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

(11) EP 0 971 076 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.01.2000 Bulletin 2000/02

(51) Int Cl.[7]: **E02F 3/96**, E02F 3/36

(21) Application number: **98112894.5**

(22) Date of filing: **10.07.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

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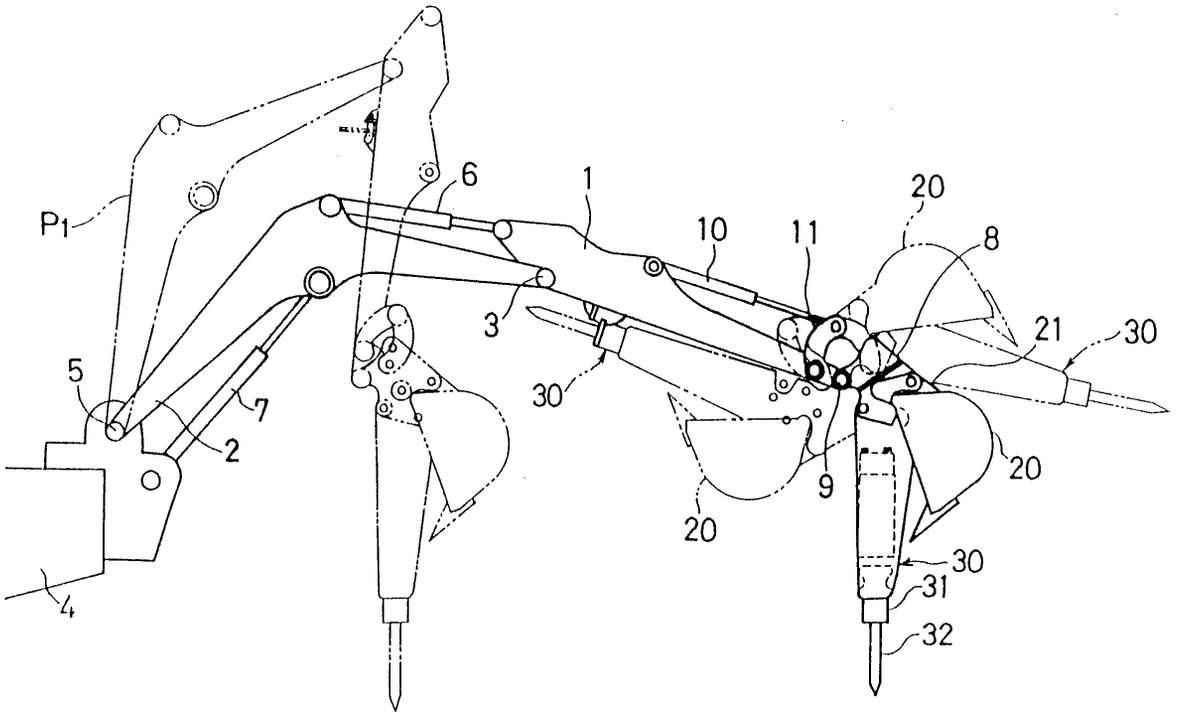
(54) Digging and breaking apparatus

(57) A digging and breaking apparatus including a bucket for a digging operation, a breaker for a breaking operation, an arm, an adapter rotatably mounted on the arm, and a drive unit for rotating the adapter. The digging and breaking apparatus is characterized **in that** the bucket and the breaker are mounted on the adapter; also **in that** the angle between the arm and the breaker is adjustable by rotating the adapter during the breaking operation; **and in that** the breaker and the bucket are so positioned with respect to each other that the breaking operation is performed by the breaker without detaching the bucket from the adapter.

FIG. 1



EP 0 971 076 A1

Description

Background of the invention

Field of the Invention

[0001] This invention relates to a digging & breaking apparatus to be attached to a power shovel and the like.

Description of the Background Art

[0002] Conventionally there are several types of a digging and breaking apparatus to be attached to a power shovel and the like. One of the digging and breaking apparatus is to enable selective attachment of a bucket and a breaker to a attaching portion of a leading end of an arm for allowing either one of a digging operation and a breaking operation at a time. Another type of the digging and breaking apparatus has a breaker permanently attached to an arm and a bucket detachably attached to the arm for the breaking operation.

[0003] However, with either one of the above apparatuses, attaching and detaching operation of the bucket is required at the time of switch-over between the digging and breaking operations, causing inconvenience in switch-over operation.

