more sides comprise a first side, a second side and two lateral sides.

[0042] Preferably, the accessory comprises a front surface and a back surface.

[0043] Preferably, the first side is parallel or substantially parallel to the second side.

[0044] Preferably, the first side has a different length from the second side.

[0045] Alternatively, the first side has a same length from the second side.

[0046] Preferably, the second side is a bottom side of the accessory.

[0047] Preferably, the first side is a narrowed front working side of the accessory.

[0048] Preferably, the lateral sides are extended from the first side to the second side.

[0049] Preferably, the lateral sides are extended from the front surface of the accessory to the back surface of the accessory.

[0050] Preferably, the one or more wear indicating means are contained between the boundaries of the one or more sides of the accessory.

[0051] Ideally, the one or more wear indicating means are contained between the boundaries of the lateral sides, the first side and the second side of the accessory.

[0052] Preferably, the second end of the one or more wear indicating means becomes exposed when the width of the worn accessory to the original width of the accessory becomes approximately half.

[0053] Preferably, the accessory is formed of abrasion-resistant metal.

[0054] In one embodiment, the wear indicating means is formed of abrasion-resistant metal.

[0055] Preferably, the accessory with wear indicating means is an integral assembly formed through a casting process from an abrasion-resistant metal.

[0056] Preferably, the accessory is made of an alloy steel.

[0057] Ideally, the accessory is made of an alloy steel comprising chromium (Cr) and molybdenum (Mo).

[0058] Preferably, the attachment is a bucket of excavator.

[0059] Preferably, the attachment comprises the main

structure.

[0060] Preferably, the attachment comprises one or more sidewall.

[0061] Ideally, the attachment comprises two sidewalls.

[0062] Preferably, each sidewall comprises one or more side edges.

[0063] Preferably, the sidewalls are connected to a shell and an upper support to define the main structure of the attachment.

[0064] Preferably, the shell defines a base and a back.

[0065] Preferably, the base comprises a leading edge.

[0066] Preferably, the back has a curved shape wherein the back comprises an inner surface that defines a cavity of bucket.

[0067] Preferably, the accessory comprises a head being locatable on wing/side edge of an opening of the attachment; wherein the head is configured to secure the wing/side edge of the attachment of the machine.

[0068] Preferably, the side edges, leading edge, and the upper support define an opening.

[0069] Preferably, the accessory comprises a head being locatable on the side edge/wing of the attachment; wherein the head is configured to secure the side edge/wing of the attachment of the machine.

[0070] Preferably, the accessory comprises a head being locatable on the side edge/wing of the sidewall of the attachment; wherein the head is configured to secure the side edge/wing of the attachment of the machine.

[0071] Alternatively, the accessory comprises a head for engaging with the leading edge of the base of the bucket.

[0072] Preferably, the head comprises the lip being locatable on the side edge/wing of the attachment.

[0073] Preferably, the head has a specified width which is configurable to reduce to approximately one-fifth of its specified width when the wear indicating means is displayed.

[0074] Ideally, an accessory is disposed on the attachment so that there is no gap between the accessory and the leading edge of the attachment.

[0075] Preferably, an accessory is disposed on the attachment so that there is no gap between the accessory and a corner tooth attached to the leading edge of the attachment.

[0076] Preferably, the head of the accessory is to be shaped such that there is no gap between the side edge of the head and the corresponding side/surface of a corner tooth attached to the leading edge of the attachment.

[0077] Preferably, the accessory comprises an interior surface disposed onto the main structure of the attachment.

[0078] Preferably, the accessory comprises an interior surface.

[0079] Preferably, the accessory comprises an interior surface disposed onto the leading edge of the attachment.

[0080] Preferably, the interior surface of the accessory being configurable for providing a mutual interface between the accessory and the attachment.

[0081] Preferably, the interior surface being configurable for providing a mutual interface.

[0082] between the accessory and an outer surface of the sidewall and/or lip of attachment.

[0083] Preferably, the wear indicating means extends from the interior surface of the accessory in a longitudinal and/or a horizontal and/or a lateral direction of the accessory.

[0084] Preferably, the accessory is a shroud for preventing the wear of the wing/side edges of the sidewall the attachment.

[0085] Preferably, the wear indicating means comprises an outer end.

[0086] Preferably, the wear indicating means comprises a depth extending from the interior surface and/or outer end of the wear indicating means to the second end of the wear indicating means.

[0087] Preferably the second end of the wear indicating means is parallel or substantially parallel to the outer end of the wear indicating means.

[0088] Preferably, the second end is located inside the accessory.

[0089] Preferably, the second end is located between the exterior surface and the interior surface of the accessory.

[0090] Preferably, the wear indicating means comprises a depth between 4mm to 15mm.

[0091] Preferably, the wear indicating means comprises a depth between 5mm to 10mm.

[0092] Preferably, the wear indicating means comprises a depth of approximately 6mm.

[0093] Preferably, the outer end of the wear indicating means extends from the interior surface towards the exterior surface.

[0094] Preferably, the interior surface of the accessory is configurable to locate on a surface the attachment.

[0095] Preferably, the second end of the wear indicating means being exposed when the specified width of the accessory is reduced by 50%-90%.

[0096] Preferably, second end of the wear indicating means being exposed when the specified width of the accessory is reduced by 60%-85%.

[0097] Ideally, the second end of the wear indicating means being exposed on the exterior surface when the specified width of the accessory is reduced by 80%.

[0098] Preferably, the wear indicating means is configured to become visible when wear level of the accessory reaches between 50%-90% of the original width.

[0099] Preferably, the wear indicating means is configured to become visible when wear level of the accessory reaches between 60%-85% of the original width.

[0100] Preferably, the wear indicating means is configured to become visible on the exterior surface when wear level of the accessory reaches 80% of the original

width.

[0101] Preferably, the accessory is configurable to be removably attached with the attachment via mechanical fixings or adhering or bonding.

[0102] Ideally, the accessory is configurable to be attached with the attachment via welding.

[0103] Preferably, the accessory comprises a first section.

[0104] Preferably, the first section comprises the head.

[0105] Preferably, the head comprises an elongated body.

[0106] Preferably, the head comprises an elongated body with a length.

[0107] Preferably, the head comprises a length between 100mm to 300mm.

[0108] Preferably, the head comprises a length between 150mm to 2500mm.

[0109] Preferably, the head comprises a length of approximately 184.7.

[0110] Ideally, the first side of the accessory is approximately 184.7mm.

[0111] Preferably, the head comprises an elongated body with a width.

[0112] Preferably, the head comprises a width between 20mm to 70mm.

[0113] Preferably, the head comprises a width between 30mm to 60mm.

[0114] Preferably, the head comprises a width of approximately 40.6mm.

[0115] Preferably, the specified width is smaller than the width.

[0116] Preferably, the specified width in a range of 10mm to 30mm.

[0117] Preferably, the specified width is approximately 18.9mm.

[0118] Preferably, the accessory comprises a height.

[0119] Preferably, the accessory comprises a height between 80mm to 250mm.

[0120] Preferably, the accessory comprises a height between 100mm to 200mm.

[0121] Preferably, the accessory comprises a height of approximately 114.5mm.

[0122] Preferably, the head tapers to the narrowed front working side.

[0123] Advantageously, the tapered head mitigates wear and other damage due to lateral forces imparted to the accessory and/or the attachment.

[0124] Preferably, the first section comprises a lip/seat/engagement portion being locatable on side edge/wing of the attachment.

[0125] Preferably, the seat/engagement portion is L-shaped corner profile for receiving/engaging the attachment.

[0126] Preferably, the seat/engagement portion is L-shaped corner profile for receiving/engaging the side edge/wing of the attachment.

[0127] Preferably, the exterior surface of the first section is substantially and /or fully curved.

[0128] Preferably, the head comprises one or more exterior surfaces for intruding in a material to be handle by the attaching means.

[0129] Preferably, the head comprises one or more exterior surfaces extending from the exterior surface of the second section to the L-shaped engagement portion.

[0130] Preferably, one or more exterior surfaces comprise a first, second, and a third exterior surface.

[0131] Preferably, the first exterior surface extends from the exterior surface of the second section.

[0132] Preferably, the first exterior surface comprises a major exterior surface and narrowed front working side.

[0133] Preferably, the front working side extends inwardly from the major exterior surface to the second exterior surface.

[0134] Preferably, the front working side extends inwardly from the major exterior surface to the second exterior surface by an angle of 92°.

[0135] Preferably, the second exterior surface extends outwardly from the first exterior surface of the head to the third exterior surface of the head.

[0136] Preferably, the third exterior surface extends inwardly from the second exterior surface of the head to the engagement portion of the first section.

[0137] Preferably, the exterior surface of the head is substantially or fully curved.

[0138] Preferably, the accessory comprises a second section.

[0139] Preferably, the second section is a mounting portion extending from the first section of the accessory towards a bottom side of the accessory.

