



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
16.07.2014 Bulletin 2014/29

(51) Int Cl.:
E02F 5/32 (2006.01)

(21) Application number: **12830291.6**

(86) International application number:
PCT/KR2012/003028

(22) Date of filing: **19.04.2012**

(87) International publication number:
WO 2013/035960 (14.03.2013 Gazette 2013/11)

(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

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(30) Priority: **09.09.2011 KR 20110092095**
27.09.2011 KR 20110097804

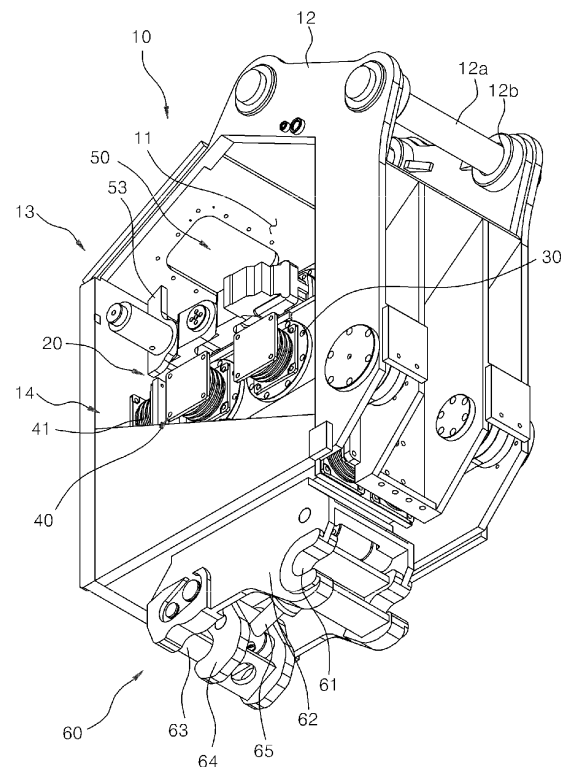
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(54) **VIBRATING RIPPER**

(57) The present invention relates to a vibration ripper including a main body having a vibration space part and also having a coupling part provided at an outer side thereof to be coupled with a boom or an arm of the heavy equipment, a vibration unit disposed in the vibration space part of the main body to have a vibrator, a plurality of vibration proof units installed at an outer surface of the vibration unit and the main body corresponding to the outer surface of the vibration unit and configured to vibratably support the vibration unit with respect to the main body, a clamp unit installed at the vibration unit and configured to allow an attachment to be coupled, and a vibration restriction part configured to connect the vibration unit and the main body and to restrict an amplitude of the vibration unit. The vibration ripper according to the present invention may reduce transmitting of the vibration generated from the vibration unit, to which the attachment is coupled, to the main body, and also may prevent the vibration unit supported to the main body through the vibration proof unit from being shaken left and right, and thus prevent a damage of the equipment when a bending moment and a rotational moment is applied to the attachment installed to the vibration unit.

Fig.1



Description

[Technical Field]

[0001] The present invention relates to a vibration ripper, and more particularly, to a vibration ripper which has an improved supporting structure of a housing vibrated with respect to a main body.

[Background Art]

[0002] Generally, an excavator as a construction machine used in civil engineering or construction sites for expressways, harbors, bridges, dams, buildings and urban developments generates a loud noise during performance of ground compaction, crushing and excavation.

[0003] Particularly, in order to excavate bedrock, concrete structure, firm ground or the like, or to scrape soil of the ground, a breaker or a ripper unit is used in a state of being installed at a boom of an excavator. When the breaker or the ripper unit is used in the state of being installed at the boom, vibration generated from the breaker or the ripper unit is directly transmitted to the boom. Thus, a noise is generated and the noise is amplified and doubled during a process of transmission to the boom.

[0004] In consideration of this problem, a ripper for an excavator is disclosed in Korean Unexamined Patent Application Publication No. 2006-0033893. The disclosed ripper for the excavator includes a connection mount part connected to a boom of an excavator, a blade body rotatably installed at the connection mount part to excavate soil of the ground, and a vibration means installed at the blade body to provide a vibration force to the blade body.

[0005] In the disclosed ripper for the excavator, the blade body is rotatably installed at the boom of the excavator, and the vibration means is installed at the blade body, and thus the vibration is transmitted to the boom through the blade body. The vibration transmitted to the boom is amplified, and thus makes it difficult to operate the excavator, and also the excavator may be damaged.

[0006] And a vibration ripper for heavy equipment is disclosed in Korean Unexamined Patent Application Publication No. 2011-0116647. The disclosed vibration ripper includes a vibration body in which gears rotated by a hydraulic motor are rotatably disposed in up and down directions therein and each of the gears has an eccentric weight to generate the vibration in up and down directions according to rotation of each gear. A ripper blade is installed at a lower portion of the vibration body in a lengthwise direction of the vibration body and configured so that the vibration body may be deeply inserted into the ground following the ripper blade during an excavating process of the ground.

