

(19)



(11)

EP 3 045 591 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.07.2016 Bulletin 2016/29

(51) Int Cl.:
E02F 9/28 (2006.01) **B23P 11/00** (2006.01)
E01H 5/06 (2006.01)

(21) Application number: **15000083.4**

(22) Date of filing: **14.01.2015**

(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

(72) Inventor: **Van Loon, John**
5366 AB Megen (NL)

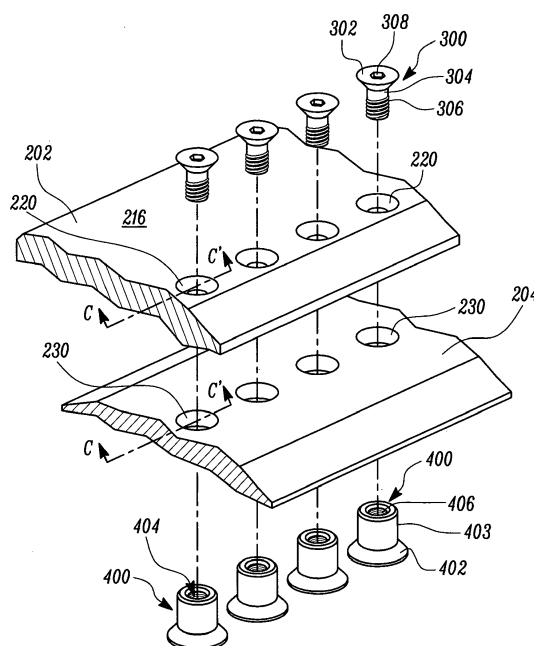
(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Thierschstrasse 11
80538 München (DE)

(71) Applicant: **Caterpillar Work Tools B. V.**
5232 BJ 's-Hertogenbosch (NL)

(54) Cutting edge for a work tool

(57) A cutting edge member (204) for a work tool (200) configured to be detachably fastened to a base edge member (202) using a bolt (300) and a sleeve member (400) is provided. The cutting edge member (204) defines holes (230) that includes a lower portion (234) proximate to a bottom surface (217) of the cutting edge member (204) and an upper portion (232) distal to the bottom surface (217). The lower portion (234) receives

a head (402) of the sleeve member (400) therein. The upper portion (232) partly receives an elongate portion (403) of the sleeve member (400) that extends into a corresponding hole (220) defined in the base edge member (202) and is in a threaded engagement with the bolt (300). A head (302) of the bolt (300) and a top surface (216) of the base edge member (202) are substantially flush and co-planar relative to each other.

**FIG. 3****EP 3 045 591 A1**

Description

Technical Field

[0001] The present disclosure relates to a work tool for a machine and more specifically to a cutting edge and a side bar for a work tool.

Background

[0002] Various construction and mining machines use a work tool such as, a bucket, a grapple, a demolition tool or the like for carrying out various operations, such as digging, sorting, demolition and the like. Typically, a cutting edge may be fastened to a base edge of the work tool for accomplishing cutting operations and to reduce wear on the base edge. The cutting edge member may be detachably coupled to the work tool by various attachment systems. Conventionally, a bolts and nuts may be used to accomplish the coupling.

[0003] In some cases, parts of the attachment systems such as, bolt heads, nuts and the like may protrude from at least one of a top surface and a bottom surface of the work tool or the cutting edge. However, such protrusions may obstruct a flow of material on the surface of the work tool. Moreover, the material may be accumulated inside and/or around the protruding parts. Additionally, it may also be difficult to disassemble the attachment systems from the work tool.

Summary of the Disclosure

[0004] In one aspect of the present disclosure, a cutting edge member for a work tool is provided. The cutting edge member is configured to be detachably fastened to a base edge member using a bolt and a sleeve member. The cutting edge member defines a plurality of holes therethrough. Each of the plurality of holes includes a lower portion proximate to a bottom surface of the cutting edge member. The lower portion is configured to receive a head of the sleeve member therein. Each of the plurality of holes also includes an upper portion distal to the bottom surface of the cutting edge member. The upper portion is configured to partly receive an elongate portion of the sleeve member therein. The elongate portion is configured to extend into a corresponding hole defined in the base edge member. The elongate portion is further configured to be in a threaded engagement with the bolt received in the corresponding hole defined in the base edge member. Further, a head of the bolt and a top surface of the base edge member are substantially flush and co-planar relative to each other.

[0005] In another aspect of the present disclosure, a work tool for an earthmoving machine is provided. The work tool includes a base edge member defining a first plurality of holes therein. The work tool also includes a cutting edge member defining a second plurality of holes coaxially aligned with the first plurality of holes. The work

tool further includes a bolt and a sleeve member. The bolt is disposed in each of the first plurality of holes such that, a head of the bolt and a top surface of the base edge member are substantially flush and co-planar relative to each other. The sleeve member is disposed in each of the second plurality of holes of the cutting edge member. Further, the sleeve member is in a threaded engagement with the bolt.

[0006] In yet another aspect of the present disclosure, work tool edge assembly for an earthmoving machine is provided. The work tool edge assembly includes a base edge member that defines a first plurality of holes therethrough. Each of the first plurality of holes includes a first portion proximate to a bottom surface of the base edge member and a second portion distal to the bottom surface. The work tool edge assembly also includes a bolt at least partly disposed in the second portion of each of the first plurality of holes. The work tool edge assembly includes a cutting edge member that is configured to be detachably fastened to the base edge member. The cutting edge member defines a second plurality of holes that are coaxially aligned with the first plurality of holes. Each of the second plurality of holes includes a lower portion proximate to a bottom surface of the cutting edge member and an upper portion distal to the bottom surface of the cutting edge member. The work tool edge assembly further includes a sleeve member that includes a head disposed in the lower portion of each of the second plurality of holes. The sleeve member also includes an elongate portion partly disposed in the first portion of each of the first plurality of holes of the cutting edge member and extending into the upper portion of the corresponding second plurality of holes. The elongate portion is further configured to be in a threaded engagement with the bolt received in the first plurality of holes defined in the base edge member.