[0140] Preferably, the exterior surface of the accessory extends from the bottom side of the accessory to the L-shaped corner profile.

[0141] Preferably, the exterior surface of accessory comprises the one or more exterior surfaces of the head and an exterior surface of the second section and bottom.

[0142] Preferably, the exterior surface of the second section extends from the bottom of the accessory to the one or more exterior surfaces of the head.

[0143] Ideally, the exterior surface of the second section extends from the bottom side of the accessory to the first exterior surface of the head.

[0144] Preferably, the interior surface of the accessory comprises the engagement portion and an interior surface of the second section.

[0145] Optionally, the accessory comprises a receiving means and/or attaching means being configurable to connect with an attaching means and/or receiving means of the attachment.

[0146] Preferably, the bottom side extends inwardly from the exterior surface of the second section towards the interior surface by an angle.

[0147] Preferably, the bottom side extends inwardly from the exterior surface of the second section towards the interior surface by an angle of 92°.

[0148] Preferably the head comprises two lateral sides.

[0149] Preferably, the lateral sides of the head being configurable to locate in a lateral direction with a corresponding lateral side of the head of an adjacent accessory.

[0150] Advantageously, there is no gap between the corresponding lateral sides of the two adjacent accessories.

[0151] According to a second aspect of the invention comprises a method for manufacturing the accessory, the method comprising casting a wear indicating means into the accessory using a casting process, wherein the wear indicating means being configurable to become visible only when the wear level of the accessory reaches a threshold value; wherein the threshold value indicates the requirement of repair or replacement to prevent damage or additional wear to the accessory and/or a main structure of the attachment.

[0152] According to a third aspect of the invention, an attachment protection assembly of a machine comprises an attachment including one or more side edges/wings and/or one or more leading edges and one or more accessories according to the first aspect of the invention being locatable on one or more side edges/wing and/or a leading edge of the attachment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0153] The invention will now be described, by way of example only, with reference to the accompanying drawings in which: -

Figure A shows a perspective view of an attachment with accessories according to prior art.

Figure B shows a perspective view of an attachment with accessories according to prior art.

Figure 1 shows a perspective view of an attachment with an accessory according to the present invention.

Figure 2 shows a front view of the accessory according to the present invention.

Figure 3 shows a top view of the accessory according to the present invention.

Figure 4A shows a section view of the accessory of Figure 4B taken along line X-X in Fig 2.

Figure 4B shows a side view of the accessory according to the present invention.

Figure 5 shows a perspective view of the accessory according to the present invention.

Figure 6 shows a perspective view of the accessory prior to wear according to the present invention.

Figure 7 shows a perspective view of the accessory after worn according to the present invention.

Figure 8 shows a section view of the accessory of Figure 4B prior to wear according to the present invention.

Figure 9 shows a section view of the accessory of Figure 4B after worn according to the present invention.

DETAILED DESCRIPTION

[0154] The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of various embodiments of the disclosure as defined by the claims and their equivalents. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognise that various changes and modifications to the various embodiments described herein can be made without departing from the scope and spirit of the disclosure. In addition, descriptions of well-known functions and constructions may be omitted for clarity and conciseness.

[0155] The terms and words used in the following description and claims are not limited to the bibliographical meanings, but are merely used by the inventor to enable a clear and consistent understanding of the disclosure. Accordingly, it should be apparent to those skilled in the art that the following description of various embodiments of the disclosure is provided for illustrative purpose only and not for the purpose of limiting the disclosure as defined by the accompanying claims and their equivalents.

[0156] It is to be understood that the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise.

[0157] Referring to the drawings, there is provided a cast accessory 1 for an attachment 100 of a machine, The cast accessory 1 is configured to be locatable on a wing/-side edge 111 of the attachment 100. The accessory has one or more hidden wear indicating arrangement 4 that is configured to become visible only when the wear level of the accessory 1 reaches a threshold value. The threshold value indicates the requirement of repair or replacement to prevent damage or additional wear to the accessory 1 and/or a main structure 101 of the attachment 100.

[0158] Referring to Figures 2 and 4A, the accessory 1 comprises an exterior surface 5 subject to wear while the machine is in use. The exterior surface 5 is configured for displaying the wear indicating arrangement 4 when the wear reaches the threshold value (as illustrated in Figure 7).

[0159] Referring to Figure 4A, the accessory 1 with wear indicator 4 is formed as an integral assembly through a casting process. The one or more wear-indicating arrangement 4 are fully embedded within the accessory 1 at a depth 2 corresponding to a depth indicating wear sufficient to result in replacement or repair of the accessory 1. The accessory 1 has a main planar body 10 formed for sitting flush to the outside surface 101 of the wing/side edge 111 of the side wall 110 of the attachments 100.

[0160] As illustrated in the Figures 1, 4A and 4B, the accessory 1 has a lip 20 protruding from the main planar body 10 for engaging with the wing/side edge 111 of the side wall 110 of the bucket 100. Advantageously, this

provides a locating arrangement 21 for the accessory 1 onto the attachment 100 so that compressive forces do not detach the accessory 1 from the attachment 100. The one or more wear-indicating arrangement 4 are exposed when the depth of the main planar body 10 of the one or more wear-indicating arrangement is worn down by 80% as illustrated in Figure 11.

[0161] Referring to Figure 5, the wear indicators 4 are formed/disposed into an interior surface 6 of the accessory 1. The wear indicators 4 extend from the interior surface 6 to a plane 6' spaced apart from the exterior surface's plane 5'. The plane 6' is located inside the accessory 1. The wear indicators 4 have a second end 41 that becomes exposed when the ratio of the width of the worn accessory 1 to the original width of the accessory becomes 1:5. The accessory 1 is formed of abrasion-resistant metal. The accessory 1 with the one or more wear-indicating arrangement 4 is an integral assembly formed through a casting process from an abrasion-resistant metal.

[0162] As shown in Figure 1, the attachment 100 is a bucket 100 of excavator. The attachment 100 has the main structure 101. The bucket 100 has two sidewalls 110. Each sidewall 110 has a side edge 111 on which the accessory is attached. The sidewalls 110 are connected to a shell 115 and an upper support 120 defines the main structure 101 of the attachment 100.The shell 115 defines a base 116 and a back 117. The base 117 has a leading edge 118. The back 117 has a curved shape. The back 117 comprises an inner surface 119 that defines a cavity 130 of bucket 100. The side edges 111, leading edge 118, back 117 and the upper support 120 define an opening 121. Each sidewall has an inner surface 112 and exterior/outer surface 113. The lip of the accessory abuts against an edge surface 111' of side edge 111 of the sidewall 110.

[0163] As shown in Figures 1 and 5, the accessory 1 has a head 3 is locatable on wing/side edge 111 of a sidewall 110 of the attachment 100. The head 3 are configured to secure the wing/side edge 110 of the attachment 100 of the machine. The head 3 comprises the lip 20 being locatable on the side edge/wing 111 of the attachment. The head 3 has a specified width SW, 16 which is configurable to reduce to approximately one-fifth of its specified width 15 when the wear indicating means is displayed. The head 3 of the accessory 1 is to be shaped such that there is no gap between a lateral side 9" of the head 3 and the corresponding side/surface of a corner tooth attached to the leading edge 118 of the attachment 100. Advantageously, the head 3 protects the corner where leading edge 118 and wing 111 of the bucket 100 meet from fracture due to the load forces and impact at the corners 111'. Moreover, the accessory 1 do not add a width to the side edge/wing 111 of the sidewall of the attachment 100.

[0164] The interior surface 6 of the accessory is mounted/disposed on the main structure 101 of the attachment 100. As illustrated in Figure 1, the accessory is attached with the attachment 100 via welding. The interior surface 6 of the accessory 1 is configurable for providing a mutual interface between the accessory 1 and an outer surface 113 of the sidewall and/or wing 111 of attachment 100.

[0165] Referring to Figures 5 and 6, the wear indicating arrangements 4 extend from the interior surface 6 of the accessory 1 in a longitudinal and/or a horizontal and/or a lateral direction of the accessory 6. The one or more wear indicating arrangement has a first end 42, a second end 41 and one or more sidewall 43. The each sidewall 43 is a continuous sidewall 43 that extends around the circumference of the wear indicating arrangements 4. The first end 42 is an open end 42. The first end 42is visibly located on the interior surface 6 of the accessory 1. The one or more wear indicating arrangement 4 have a depth 2 that extends from the interior surface and/or the first end to the second end towards the exterior surface of the accessory. The one or more wear indicators 4 are contained between the boundaries of the lateral sides 9, 9', the first side 80and the second side 8' of the accessory 1. The depth 2 of the one or more wear indicators 4 is approximately 6mm. The second end of the wear indicating arrangements 4 is exposed when the specified width of the accessory is reduced by approximately 80%.

