



- (51) International Patent Classification:
E02F 3/80 (2006.01) *E02F 9/28* (2006.01)
- (21) International Application Number:
PCT/US2014/046535
- (22) International Filing Date:
14 July 2014 (14.07.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant: VOLVO CONSTRUCTION EQUIPMENT
AB [SE/SE]; S-631 85 Eskilstuna (SE).
- (72) Inventor; and
- (71) Applicant (for US only): RIFE, Kyle [US/US]; 2448 Sol-
lenberger Rd., Chambersburg, Pennsylvania 17202 (US).
- (74) Agents: SCHIVLEY, G. Gregory et al.; Harness, Dickey
& Pierce, P.L.C., P.O. Box 828, Bloomfield Hills, MI
48303 (US).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

- (84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

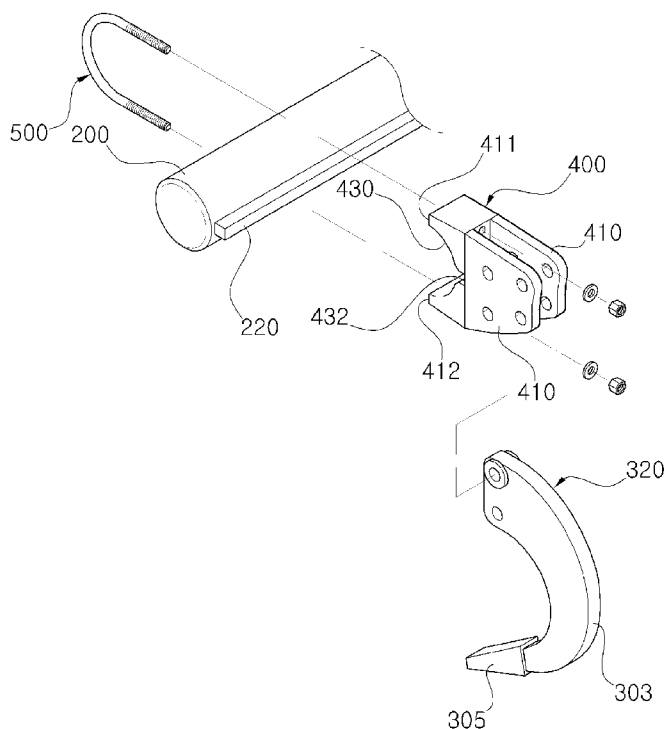
Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

[Continued on next page]

- (54) Title: CONSTRUCTION MACHINERY WITH A RIPPER OR A SCARIFIER

FIG. 3



(57) Abstract: A construction machinery with a ripping tool is disclosed. The construction machinery with a ripping tool according to the present invention is configured by comprising a key formed in the outer surface of a tool bar attached to the rear of the vehicle body; a retainer, one side of which is coupled to the tool bar and the other side of which a ripper is attached to; and a fastening member, both ends of which are coupled to the retainer while wrapping the remaining part of the outer circumference surface of the tool bar under the state that the retainer is in contact with the tool bar, wherein a key hole engaged with the key of the tool bar is formed in the retainer.



Published:

— *with international search report (Art. 21(3))*

CONSTRUCTION MACHINERY WITH A RIPPER OR A SCARIFIER

TECHNICAL FIELD

5 The present invention relates to a construction machinery, more particularly, road machinery, such as a motor grader.

BACKGROUND OF THE INVENTION

Construction machinery, such as a motor grader, generally comprises a ripper or a
10 scarifier, which is detachably mounted on the rear of the vehicle body. Both ripper and scarifier are tools used for tearing up asphalt, hard-pack or other obstacles to aid the grading operation. The ripper and the scarifier are similar in function but they can be used with different sets of ground engaging tools. The ripper teeth are generally bigger and have deeper cut than the scarifier teeth.

15

US 5,040,616 discloses a shank attachment device for holding rippers. That is, a tool bar comprises a plate to which a ripper is detachably coupled. In the prior art, a ripper was attached to a target surface to be mounted and was usually mounted by welding on the outer circumference surface of the bucket of an excavator. As the outer surface of a
20 bucket was generally narrow, there was a limit to the number of rippers that could be included in the bucket. Further, the ripper and the bucket were welded together, and thus, it was difficult to replace them.

Meanwhile, US 2008/245540A1 discloses a tool bar on which a plurality of rippers are
25 mounted. Specifically, a plurality rippers are mounted on a tool bar having a certain length. However, the rippers are fixed to the tool bar, which makes it difficult to be separated, thereby the number of rippers cannot be freely adjusted. Further, since it is difficult to set spaces between the rippers fixed to the tool bar, it is also difficult to adjust the number of rippers or set the location of rippers according to the on-site road
30 condition. When it is necessary to mount a scarifier besides a ripper or a ripper and to use a scarifier in a combined form, it was difficult in the prior art to change the structure of the ripper and the scarifier, because they were in a fixed structure. Due to this, a suitable tool could not be selected, which resulted in lowering work efficiency.

SUMMARY OF THE INVENTION

The present invention provides construction machinery, comprising a plurality of rippers or scarifiers detachable to a tool bar, wherein by improving a coupling structure between the rippers or the scarifiers and the tool bar, they can be fixed not to rotate by impact applied during working and a combination of a plurality of rippers or scarifiers or spaces between them when mounted can be appropriately adjusted.