[0007] Other features and aspects of this disclosure will be apparent from the following description and the accompanying drawings.

Brief Description of the Drawings

[0008]

FIG. 1 is a perspective view of an exemplary machine;

FIG. 2 is a perspective view of an exemplary work tool of the machine, according to an embodiment of the present disclosure;

FIG. 3 is an exploded view of a base edge member and a cutting edge member of the work tool fastened to each other using a bolt and a sleeve member, according to an embodiment of the present disclosure;

FIG. 4 is a cross-sectional view of the work tool taken along a section line C-C' of FIG. 3, according to an embodiment of the present disclosure;

FIG. 5 is a top view of the work tool, according to

another embodiment of the present disclosure; and FIG. 6 is a bottom view of the work tool, according to another embodiment of the present disclosure.

Detailed Description

[0009] Reference will now be made in detail to specific embodiments or features, examples of which are illustrated in the accompanying drawings. Wherever possible, corresponding or similar reference numbers will be used throughout the drawings to refer to the same or corresponding parts. FIG. 1 illustrates an exemplary earthmoving machine 100 (hereinafter referred to as "the machine 100") according to one embodiment of the present disclosure. In the illustrated embodiment, the machine 100 is an excavating machine. However, it may be contemplated that the machine 100 may be any other machine known in the art, such as a wheel loader, a track loader, a dump truck, a shovel and the like, used for various industries including construction, mining, agriculture and transportation.

[0010] The machine 100 may include a power source such as an engine (not shown), an operator station or a cab 106 supported on a frame 104. The cab 106 may include input devices and operator interfaces for receiving inputs from an operator and operating the machine 100. The machine 100 may include a set of ground engaging members 102 for steering and maneuvering the machine 100, and for propelling the machine 100 in forward and reverse directions. In the illustrated embodiment, the ground engaging members 102 are track assemblies.

[0011] As illustrated in FIG. 1, the machine 100 includes a work tool 200. The work tool 200 is embodied as an excavating bucket. The work tool 200 may be fastened to the machine 100 using a coupling assembly 108 for example, a boom and stick. The work tool 200 may be configured to perform different operations such as digging, loading, dumping, and the like. In various alternate embodiments, the work tool 200 may be a grapple, a demolition tool, a snow plow, and the like. Referring to FIG. 2, the work tool 200 may include a curved heel section 208 and a base section 206 extending horizontally therefrom. The base section 206 may include a base edge member 202 distally located from the heel section 208.

[0012] The work tool 200 may further include laterally spaced sidewalls 210, 212 extending from opposing ends of the base section 206. The sidewalls 210, 212 are laterally disposed in relation to the base section 206 and the heel section 208. Different elements and structures may be used to form the work tool 200, as will be apparent to those of ordinary skill in the art. For example, the heel section 208, the sidewalls 210, 212 or the base section 206 may include shroud members, teeth and the like.

[0013] The work tool 200 also includes a cutting edge member 204 that may be fastened to the base edge member 202. In an example, the cutting edge member 204

may be a blade that may be used to perform various cutting operations. The cutting edge member 204 and the base edge member 202 may together constitute a work tool edge assembly. Such a work tool edge assembly may be implemented on various work tools such as, a bucket, a grapple, a snow plow and the like to perform various operations. In the illustrated embodiment, the work tool edge assembly will be explained in conjunction with the work tool 200 as described above.

[0014] Referring to FIG. 3, the base edge member 202 defines a first plurality of holes 220 therethrough. Similarly, the cutting edge member 204 defines a second plurality of holes 230 coaxially aligned with the first plurality of holes 220. The base edge member 202 may be coupled to the cutting edge member 204 using multiple fasteners inserted into each of the first plurality of holes 220 and the second plurality of holes 230. Moreover, the coupling may be such that, a top surface 216 of the base edge member 202 and the corresponding fasteners are substantially flush or co-planar relative to each other as shown in FIG. 2. Further, a bottom surface 217 (shown in FIG. 4) of the cutting edge member 204 and the corresponding fasteners are substantially flush or co-planar relative to each other.

[0015] In the illustrated embodiment, the coupling may be established using a bolt 300 and a sleeve member 400 inserted into each of the first plurality of holes 220 and the second plurality of holes 230 respectively. Further, the bolt 300 and the sleeve member 400 are configured to fasten the base edge member 202 to the cutting edge member 204. Moreover, multiple bolts 300 and the sleeve members 400 may be used to fasten the cutting edge member 204 to the base edge member 202. The first plurality of holes 220 and the second plurality of holes 230 will be explained later in the document with reference to FIG. 4. The bolt 300 and the sleeve member 400 will be explained hereinafter with reference to FIGS. 3 and 4.

[0016] In the illustrated embodiment of FIG. 3, the bolt 300 includes a head 302 and a shank portion 304 extending from the head 302. The shank portion 304 may include a plurality of external threads 306 disposed thereon. Further, the bolt 300 defines a central hole 308 therethrough.