[0007] In this vibration ripper, the vibration generated from the vibration body is not offset, but transmitted to the boom or a construction machine in which the vibration ripper is installed, and then amplified. However, since a

means for preventing amplification or diffusion of the vibration is not provided, it is not possible to fundamentally solve the above-mentioned problems.

5 [Disclosure]

[Technical Problem]

10 **[0008]** The present invention is directed to providing a vibration ripper in which vibration generated from a vibration unit supported by a vibration proof unit at a main body can be prevented from being transmitted to the main body, and a supporting force of the vibration unit with respect to the main body can be enhanced, and thus the vibration proof unit can be prevented from being damaged.

15 **[0009]** The present invention is also directed to providing a vibration ripper in which the vibration unit and the main body are bilaterally restricted by a connection link, and an action force and a reaction force of an attachment installed at the vibration unit is applied to the vibration proof unit, and thus the vibration proof unit can be prevented from being damaged, and also durability of the vibration proof unit can be enhanced.

20 **[0010]** The present invention is also directed to providing a vibration ripper which prevents left and right vibration of the vibration unit supported by the vibration proof unit at the main body, and thus prevents damage of equipment when bending moment and rotational moment are applied to the attachment installed at the vibration unit.

[Technical Solution]

35 **[0011]** One aspect of the present invention provides a vibration ripper including a main body having a vibration space part and also having a coupling part provided at an outer side thereof to be coupled with a boom or an arm of heavy equipment, a vibration unit disposed in the vibration space part of the main body to have a vibrator, a plurality of vibration proof units installed at an outer surface of the vibration unit and the main body corresponding to the outer surface of the vibration unit and configured to vibratably support the vibration unit with respect to the main body, a clamp unit installed at the vibration unit and configured to allow an attachment to be coupled, and a vibration restriction part configured to connect the vibration unit and the main body and to restrict an amplitude of the vibration unit.

40 **[0012]** The vibration restriction part may include a first connection link part configured to connect an upper side portion of a housing of the vibration unit and the main body, and a second connection link part configured to connect a lower side portion of the housing of the vibration unit. The first connection link part may include a first link of which one side is pin-coupled to the housing of the vibration unit, and a second link configured to be connected to the first link and also pin-coupled to the main

body, but may not limited thereto and may be configured with a chain, a wire or the like. And the second connection link part may include a third link of which both ends are hinged to the housing of the vibration unit and the main body.

[Advantageous Effects]

[0013] The vibration ripper of the present invention can minimize transmission of the vibration generated from the vibration ripper to the boom or the arm when being installed at a construction machine such as excavator and a bulldozer, and also prevent damage of the vibration proof unit configured to support the vibration unit with respect to the main body when rotational moment or bending moment is applied to an attachment connected to the vibration unit of the vibration ripper. Further, the vibration unit can be prevented from being vibrated forward and backward instead of upward and downward with respect to the main body.

[Description of Drawings]

[0014]

FIG. 1 is a partially cut away perspective view of a vibration ripper according to the present invention. FIG. 2 is a side view of the vibration ripper illustrated in FIG. 1.

FIG. 3 is a perspective view illustrating a state in which a vibration unit of the vibration ripper illustrated in FIG. 1 is supported by first and second connection link parts.

FIG. 4 is a perspective view illustrating a state in which a ripper blade is installed at the vibration ripper.

FIG. 5 is a side view of the vibration ripper to which the ripper blade illustrated in FIG. 4 is installed.

FIG. 6 is a perspective view illustrating a state in which a bucket is installed at the vibration ripper.

FIG. 7 is a side view illustrating a state in which the bucket as an attachment is installed at the vibration ripper.

FIG. 8 is a perspective view illustrating a state in which a cutter is installed at the vibration ripper.

FIG. 9 is a side view illustrating the state in which the cutter is installed at the vibration ripper.

FIG. 10 is a perspective view illustrating a state in which a tamping plate is installed at the vibration ripper.

FIG. 11 is a side view illustrating the state in which the tamping plate is installed at the vibration ripper.

FIG. 12 is a perspective view illustrating a state in which a pile clamper is installed at the vibration ripper.

FIG. 13 is a side view illustrating a state in which the ripper blade is installed at a bulldozer.

[Modes of the Invention]

[0015] A vibration ripper according to the present invention is installed at a boom or an arm of heavy equipment used in engineering public works or construction works, such as an excavator, a bulldozer and a payloader to excavate or crush concrete, asphalt and soft ground. One embodiment thereof is illustrated in FIGS. 1 to 3.

[0016] Referring to the drawings, a vibration ripper 10 includes a main body 13 configured to have a vibration space part 11 and also has a fixing bracket 12 provided at an outer side thereof to be coupled with a boom or an arm of the heavy equipment, a vibration unit 20 disposed in the vibration space part 11 to have a vibrator 30, and a plurality of vibration proof units 40 supported by an outer surface of a housing 21 of the vibration unit 20 and the main body corresponding to the outer surface and supporting the vibration unit 20 to be vibratable with respect to the main body 13. The vibration ripper 10 further includes a vibration restriction part 50 installed at the vibration unit 20 and the main body 13 to restrict a vibration range due to bending moment and rotational moment of the vibration unit 20 caused by vibration and an action force. A clamp unit 60 is installed at the vibration unit 20 to fix an attachment, such as a ripper blade, a cutter and a bucket, which extends downward.