[0004] In view of the above problem, there was proposed a digging and breaking apparatus that keeps a bucket and a breaker mounted onto an arm all the time, but still enabling a selection of operation between the digging and the breaking. In Japanese unexamined patent publication Serial No. Hei 7-216932, there disclosed an apparatus having a bucket mounted onto a lead end of an arm that is driven by a drive means including a link mechanism and a hydraulic cylinder, a breaker provided on the lower surface of the arm and a cylinder provided on the lower surface of the arm for driving the breaker along the arm. With this apparatus, the breaking operation is enabled when the breaker is slid forward further from the lead end of the arm, in an extended state and the digging operation is enabled when the breaker is restored to the home position, in a retracted state.

[0005] In Japanese unexamined patent publication Serial No. Hei 8-35242, there is disclosed an apparatus having a bucket cylinder pivotally provided in a forward surface of an arm, a bucket, provided at a lead end of the arm, rotated via a first four bar linkage mechanism upon receiving the drive power from the bucket cylinder, a breaker, provided on the rear surface of the arm, that is rotated via second four bar linkage mechanism which is operatively connected to the first four bar linkage mechanism. The breaker can be rotated to a retracted position in which the breaker lies along the longitudinal direction of the arm and be fixed onto the arm, thereafter, the second four bar linkage mechanism is dismounted for enabling the operation by the bucket.

[0006] In the apparatus disclosed in the Japanese unexamined patent publication Serial No. Hei 7-216932, in addition to the hydraulic cylinder for driving the bucket, there is provided another cylinder for driving the breaker based on the selection of the operation, the breaking operation or the digging operation, resulting in increasing number of parts in the drive mechanism, thereby causing to increase weight and cost thereof. Furthermore, the breaker in this art is fixed in its angle with respect to the arm, thus the orientation of the breaker to the arm cannot be changed, resulting in inconvenience when the breaking angle needs to be changed during the breaking operation.

[0007] In the apparatus disclosed in the Japanese unexamined patent publication Serial No. Hei 8-35242, a single bucket cylinder can be used to drive both the bucket and the breaker, thus enabling the avoidance of an increase of the parts in the drive mechanism. In addition, the breaker is set to be rotated and the angle between the breaker and the arm can be adjusted upon arising the need during the breaking operation. However, the operation of the breaker in accordance with the drive of the bucket cylinder is so different from the same for the bucket thus complicating the operations. In addition, when fixing the breaker at the retracted position, the removal of the second four bar linkage mechanism becomes necessary and when the breaking operation is to be conducted, the attachment of the second four bar linkage mechanism becomes necessary. As a result, this removal or attachment of the four bar linkage mechanism inconveniences the operation.

Summary of the Invention

[0008] It is therefore an object of this invention to solve the problems of the conventional apparatuses as described in the above section. It is another object of this invention to provide a digging and breaking apparatus having a bucket and a breaker mounted onto an arm for allowing the selection of operation between the digging and the breaking without increasing the parts in the driving mechanism but without sacrificing the operability of the apparatus for its intended use, the digging operation and the breaking operation.

[0009] In order to fulfill the above objects, the digging and breaking apparatus according to this invention comprises a bucket for a digging operation, a breaker for a breaking operation, an arm, an adapter rotatably mounted on the arm, and a drive unit for rotating the adapter characterized **in that** the bucket and the breaker are mounted on the adapter; **in that** the angle between the arm and the breaker is adjustable by rotating the adapter during the breaking operation; **and in that** the breaker and the bucket are so positioned with respect to each other that the breaking operation is performed by the breaker without detaching the bucket from the adapter.

[0010] By using the thus constructed apparatus, the bucket is tilted by rotating the adapter via the drive unit at the time of digging operation by the bucket. Similarly, at the time of breaking operation, the breaker's angle to

the arm can be adjusted by rotating the adapter via the drive unit. During this angle adjustment of the breaker, the breaker is rotated along with the adapter by the drive unit, simplifying the operation of the breaker. In addition, the breaker and the bucket are so positioned that the bucket does not interfere with the operation of the breaker and the angle adjustment of the breaker with respect to the arm.

[0011] The above and other objects, features, and advantages of the present invention will become more apparent upon reading the following detailed description along with the accompanying drawings.

Brief Description of the Drawings

[0012]

Fig. 1 is a frontal view of a power shovel, in a state for a breaking operation, equipping a digging & breaking apparatus as a first embodiment of this invention;
Fig. 2 is an enlarged front view showing the principal portion of the apparatus in the state for the breaking operation;
Fig. 3 is a front view showing the power shovel in the state for the digging operation;
Fig. 4 is an enlarged front view showing a principal portion of the power shovel in the state for the digging operation;
Fig. 5 is an enlarged front view showing an adapter of the digging & breaking apparatus;
Fig. 6 is an enlarged side view of the adapter;
Fig. 7 is an enlarged front view showing the breaker of the digging & breaking apparatus;
Fig. 8 is an enlarged side view of the breaker;
Fig. 9 is an enlarged front view of a fixing unit of the digging & breaking apparatus for this invention and
Fig. 10 is an enlarged side view of the fixing unit.