[0017] The sleeve member 400 includes an elongate portion 403 and a head 402 disposed thereon. The sleeve member 400 also defines a central hole 404 therethrough. The central hole 404 may be coaxially aligned with the central hole 308 defined in the bolt 300. The central hole 404 is configured to receive at least partly the shank portion 304 of the bolt 300 therein. Further, the central hole 404 includes a plurality of internal threads 406 disposed thereabout. The internal threads 406 may be configured to be in a threaded engagement with the external threads 306 of the shank portion 304. Further, the central holes 308, 404 of the bolt 300 and the sleeve member 400 together define a continuous passage. As such, the bolt 300 and the sleeve member 400 may allow a passage of air therethrough.

[0018] In an example, the central holes 308, 404 may have a circular cross-section in the shank portion 304 and the elongate portion 403 respectively, thereby enabling removal of the corresponding bolt 300 and the sleeve member 400 by a cutting torch or a suitable machining tool. Further, the central holes 308, 404 may have a hexagonal cross-section in the heads 302, 402 of the corresponding bolts 300 and the sleeve members 400. The hexagonal cross-section may facilitate usage of a key, for example an allen key, to tighten the bolts 300 and the sleeve members 404 that are inserted into the first and second plurality of holes 220, 230 respectively.

[0019] Referring to FIGS. 3 and 4, each of the first plurality of holes 220 defined in the base edge member 202 includes a first portion 226 proximate to a bottom surface 215 of the base edge member 202. The first portion 226 is configured to at least partly receive the sleeve member 400 therein. Specifically, the first portion 226 may be configured to at least partly receive the elongate portion 403 of the sleeve member 400 therein. In an embodiment, the sleeve member 400 may be press-fitted into the first portion 226 of each of the first plurality of holes 220. As such, the first portion 226 may have a configuration corresponding to a configuration of the sleeve member 400. For example, the first portion 226 may be configured to have a substantially cylindrical shape having a diameter greater than or equal to a diameter of the sleeve member 400.

[0020] Each of the first plurality of holes 220 also includes a second portion 224 distal to the bottom surface 215 of the base edge member 202. The second portion 224 is configured to at least partly receive the bolt 300 therein. Specifically, the second portion 224 is configured to partly receive the shank portion 304 of the bolt 300.

[0021] Each of the first plurality of holes 220 may also include a third portion 222 proximate to the top surface 216 of the base edge member 202. The third portion 222 may be configured to receive the head 302 of the bolt 300 therein. The third portion 222 may have a configuration that conforms to a configuration of the head 302 of the bolt 300. In the illustrated embodiment, the third portion 222 is tapered to accommodate the head 302 of the bolt 300. Moreover, upon inserting the bolt 300 into the corresponding first plurality of holes 220 of the base edge member 202, the head 302 of the bolt 300 and the top surface 216 of the base edge member 202 are substantially flush and co-planar relative to each other (shown in FIG. 5). As such, the bolt 300 may not obstruct a flow of material on the top surface 216 of the base edge member 202.

[0022] Referring still to FIGS. 3 and 4, each of the second plurality of holes 230 defined in the second plurality of holes 230 includes an upper portion 232 distal to the bottom surface 217 of the cutting edge member 204. The upper portion 232 is configured to partly receive the elongate portion 403 of the sleeve member 400 therein. Moreover, the upper portion 232 of the second plurality of holes 230 and the first portion 226 of the first plurality of holes

220 may be relatively configured so as to fully receive the elongate portion 403 of the sleeve member 400 therein. For example, a sum of lengths of the upper portion 232 and the first portion 226 may be substantially equal to a length of the elongate portion 403.

[0023] Each of the second plurality of holes 230 further includes a lower portion 234 proximate to the bottom surface 217 of the cutting edge member 204. The second portion 224 is configured to receive the head 402 of the sleeve member 400 therein. Moreover, upon fastening the base edge member 202 to the cutting edge member 204, the head 402 of the sleeve member 400 and the bottom surface 217 of the cutting edge member 204 are substantially flush and co-planar relative to each other (shown in FIG. 6).

[0024] Further, the coupling between the base edge member 202 and the cutting edge member 204 may be accomplished by the threaded engagement between the internal threads 406 of the sleeve member 400 and the external threads 306 of the bolt 300. In an embodiment, an adhesive such as loctite may also be used to attach the bolt 300 to the sleeve member 400 in addition to the threaded engagement.

[0025] It may be apparent to a person ordinarily skilled in the art, that various details of the first and second plurality of holes 220, 230, the bolts 300 and the sleeve members 400 as described above with reference to the base edge member 202 and the cutting edge member 204 respectively, may also be applicable to other components that require coupling such as, the sidewalls 210, 212 of the work tool 200, corresponding wear assemblies, cutters and the like. For example, the cutting edge member 204 may be a wear member that is coupled to the sidewalls 210, 212 of the work tool 200. In another example, the cutting edge member 204 may be coupled to a grapple using the bolt 300 and the sleeve member 400. Accordingly, the grapple may define the first plurality of holes 220 as described above. Further, the bolt 300 and the sleeve member 400, as described above, is exemplary in nature and alternative configurations are possible within the scope of the present disclosure.

Industrial Applicability

[0026] The present disclosure is related to the work tool 200 for the machine 100. The work tool 200 includes the base edge member 202 and the cutting edge member 204 fastened to each other using the bolt 300 and the sleeve member 400. The work tool 200 and the cutting edge member 204 includes the first plurality of holes 220 and the second plurality of holes 230 coaxially aligned with each other.

