(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 198 211 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.06.2023 Bulletin 2023/25

(21) Application number: **21214481.0**

(22) Date of filing: **14.12.2021**

(51) International Patent Classification (IPC):
E02F 9/28 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E02F 9/2883; E02F 9/2858

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Sandvik Mining and Construction Australia (Production/Supply) Pty Ltd**
Milton QLD 4064 (AU)

(72) Inventors:
- **Javadi, Mehrdad**
  Perth, 6155 (AU)
- **Hyvönen, Ilkka**
  20360 Turku (FI)

(74) Representative: **Sandvik**
Sandvik Intellectual Property AB
811 81 Sandviken (SE)

(54) AN EARTH MOVING EQUIPMENT BUCKET CORNER

(57) An earth moving equipment bucket corner (100) comprising a side upright portion (140), attachable to a bucket sidewall (640); a floor portion (150), defining a horizontal plane (170), attachable to a bucket floor lip (650), the floor portion (150) having an upper GET contacting surface (180) and a lower GET contacting surface (190), and a boss (200), having a central horizontal longitudinal axis (210), on the upper GET contacting surface (180) configured to engage a GET (110) wherein the upper GET contacting surface (180) is parallel with the lower GET contacting surface (190). The invention also relates to an earth moving bucket lip protection system (130) comprising the bucket corner (100) as and a GET (110) and to a bucket comprising the earth moving bucket lip protection system (130).

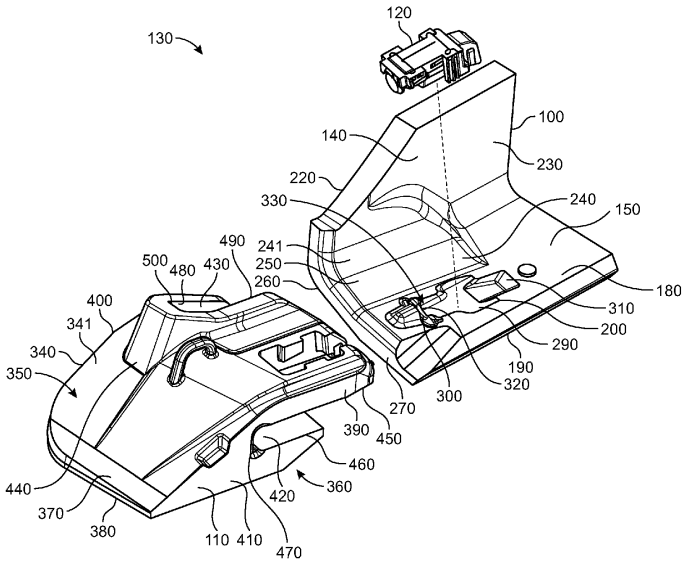

FIG. 4

EP 4 198 211 A1

Description

Field of the Invention

[0001] This invention relates to an earth moving equipment bucket corner for receiving a ground engaging tool (GET) and to an earth moving bucket lip protection system comprising the bucket corner and a GET. The invention also relates to a GET connectable to a bucket corner.

Background to the Invention

[0002] Loaders, such as underground loaders, provided with buckets play a crucial role in mining production and the like by helping to efficiently move ore for processing. However, loader buckets are subject to considerable wear that can compromise mining efficiency.

[0003] For example, as the condition of a loader bucket deteriorates the following problems can arise: reduced penetration due to wear of the bucket leading edge; higher fuel usage due to the loader working harder; increased wear and tear on consumables such as tyres which must work harder and tend to spin as the loader attempts to penetrate material, and reduced loading due to the volume of material shifted by a worn bucket being up to 20% less per cycle than that moved by a new one.

[0004] As a result of the above problems, replaceable GETs are frequently mounted on buckets to protect the areas prone to wear. Examples of such GETS include lip shrouds, heel shrouds, teeth, corner shrouds and cast corners.

[0005] Traditionally, GETs were welded onto the lips of buckets and when the GET came to the end of their useful life, they were cut from the bucket, and a new GET welded in their place - for example, the right angled corners of the buckets were protected by a GET welded to the leading edge or lip of the floor of the bucket and also along the leading edge of the upright sides of the bucket. However, the welding and rewelding steps to fit and remove GETs directly to a bucket ultimately resulted in the weakening of the bucket and also added to a loss of productivity and increased operating costs to a business.

[0006] As a result, various mechanical GET attachment methods have been proposed to reduce the need for welding and rewelding which involve the use of mechanical fasteners to attach GETs or shrouds to a bucket. However, the effective mechanical connection of GETs to bucket corners is particularly problematical due to the high stresses to which the bucket corner is subjected in use. These high stresses can result in deformation and weakening of the mechanical fastener while, in some cases the deformation can be so severe that the GET must be cut away, completely negating any advantage of mechanical connection.

[0007] Various attempts have been made to overcome the aforementioned problems. For example, PCT Patent Specification No. 2014/037781 describes connection means involving the use of a shroud which mounts about a boss on the lip or corner of an excavator bucket and a locking device in the form of a pin assembly which locates between the shroud and the boss.

[0008] However, it has been found that the locking devices of the prior art can still fail prematurely due to the high forces exerted on the GET at the contacting surfaces between GETs and bucket corners and at the pin assemblies. In addition, due to the complex shapes of the known bucket corners and associated GETs, it can be difficult to accurately cast the bucket corners and GETs to ensure the tight fit required at the contacting surfaces to optimally resist high forces in use.

[0009] It is an object of the invention to overcome at least one of the above-referenced problems.

Summary of the Invention

[0010] According to the invention there is provided an earth moving equipment bucket corner comprising:

a side upright portion attachable to a bucket sidewall, the side upright portion defining an upright outside GET contacting surface on the outside of the of the side upright portion and an upright inside GET contacting surface on the inside of the side upright portion;

a floor portion, defining a horizontal plane, attachable to a bucket floor lip, the floor portion having an upper GET contacting surface and a lower GET contacting surface;

an intermediate portion extending between and angled with respect to the side upright portion and the floor portion, wherein

a boss, having a central horizontal longitudinal axis and configured to engage a GET, is provided on the upper GET contacting surface and the upper GET contacting surface is parallel with the lower GET contacting surface. This arrangement results in an improved grip between the bucket corner and the GET at the contacting surfaces as the boss is located on the upper GET contacting surface which is substantially horizontal and also parallel with the lower GET contacting surface. As a result GET connectors are subjected to reduced reaction forces in use.

[0011] Preferably, the upper GET contacting surface is parallel with the lower GET contacting surface to within an angle ϕ of from about 0° to about 5°. The range of angles ensures an optimal parallel configuration for optimal reductions reaction forces.

[0012] In one embodiment, the outside GET contacting surface and the inside GET contacting surface are parallel. This arrangement allows for improved dimensional control of castings together with an improved bucket corner - GET grip and reduced reaction forces.

[0013] In any embodiment, the earth moving equipment bucket corner comprises an intermediate portion extending between and angled with respect to the side

upright portion and the floor portion wherein the intermediate portion defines a top GET contacting surface and a bottom GET contacting surface disposed parallel with the top GET contacting surface. This arrangement also allows for improved dimensional control of castings together with an improved bucket corner - GET grip and reduced reaction forces.

[0014] Optionally, the side upright portion, the floor portion and the intermediate portion comprise a leading edge, defining a leading edge plane, for insertion in a GET and the boss comprises a recess in the upper GET contacting surface for abutting a GET connector at an upright GET connector contacting seat, which defines a contacting seat plane, wherein the leading edge plane and the contacting seat plane are parallel. This configuration ensures a reduced bending moment of GET connectors, particularly GET connectors of the pin assembly type.

[0015] Preferably, the leading edge plane and the contacting seat plane are parallel to within an angle ω of from about 0° to about 20° An angle ω in this range ensures optimal bending moment reductions.

[0016] In any embodiment, the side upright portion, the floor portion and the intermediate portion comprise a chamfer between the leading edge and the inside GET contacting surface, the upper GET contacting surface and the top GET contacting surface respectively. Such a chamfer allows for effective matching of the bucket corner with the bucket lip.

[0017] In one embodiment, the earth moving equipment bucket corner comprises a GET contacting surface transition zone between the leading edge and the upper GET contacting surface wherein the transition zone comprises a bevel formed from a radiused surface and a first sloped surface intersecting with a first side of the radiused surface. The transition zone allows for a smooth transition between the leading edge and the chamfer. The transition zone also allows for a smooth transition between the bucket corner and a sloped lip of a bucket.