According to an example, the present invention comprises a bracket attached to the rear of the vehicle body and a tool bar connected to the bracket by a plurality of linkages to be installed to elevate with respect to the ground surface under the state of maintaining a level with the ground. The present invention also comprises a retainer, one side of which is coupled to one outer circumference surface of the tool bar and the other side of which a ripper is attached to.

Further, the present invention comprises a fastening member, which is coupled to the retainer while wrapping the remaining part of the outer circumference surface of the tool bar under the state that the retainer is in contact with the tool bar, and thus, provides fixation power. The tool bar extends in the width direction of the vehicle body and forms a circular cross section.

It is preferable that a key is formed in the tool bar to protrude from the outer surface of the tool bar and extend along the longitudinal direction of the tool bar.

It is preferable that the retainer is formed in a semicircular shape so that one side of the retainer can correspond to part of the outer circumferential shape (profile) of the tool bar, and forms a key hole to be engaged with the key when one side of the retainer is in contact with the outer surface of the tool bar.

It is preferable that the fastening member is a U-shaped bolt which forms screw threads in both ends thereof.

According to another example, under the state that the retainer is in contact with the tool bar, the fastening member is a clamp, both ends of which are coupled to the retainer

while wrapping the remaining part of the outer circumference surface of the tool bar, and in which a key hole engaged with the key of the tool bar is formed.

Meanwhile, according to yet another example, a key hole engaged with the key of the tool bar is formed to be attached to one side of the outer surface of the tool bar, and a retainer to which a ripper is attached is provided in the other side of the outer surface of the tool bar. Further, under the state that the retainer is in contact with the tool bar, a retainer, both ends of which are coupled to the retainer while wrapping the remaining part of the outer circumference surface of the tool bar, and the other side of which a scarifier is attached to is provided.

A fastening bolt is provided to integrally fasten these two retainers. Herein a key hole engaged with a key of the tool bar is formed in one of the two retainers. According to the present invention, the ripper or the scarifier attached to the tool bar can be coupled by non-welding, thereby being capable of assembling and separating. Accordingly, since a combination of a plurality of rippers or scarifiers can be selected and spaces between them as mounted can be freely set, suitable tools for the work site can be provided to enhance work efficiency and make maintenance easy.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows construction machinery with a ripper or a scarifier according to the present invention.

FIG. 2 is a perspective view of a ripping tool according to the present invention.

FIG. 3 is an exploded perspective view of a coupling structure according to Example 1 in the ripping tool shown in FIG. 2.

FIG. 4 is a partial exploded view of a coupling structure according to Example 2 in the ripping tool shown in FIG. 2.

FIG. 5 is a partial exploded view of a coupling structure according to Example 3 in the ripping tool shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

Based on the attached drawings, below are preferred examples of the present invention in detail. The examples explained below are merely to enable a person having ordinary skill in the art to which the present invention pertains to readily carry out the invention.

5 Accordingly, the technical idea and scope of the present invention should not be interpreted to be limited. Further, the size or shape of the elements shown in the drawings may be exaggerated for purposes of clarification and convenience. The terms specifically defined by considering the constitution and working effect of the present invention may vary depending on the user's intension or practice. The definitions of
10 these terms should be based on the description throughout the specification of the subject application.

Among the attached drawings, FIG. 1 shows construction machinery with a ripper or a scarifier according to the present invention. FIG. 2 is a perspective view of a ripping
15 tool according to the present invention. FIG. 3 is an exploded perspective view of a coupling structure according to Example 1 in the ripping tool shown in FIG. 2. FIG. 4 is a partial exploded view of a coupling structure according to Example 2 in the ripping tool shown in FIG. 2. FIG. 5 is a partial exploded view of a coupling structure according to Example 3 in the ripping tool shown in FIG. 2.

20 As shown in FIG. 1 and FIG. 2, the construction machinery according to the present invention comprises a ripping tool (300) attached to the rear of a motor grater (M). Of course, it is not necessary to be limited to a motor grader, and such ripping tool is also applied to a dozer and a wheel loader. The ripping tool (300) comprises a bracket
25 attached to one side of the vehicle body; a tool bar (200), which is connected to the other end of the linkage (120) hingedly coupled to one end of the bracket (100) and is installed to ascend or descend under the state of maintaining a level with the ground; and a ripper (320) or a scarifier (340) attached to the tool bar (200). The linkage (120) connects the bracket (100) to the tool bar (200) and comprises a plurality of link bars, which hingedly
30 couple the bracket (100) to the tool bar (200) to enable the elevating operation of the tool bar (200). Further, a cylinder unit (170) connects the bracket (100) to the tool bar (200) and allows the tool bar (200) to elevate or rotate at a certain angle.

As shown in FIG. 3, the tool bar (200) extends in the width direction of the vehicle body, forms a circular cross section and forms a key (220) extending in the longitudinal direction of the tool bar. The key (220) has a square or rectangular cross section. A single key may be formed on the outer circumference surface of the tool bar (200) or a plurality of single keys may be formed in the circumferential direction. The ripper (320) and the scarifier (340) consists of a shank (303) formed in an arc shape and a tooth (305) adhered to the bottom of the shank (303). The upper end of the shank (303) is coupled to the retainer (400, 800), as will be explained below. The shank (303) of each of the ripper (320) and the scarifier (340) is detachably coupled to the retainer (400, 800). Preferably, the retainer (400) is coupled to one side of the outer circumference surface of the tool bar (200), and the ripper (320) is attached to the coupled retainer (400).