[0166] Each wear indicating arrangement 4 has at least one recess 40 on the interior surface 6 of the accessory 1. The at least one recess 40 is recessed to a depth 2 into the accessory corresponding to a depth indicating wear sufficient to result in replacement or repair of the accessory. As shown in figure 7, the wear indicating arrangements 4 have a plurality of recesses 40. The plurality of recesses 40 provides a visual indicating arrangement to an operator of the vehicle that wear sufficient to result in replacement or repair of the accessory has occurred. The visual indicating arrangements provide an intelligible word readable by an operator of the excavator. The intelligible word can be any word providing a warning to the operator of the vehicle that wear sufficient to result in replacement or repair of the accessory has been achieved. Figure 7 shows an example of the word 'STOP' that is displayed when wear reaches 80%. The specified width 73 of accessory is reduced to a predetermined width 76 when the wear indicator is exposed. At this stage, the specified width of the accessory is reduced from 18.9mm to a predetermined width of 3.9mm. The word 'STOP' is displayed when the specified width becomes 3.9mm. The exposed surface 5" of the worn accessory 1 is illustrated in Figure 7 and Figure 9.

[0167] Referring to figure 4B, 5 and 6, the accessory 1 has two lateral sides 9, 9' and two sides 80, 8'. The accessory has a first section 7. The first section has the head having an elongated body. The accessory has a length 71 and a width 72. The width 72 of the accessory 3 is approximately 40.6mm. The accessory has a specified width 73 of approximately 18.9mm. The accessory comprises a height 74 of approximately 114.5mm. The height 74 of accessory is reduced to a predetermined height 75 when the wear indicator is ex-

posed.

[0168] As shown in Figure 4A, the accessory has a first side 80, a second side 8' and two lateral sides 9, 9'. The accessory has a front surface and a back surface. The first side 80 is parallel or substantially parallel to the second side 8'. The first side has a length of 184.7mm. The second side 8' is the bottom side of the accessory. The first side 80 is a narrowed front working side of the accessory 1. The lateral sides are extended from the first side to the second side. The lateral sides 9, 9' are extended from the front surface of the accessory to the back surface of the accessory.

[0169] As shown in figures 4A, 5, and 8, the head 3 tapers to a narrowed front working side 80. The narrow working side is shown in figure 3. Advantageously, the tapered head mitigates wear and other damage due to lateral forces imparted to the accessory and/or the attachment. The first section 7 comprises the lip/ seat/engagement portion 20, 21 is locatable on side edge/wing 111 of the attachment 100. The seat/engagement portion 21 is an L-shaped corner profile for receiving/engaging the side edge/wing 111, 111' of the sidewall 110 of the attachment 100. The exterior surface 51 of the first section 7 is substantially curved. The head comprises one or more exterior surfaces 51 for intruding in a material to be handled by the attachment/ bucket 110. The one or more exterior surfaces comprise a first 52, a second 53, and a third exterior surface 54.

[0170] The first exterior surface 52 extends from the exterior surface 53 of the second section 11. The first exterior surface 52 comprises a major exterior surface 52' and a surface 52" of narrowed front working side 80. The front working side 80 is a first side 8. The front working side 80 extends inwardly from the major exterior surface 52' to the second exterior surface 53 by an angle of 92°. The second exterior surface 53 extends outwardly from the first exterior surface 52 of the head 3 to the third exterior surface 54 of the head 3. The third exterior surface 54 extends inwardly from the second exterior surface 53 of the head 3 to the engagement portion 20, 21 of the first section 7.

[0171] The accessory comprises a second section 11. The second section 11 is a mounting portion that extends from the first section 7 of the accessory towards a bottom side 8' of the accessory 1. The exterior surface 5 of accessory 1 comprises the exterior surface 51 of the first section 7 and an exterior surface 55 of the second section 11. The exterior surface 55 of the second section 11 extends from the bottom side 8' of the accessory 1 to the first exterior surface 51 of the head.

[0172] The front surface of the accessory comprises the major exterior surface 52' and the exterior surface 55 of the second section 11 of the accessory 1. The back surface 8 of the accessory comprises the interior surface 6, the second exterior surface 53 and the third exterior surface 54.The interior surface 6 of the accessory 1 extends from the bottom side 8' of the accessory 1 to the L-shaped corner profile 20, 21 being locatable on the wing 111. The interior surface 6 of the accessory comprises the surface of the engagement portion 20, 21 and an interior surface 60 of the second section 11. The bottom side 8' of the accessory 1 extends inwardly from the exterior surface 54 of the second section 11 towards interior surface 60 by an angle of 92°. The lateral side 9" of the head 3 of the accessory 1 is configurable to locate in a lateral direction with a corresponding lateral side 9" of the head of adjacent accessory 1. Advantageously, there is no gap between the corresponding lateral sides 9" of the head of the two adjacent accessories 1 as illustrated in figure 1.

[0173] Figure 1 shows an attachment protection assembly 1000 of a machine comprises an attachment 100 including one or more side edges/wings 111 and/or one or more leading edges 118 and one or more accessories 1 according to the first aspect of the invention being locatable on one or more side edges/wing 111 and/or a leading edge 118 of the attachment 100.

[0174] The skilled person will appreciate that all preferred or optional features of the invention described with reference to only some aspects or embodiments of the invention may be applied to all aspects of the invention.

[0175] It will be appreciated that optional features applicable to one aspect of the invention can be used in any combination, and in any number. Moreover, they can also be used with any of the other aspects of the invention in any combination and in any number. This includes, but is not limited to, the dependent claims from any claim being used as dependent claims for any other claim in the claims of this application.

[0176] In relation to the detailed description of the different embodiments of the invention, it will be understood that one or more technical features of one embodiment can be used in combination with one or more technical features of any other embodiment where the transferred use of the one or more technical features would be immediately apparent to a person of ordinary skill in the art to carry out a similar function in a similar way on the other embodiment.

[0177] The features disclosed in the foregoing description or the following drawings, expressed in their specific forms or in terms of a means for performing a disclosed function, or a method or a process of attaining the disclosed result, as appropriate, may separately, or in any combination of such features be utilised for realising the invention in diverse forms thereof.

Claims

1. A cast accessory for an attachment of a machine, the cast accessory being locatable on a wing/side edge of the attachment comprising one or more hidden wear indicating means being configurable to become visible only when a wear level of the accessory reaches a threshold value; wherein the threshold value indicates the requirement of repair or replace-

ment to prevent damage or additional wear to the accessory and/or a main structure of the attachment.

2. A cast accessory as claimed in claim 1, wherein the accessory comprises an exterior surface subject to wear while the machine is in use; wherein the exterior surface being configurable for displaying the wear indicating means when the wear reaches the threshold value.

3. A cast accessory as claimed in claim 1 or 2, wherein the accessory with the one or more wear indicating means is formed as an integral assembly through a casting process.

4. A cast accessory as claimed in any preceding claims, wherein the one or more wear indicating means are at least partially or fully embedded within the accessory at a depth corresponding to a depth indicating wear sufficient to result in replacement or repair of the accessory.

5. A cast accessory as claimed in any preceding claims, wherein the accessory comprises a main planar body formed for sitting flush to the outside surface of the wing/side edge of the side wall of the attachment;
wherein the accessory comprises a locating means protruding from the main planarly body for engaging with the wing/side edge of the side wall of the bucket; wherein the locating means provides a lip acting as the locating means for the accessory onto the attachment so that compressive forces do not detach the accessory from the attachment.

6. A cast accessory as claimed in any one of preceding claims 3 to 5 while dependent on claim 2, wherein the one or more wear indicating means are formed/located on an interior surface of the accessory; wherein the one or more wear indicating means extend from the interior surface to a plane spaced apart from the exterior surface towards the interior surface.

7. A cast accessory as claimed in any preceding claims, wherein the wear indicating means comprises at least one recess on the accessory; wherein the at least one recess is recessed to a depth into the accessory corresponding to a depth indicating wear sufficient to result in replacement or repair of the accessory.

8. A cast accessory as claimed in any preceding claims, wherein the wear indicating means comprises a plurality of recesses; wherein the plurality of recesses provides a visual indicating means to an operator of the vehicle that wear sufficient to result in replacement or repair of the accessory has occurred.

9. A cast accessory as claimed in any one of preceding claims 3 to 8 while dependent on claim 2, wherein the one or more wear indicating means comprise a first end, a second end, and one or more sidewalls;
wherein the one or more wear indicating means has a depth that extends from the first end to the second end towards the exterior surface of the accessory; and wherein the wear indicating means comprises the depth between 4mm to 15mm.

10. A cast accessory as claimed in any preceding claims, wherein the accessory comprises one or more sides; wherein the one or more sides comprise a first side, a second side and two lateral sides; and wherein the accessory comprises a front surface and a back surface.

11. A cast accessory as claimed in claim 9, wherein the second end of the one or more wear indicating means becomes exposed when an original width of the accessory is reduced to approximately half.