[0017] The vibration ripper 10 configured as described above according to present invention will be described in detail according to each construction element.

[0018] A fixing bracket 12 formed at an upper portion of the main body 13 of the vibration ripper 10 to be fixed to a boom or an arm of a construction machine has a plurality of coupling holes 12b configured to be pin-coupled with the boom. And the main body 13 forms the vibration space part 11, and a vibration proof means is installed at the main body 13 to support the vibration unit 20, and a supporting part 14 configured to enclose an outer surface of the vibration unit 20 is provided at the main body 13. A lower side of the main body 13 is opened so that a clamp unit 60 installed at a lower portion of the vibration unit 20 is exposed, and a reinforcing member may be installed at an outer surface of the supporting part 14 to reinforce a supporting strength of the supporting part 14. The main body 13 is not limited to the above-mentioned embodiment. Any supporting structure may be used, as long as the supporting structure has a structure which allows the vibration unit 20 to which the attachment is installed by the clamp unit 60 to be smoothly vibrated in up and down directions.

[0019] The vibration proof unit 40 configured to suspend the vibration unit 20 in the vibration space part 11 of the main body 13 so that the vibration unit 20 is smoothly supported has vibration proof members 41 disposed between the supporting part 14 of the main body 13 and the outer surface of the housing 21. Each of the vibration proof members 41 may have supporting plates 41a and 41b installed at both ends thereof. Here, the vibration proof members 41 may be formed of a rubber material.

However, the vibration proof members 41 are not limited thereto. Any structure may be used, as long as the structure has a structure which may elastically support the vibration unit 20. For example, the vibration proof members 41 may be configured as one of coil springs, flexible synthetic resins having an elastic force and links. In the case of the links, a damping space may be secured or a separate damping member may be installed so as to absorb a distance difference between the main body and the housing according to rotation of each link at hinge-coupled portions.

[0020] Meanwhile, in the vibration proof unit 40, although not shown in the drawings, the vibration proof member 41 installed between the supporting plates 41a and 41b may include a supporting plate and a vibration proof rubber.

[0021] The vibration unit 20 configured to be suspended in the main body 13 by the vibration proof unit 40 to be vibrated has a vibrator 30 installed at the housing 21. The vibrator 30 may be a well-known vibrator (disclosed in Korean Patent No. 0755017 filed and registered by the applicant). The vibrator includes a pair of rotational shafts installed at a housing, driving gears installed at each rotational shaft to be engaged with each other, an eccentric weight member installed at each rotational shaft, and a hydraulic motor installed at the housing to drive one of the rotational shafts.

[0022] The vibrator is not limited to the above-mentioned embodiment. Any structure may be used, as long as the structure has a structure which vibrates the vibration unit in up and down directions. For example, the rotational shafts to which the eccentric weight member is respectively provided are vertically installed at the housing of the vibration unit to be parallel with each other, the hydraulic motor for driving the rotational shafts may be installed at one of the rotational shafts. In this case, the rotational shafts are connected with each other by a separate power transmitting means, such as a gear and a chain, to be simultaneously driven by the hydraulic motor. Three or more rotational shafts may be installed.

[0023] The vibration restriction part 50 prevents the vibration proof unit 40 from being damaged by the vibration of the vibration unit and an action force transmitted from an adapter coupled by the clamp unit 60. Further, it is possible to restrict an amplitude of the vibration unit and a change in the amplitude due to the action force applied from the adapter. The vibration restriction part 50 includes an upper portion of the housing 21, a first connection link portion 51 configured to connect an upper portion of the main body 13, and a second connection link portion 56 configured to connect the main body 13 and a lower portion of the housing 21 corresponding to the first connection link portion 51.

[0024] As illustrated in FIGS. 1 to 3, the first connection link portion 51 includes a first supporting bracket 52 installed at an upper surface of the housing 21, a second supporting bracket 53 installed at the supporting part 14 of the main body 13 to corresponding to the first support-

ing bracket 52, and first and second links 54 and 55 and 55 configured to connection the first and second supporting brackets 52 and 53. The first and second supporting brackets 52 and 53 and the first and second links are arranged in a line with each other, such that the first connection link portion 51 is smoothly vibrated in the up and down direction and the housing 21 is not rotated forward and backed or not rotate in a rotational direction with respect to main body.

[0025] The first connection link portion 51 is not limited to the above-mentioned embodiment, but two or more links may be arranged in parallel in consideration of a vibration trace and the amplitude of the housing 21 in the up and down directions. The first connection link portion 51 may be configured with a wire or a structure in which a link and a wire are coupled with each other.