Detailed Description of the Preferred Embodiments of the Invention

[0013] Hereinafter, an embodiment of this invention is described with reference to the Figs.

[0014] Figs. 1 to 4 show a digging & breaking apparatus of a power shovel as a first embodiment of this invention. In these figures, a reference numeral 1 is an arm that is pivotally connected to a leading end of a boom 2 via a pivot shaft 3. The boom 2 at its base end is rotatably connected to a main body of a power shovel 4 via a pivot shaft 5. A hydraulic cylinder (as a boom cylinder) 7 is provided between the main body of the power shovel 4 and the boom 2 to rotate the boom 2 with respect to the main body of the power shovel 4. Another hydraulic cylinder (as an arm cylinder) 6 is provided between the boom 2 and the arm 1 to rotate the arm 1 with respect to the boom 2.

[0015] At the lead end of the arm 1, an adapter 8 is pivotally provided via a pivot shaft 9. This adapter 8 is rotated by the hydraulic cylinder 10 and a link mechanism 11 as a drive unit. The link mechanism 11 includes a pair of links 12, 13 that are pivotally connected to each other via a pin 14 and an end of one link 12 is pivotally connected to the lead end of the arm 1 via a pin 15 and an end of the other link 13 is pivotally connected to the adapter 8 via a pin 16. The hydraulic cylinder 10 is connected between the pin 14 of the link mechanism 11 and the middle portion of the arm 1.

[0016] The adapter 8 is attached with a bucket 20 for a digging operation and a breaker 30 for a breaking operation. The bucket 20 is fixedly connected to the adapter 8 via a bucket bracket 21. The breaker 30 is connectable to the adapter in a connecting state where the adapter 8 and the breaker 30 are integrally movable and in a disconnecting state where relative movement of the breaker 30 with respect to the adapter 8 is permitted. A fixing unit is provided to the arm 1 for fixing the breaker 30 onto the arm 1 when the breaker 30 is in the disconnecting state.

[0017] Thus when the breaking operation is performed, the breaker 30 is put into the connecting state. In this state, the angle between the arm 1 and the breaker 30 can be adjusted by rotating the adapter 8 and moreover the breaker 30 and the bucket 20 are so positioned to each other that the breaking operation is carried out by the breaker 30 without further operation to the bucket 20.

[0018] A rotation restrictor is provided in between the link mechanism 11 and the adapter 8 for allowing the switch-over of the rotation range between a first range and a second range.

[0019] With reference to Figs. 3 to 9, the adapter 8, the bucket 20, the breaker 30, the rotation restrictor, the connecting unit and the fixing unit are described in more detail.

[0020] As shown in Figs. 5 and 6, the adapter 8 has a pair of side walls 8a, 8b spaced apart from each for encasing the arm 1 forming an arm side portion, another pair of side walls 8c, 8d narrowly spaced each other than the side walls 8a, 8b, forming an operation side portion and an intermediate plate 8e connecting these side portions.

[0021] On one side of the arm side portion of the adapter 8, a pivot shaft insertion hole 22 is formed and on the other side thereof, a first and a second connecting holes 23, 24 are formed. The adapter 8 is pivotally connected to the arm 1 via the pivot shaft 9 being inserted to the pivot shaft insertion hole 22. Moreover, when the pin 16 is selectively inserted to either one of the connecting holes 23, 24, the link 13 is pivotally connected to the adapter 8.

[0022] The aforementioned first and second connecting holes 23, 24 and the pin 16 for a pivotal connection form the rotation restrictor. For a distance between the first connecting hole 23 and the pivot shaft insertion hole 22 is set different from a distance between the second

connecting hole 24 and the pivot shaft insertion hole 22, a range of the maximum angular displacement of the adapter 8 by operating the hydraulic cylinder 10 when the pin 16 is placed in the first connecting hole 23 is set as a first rotation range that is greater than a second rotation range of the adapter 8 when the pin 16 is placed in the connecting hole 24. In the first rotation range, the breaker 30 is permitted to rotate with respect to the arm 1 to the retracted position (indicated by a phantom line in Fig. 2) whereas in the second rotation range, the breaker 30 is not permitted to rotate to the retracted position, i.e., the maximum movable limit position (as indicated by a phantom line in Fig. 4) falls short to the retracted position thereby prohibiting the rotation of the breaker 30 to the retracted position.