A semicircular recess (430) is formed in the retainer (400) so that one side of the retainer (400) may be coupled to the outer circumference surface of the tool bar (200). Two boards (410) are disposed by a predetermined distance in the other side of the retainer to form a space into which the shank (303) is inserted. A first lateral plate (411) and a second lateral plate (412) are formed in both ends of the retainer. One side of the fastening member (500) is coupled by penetrating through the fastening hole formed in the second lateral plate (412). The ripper (320) is attached by fastening two pins from the lateral side of the two boards (410) to fix the shank (303).

Meanwhile, the retainer (400) forms a key hole (432) engaged with the key (220) of the tool bar (200) in the inner circumference surface of a recess (430) formed in a semicircular shape. Preferably, the key hole (432) is formed in the middle of the recess (430) by considering distribution of work load. Accordingly, the ripper (320) does not rotate even if work load is applied to the ripper attached to the retainer (400) by the coupling of the key (220) and the key hole (432).

Meanwhile, a fastening member (500), which is coupled to the tool bar while wrapping the other side of the outer circumference surface of the tool bar (200), and both ends of which are coupled to the retainer (400), is further provided. The fastening member (500) is a U-shaped bolt, wherein the fastening member wraps the outer circumference surface of the tool bar (200), and then, both ends thereof are coupled by penetrating through a

fastening hole formed in the second lateral plate (412) of the retainer (400). Accordingly, both ends of the U-shaped bolt are coupled by respectively penetrating through the fastening hole formed in the top and the bottom of the retainer (400). A nut is fastened in both ends of the U-shaped bolt, which penetrates through the fastening hole, to exhibit
5 fixation power.

According to another example, the fastening member (500) may be a clamp (not shown). The clamp is formed in an arc shape to wrap the other side of the outer circumference surface of the tool bar (200). Both ends of the clamp are adhered to both ends of the
10 retainer (400), and then, are fastened with a bolt to be integrally coupled.

Meanwhile, a plurality of retainers (400) and fastening members (500) are installed at by a predetermined distance along the longitudinal direction of the tool bar (200). The ripper (320) or the scarifier (340) is coupled to the plural retainers (400). Only one of
15 the ripper (320) and the scarifier (340) is selected to be attached or the ripper (320) and the scarifier (340) are appropriately combined and disposed. The retainer (400) is coupled to the key (220) formed in the longitudinal direction of the tool bar (200). Thus, the spaces between the plurality of retainers (400) can be adjusted by loosening the fastening member (500) and pushing the retainers to one side. Accordingly, by such
20 adjustment, the space of the ripping tool (A) coupled to the retainers can be adjusted, thereby the shape can be changed to be suitable for the work environment.

The operation of the present invention as constituted above is described below.

The retainer (400) is adhered to one side of the outer surface of the tool bar (200). That is,
25 the recess (430) is adhered to one side of the outer surface of the tool bar (200) so that the key (220) of the tool bar (200) can be inserted into the key hole (432). Thereafter, the U-shaped bolt, which is a fastening member (500), is coupled to the other side of the outer surface of the tool bar (200) to wrap the outer circumference surface, and both ends of the U-shaped bolt are coupled by penetrating through the fastening hole formed in the
30 second lateral plate of the retainer (400), and then, are fastened by a nut. Thereafter, the ripper (320) is attached to the other side of the retainer (400). Before tightening the nut of the U-shaped bolt, the spaces between the plural retainers attached to the tool bar (200) can be appropriately adjusted, and the spaces between the plural rippers (320) coupled to

each retainer (400) can be adjusted. The tool bar (200), to which the ripper (320) is attached, is connected to one end of the linkage (120), and the other end of the linkage (120) is hingedly connected to the bracket (100).

5 A cylinder unit (170) connects the bracket (100) to the tool bar (200) and allows the tool bar (200) to elevate or rotate at a certain angle. By attaching the cylinder unit (170), the assembling of the ripping tool (A) is completed. The bracket (100) is attached to the rear of the vehicle body of the motor grader. Thereafter, the grounding work is conducted, and stress occurs while the ripper (320) is in contact with the ground to dig up or tear up
10 asphalt. Thus, a rotary power by elevating is applied to the ripper (320). However, the ripper can maintain its fixed state not to rotate by the coupling of the key (220) and the key hole (432).

As shown in FIG. 4, Example 2 of the present invention applies a clamp (600) having a
15 key hole (620) in lieu of the U-shaped bolt, which is a fastening member (500) in Example 1.

As shown in FIG. 2 and FIG. 4, Example 2 according to the present invention comprises a tool bar (200) and a scarifier (340) coupled to the tool bar (200). The tool bar (200)
20 extends in the width direction of the vehicle body, forms a circular cross section, and forms a key (220) extending in the longitudinal direction of the tool bar (200) in the outer circumference surface.