[0027] The sleeve member 400 may be inserted into the second plurality of holes 230. In an example, a key may be used to insert the sleeve member 400. Similarly, the bolt 300 may be inserted into the first plurality of holes 220. The bolt 300 may be further received in the central hole 404 defined in the sleeve member 400. Further, the

external threads 306 disposed on the bolt 300 may be threadably engaged with the internal threads 406 disposed in the sleeve member 400. As such, the base edge member 202 may be fastened to the cutting edge member 204. Additionally, adhesives may be also used to attach the bolt 300 to the sleeve member 400.

[0028] The work tool 200 described herein may have the top surface 216 of the base edge member 202 and the head 302 of the bolt 300 substantially flush and co-planar relative to each other. Further, the bottom surface 217 of the cutting edge member 204 and the head 402 of the sleeve member 400 are also substantially flush and co-planar relative to each other. Further, a relative configuration between the first and second plurality of holes 220, 230, the bolts 300, and the sleeve members 400 minimizes protrusions from the work tool 200. As such, an obstruction to a flow of the material on the top surface 216 of the base edge member 202 and the bottom surface 217 of the cutting edge member 204 due to the fasteners may be minimized.

[0029] The base edge member 202 and the cutting edge member 204 also defines the central holes 308, 404 therethrough. The bolts 300 and the sleeve members 400 may be inserted into the respective first and second plurality of holes 220, 230. Further, the bolts 300 and the sleeve members 400 may be tightened using a key, such as the allen key, inserted into the central holes 308, 404, respectively.

[0030] Additionally, the central holes 308, 404 may facilitate removal of the bolts 300 and the sleeve members 400 respectively to detach the cutting edge member 204 from the base edge member 202. In an example, the cutting edge member 204 may be detached from the base edge member 202 by using the cutting torch. In such a case, the central holes 308, 404 may provide a start hole for the cutting torch to burn out the bolts 300 and the sleeve members 400, respectively. Alternatively, the bolts 300 and the sleeve members 400 may be removed using a machining tool inserted into the respective central holes 220, 230.

[0031] Further, upon assembling the base edge member 202 and the cutting edge member 204, the central holes 308, 404 defined in the bolts 300 and the sleeve members 400, respectively, may be coaxial to each other. Such an arrangement enables venting of air through the central holes 308 and 404.

[0032] Although, the bolt 300 and the sleeve member 400 are explained in conjunction with the base edge member 202 and the cutting edge member 204, it may be contemplated to use the bolt 300 and the sleeve member 400 to accomplish coupling between any two components. Accordingly, the components may define holes having configurations similar to that of the first and second plurality of holes 220, 230.

[0033] While aspects of the present disclosure have been particularly shown and described with reference to the embodiments above, it will be understood by those skilled in the art that various additional embodiments may

be contemplated by the modification of the disclosed machines, systems and methods without departing from the spirit and scope of what is disclosed. Such embodiments should be understood to fall within the scope of the present disclosure as determined based upon the claims and any equivalents thereof.

Claims

1. A cutting edge member (204) for a work tool (200) configured to be detachably fastened to a base edge member (202) using a bolt (300) and a sleeve member (400), the cutting edge member (204) defining a plurality of holes (230) therethrough, each of the plurality of holes (230) comprising:

a lower portion (234) proximate to a bottom surface (217) of the cutting edge member (204), wherein the lower portion (234) is configured to receive a head (402) of the sleeve member (400) therein; and

an upper portion (232) distal to the bottom surface (217) of the cutting edge member (204), wherein the upper portion (232) is configured to partly receive an elongate portion (403) of the sleeve member (400) therein, wherein the elongate portion (403) is configured to extend into a corresponding hole (220) defined in the base edge member (202), and wherein the elongate portion (403) is further configured to be in a threaded engagement with the bolt (300) received in the corresponding hole (220) defined in the base edge member (202); and wherein a head (302) of the bolt (300) and a top surface (216) of the base edge member (202) are substantially flush and co-planar relative to each other.

2. The cutting edge member (204) of claim 1, wherein each of the plurality of holes (230) defined in the cutting edge member (204) are coaxially aligned with the corresponding hole (220) defined in the base edge member (202).

3. The cutting edge member (204) of claim 1, wherein each of the holes (220) defined in the base edge member (202) comprises:

a first portion (226) proximate to a bottom surface (216) of the base edge member (202), wherein the first portion (226) is configured to partly receive the sleeve member (400) therein; and

a second portion (224) distal to the bottom surface (216) of the base edge member (202), wherein the second portion (224) is configured to partly receive the bolt (300) therein.

4. The cutting edge member (204) of claim 3, wherein each of the holes (220) defined in the base edge member (202) further comprises a third portion (222) proximate to the top surface (216) of the base edge member (202), the third portion (222) configured to receive the head (302) of the bolt (300) therein. 5
5. The cutting edge member (204) of claim 1, wherein the bottom surface (217) of the cutting edge member (204) and the head (402) of the sleeve member (400) are substantially flush and co-planar relative to each other. 10
6. The cutting edge member (204) of claim 1, wherein the work tool (200) is a loader bucket. 15
7. The cutting edge member (204) of claim 1, wherein the sleeve member (400) defines a central hole (404) therethrough, the central hole (404) including a plurality of internal threads (406), wherein the plurality of internal threads (406) are in the threaded engagement with a plurality of external threads (306) disposed on the bolt (300). 20