[0018] Optionally, the transition zone further comprises a second sloped surface intersecting with a second side of the radiused surface. Accordingly, the bevel of the transition zone can be formed by the radiused surface and a single sloped surface or by the radiused surface and two sloped surfaces as required.

[0019] In another embodiment, the transition zone is formed from a chamfer.

[0020] In one embodiment, the central horizontal longitudinal axis of the boss and the inside GET contacting surface of the side upright portion are parallel to within +/-10°. Preferably, the central horizontal longitudinal axis of the boss and the inside GET contacting surface of the side upright portion are completely parallel These parallel arrangements facilitate a highly effective fit between the bucket corner and the GET.

[0021] The invention also extends to an earth moving bucket lip protection system comprising:

a bucket corner as hereinbefore defined and
a GET for connection with the bucket corner.

[0022] In one embodiment, the GET is connectable with the bucket corner at defined contact points on the GET configured to stand proud of the outer surface of the GET. The contact points provide pre-defined contact areas between the GET and the bucket corner.

[0023] Suitably, the GET comprises pads defining the contact points. Pads which stand proud of the GET surface can be applied to individual GETs following casting as required. This configuration allows for better control of mating faces and support positions between the bucket corner and GETs.

[0024] In any embodiment, the earth moving bucket lip protection system further comprises a GET connector for reversibly attaching the GET to the bucket corner at the boss.

[0025] The invention also extends to an earth moving equipment bucket comprising a bucket corner or an earth moving bucket lip protection system as hereinbefore defined.

[0026] The invention also extends to a GET for connection to a bucket comprising:

a body having an outer surface, and
bucket contact points configured to stand proud of the surface for contacting the bucket at specific locations defined by the contact points.

[0027] In a preferred embodiment, the GET is for connection to a bucket corner.

[0028] In one embodiment, the outer surface comprises a top face and a bottom face and the contact points are provided on the bottom face.

[0029] In one embodiment, the GET comprises pads defining the contact points.

[0030] The applicant has found by ensuring that contact surfaces on a bucket corner are arranged in as parallel a configuration as possible as defined above to eliminate unnecessary slopes at the contact surfaces between GETs and bucket corners that load transfers to GET connectors (pin assembly locking mechanisms and the like) are minimised and better load distribution between the GET, bucket corner and GET connector is achieved for optimal performance of bucket corners and GETs. As a result, bucket corners and GETs are less likely to fail so that machine downtime is minimised and optimal bucket loader performance is maintained. In effect, the configuration of the bucket corner of the invention ensures that stresses on the pin assembly are minimised. Moreover, easier control of the casting processes required in the manufacture of bucket corners and GETs is achieved.

Brief Description of the Drawings

[0031] The invention will now be described, by way of

example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view from above and one side of an earth moving equipment bucket corner of the prior art fitted with a GET, for protecting the lip of a bucket, attached to the bucket corner with a mechanical GET connector;

Figure 2 is an enlarged perspective view from above and one side of the bucket corner of the prior art of Figure 1;

Figure 3 is a perspective view from above and one side of an earth moving equipment bucket corner of the invention fitted with a GET for protecting the lip of a bucket attached to the bucket corner with a mechanical GET connector, the bucket corner, GET and the GET connector forming an earth moving bucket lip protection system of the invention;

Figure 4 is an exploded view of the bucket corner, GET and mechanical connector of Figure 3;

Figure 5 is a perspective view from above and one side of the bucket corner of Figure 4 showing the substantially parallel upper and lower GET contacting surface of the bucket corner and the GET contacting surface transition zone;

Figure 6 is a front end view of the bucket corner of Figure 4 showing the substantially parallel outside and inside GET contacting surfaces, the substantially parallel top and bottom GET contacting surfaces of the bucket corner and the GET contacting surface transition zone of the bucket corner;

Figure 7 is a top plan view of the bucket corner of Figure 4; showing the central longitudinal axis of the boss of the bucket corner;

Figure 8 is a cross-sectional view along the line VIII-VIII of Figure 7 showing the GET connector contacting seat of the boss of the bucket corner;

Figure 9 is a side plan view of the bucket corner showing the leading edge of the bucket corner for inserting in a GET;

Figure 10 is a perspective view from below and one side of a further embodiment of a GET of the invention in which the GET is provided with contact points positioned proud of the surface of the GET for making contact with the bucket corner at specific locations, and

Figure 11 is a perspective view from above and one side of a bucket fitted with an earth moving bucket lip protection system of the invention.

Detailed Description of the Invention

[0032] Figure 1 shows a perspective view from above and one side of an earth moving equipment bucket corner 10 of the prior art fitted with a GET 20 for protecting the lip of a bucket. The GET 20 is attached to the bucket corner 10 with a mechanical GET connector 30 of the pin assembly type. Figure 2 shows an enlarged perspective view of the bucket corner 10.

[0033] As shown in the drawings, the bucket corner 10 is substantially L-shaped and is made up of a side upright portion 40 attachable to a bucket sidewall and a floor portion 50 attachable to a bucket floor lip. A sloped intermediate portion 60 extends between the sidewall portion 40 and the floor portion 50 so that the sidewall portion 40, the floor portion 50 and the intermediate portion 60 are in different planes while a boss 70 for receiving the connector 30 is provided on the sloped intermediate portion 60. Accordingly, the GET 20 makes contact with the bucket corner 10 at the sloped intermediate portion 60.. In addition, the side upright portion 40 defines an outside GET contacting surface 80 and an inside GET contacting surface 90 which are also differently sloped.

[0034] Figures 3 and 4 show a bucket corner 100, GET 110 and GET connector 120 of the invention. As outlined further below, the bucket corner 100, GET 110 and optionally the GET connector 120 in combination form an earth moving bucket lip protection system 130 of the invention.

[0035] As shown in the drawings, the bucket corner 100 is made up of a side upright portion 140 attachable to a bucket sidewall and a floor portion 150 attachable to a bucket lip. The side upright portion 140 defines an upright outside GET contacting surface 220 on the outside of the of the side upright portion 140 and an upright inside GET contacting surface 230 on the inside of the side upright portion 140 about which the GET 110 can also receive the upright side portion 140 in a mating relationship. The floor portion 150 defines a substantially horizontal plane 170 disposed perpendicular to the upright portion 140. Generally, the bucket corner 100 is a cast bucket corner 100 which can be attached to a bucket by welding the side upright portion 140 and the floor portion 150 to the bucket.

[0036] The floor portion 150 is provided with an upper GET contacting surface 180 and an oppositely disposed lower GET contacting surface 190 about which the GET 110 can receive the floor portion 150 in a mating relationship. A boss 200, configured to engage the GET 110 and having a central horizontal longitudinal axis 210 (see Figure 7), is provided on the upper GET contacting surface 180.

[0037] The bucket corner 100 is further provided with a sloped intermediate portion 240 extending between and angled with respect to the side upright portion 140 and the floor portion 150. The intermediate portion 240

meets the side upright portion 140 at a radiused corner portion 241. The intermediate portion 240 defines a top GET contacting surface 250 and a bottom GET contacting surface 260 disposed substantially parallel with the top GET contacting surface 250 about which the GET 110 can also receive the intermediate portion 240 in a mating relationship.

[0038] The bucket corner 100 has a leading edge 270 for insertion in the GET 20 defined by the side upright portion 140, the floor portion 150 and the intermediate portion 240. The leading edge 270 defines a generally vertical leading edge plane 270.

[0039] As indicated above, the boss 200 is located on the upper GET contacting surface 180 and is made up of a recess 290 defined in the upper GET contacting surface 180 for receiving the GET connector 120 and attaching the GET 110 to the bucket corner 100. More particularly, the recess 290 has a proximal leading edge end 300 and a distal bucket end 310 between which the GET connector 120 is held in place in the boss 200. At the proximal leading edge end 300, the recess 210 is provided with an upright GET connector contacting seat 320 to prevent lateral movement of the GET connector 120 and the hence the GET 110 in the boss 200 towards the leading edge 190. The GET connector contacting seat 320 defines a substantially vertical contacting seat plane 330.

[0040] The GET 110 is shaped and configured to define a tooth for penetrating material to be loaded and has a body 340 with a body outer surface 341. The body outer surface is generally made up of a top face 350 and a bottom face 360.