One side of a retainer (400b) is formed in a semicircular shape to correspond to part of
25 the outer circumferential shape (profile) of the tool bar (200) and the scarifier (340) is attached to the other side of the retainer (400b). A semicircular recess (430b) is formed to correspond to part of the outer circumferential shape (profile) of the tool bar (200) in one side of the retainer (400b). A clamp (600) is coupled to the tool bar while wrapping the other side of the outer circumference surface of the tool bar (200), and both ends of
30 the clamp (600) are coupled to the retainer (400b). The clamp (600) is formed in an arc shape, and forms a key hole (620) engaged with the key (220) in the inner circumference surface thereof. A bolt (630) is coupled by penetrating through both ends of the clamp (600) and both ends of the retainer (400b). The retainer (400b) forms a space, which a

shank (303) is inserted into, inside by disposing two plates (410b) forming a recess (430b) in one side by a predetermined distance, wherein an outer circumference surface of the tool bar (200) is inserted into the recess (430b). A first lateral plate (411b) is formed in one side of the two boards (410b) to form a channel-shaped cross section, and a second lateral plate (412b) is formed in the top and the bottom of the recess (430b). Each fastening hole (413b) is formed in the second lateral plate (412b). The bolt (630) is coupled by penetrating through the fastening hole (413b). The shank (303) of the scarifier (340) is coupled between the two boards (410b).

10 The clamp (600) is formed in an arc shape to wrap the other side of the circumference surface of the tool bar (200). The fastening piece (610) formed in both ends of the clamp is adhered to the second lateral plate (412b) of the retainer (400b) and coupled. A key hole (620) bending in a relatively square or rectangular shape is formed in the middle of the clamp. A bolt (630) is fastened through the fastening hole (611) formed in
15 the fastening piece (610) in both ends of the clamp (600) and penetrates through the second lateral plate (412b) of the retainer (400b) and is screw-coupled and assembled. The head (631) of the fastened bolt (630) is adhered to the fastening piece (610) in both ends of the clamp (600), and thus, the fastening state can be fixed. Additionally, a washer (632) is inserted into the bolt (630) and is disposed between the head and the
20 fastening piece (610).

Meanwhile, the retainer (400b) is coupled to the key (220) formed in the longitudinal direction of the tool bar (200), and thus, spaces between the plural retainers (400b) can be adjusted by loosening the bolt (630) and pushing the retainer to be slidable.

25

As shown in FIG. 5, Example 3 of the present invention comprises: a tool bar (200); a ripper (320) and a scarifier (340) coupled to the tool bar (200) to dig up the ground; and each retainer (700, 800) to which the ripper and the scarifier are attached. The tool bar (200) extends in the width direction of the vehicle body, forms a circular cross section, and forms a key (220) extending in the longitudinal direction of the tool bar in the outer circumference surface.

30

A retainer (700), which the ripper is attached to, is coupled to one side of the outer circumference surface of the tool bar (200). A retainer (800), which is coupled to both ends of said retainer (700) and which the scarifier (340) is attached to, is coupled to the other side of the outer circumference surface of the tool bar (200). A bolt (900) is coupled by penetrating both ends of the retainer (700), which the ripper (320) is attached to, and both ends of the retainer (800), which the scarifier (340) is attached to. The retainer (700) attaching the ripper (320) forms a space inside by disposing two boards (712) forming a semicircular recess (730) in one side by a predetermined distance, wherein the outer circumference surface of one side of the tool bar (200) is inserted into the recess (730). Lateral plates (720) are formed in the top and the bottom of the recess (730), and fastening holes are formed in the lateral plates (720), respectively. One side of the bolt (900) penetrates through the fastening hole and is coupled. The upper part of the shank (303) of the ripper (320) is inserted between the two boards (712), and two pins (not shown) are fastened in the boards (712) and the upper and lower side of the shank (303).

Meanwhile, the retainer (800) attaching the scarifier (340) form a space inside by disposing two boards (811) forming a recess (820) by a predetermined distance, wherein the outer circumference surface of the other side of the tool bar (200) is inserted into the recess (820). A first lateral plate (830) is formed in one side of the two boards (811). A second lateral plate (840) is formed in the top and the bottom of the recess (820). The fastening holes are formed in the second lateral plates (840), respectively.

The bolt (900) is a threaded rod that forms a screw thread in the outer circumference surface, penetrates through the lateral plate (720) of the retainer (700) and the second lateral plate (840) of the retainer (800) and is fastened. A washer (910) is inserted into one side of the bolt (900) and a nut (920) is fastened to be adhered to one side of the lateral plate (720) of the retainer (700) and is coupled. Accordingly, the retainers (700, 800) are installed in both sides of the tool bar (200), respectively, and each retainer (700, 800) is coupled to the ripper (320) and the scarifier (340), respectively.

Meanwhile, a key hole (720) engaged with the key (220) is formed in one of the retainer (700) and the retainer (800). As shown in FIG. 5, the description of the present invention

discloses a key hole (732) formed in the recess (730) of the retainer (700) as an example. Of course, this is only an example, and the location of the key hole (732) may be changed based on need. The retainer (700) or the retainer (800), to which the ripper (320) is attached, can be integrated by the coupling of the bolt (900). Further, by the key hole
5 (720) engaged with the key (220) of the tool bar (200) is coupled to the key hole (720), and thus, the retainer (700) or the retainer (800) can be strongly fixed not to rotate by load applied during the work.

Although the present invention has been explained in connection with the preferred
10 examples mentioned above, one of ordinary skill in the art could easily understand that various corrections and modification are possible within the subject matter and the scope of the present invention. Further, it is obvious that such corrections and modification fall within the scope of the claims attached hereto.