25

30

35

40

45

50

55

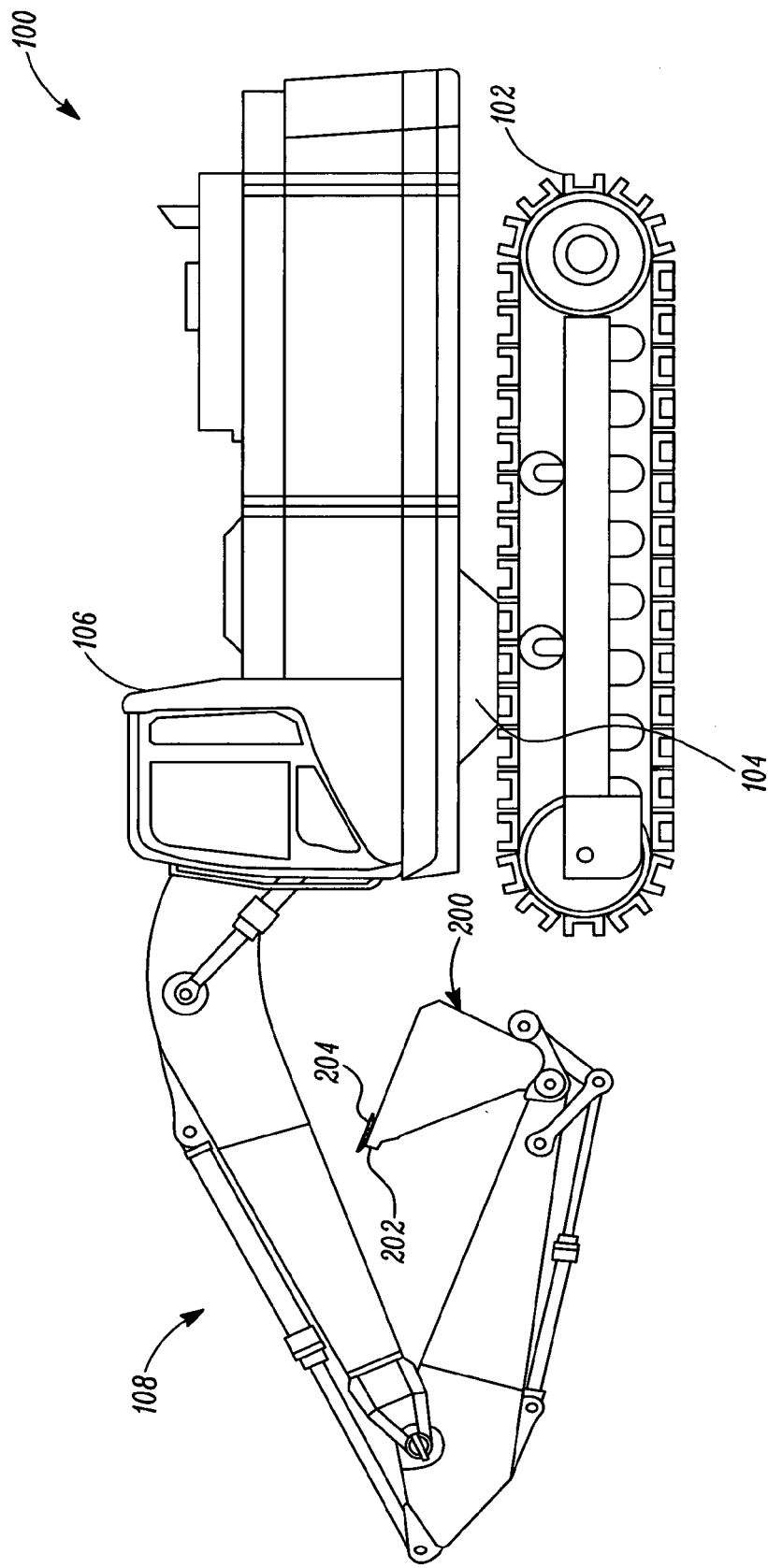


FIG. 1

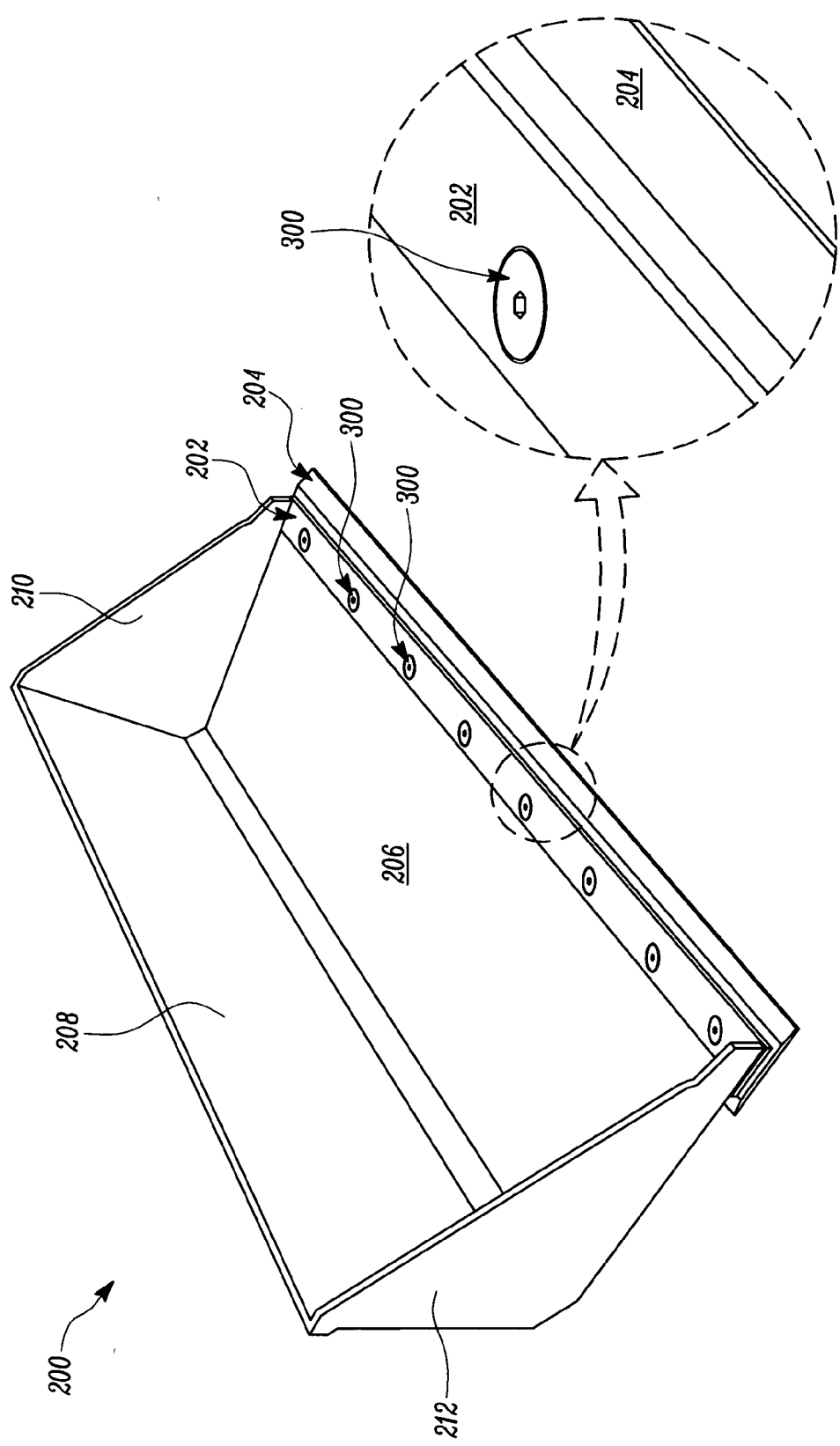


FIG. 2

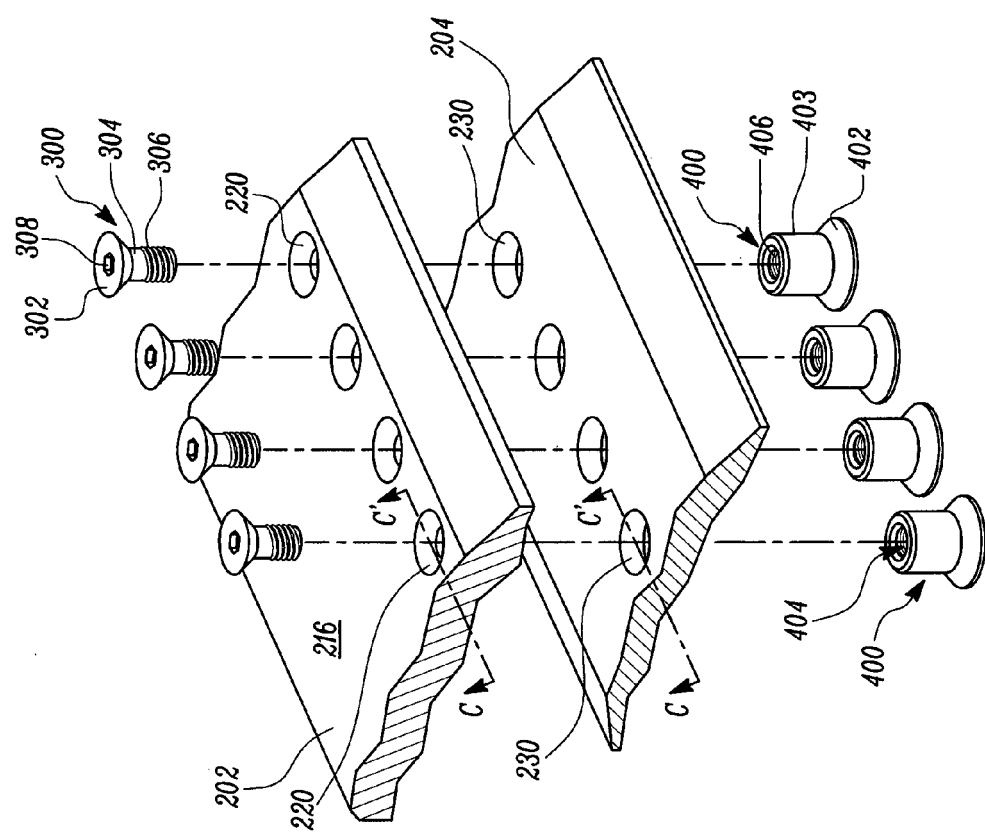


FIG. 3

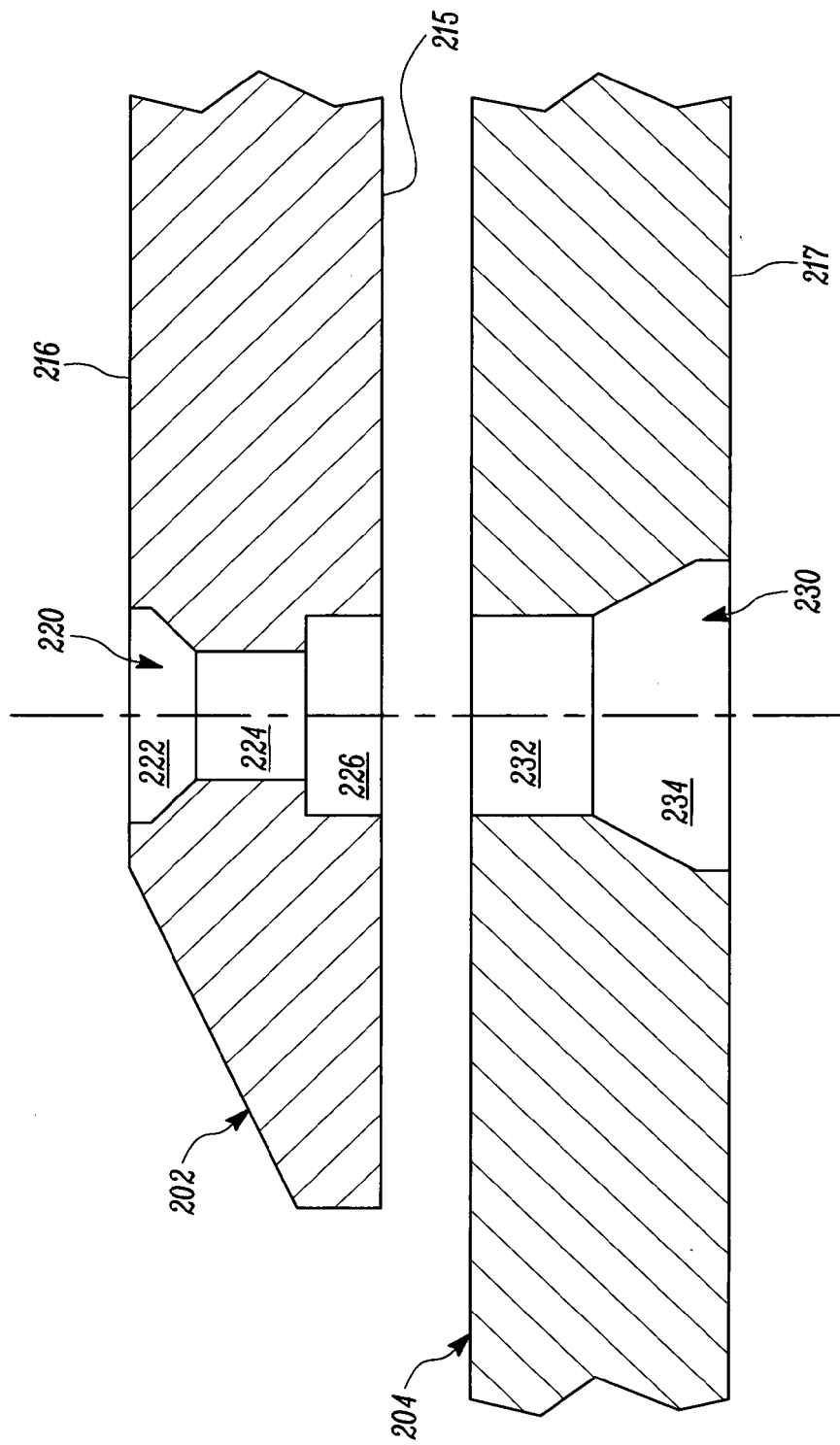


FIG. 4

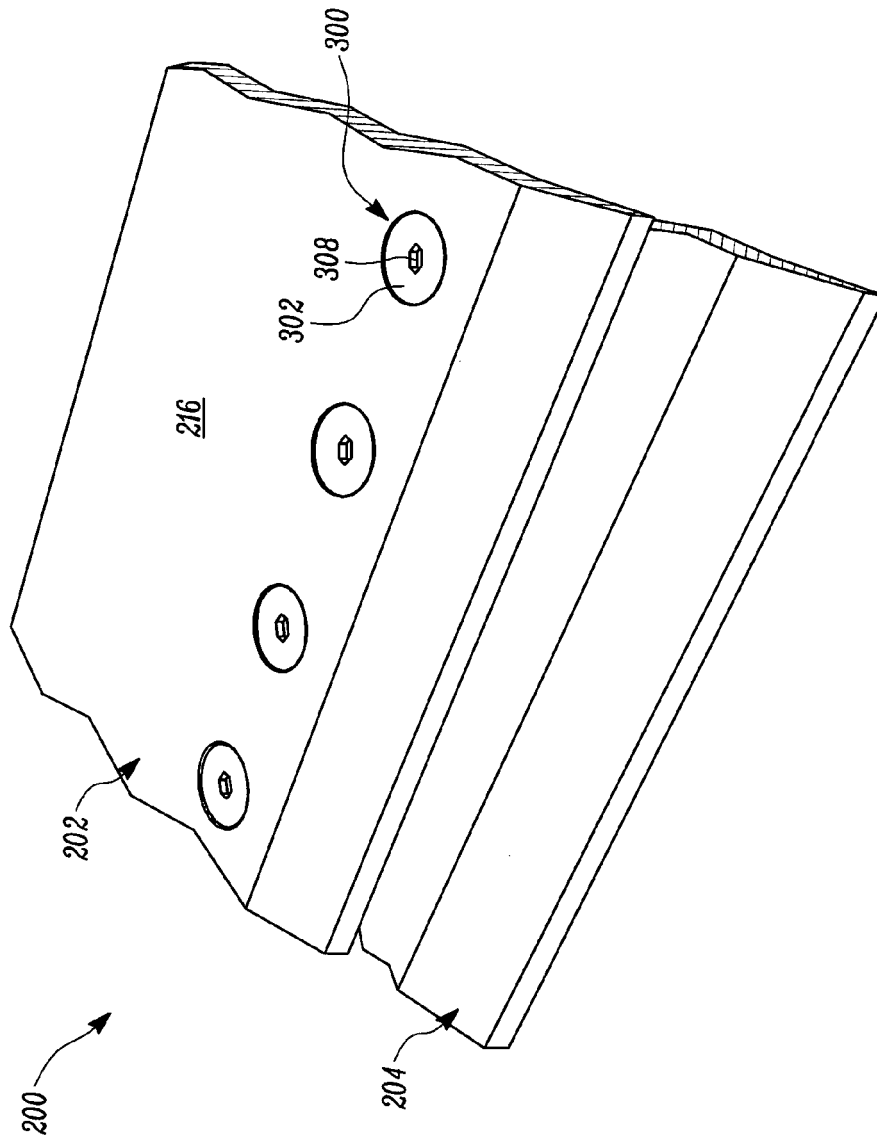


FIG. 5

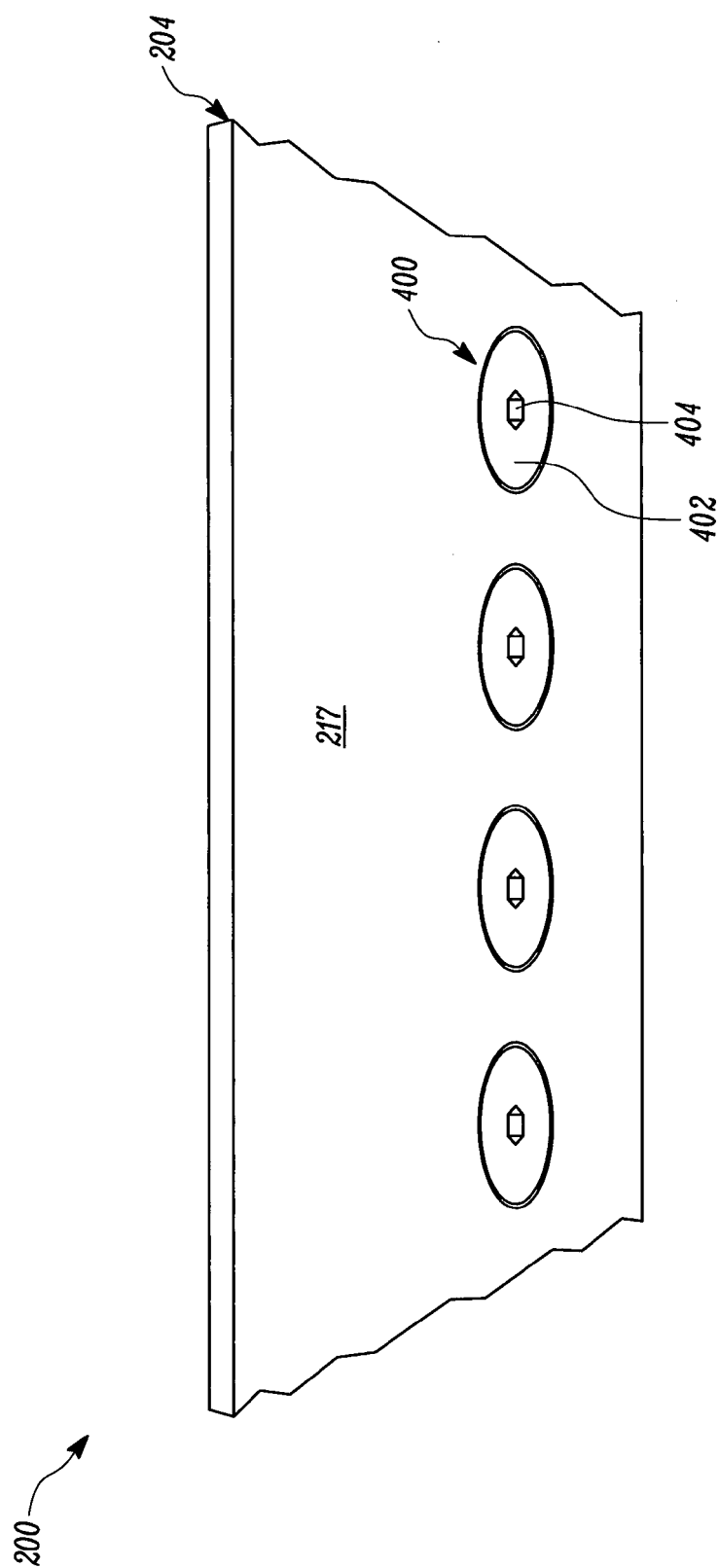


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 15 00 0083

5

10

15

20

25

30

35

40

45

50

55

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	US 872 439 A (LIVENGGOOD WINFIELD S [US]) 3 December 1907 (1907-12-03) * paragraph [0002] - paragraph [0010]; figures 1-3 *	1-7	INV. E02F9/28 B23P11/00 E01H5/06
A	US 2009/165339 A1 (WATANABE KIYOSHI [JP]) 2 July 2009 (2009-07-02) * figures 1-2 *	1-7	
A	US 2003/066215 A1 (GRANT JAMES [CA]) 10 April 2003 (2003-04-10) * figure 6 *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			E02F B23P E01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 June 2015	Examiner Pedersen, Henrik
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 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 00 0083

5 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.

26-06-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 872439 A	03-12-1907	NONE	
US 2009165339 A1	02-07-2009	NONE	
US 2003066215 A1	10-04-2003	CA 2358339 A1 US 2003066215 A1	05-04-2003 10-04-2003