[0041] The top face 350 has low profile front end 370 provided with a front edge 380 for engaging material, an open bucket corner receiving end 390, a first side 400 and an opposite second side 410. The bucket corner receiving end 390 has a substantially horizontal slot 420 and a substantially vertical slot 430 defined by an upstanding wall 440 and contiguous with the horizontal slot 420 for receiving the bucket corner 100 at the leading edge 270.

[0042] The horizontal slot 420 is defined by a horizontal slot top face 450, a horizontal slot bottom face 460 and a horizontal slot end face 470 while the vertical slot 430 is similarly defined by a vertical slot first side face 480, a vertical slot second side face 490 and a vertical slot end face 500. The faces 450, 460, 480 and 490 of the horizontal slot 420 and the vertical slot 430 are shaped and contoured with surfaces 361, 362, 363, 364 and 365 complementary with the upper GET contacting surface 180, the intermediate portion 240, the radiused corner portion 24, the inside GET contacting surface 230 and the outside GET contacting surface 220 respectively of the bucket corner 100 to ensure an effective mating relationship.

[0043] The GET 110 is provided with a GET connector receiving notch 510 which extends inwards from the bucket corner receiving end 390 and through the GET 110. Following mounting of the GET 110 on the bucket corner 100, the GET connector 120 is inserted into the notch 510 so that the pin assembly (not shown) in the GET connector 120 can hold the GET 110 in place on the bucket corner 100.

[0044] Figure 5 shows a perspective view from above and one side of the bucket corner 100 of Figure 4. As shown in the drawing, the upper GET contacting surface 180 is substantially parallel or nearly parallel with the lower GET contacting surface 190 to facilitate an improved grip between the bucket corner 100 and the GET 110 at the contacting surfaces 180,190. More particularly, as the boss 200 is located on the upper GET contacting surface 180 which is substantially horizontal and also parallel with the lower GET contacting surface 190, the GET connector 120 (and particularly the pin assembly) is subjected to reduced reaction forces in use.

[0045] The upper GET contacting surface 180 is typically parallel with the lower GET contacting surface 190 to within an angle ϕ of from about 0° to about 5° (see also Figure 9)

[0046] In addition, the sloped intermediate portion 240 can be angled with respect to the side upright portion 140 and the floor portion 150 at an angle α of between about 10° and about 60° (see also Figure 6). This angle allows for space for additional wear material of the shroud. The exact angle α can be selected according to the dimensions of, and hence the amount of wear material required in, the GET 110. As shown in the drawing, the side upright portion 140, the floor portion 150 and the intermediate portion 240 are provided with a chamfer 520 between the leading edge 270 and the inside GET contacting surface 230, the upper GET contacting surface 180 and the top GET contacting surface 250. The chamfer 520 allows for a lower profile bucket corner profile towards the leading edge 270.

[0047] Figure 5 also shows a GET contacting surface transition zone 540 defined between the leading edge 270 and the upper GET contacting surface 180. The transition zone 540 allows for a smooth transition between the leading edge 270 and the chamfer 520. The transition zone also allows for a smooth transition between the bucket corner 100 and a sloped lip 650 of a bucket 630 (see also Figure 11). The transition zone 540 is cut into a corner 550 of the bucket corner 100 defined between the proximal leading end 300 and the free edge 560 of the floor portion 150. The transition zone 540 is made up of a bevel 570 formed in the floor portion 150 from a radiused surface 580, having a radius R, and a first sloped surface 590 which intersects and is contiguous with a first side of the radiused surface 580.

[0048] In the present embodiment, the transition zone 540 is further provided with an optional second sloped surface 600 intersecting with a second side of the radiused surface 580 to form the transition zone. The transition zone 540 also serves to minimise stress on the bucket corner 100 in use to reduce fatigue and optimise the life of the bucket corner 100.

[0049] In an alternative embodiment, the transition zone 540 can be formed from a chamfer instead of the radiused surface 580 and the sloped surface(s) 590, 600.

[0050] In another embodiment of the invention, the transition zone 540 can be omitted where the lip 650 of the bucket 630 is not sloped.

[0051] Figure 6 is a front end view of the bucket corner 100 of Figure 4. As shown in the drawing, the outside GET contacting surface 220 on the outside of the of the side upright portion 140 and the inside GET contacting surface 230 on the inside of the side upright portion 140 are disposed substantially parallel with each other. This arrangement allows for improved dimensional control of the bucket corner 100 during casting and an improved fit with the GET 110 as sloped contacting surfaces between the bucket corner 100 and GET 110 are further eliminated. As a consequence, as before, the GET connector 120 (and particularly the pin assembly) is subjected to reduced reaction forces in use.

[0052] In addition, as indicated above, the top GET contacting surface 250 and bottom GET contacting surface 260 of the intermediate portion 240 are substantially parallel with the top GET contacting surface 250. This parallel configuration also allows for improved dimensional control of the bucket corner 100 during casting, an improved GET 110 and reduced reaction forces on the GET connector 120 in use.

[0053] Figure 6 also shows the angle γ in the GET contacting transition zone 540 defined between the radiused surface 580 (and the second sloped surface 600 where present) and the first sloped surface 590 towards the leading edge 270. This angle can be between about 90° and about 179°, preferably between about 90° and about 160°. The angle γ and the radius R can be selected to optimise the stress performance of the bucket corner 100.

[0054] Also, as shown in Figure 6, the angle α defines the angle between the slope of the intermediate portion 240 and the horizontal plane 170 of the floor portion 150. In the present embodiment, the angle α is configured to be less than about 20° and preferably at about 15° to allow increased boss space on the floor portion 150 and reduce the risk of GET sliding.

[0055] Figure 7 shows a top plan view of the bucket corner 100. As shown in the drawing, the central longitudinal axis 210 of the boss 200 is configured to be substantially parallel with the outside and inside GET contacting surfaces 220, 230 of the side upright portion 140. The central longitudinal axis 210 and in particular the inside GET contacting surface 230 can be parallel to within +/- 10° while a completely parallel configuration is optimal. This parallel arrangement also facilitates a highly effective fit between the bucket corner 100 and the GET 110.

[0056] Figure 8 shows a cross-sectional view along the line VIII-VIII of Figure 7. As shown in the drawing, the leading edge plane 270, and the contacting seat plane 330 of the contacting seat 320 are substantially parallel which also serves to reduce the bending moment and reaction force on the GET connector pin assembly. Typically, the leading edge plane 270 and the contacting seat plane 330 are substantially parallel to within an angle ω of from about 0° to about 20°, preferably about 5° to about 10°.

[0057] As indicated above, the bucket corner 100 is provided with a leading edge 270, which as shown in Figure 9, defines a generally vertical leading edge plane 270. Figure 9 also shows the upper GET contacting surface 180 being configured to be substantially parallel or nearly parallel with the lower GET contacting surface 190.

[0058] Figure 10 shows a perspective view from below and one side of a further embodiment of a GET 110 of the invention. In the present embodiment, the GET 110 is provided with (raised) bucket corner contact points 610 positioned on the surface 341 of the GET 340 so that the contact points 610 stand proud of the surface 341. Accordingly, the GET 110 only makes contact with the bucket corner 100 at specific locations determined by the contact points 610. In the present embodiment, the contact points 610 are formed by pads 620 provided on the GET surface 341.

[0059] In the present embodiment, the contact points 610 are provided on the shaped and contoured surfaces 361 and 364 of the GET 110 which are complementary with the upper GET contacting surface 180 and the inside GET contacting surface 230 respectively of the bucket corner 100. However, additional or other contact points 610 can be located on the GET 110 as required.

[0060] The contact points 610 provide pre-defined contact areas between the GET and the bucket corner 100 to help ensure an optimal fit between the bucket corner 100 and the GET 110. This configuration also allows for better control of mating faces and support positions between the bucket corner 100 and a GET 110.

[0061] Figure 11 shows a perspective view from above and one side of a bucket 630 fitted with an earth moving bucket lip protection system 130 of the invention. As shown in the drawing, the bucket lip protection system 130 is made up of a bucket corner 100, a GET 110 and a GET connector 120 as previously described. The bucket corner 100 is secured to the bucket 630 by locating the side upright portion 140 of the bucket corner 100 at a sidewall 640 of the bucket 630 and the floor portion 150 of the bucket corner 100 at the adjacent lip 650 of the bucket 630 so that the side upright portion 140 is contiguous with the bucket sidewall 640 and the floor portion 150 is contiguous with the lip 650. Generally, the bucket corner 100 can be attached to the bucket 630 by a welding step.