12. A cast accessory as claimed in claim 1, wherein the attachment is a bucket of an excavator; wherein the attachment comprises one or more sidewalls; wherein each sidewall comprises one or more side edges; wherein the sidewalls are connected to a shell and an upper support to define the main structure of the attachment; wherein the shell defines a base and a back; wherein the base comprises a leading edge; and wherein the back has a curved shape wherein the back comprises an inner surface that defines a cavity of the bucket.

13. A cast accessory as claimed in any preceding claim, wherein the accessory comprises a head being locatable on a wing/side edge of an opening of the attachment; wherein the head comprises the lip being locatable on the side edge/wing of the attachment; and wherein the head has a specified width configurable to reduce to approximately one-fifth when the wear indicating means is displayed; and
wherein the head of the accessory is to be shaped such that there is no gap between the accessory and a corresponding side/surface of a corner tooth attached to the leading edge of the attachment.

14. An attachment of an excavator comprises one or more cast accessories as claimed in any preceding claims.

15. A method for manufacturing the cast accessory as claimed in any one of claims 1 to 13, the method comprising casting a wear indicating means into the accessory using a casting process, wherein the wear indicating means being configurable to become visible only when a wear level of the accessory reaches a threshold value; wherein the threshold value in-

dicates the requirement of repair or replacement to prevent damage or additional wear to the accessory and/or a main structure of the attachment.

Figure A

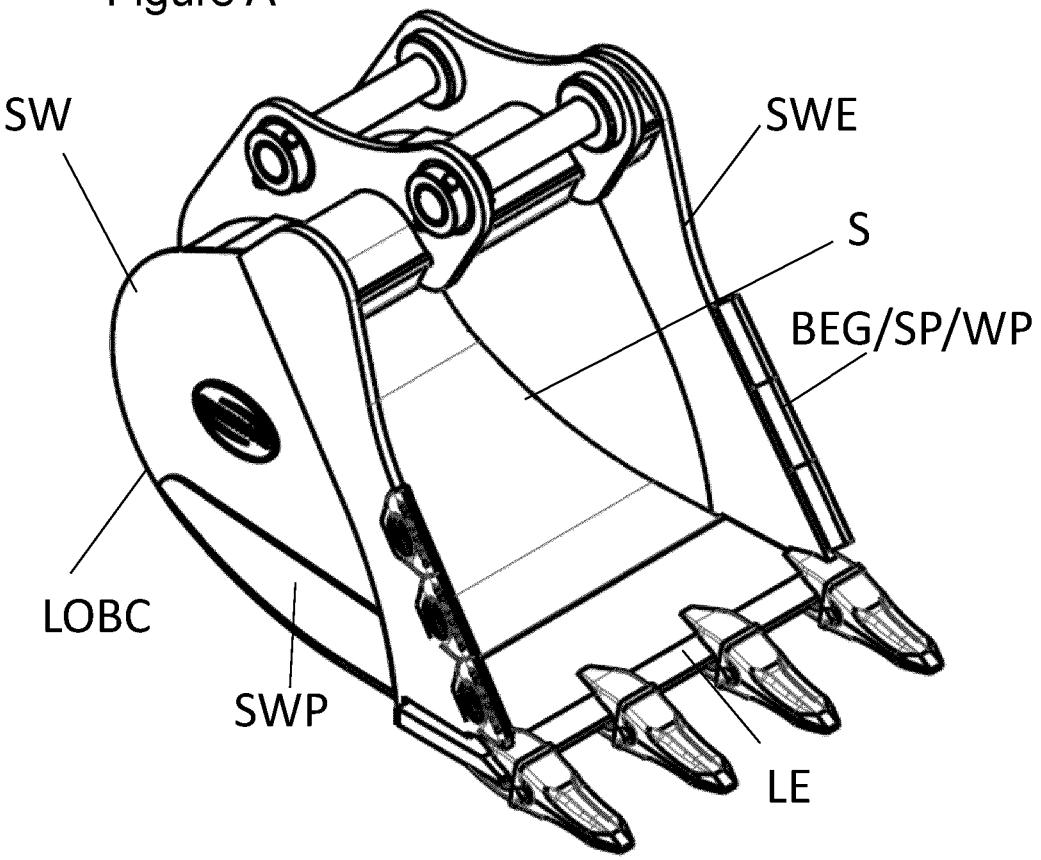
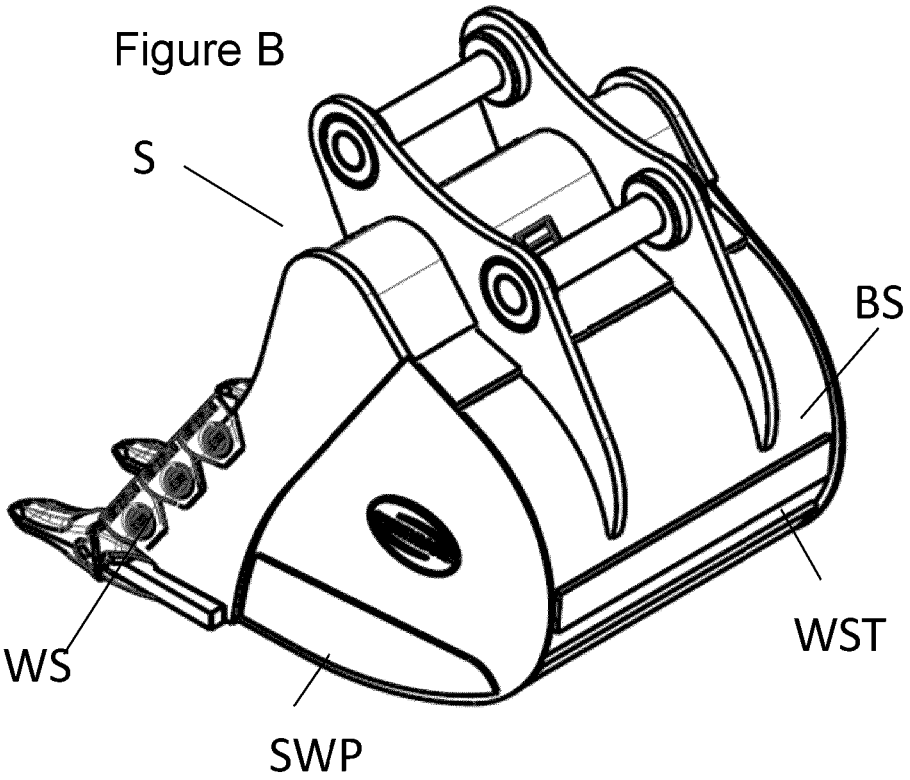