15 Reference Numerals

100 : bracket	200 : tool bar
220 : key	300 : ripping tool
303 : shank	305 : tooth
320 : ripper	340 : scarifier
20 400,400b : retainer	500 : fastening member
700 : retainer	800 : retainer

CLAIMS

1. A construction machinery with a ripping tool, the ripping tool comprising:
a bracket attached to the rear of the vehicle body and a tool bar connected to the bracket
5 by a linkage to be installed to elevate with respect to the ground under the state of
maintaining a level with the ground, wherein the tool bar extends in the width direction
of the vehicle and form a circular cross section;
a key protruding from the tool bar and extending along the longitudinal direction of the
tool bar;
10 a retainer, one side of which is formed in a semicircular shape to correspond to part of
the outer circumferential shape of the tool bar, and the other side of which a ripper or a
scarifier is attached to, wherein a key hole engaged with the key is formed when the one
side is in contact with the outer circumference surface of the tool bar; and
a fastening member, both ends of which are coupled to said retainer while wrapping the
15 remaining part of the outer circumference surface of the tool bar under the state that the
retainer is in contact with the tool bar.
2. The construction machinery with a ripping tool of Claim 1, wherein a plurality of
retainers and fastening members are installed at the tool bar.
- 20 3. The construction machinery with a ripping tool of Claim 1, wherein
the fastening member is a U-shaped bolt which forms screw threads in both ends thereof;
both ends of the U-shaped bolt are coupled by penetrating through the fastening hole
formed in the top and the bottom of the retainer; and
25 a nut is fastened to both ends of the U-shaped bolt that penetrated through the fastening
hole.
4. The construction machinery with a ripping tool of Claim 1, wherein
the fastening member is formed in an arc shape to wrap the other side of the outer
30 circumference surface of the tool bar, and both ends thereof are coupled to the retainer.

5. A construction machinery with a ripping tool, the ripping tool comprising:
a bracket attached to the rear of the vehicle body and a tool bar connected to the bracket
by a linkage to be installed to elevate with respect to the ground under the state of
maintaining a level with the ground, wherein the tool bar extends in the width direction
5 of the vehicle and forms a circular cross section;
a key protruding from the tool bar and extending along the longitudinal direction of the
tool bar;
a retainer, one side of which is formed in a semicircular shape to correspond to part of
the outer circumferential shape of the tool bar, and the other side of which a ripper or a
10 scarifier is attached to;
a clamp, both ends of which are coupled to said retainer while wrapping the remaining
part of the outer circumference surface of the tool bar under the state said retainer is in
contact with the tool bar, and in which a key hole engaged with the key of the tool bar is
formed; and
15 a bolt, which is coupled by penetrating through both ends of the clamp and both ends of
the retainer and is coupled.
6. The construction machinery with a ripping tool of Claim 5, wherein
a plurality of retainers and clamps are installed along the longitudinal direction of the
20 tool bar.
7. The construction machinery with a ripping tool of Claim 1 or 5, wherein the ripping
tool comprises a ripper.
- 25 8. The construction machinery with a ripping tool of Claim 1 or 5, wherein the ripping
tool comprises a scarifier.
9. A construction machinery with a ripping tool comprising a ripper or a scarifier, the
ripping tool comprising:
30 a bracket attached to the rear of the vehicle body and a tool bar connected to by a linkage
to be installed to elevate with respect to the ground under the state of maintaining a level
with the ground, wherein the tool bar extends in the width direction of the vehicle and
forms a circular cross section;

a key protruding from the tool bar and extending along the longitudinal direction of the tool bar;

a retainer, one side of which is formed in a semicircular shape to correspond to part of the outer circumferential shape of the tool bar, and the other side of which a ripper or a scarifier is attached to;

a retainer, both ends of which are coupled to said retainer while wrapping the remaining part of the outer circumference surface of the tool bar under the state that the retainer is in contact with the tool bar, and the other side of which the scarifier is attached to;

a bolt, which couples both ends of the retainer, which the ripper is attached to, and both ends of the retainer, which the scarifier is attached to; and

a key hole, which is engaged with the key of the tool bar and formed in one of the retainer to which the ripper is attached or the retainer to which the scarifier is attached.

10. The construction machinery with a ripping tool of Claim 9, wherein the bolt is a threaded rod which forms screw threads in the outer circumference surface thereof.