[0026] As illustrated in FIG. 3, the second connection link portion 56 is disposed at at least one side of front and rear surfaces of the lower portion of the housing 21, and includes a third link 57 of which both ends are rotatably hinged to a first hinge shaft 56a installed to pass through the housing 21 and a second hinge shaft 56b installed to be parallel with the first hinge shaft 56a. Two third links 37 configuring the second connection link portion 56 may be installed to be located at each of front and rear sides of the housing. At this time, both ends of each of the two links may be installed at one rotational shaft installed at the housing and the supporting part.

[0027] Meanwhile, the clamp unit 60 which is fixed installed at a lower surface of the housing 21 of the vibration unit 20 includes a fixing bracket 62 having a first supporting groove 61 of which one side is opened so that one fixing pin installed at the attachment is coupled thereto, a moving bracket 64 which is rotatably installed at the fixing bracket 62 to be opened in an opposite direction to an opened direction of the first supporting groove 61, and an actuator 65 which is rotatably installed at the fixing bracket 62 and of which a rod is installed at the moving bracket 64. The actuator 65 is configured with a hydraulic cylinder.

[0028] As illustrated in FIGS. 4 to 12, the attachment coupled to the vibration unit 20 by the clamp unit 60 may include various attachments such as a ripper blade 101, a bucket 102, a cutter 103, a tamping plate 104 and a pile clamper 105. Particularly, as illustrated in FIG. 13, the vibration ripper to which the ripper blade is installed may be installed and used in a bulldozer.

[0029] An operation of the vibration ripper configured as described above according to the present invention will be described as follows.

[0030] The vibration ripper according to the present invention is to perform a crushing and excavating operation, a tamping operation, a piling operation and the like with respect to concrete, asphalt, soft stone and wind stone, which have a higher strength than general soil, in civil engineering, construction or removal sites. The vibration ripper according to the present invention may minimize generation of a noise and prevent the vibration

from being transferred to the boom or the arm.

[0031] That is, in a state in which the vibration ripper 10 according to the present invention is installed at the boom of the excavator, the bulldozer or the like, when the hydraulic motor of the vibrator 30 is driven, the eccentric weight installed at the vibrator is rotated and thus the vibration is generated. Therefore, the vibration unit, i.e., the housing 21 and the attachment connected to the housing 21 are vibrated in the up and down directions and perform a predetermined operation.

[0032] In this process, since the housing 21 of the vibration unit 20 is suspended by the vibration proof member 41 of the vibration proof unit 40, i.e., the vibration proof member 41 formed of a rubber material having the elastic force, the vibration in the up and down directions do not interfere with the housing 21 of the vibration unit 20. Particularly, since the vibration ripper 10 according to the present invention is suspended by the vibration proof unit 40 and the amplitude thereof is restricted by the vibration restriction part 50, an external force applied from the attachment and the vibration of the vibrator are resonant, and thus the vibration proof unit 40 can be prevented from being damaged.

[0033] Since the vibration restriction part 50 includes the first connection link portion 51 configured to connect one side of the upper portion of the main body 13 and the upper side of the housing 21, and the second connection link portion 56 configured to connect the lower side of the main body corresponding to the first connection link portion 51 and the housing, the vibration in the up and down directions is restricted by interaction thereof. That is, the second connection link portion 56 has one third link 57 configured to connect the main body 13 and the lower side of the housing, and thus the housing 21 supported by the second connection link portion 56 forms a fine arc-shaped trajectory while being vibrated in up and down directions. The arc-shaped trajectory is compensated by the first connection link portion 51. That is, since the first connection link portion 51 includes the two first and second links 54 and 55, and the first and second links 54 and 55 are bent and stretched to compensate for the vibration having the arc-shaped trajectory in the up and down directions. Therefore, the housing 21 is substantially vibrated in the up and down directions. Particularly, since the first connection link portion 51 has the first and second links 54 and 55 arranged in a line, it is possible to secure a vibration degree of freedom in the up and down directions and a vibration degree of freedom in left and right directions. The degree of freedom may reduce amplification of the vibration according to the connection of the links.

[0034] Further, since the vibration restriction part 50 has a structure in which the lower side of the housing 21 and the main body 13 are connected by the second connection link portion 56, the vibration unit 20 is restrictedly controlled as described above, and the action and reaction forces applied to the attachment can be prevented from being applied to the vibration proof member, and a

working force generated when performing an operation using the attachment is transmitted to the housing 21 and the vibration proof member 41 configured to support the housing 21 can be prevented from being damaged.

[0035] Meanwhile, the vibration ripper 10 which is vibrated as described above may perform various operations according to the kinds of attachments installed by the clamp unit 60 (referring to FIGS. 5 to 13). That is, as illustrated in FIGS. 4 and 5, the ripper blade 101 may be installed to excavate the soft ground or crush and scrape rocks, and as illustrated in FIG. 13, the vibration ripper 10 to which the ripper blade is installed may be installed at a rear end of the bulldozer to excavate the soft ground, crush the rocks or scrape jagged stones and roots of trees. Particularly, as illustrated in FIGS. 8 and 9, in the case that the attachment is the circular cutter 103, it is possible to cut a paved road or the like using the vibration generated from the housing of the vibration ripper. And as illustrated in FIGS. 10 and 11, when the tamping plate 104 is installed at the lower surface of the housing of the vibration ripper 10 through the clamp unit, it is possible to tamp a road or the soil covered ground by the vibration generated from the housing of the vibration unit 20.