Figure B



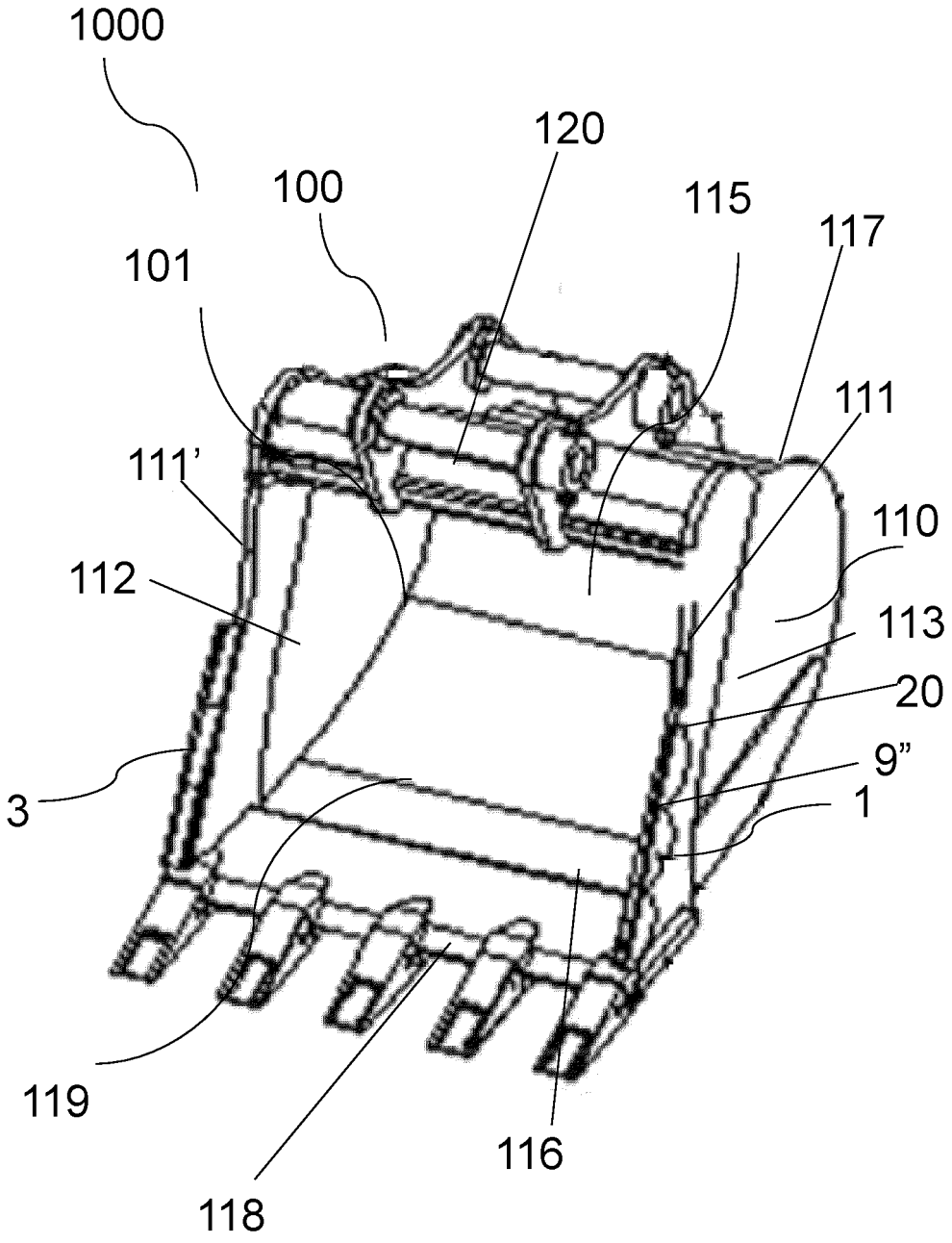


Figure 1

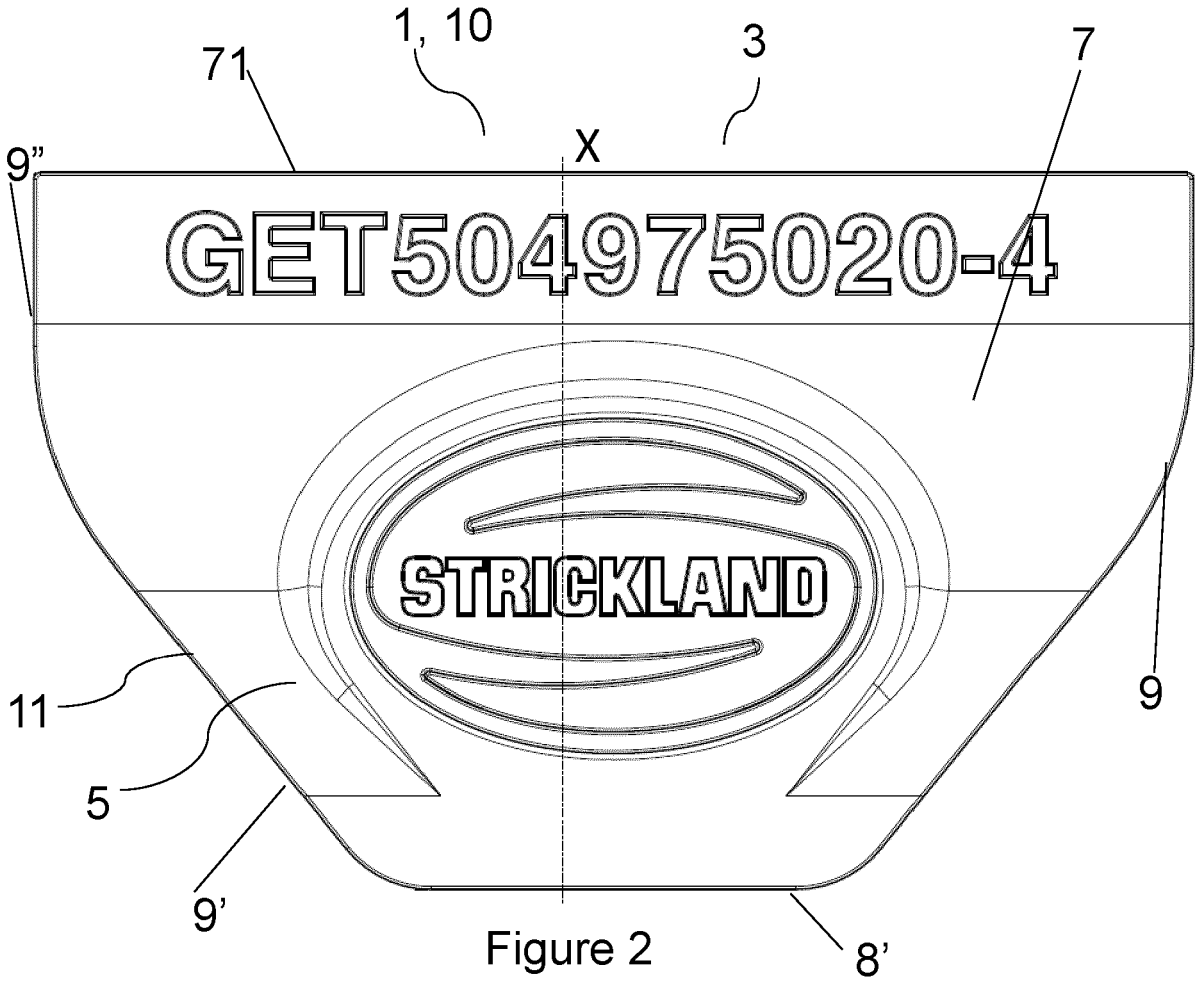


Figure 2

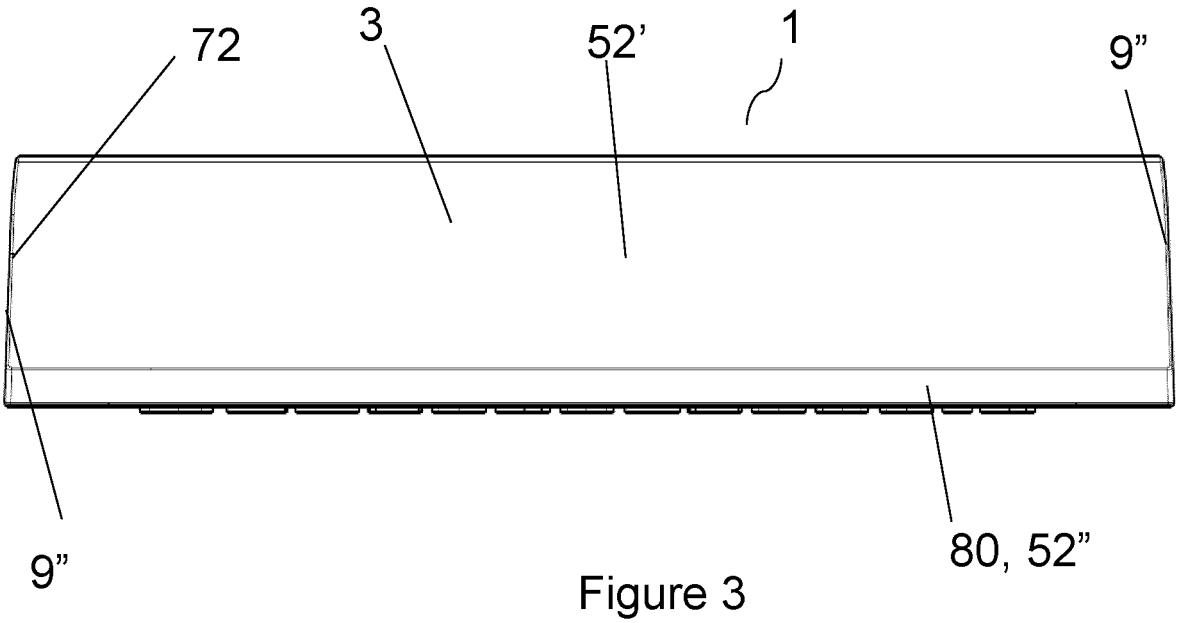


Figure 3

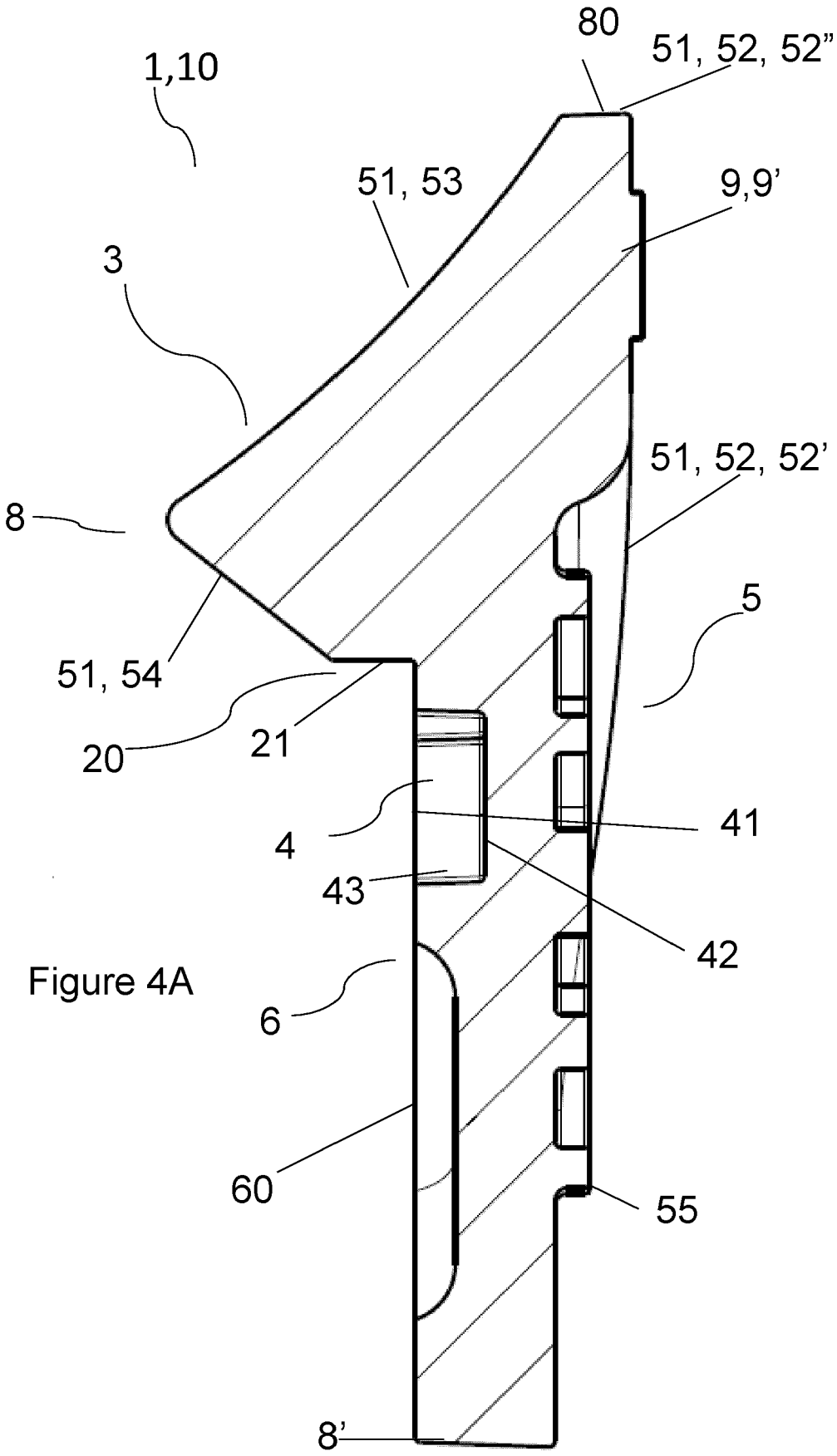


Figure 4A

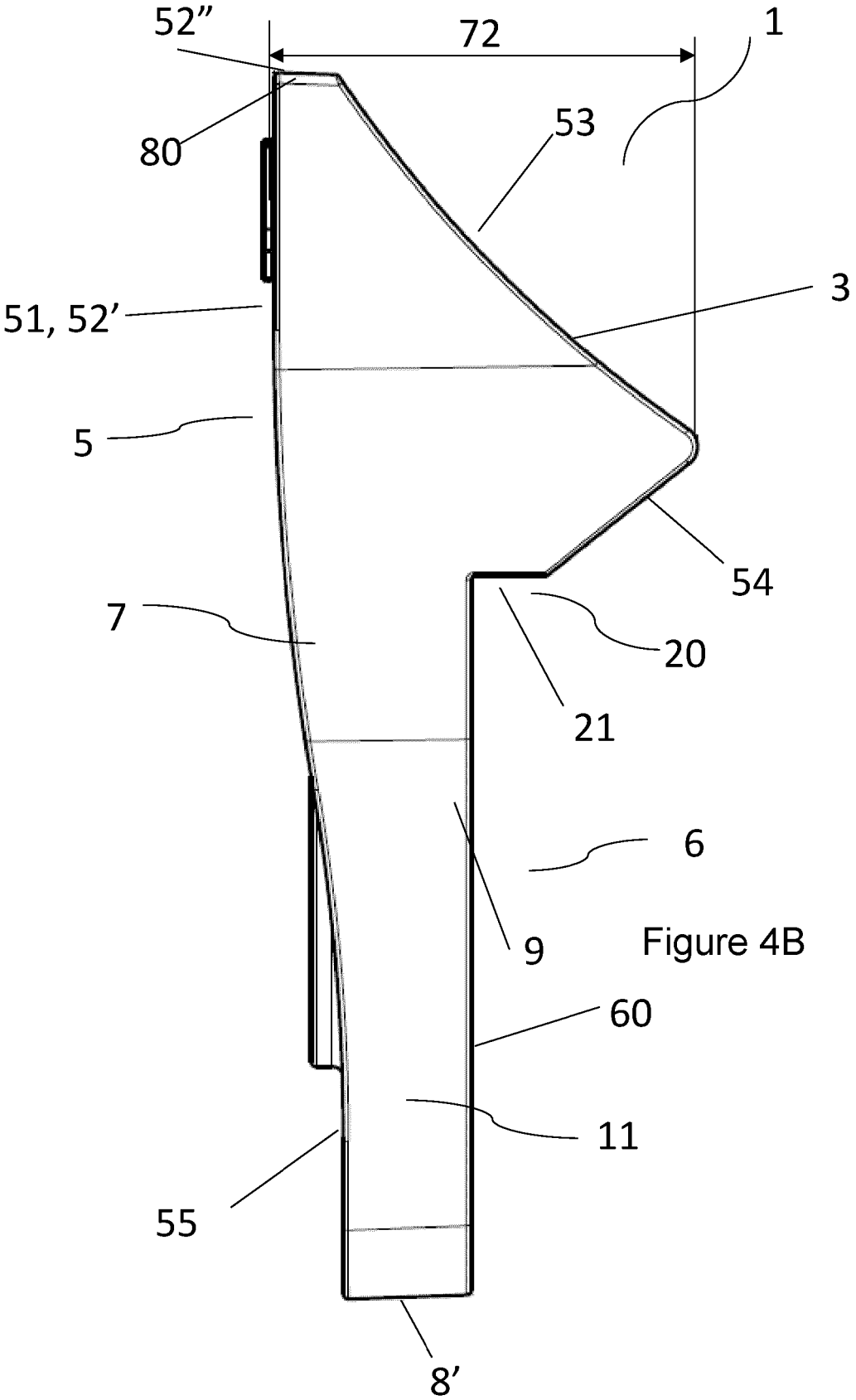


Figure 4B

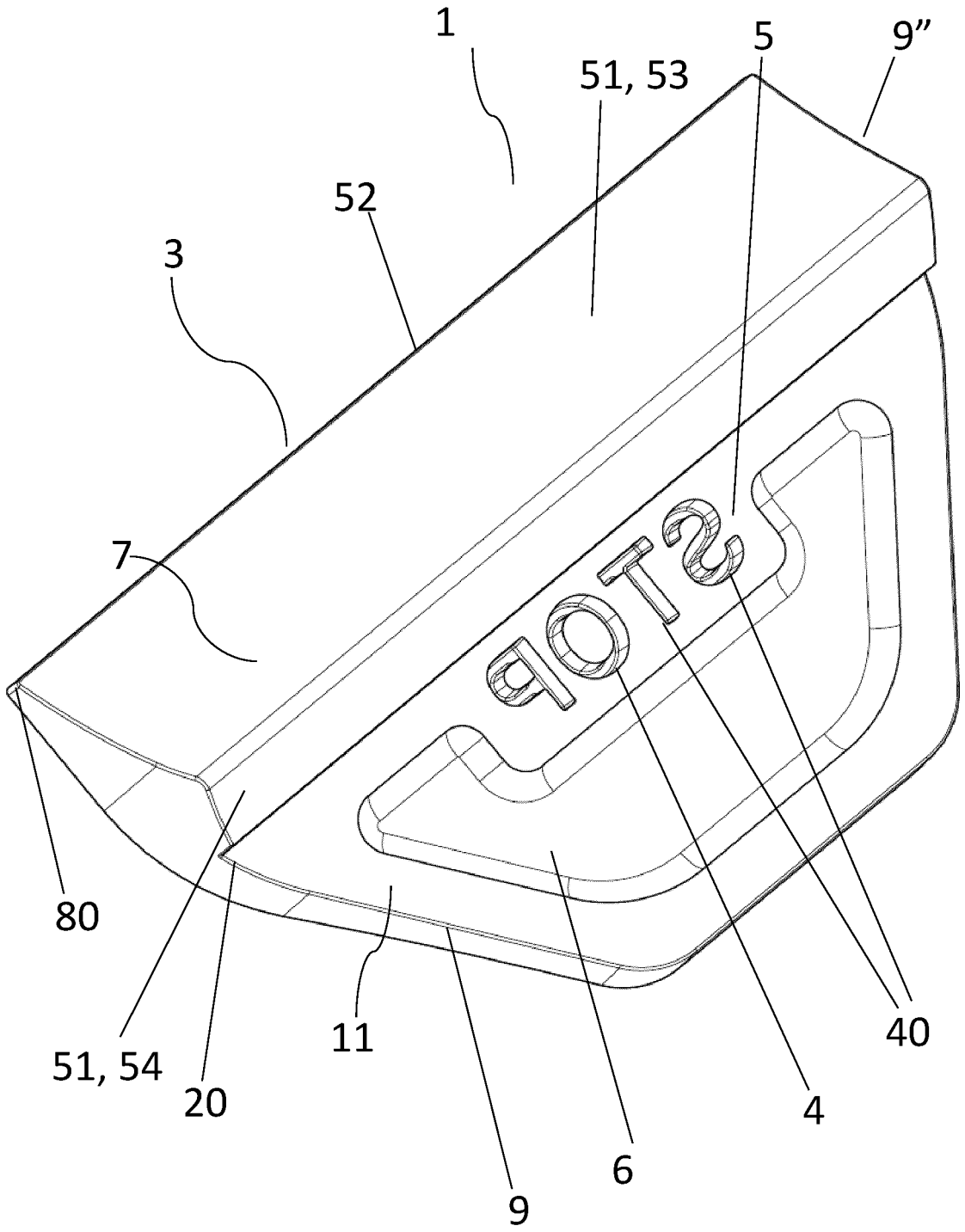