Claims

1. An earth moving equipment bucket corner (100) comprising:

a side upright portion (140) attachable to a bucket sidewall (640), the side upright portion (140) defining an upright outside GET contacting surface (220) on the outside of the of the side upright portion (140) and an upright inside GET contacting surface (230) on the inside of the side upright portion (140);
a floor portion (150), defining a horizontal plane (170), attachable to a bucket floor lip (650), the floor portion (150) having an upper GET contacting surface (180) and a lower GET contacting surface (190);
an intermediate portion (240) extending between and angled with respect to the side upright portion (140) and the floor portion (150), wherein a boss (200), having a central horizontal longitudinal axis (210) and configured to engage a GET (110), is provided on the upper GET contacting surface (180) and the upper GET contacting surface (180) is parallel with the lower GET contacting surface (190).

2. An earth moving equipment bucket corner (100) as claimed in Claim 1 wherein the upper GET contacting surface (180) is parallel with the lower GET contacting surface (190) to within an angle ϕ of from about 0° to about 5°.

3. An earth moving equipment bucket (100) corner as claimed in Claim 1 or Claim 2 wherein the outside GET contacting surface (220) and the inside GET contacting surface (230) are parallel.

4. An earth moving equipment bucket corner (100) as claimed in Claim 3 wherein the intermediate portion (240) defines a top GET contacting surface (250) and a bottom GET contacting surface (260) disposed parallel with the top GET contacting surface (250).

5. An earth moving equipment bucket corner (100) as claimed in Claim 4 wherein the side upright portion (140), the floor portion (150) and the intermediate portion (240) comprise a leading edge (270), defining a leading edge plane (270), for insertion in a GET (110) and the boss (200) comprises a recess (290) in the upper GET contacting surface (180) for abutting a GET connector (120) at an upright GET connector contacting seat (320), which defines a contacting seat plane (330), wherein the leading edge plane (270) and the contacting seat plane (330) are parallel.

6. An earth moving equipment bucket corner (100) as claimed in Claim 5 wherein the leading edge plane (270) and the contacting seat plane (330) are parallel to within an angle ω of from about 0° to about 20°.

7. An earth moving equipment bucket corner (100) as claimed in Claim 5 or Claim 6 wherein the side upright portion (140), the floor portion (150) and the intermediate portion (240) comprise a chamfer (520) between the leading edge (270) and the inside GET contacting surface (230), the upper GET contacting surface (180) and the top GET contacting surface (250) respectively.

8. An earth moving equipment bucket corner (100) as claimed in any of Claims 5 to 7 comprising a GET contacting surface transition zone (540) between the leading edge (270) and the upper GET contacting surface (180) wherein the transition zone (540) comprises a bevel (570) formed from a radiused surface (580) and a first sloped surface (590) intersecting with a first side of the radiused surface (580).

9. An earth moving equipment bucket corner (10) as claimed in Claim 8 wherein the transition zone (540) further comprises a second sloped surface (600) intersecting with a second side of the radiused surface (580).

10. An earth moving equipment bucket corner (100) as claimed in any of Claims 1 to 9 wherein the central horizontal longitudinal axis (210) of the boss (200) and the inside GET contacting surface (230) of the side upright portion (140) are parallel to within +/- 10°.

11. An earth moving bucket lip protection system (130) comprising:

a bucket corner (100) as claimed in any of Claims 1 to 10 and
a GET (110) for connection with the bucket corner (100).

12. An earth moving bucket lip protection system (130) as claimed in Claim 11 wherein the GET (110) is connectable with the bucket corner (100) at defined contact points (610) on the GET (110) configured to stand proud of the outer surface (341) of the GET (110).

13. An earth moving bucket lip protection system (130) as claimed in Claim 12 wherein the GET (110) comprises pads (620) defining the contact points (610).

14. An earth moving bucket lip protection system (130) as claimed in any of Claims 11 to 13 further comprising a GET connector (120) for reversibly attaching the GET (110) to the bucket corner (100) at the boss (200).

15. An earth moving equipment bucket (630) comprising a bucket corner (100) as claimed in any of Claims 1 to 10 or an earth moving bucket lip protection system

(130) as claimed in any of Claims 11 to 14.