[0036] As described above, since the vibration ripper according to the present invention may restrictedly control the action and reaction force generated upon the operation using the first and second connection link portions forming the vibration restriction part, it is possible to perform various operations, such as an excavating operation, a cutting operation, a crushing operation and a piling operation, according to the attachment installed through the clamp unit of the vibration unit.

[0037] In this specification, exemplary embodiments of the present invention have been classified into the first, second and third exemplary embodiments and described for conciseness. However, respective steps or functions of an exemplary embodiment may be combined with those of another exemplary embodiment to implement still another exemplary embodiment of the present invention.

[Industrial Applicability]

[0038] The vibration ripper according to the present invention may restrict the amplitude, and may prevent the vibrations of the vibrator from being resonant with the external force due to the operation, thereby improving durability thereof. The vibration ripper according to the present invention may be widely used in various construction equipment and heave equipment.

Claims

1. A vibration ripper comprising:

a main body having a vibration space part and also having a coupling part provided at an outer

side thereof to be coupled with a boom or an arm of heavy equipment,
 a vibration unit disposed in the vibration space part of the main body to have a vibrator,
 a plurality of vibration proof units installed at an outer surface of the vibration unit and the main body corresponding to the outer surface of the vibration unit and configured to vibratably support the vibration unit with respect to the main body,
 a clamp unit installed at the vibration unit and configured to allow an attachment to be coupled, and
 a vibration restriction part configured to connect the vibration unit and the main body and to restrict an amplitude of the vibration unit.

2. The vibration ripper of claim 1, wherein the vibration restriction part comprises a first connection link part configured to connect an upper side portion of a housing of the vibration unit and the main body, and a second connection link part configured to connect a lower side portion of the housing of the vibration unit.
3. The vibration ripper of claim 1, wherein the first connection link part comprises a first link of which one side is pin-coupled to the housing of the vibration unit, and a second link configured to be connected to the first link and also pin-coupled to the main body, and the second connection link part comprises a third link configured to connect the lower side portion of the housing of the vibration unit corresponding to the first connection link part and the main body corresponding to the lower side portion of the housing of the vibration unit.
4. The vibration ripper of claim 1, wherein the vibration proof unit comprises a vibration proof member installed between an outer surface of the housing and the main body and formed of a rubber material.
5. The vibration ripper of claim 1, wherein the attachment is one selected from a ripper blade, a tamping plate, a bucket, a pile clamp and a cutter.