1/5

FIG. 1

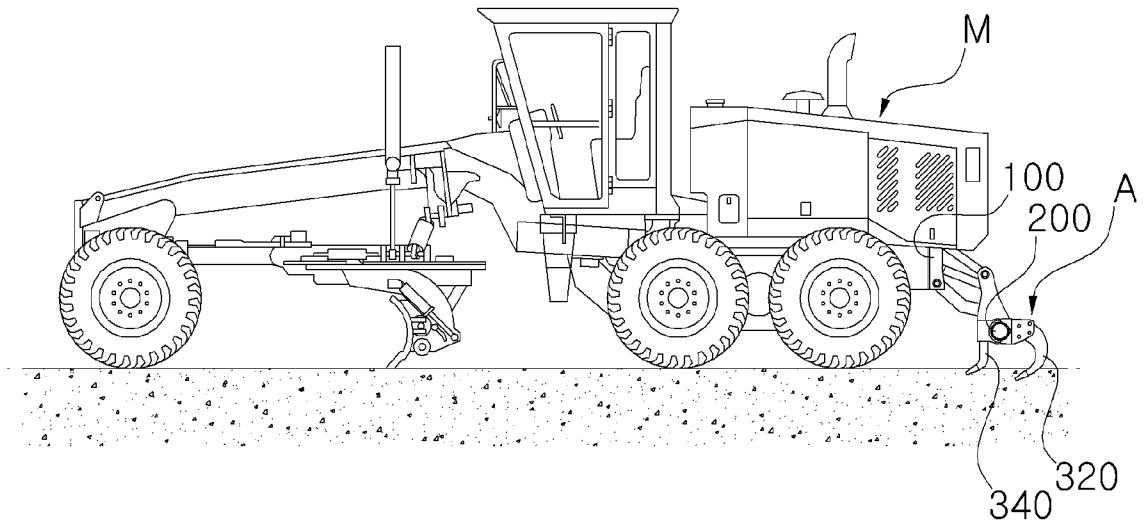
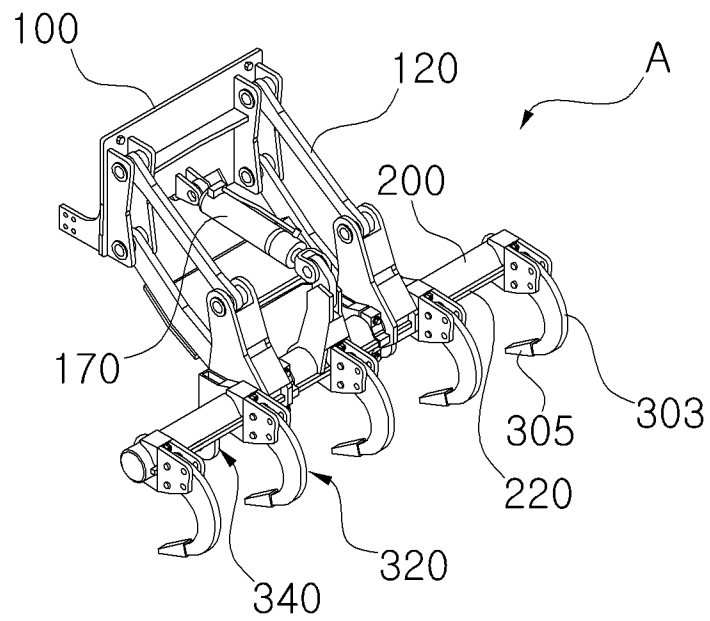