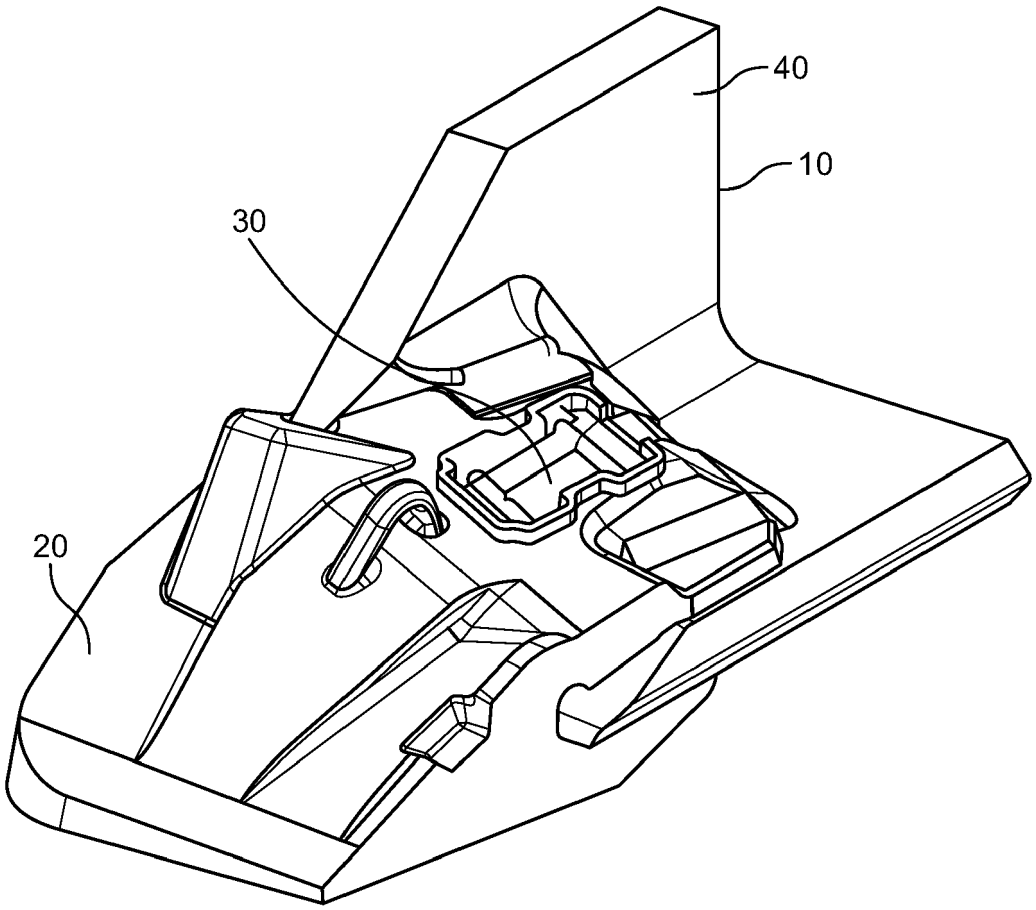

FIG. 1

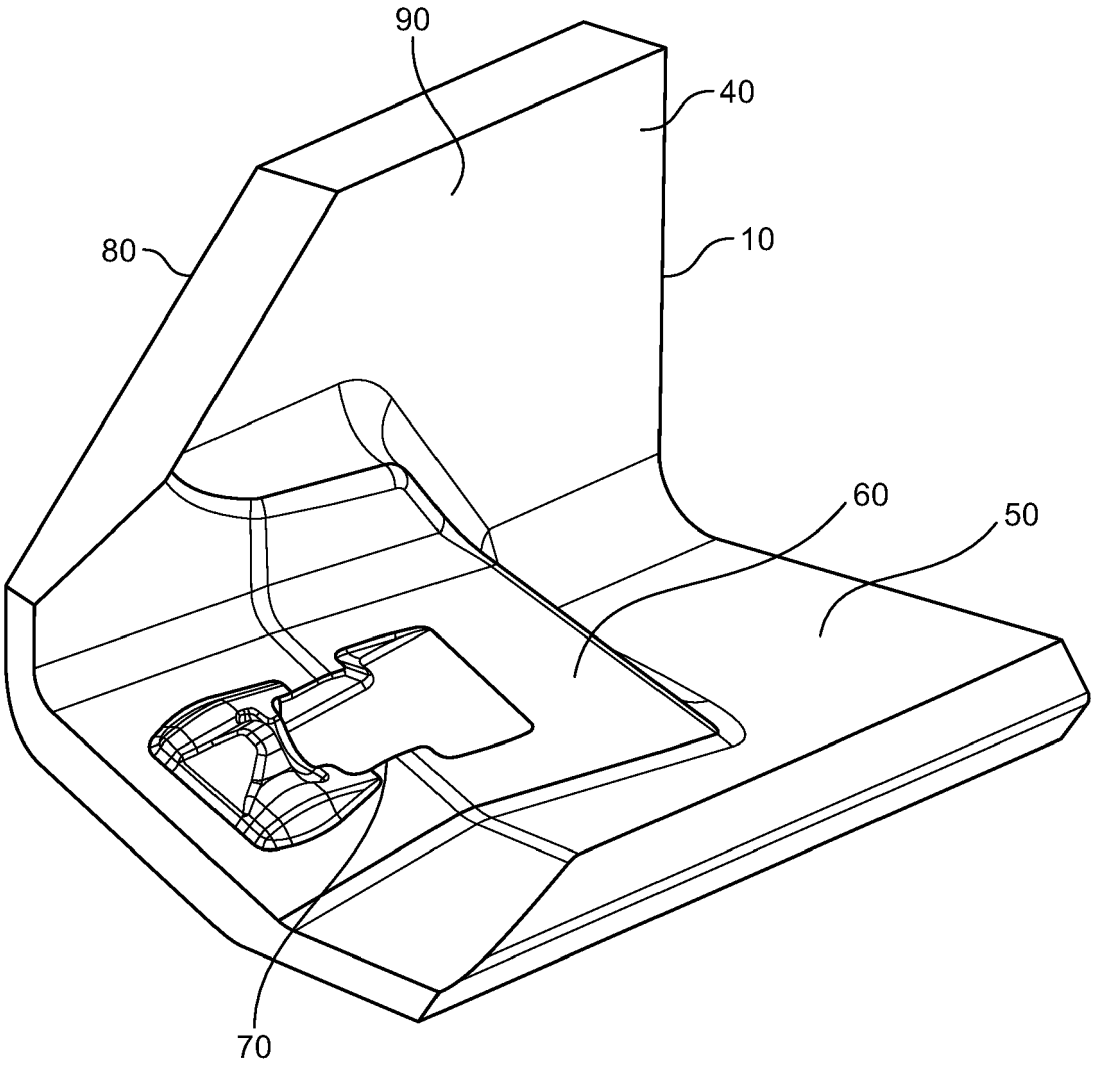

FIG. 2

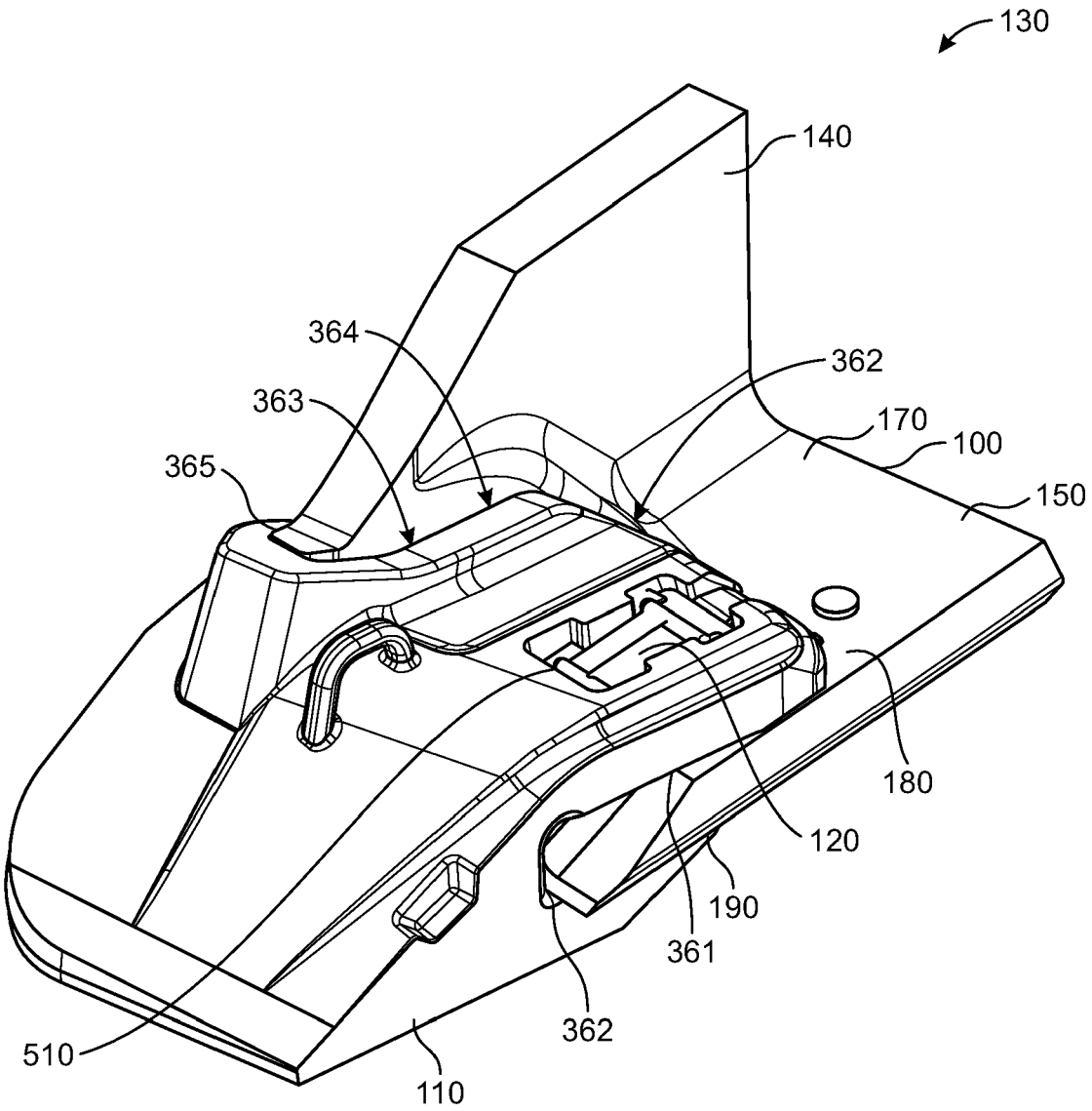

FIG. 3

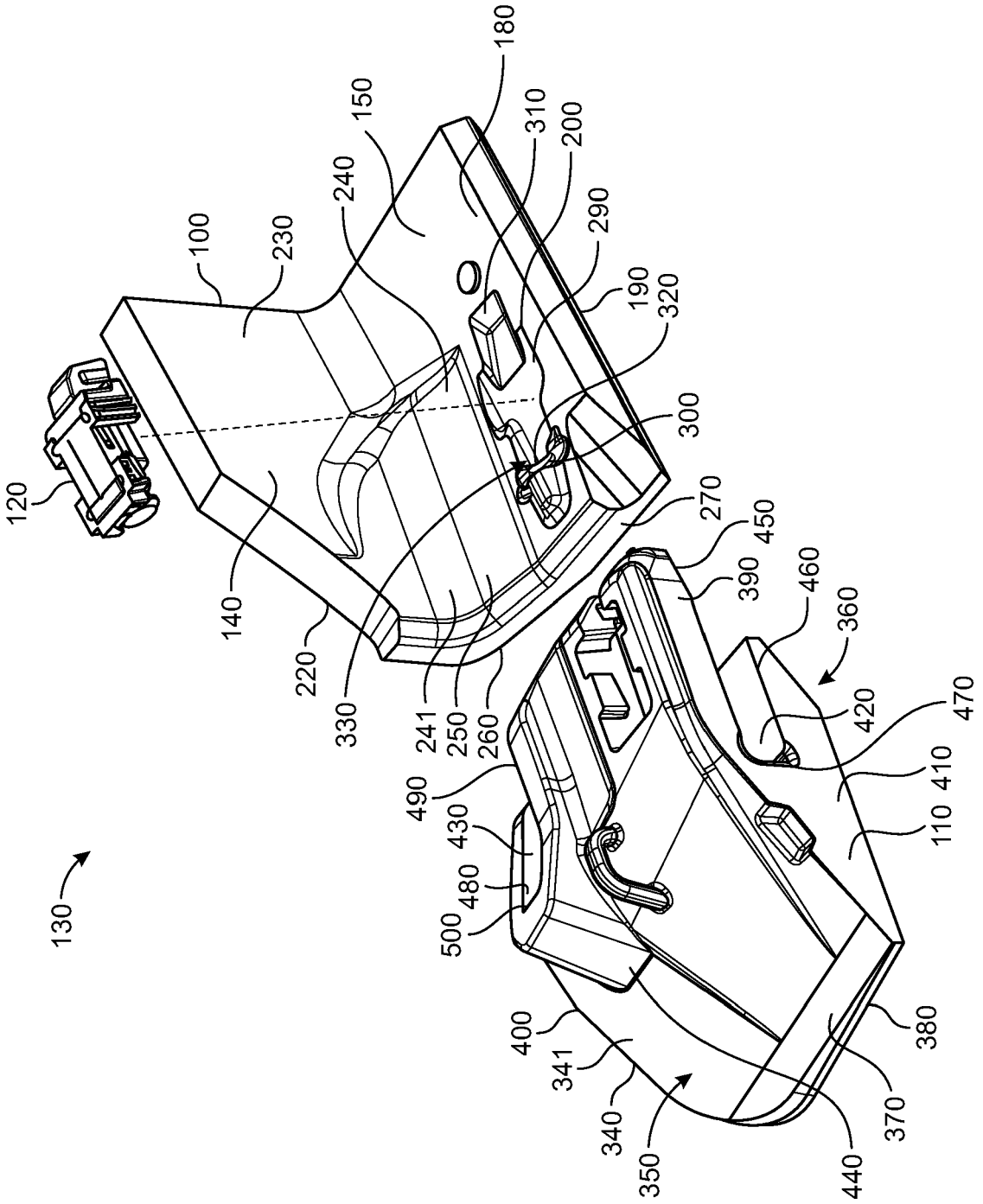
180
150
310
200
240
290
100
230
190
320
300
120
270
450
390
460
360
140
220
330
241
250
260
420
470
490