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Fig.1

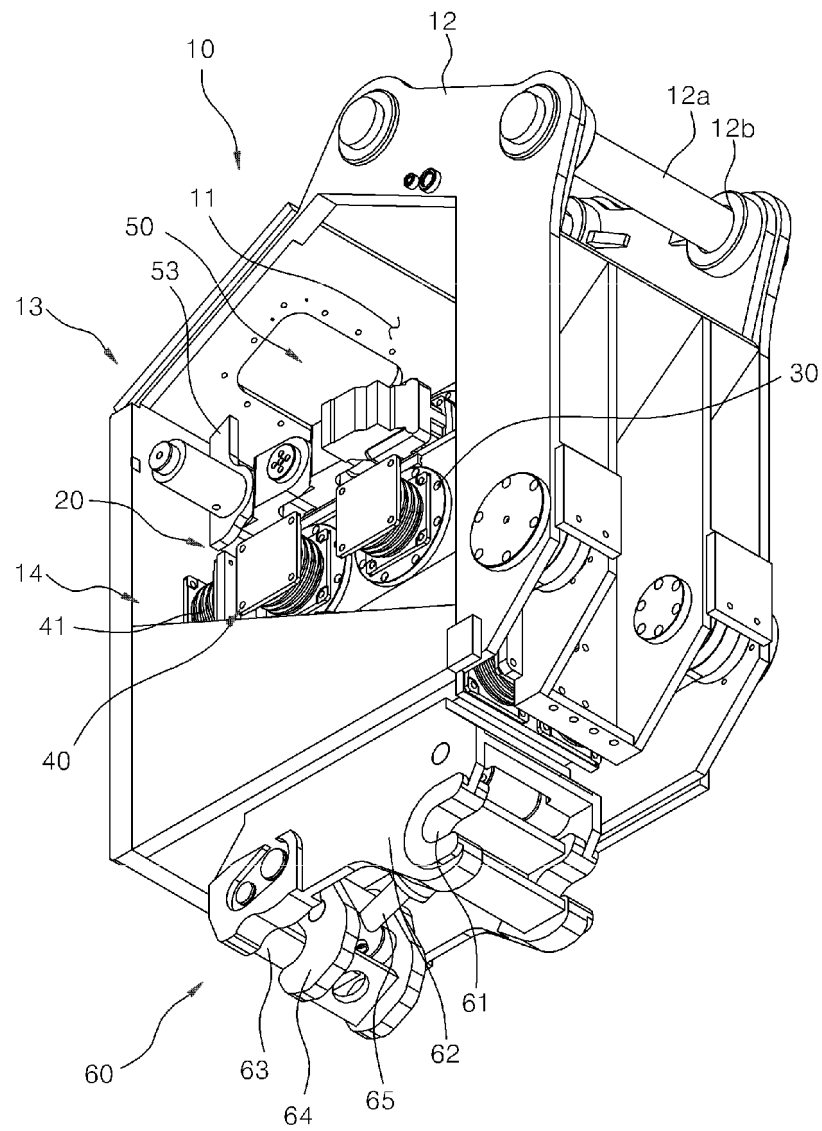


Fig.2

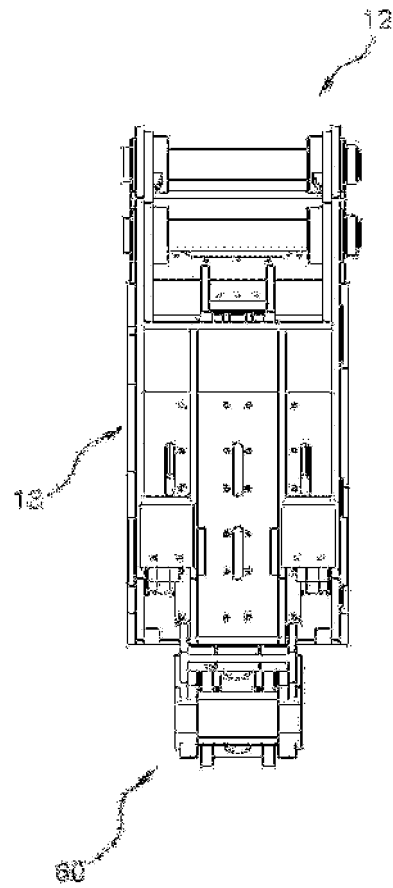


Fig.3

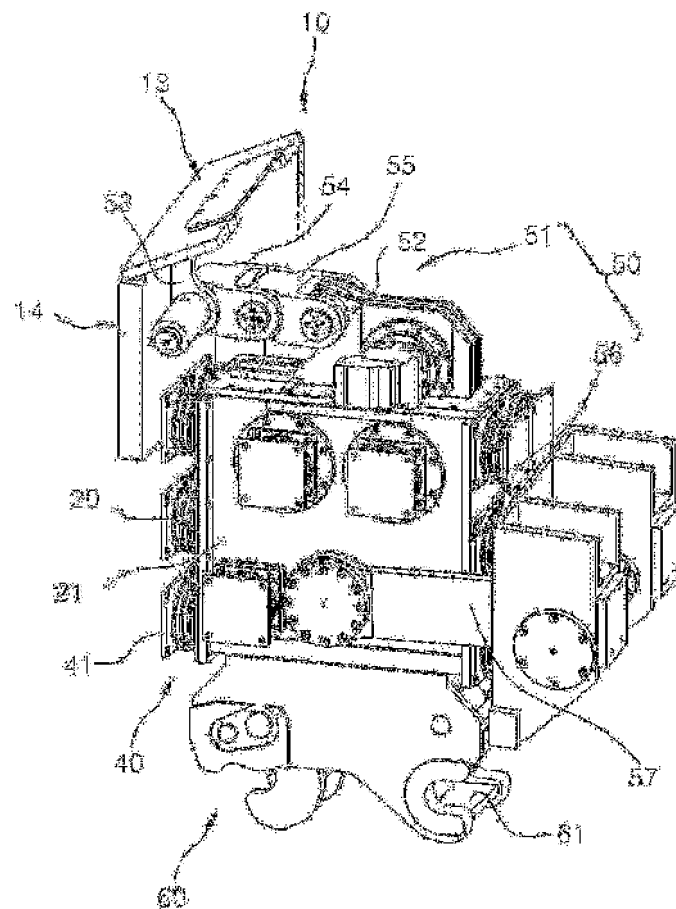


Fig.4

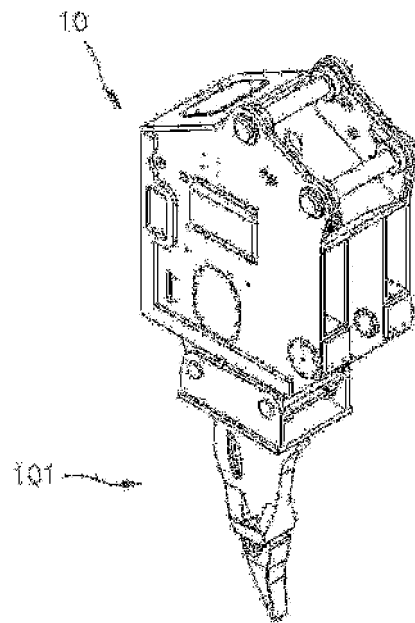


Fig.5

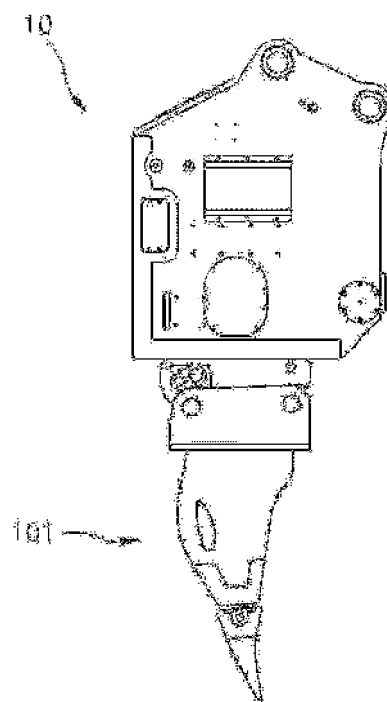


Fig.6

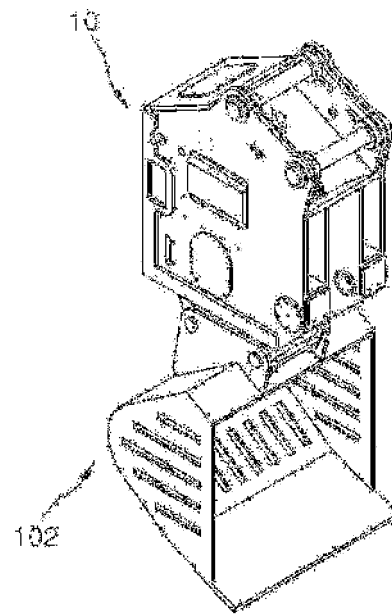


Fig.7

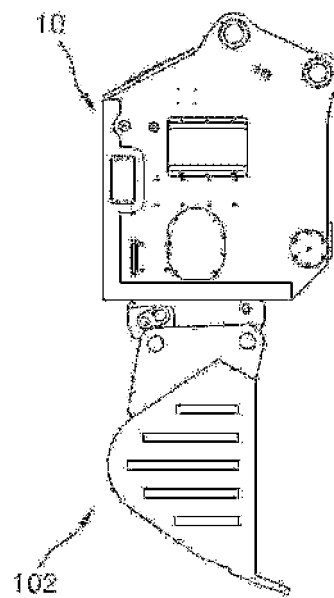


Fig.8

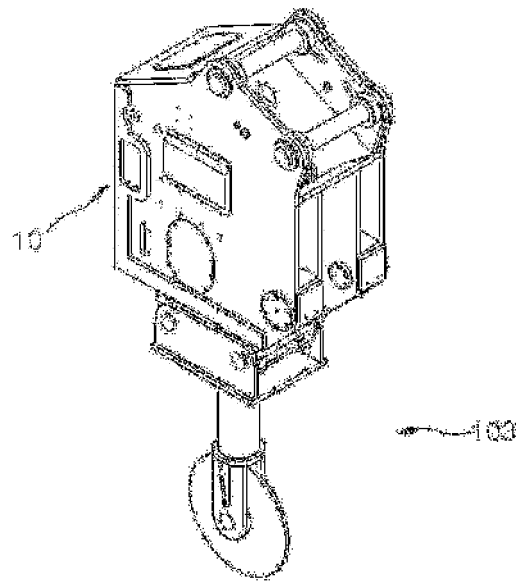


Fig.9

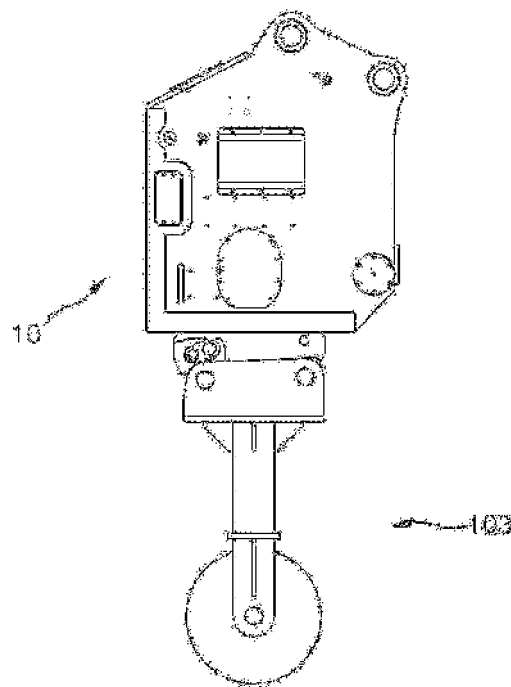


Fig.10

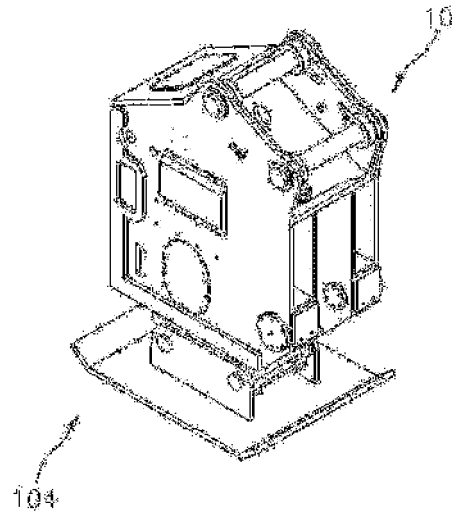


Fig.11

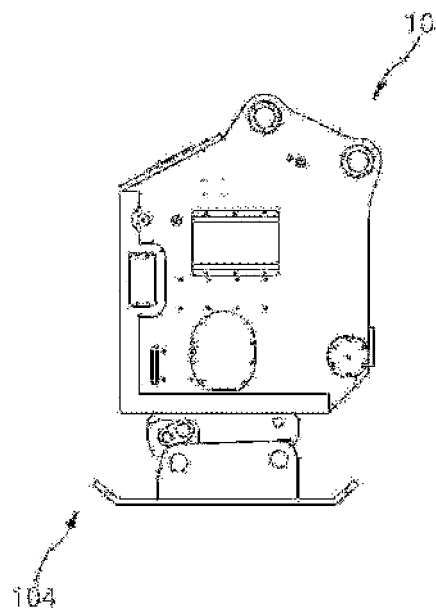


Fig.12

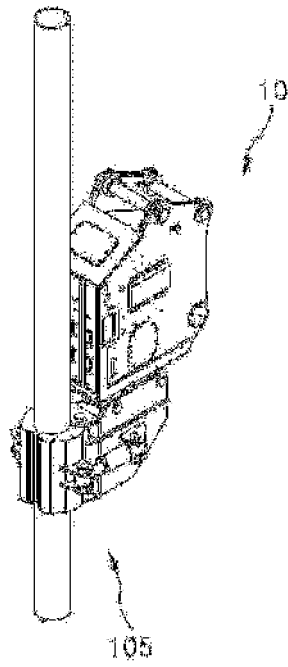
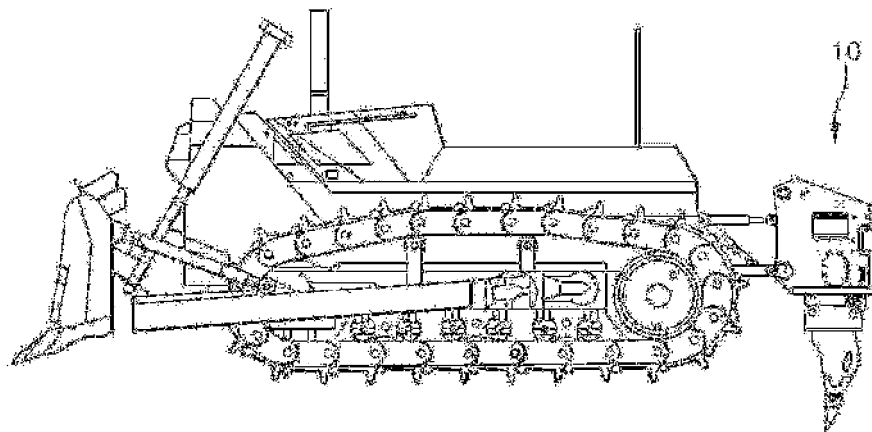