FIG. 2



3/5

FIG. 3

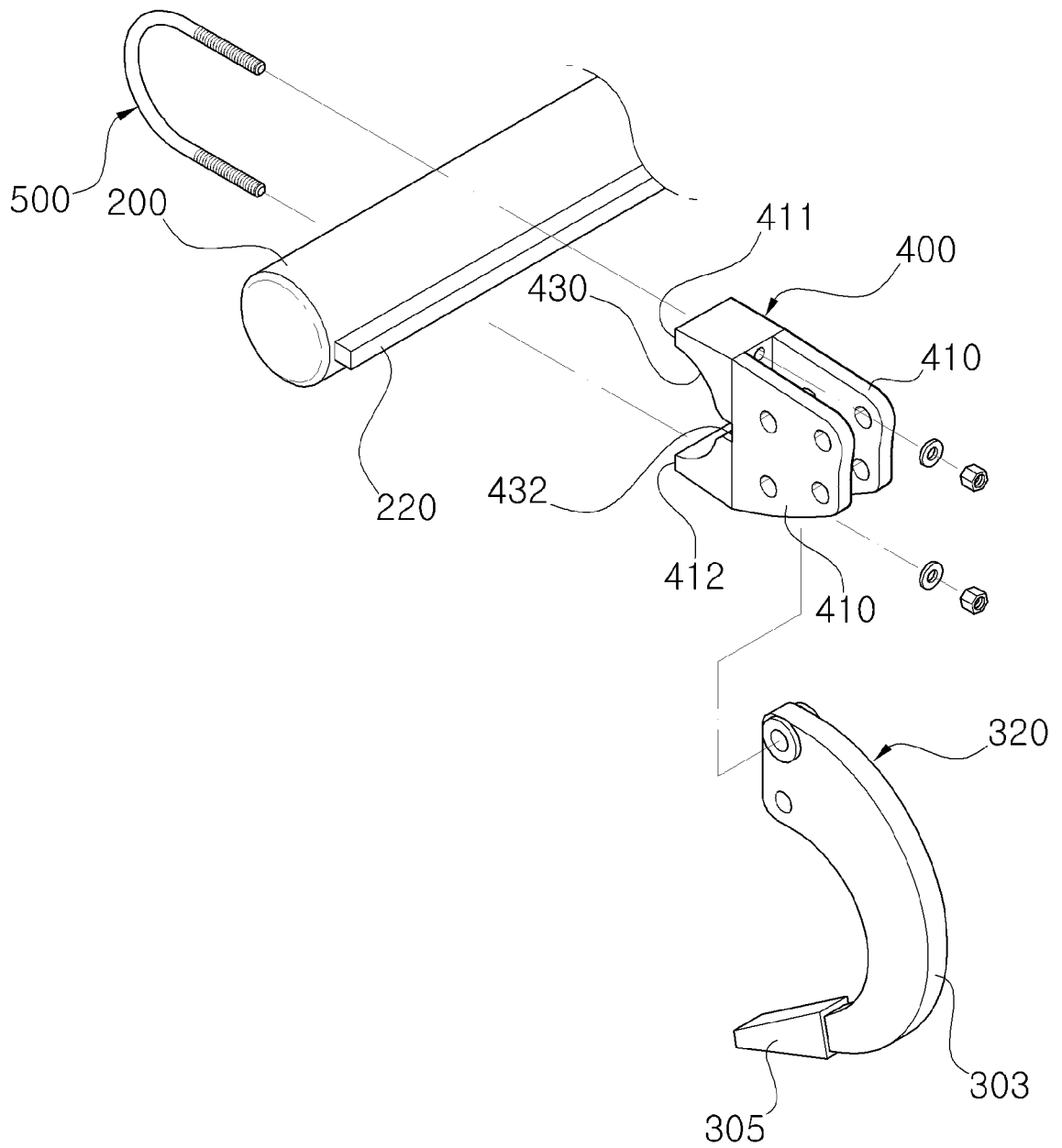


FIG. 4

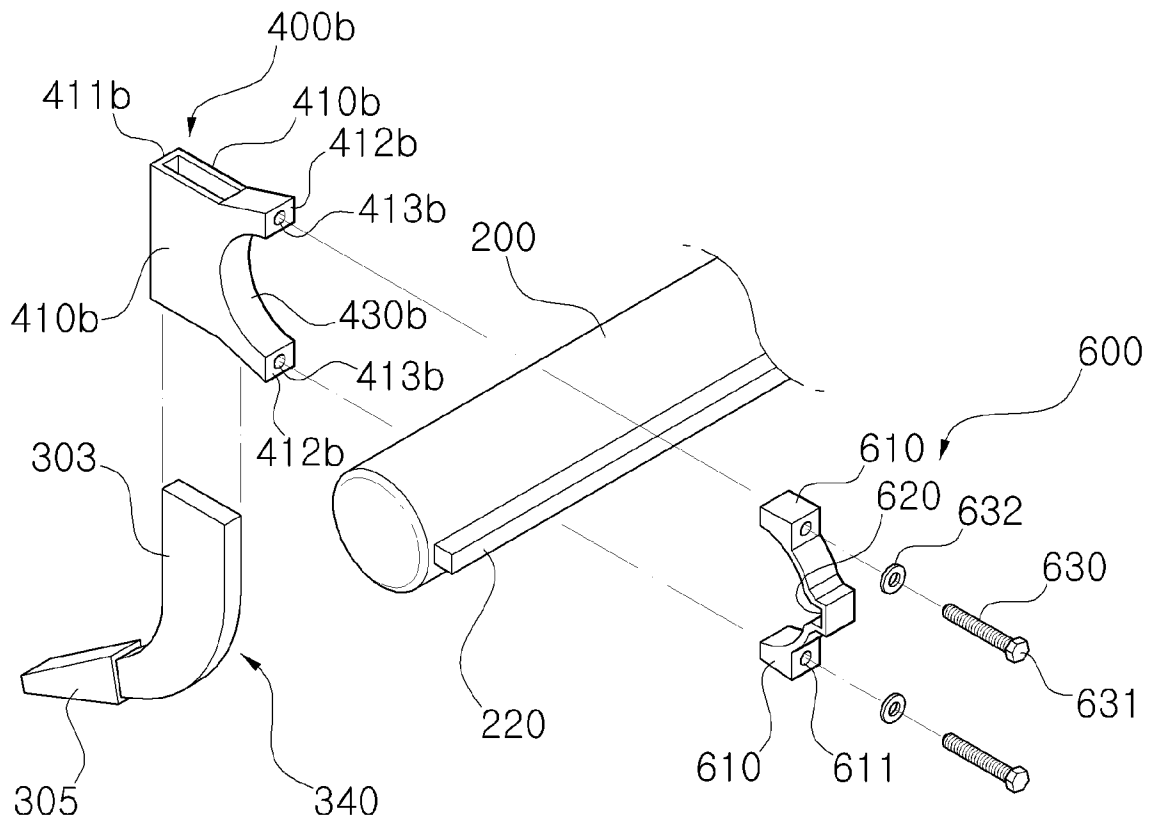
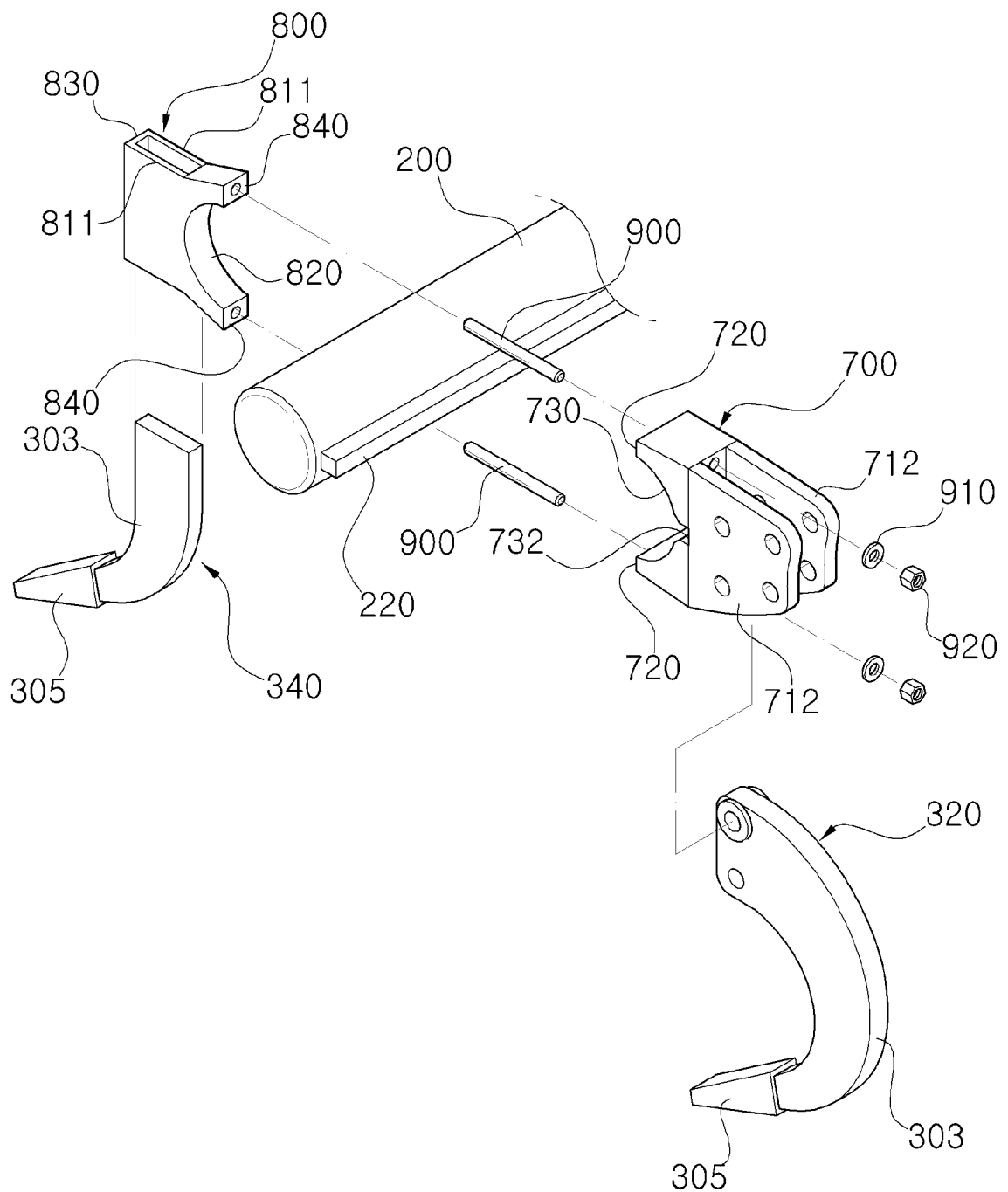