410
430
110
480
500
400
341
380
340
370
350
440
130

FIG. 4

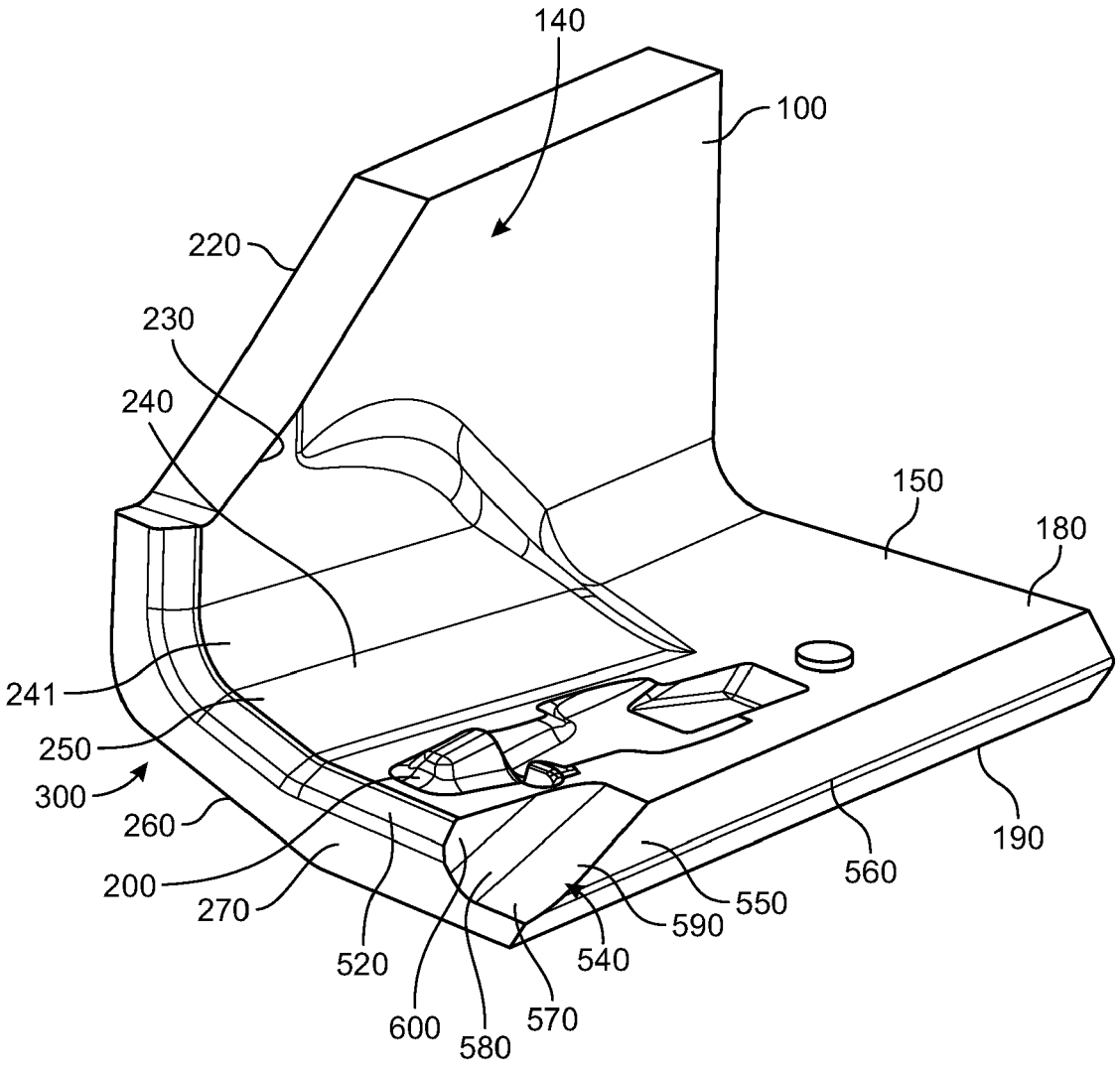
140
100
220
230
240
150
180
241
250
300
260
200
270
520
600
580
570
540
590
550
560
190

FIG. 5

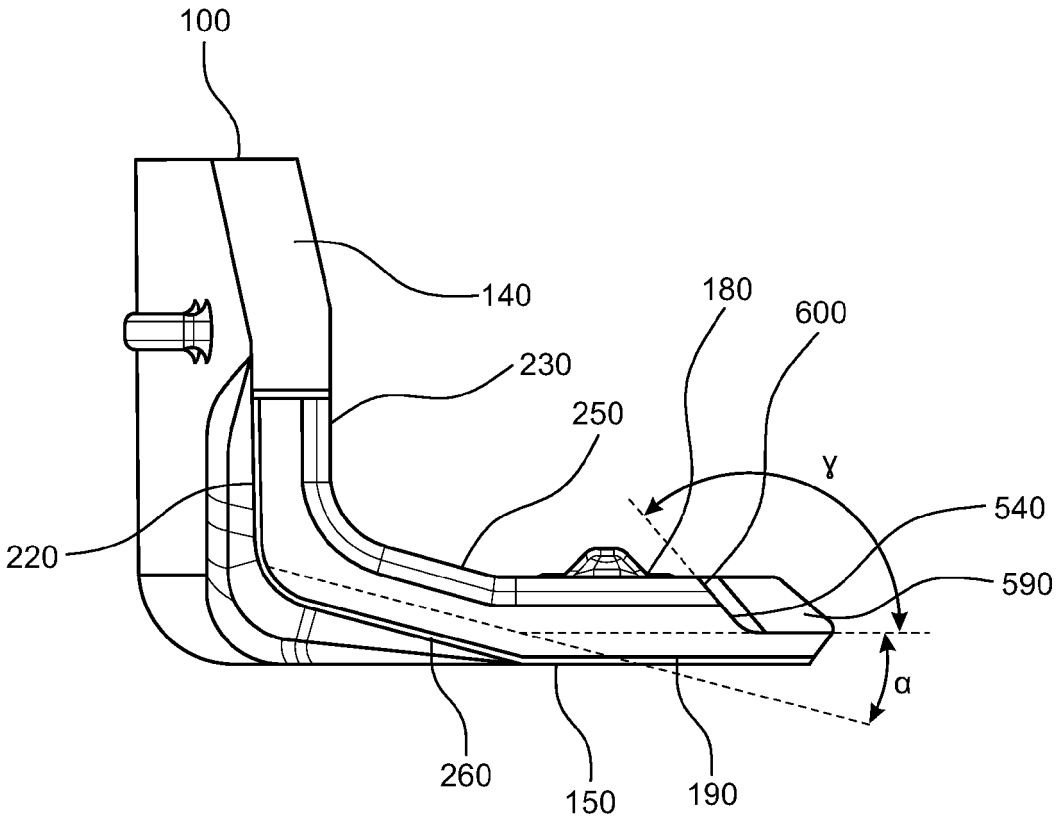
100
140
180
600
230
250
γ
540
220
590
α
260
150
190