Figure 5

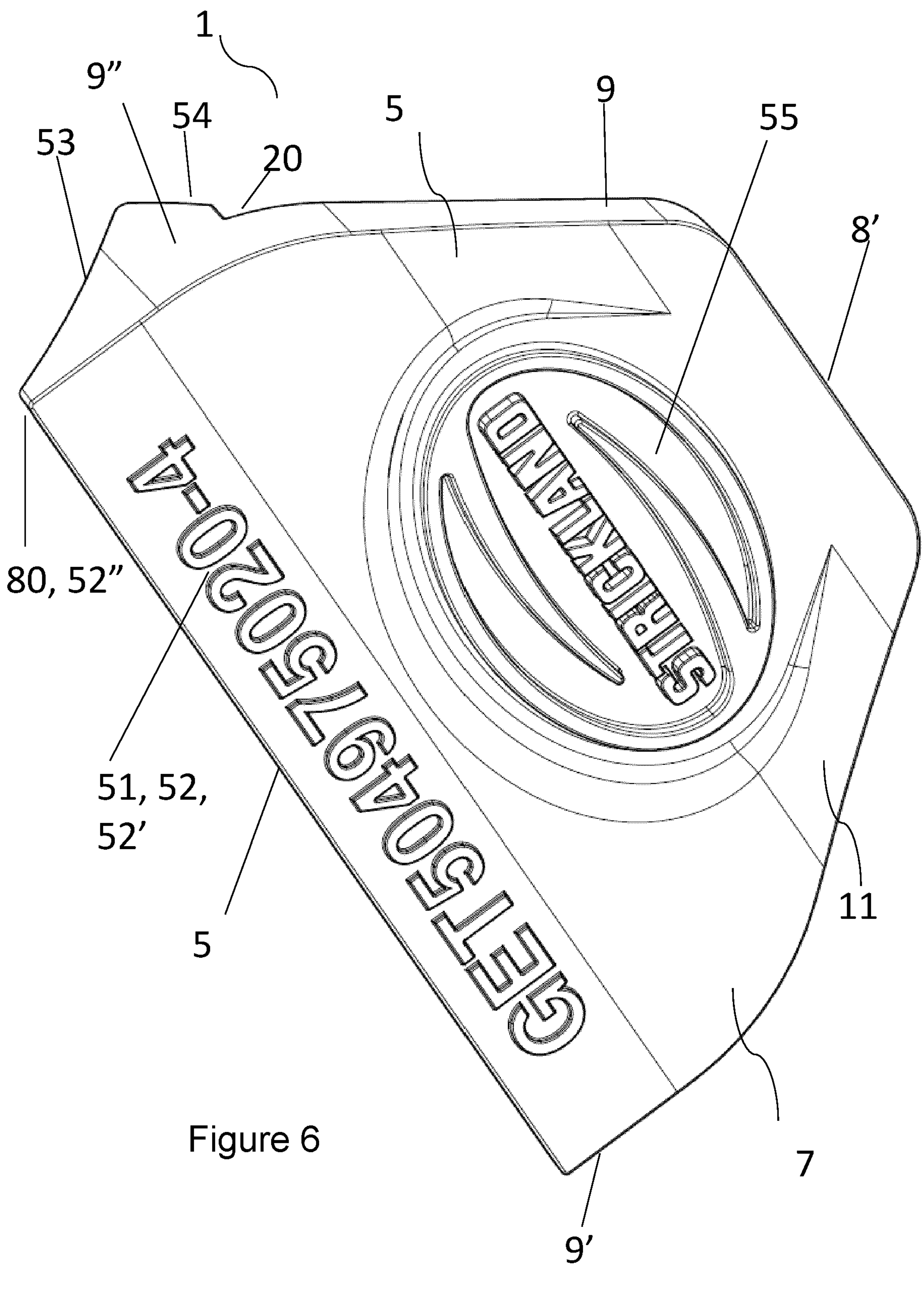


Figure 6

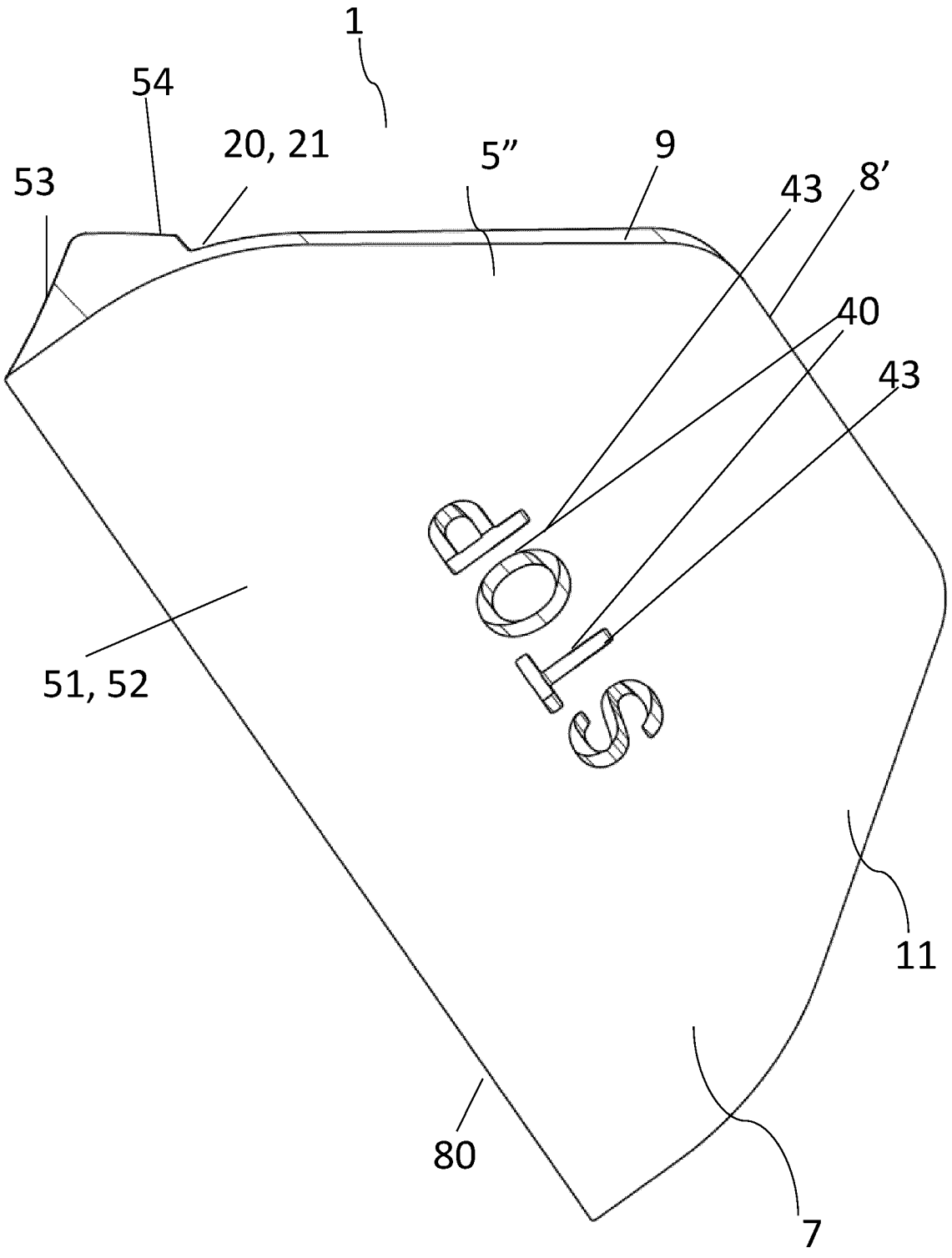


Figure 7

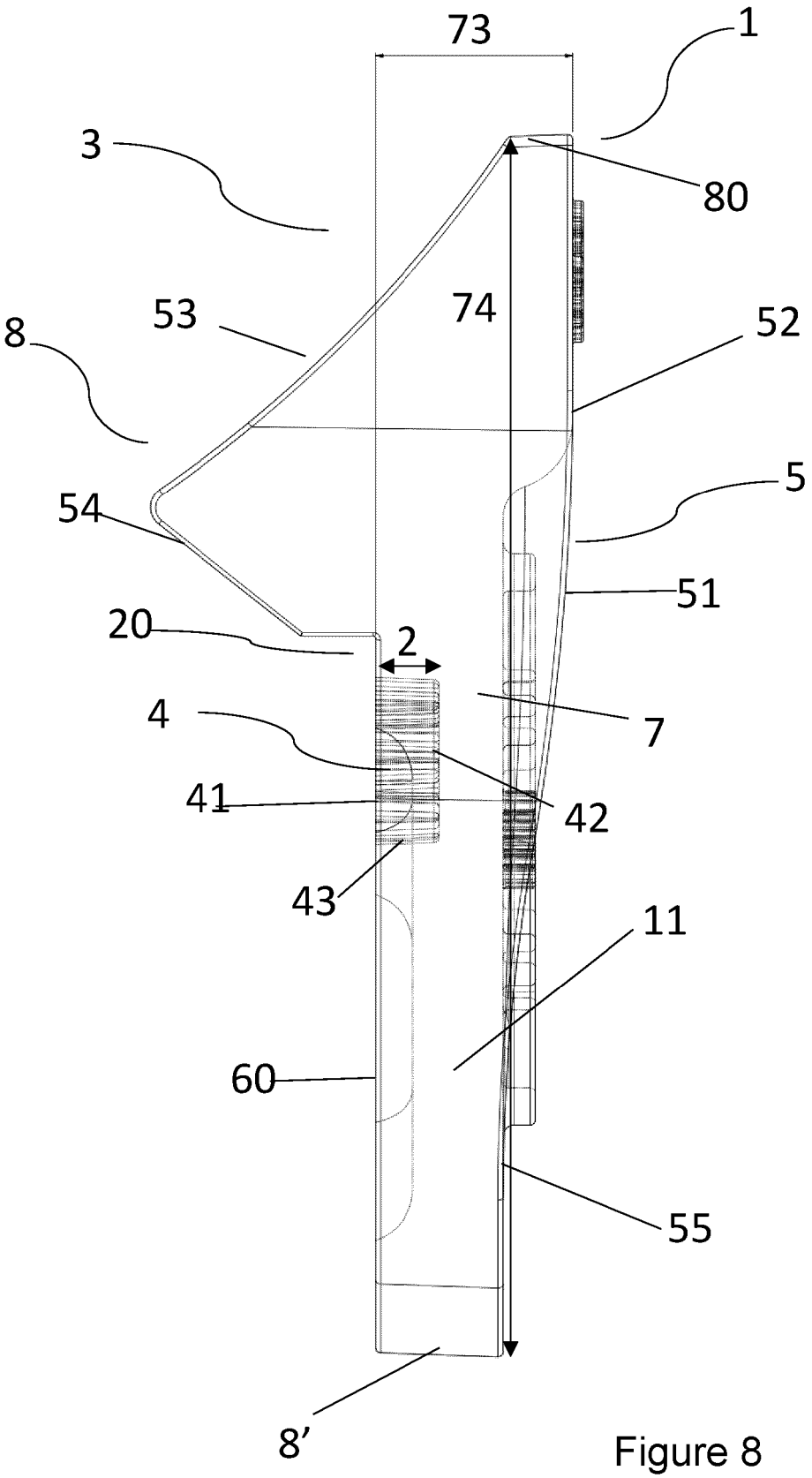


Figure 8

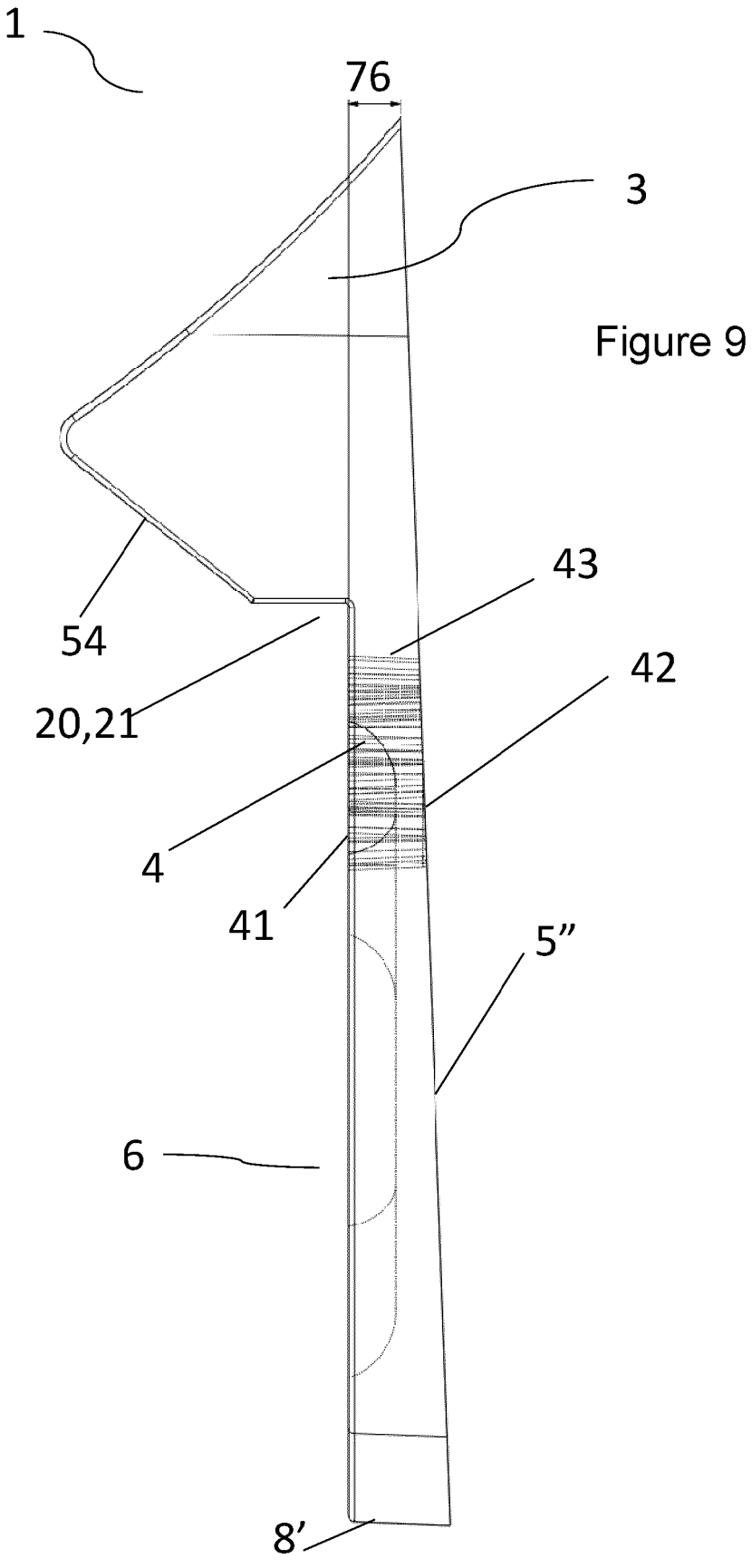


Figure 9

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EUROPEAN SEARCH REPORT

Application Number
EP 24 02 5014

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 109 312 558 A (CATERPILLAR INC) 5 February 2019 (2019-02-05) * figure 1 to 6 * -----	1,2, 4-10,12, 14	INV. E02F9/26 E02F9/28
X	US 10 196 799 B2 (CATERPILLAR INC [US]) 5 February 2019 (2019-02-05) * figure 1 to 5 * * column 3, line 51 - column 4, line 9 * -----	1,2,4,5, 7,9-12, 14	
X	CA 2 445 795 C (GRANT JAMES [CA]) 26 July 2005 (2005-07-26) * figure 1 to 7 * * paragraph [0004] * -----	1-5,7, 10,12-15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 April 2025	Bultot, Coralie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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