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/046535**A. CLASSIFICATION OF SUBJECT MATTER****E02F 3/80(2006.01)i, E02F 9/28(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E02F 3/80; A01B 13/08; B23P 11/00; A01B 63/102; E02F 5/32; E02F 3/96; A01B 63/118; E02F 9/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: construction, ripper, scarifier, bracket, retain, bar, key, fasten, bolt, clamp

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009-0050340 A1 (MCINTYRE, RODNEY BRUCE) 26 February 2009 See abstract, paragraphs [0032],[0034],[0036], claims 1,11, and figures 1,5.	1-10
A	US 4013129 A (WILKINSON, JOHN R.) 22 March 1977 See abstract, column 1, lines 50-60, column 2, lines 11-13, 36-45, claim 1, and figures 1,2.	1-10
A	US 2008-0060231 A1 (TAJIRI et al.) 13 March 2008 See abstract, paragraph [0015], claim 1, and figure 1.	1-10
A	US 2013-0087354 A1 (JORGENSEN, JOHN E.) 11 April 2013 See abstract, paragraphs [0016]-[0018], claim 1, and figures 1,2.	1-10
A	US 4313504 A (FISCHER, ROBERT L.) 02 February 1982 See abstract, column 2, line 31 - column 3, line 20, claim 1, and figures 1,2.	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

17 March 2015 (17.03.2015)

Date of mailing of the international search report

17 March 2015 (17.03.2015)

Name and mailing address of the ISA/KR

International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea

Facsimile No. ++82 42 472 7140

Authorized officer

KIM, Jin Ho

Telephone No. +82-42-481-8699



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/046535

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0050340 A1	26/02/2009	AU 2006-274517 A1 CA 2658879 A1 NZ 565847 A WO 2007-012141 A1	01/02/2007 01/02/2007 31/03/2011 01/02/2007
US 4013129 A	22/03/1977	CA 1028495 A1 GB 1548631 A	28/03/1978 18/07/1979
US 2008-0060231 A1	13/03/2008	US 2010-0242701 A1 US 7587842 B2 US 8371049 B2	30/09/2010 15/09/2009 12/02/2013
US 2013-0087354 A1	11/04/2013	CN 103857846 A US 8763718 B2 WO 2013-055748 A1	11/06/2014 01/07/2014 18/04/2013
US 4313504 A	02/02/1982	None	