Fig.13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2012/003028

A. CLASSIFICATION OF SUBJECT MATTER

E02F 5/32(2006.01);

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 5/32; E21B 1/26; E02F 5/30; E02F 3/40; E01C 19/29; E02F 3/36; E04G 23/08

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: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: vibro ripper, vibrator, exciter, exciter, vibration unit, vibration isolation, link, vibration limit.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	KR 10-2011-0032791 A (YOON, YONG HWAN) 30 March 2011 Claim 1 and figures 3-5.	1,4-5 2-3
Y	JP 09-105236 A (JIYAKUTEI ENG KK) 22 April 1997 Claims 1-3 and figures 1-2.	1,4-5
A	JP 2000-282503 A (NAGASAWA YOKICHI et al.) 10 October 2000 Claims 1-4 and figures 1-3.	1-5
A	KR 10-2009-0054513 A (PARK, JEONG YEL) 01 June 2009 Claims 1-2 and figures 1,3-4.	1-5

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

31 OCTOBER 2012 (31.10.2012)

Date of mailing of the international search report

01 NOVEMBER 2012 (01.11.2012)

Name and mailing address of the ISA/KR


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 Republic of Korea

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2012/003028

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KR 10-2009-0054513 A	01.06.2009	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 20060033893 [0004]
- KR 20110116647 [0006]
- KR 0755017 [0021]