FIG. 6

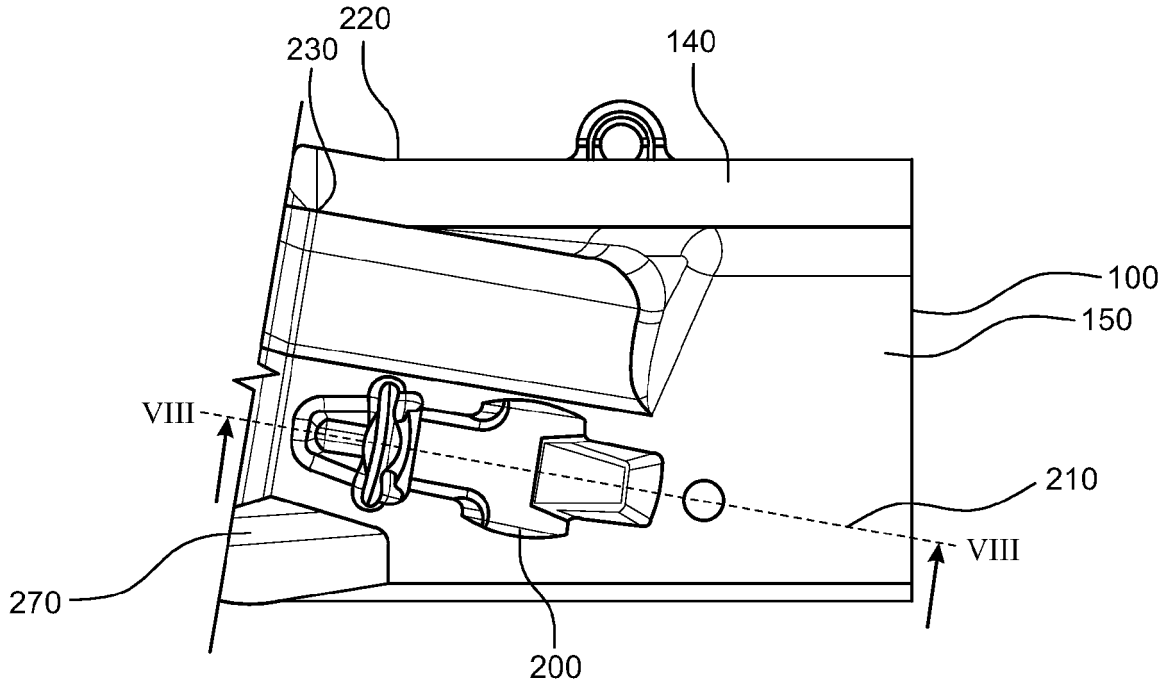
220
230
140
100
150
VIII
210
VIII
270
200

FIG. 7

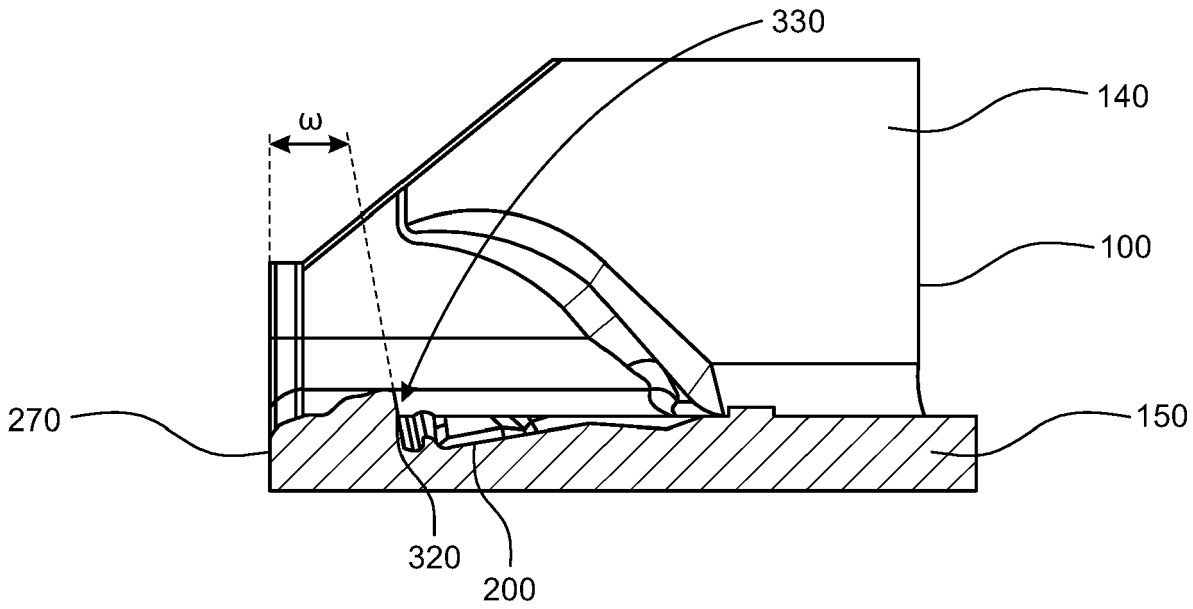

FIG. 8

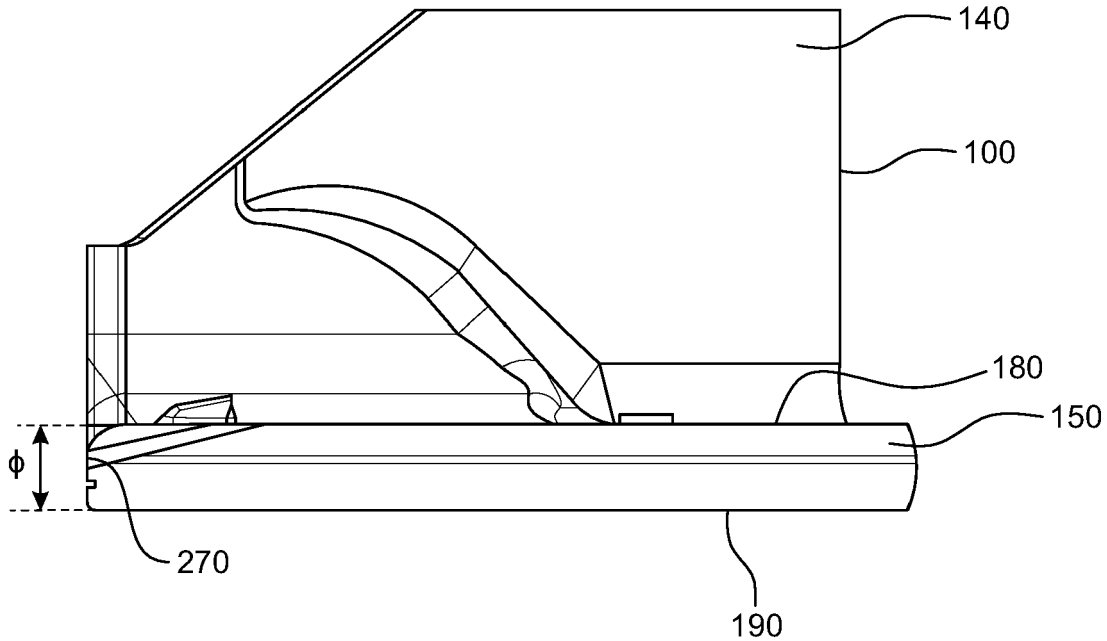

FIG. 9

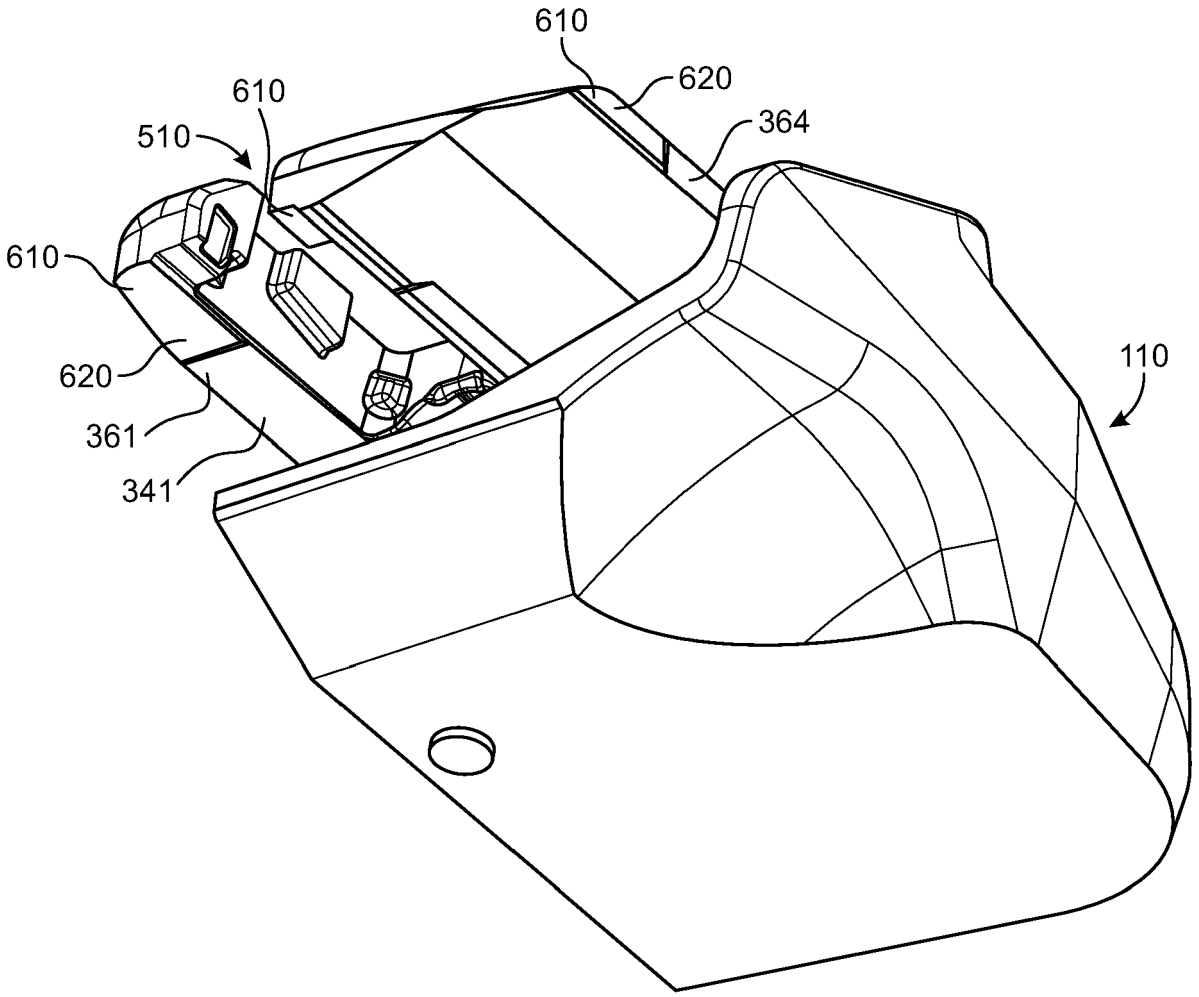

FIG. 10

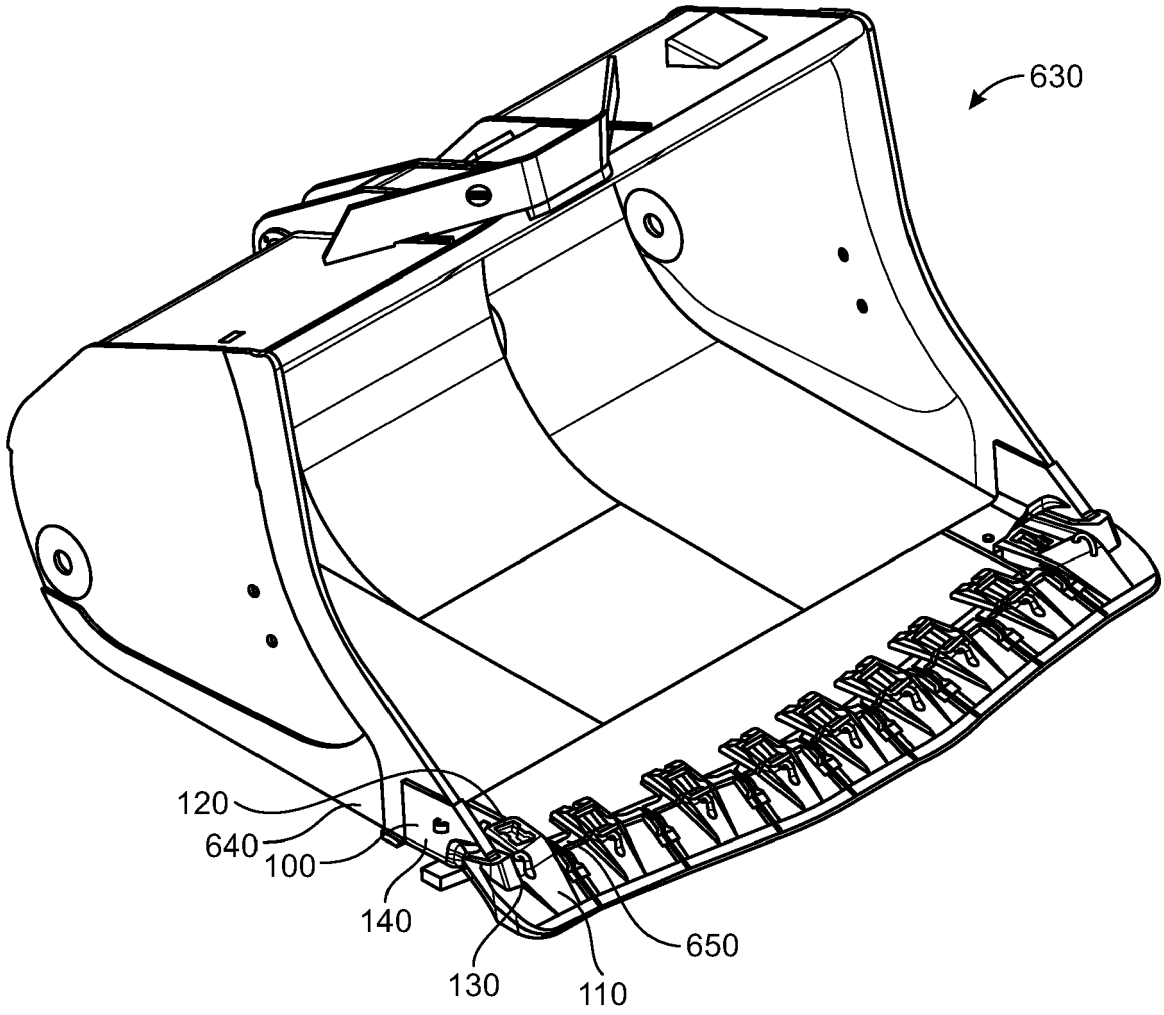

FIG. 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 21 4481

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2017/075663 A1 (TALON ENG SDN BHD [MY]; DENNIS NEIL [MY]) 11 May 2017 (2017-05-11) * figures 1-4 *	1-15	INV. E02F9/28
A	US 2015/211215 A1 (DALLARD BRADLEY JOHN [AU] ET AL) 30 July 2015 (2015-07-30) * figures 1-4 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

E02F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 June 2022	Rocabruna Vilardell

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 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 21 4481

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-06-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017075663 A1	11-05-2017	NONE	
US 2015211215 A1	30-07-2015	AU 2013311372 A1	02-04-2015
		BR 112015004687 A2	04-07-2017
		CA 2882838 A1	13-03-2014
		CL 2015000457 A1	02-10-2015
		CN 104603370 A	06-05-2015
		EA 201590496 A1	30-06-2015
		EP 2893089 A2	15-07-2015
		MX 356066 B	14-05-2018
		MY 171410 A	11-10-2019
		US 2015211215 A1	30-07-2015
		WO 2014037781 A2	13-03-2014

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2014037781 A **[0007]**