[0023] On the operation side portion of the adapter 8, there is formed a pair of bucket mounting holes 25 as shown in Fig. 5; one is in the right edge and the other one is in the middle of the adapter 8, a bracket 21 extending from the bucket 20 is fixed to the adapter 8 by inserting the fixing pin 26 to the respective bucket mounting holes 25. Further, on the operation side portion of the adapter 8, there is formed a pin mounting hole 27 on the left side thereof and an engaging groove 28 on the lower middle portion thereof as shown in Fig. 5. The engaging groove 28 is shaped in an arc with an arc center corresponding to the pivot shaft insertion hole 22 of the adapter 8.

[0024] With reference to Figs. 7 & 8, the breaker 30 has a breaker main body 31 with a power source therein and a chisel 32 that is detachably attached to the leading end of the breaker main body 31. The pair of brackets 33 are connected by plural bolts 34 and nuts 34a at the position corresponding to the lead end side and tail end side of the breaker main body 31 in such a manner that the brackets 33 are opposingly arranged to each other for placing the bracket main body 31 therebetween. Hoses 35 are plugged to the breaker main body 31 for supplying a hydraulic pressure to the power source in the breaker main body 31 in case the breaker 30 is a hydraulically operated type.

[0025] On the bracket 33 at its one side portion in the tail end, there is formed a pin mount hole 36 corresponding to the pin mount hole 27 of the adapter 8 for connecting the bracket 33 to the adapter 8 and a pin mount hole 37 for disengagement of the bracket 33 from the adapter 8. The pin mount hole 36 is distanced away from the pin mount hole 37 by a certain dimension. On the other side portion of the bracket 33 in the tail end thereof, there is formed an engaging pin mount hole 38 in which an engaging pin 39 is fixed, that is used for connection with the engaging groove 28 of the adapter 8. As shown in Fig. 9, a chisel mount hole 40 is formed at the lead end of the breaker main body 31.

[0026] Furthermore, as shown in Fig.2, a bracket 41 having a pin mount hole 42 is provided on the lower surface of the lead end of the arm 1 at a position corresponding to the pin mount hole 37 when the breaker 30 is disengaged from the adapter 8 and is in the retracted position.

[0027] A connecting state of the breaker 30 to the adapter 8 where the breaker 30 is integrally rotatable with the adapter 8 is realized when the connecting pin 43 pierces the pin mount hole 27 of the adapter 8 and the pin mount hole 36 of the bracket 33 of the breaker 30 respectively and the engaging pin 39 fixed in the engaging pin mount hole 38 of the bracket 33 is fitted in the engaging groove 28 of the adapter 8. On the other hand, a disconnecting state of the breaker with respect to the adapter 8 where the breaker 30 is free from the adapter 8 is realized when the connecting pin 43 is removed from the pin mount holes 27, 36 to be placed into the pin mount holes 37, 42 of the bracket 33 of the breaker 30 and the bracket 41 of the arm 1 and the engaging pin 39 is released from the engaging groove 28 of the adapter 8. This is how the connecting unit is constructed.

[0028] With reference to Figs. 9 & 10, on the lower surface of the base end of the arm 1, a fixing unit having a pivotal fix member 45, and a spring 46 as a bias member is provided. An upper end of the fix member 45 is connected to a pivot shaft 47 that is pivotally connected to a bracket 48 provided lower side of the arm 1. As a result, the fix member 45 is pivotable around the pivot shaft 47 between an upright posture in which the fix member 45 is perpendicularly arranged with respect to the lower surface of the arm 1 (as indicated by a solid line in Fig. 9) and an inclined posture in which the fix member 45 is inclined rearward to disengage from the lead end of the breaker 30 (as indicated by a phantom line in Fig. 9). Moreover, on one side of the fix member 45, a projection 49 to be engaged with the chisel mount hole 40 of the breaker main body 31 is provided. The projection 49 has a sloped surface 50 on its lower end in such a manner that the projection 49 is automatically placed into the chisel mount hole 40 as the breaker 30 is put in the retracted position where the breaker lies along the lower side of the arm 1. As shown in Fig. 10, an operation piece 45a is extended from the lower end of the fix member 45.

[0029] The spring 46 is provided in between the fix member 45 and an opposingly arranged spring base plate 51 and is retained by the shaft 52 mounted on the spring base plate 51. The spring 46 is set to bias the fix member 45 towards its upright posture. The upright posture of the fix member 45 is supported by a stopper 53 as shown in Fig. 9.

[0030] With the thus constructed apparatus, when the breaking operation of the breaker 30 is to be conducted, as shown in Figs. 1 & 2, the connecting pin 16 of the end portion of the link 13 is placed in the first connecting hole 23 of the adapter 8, the connecting pin 43 is placed in the pin mount holes 27 & 36 of the adapter 8 and the breaker 30, and the engaging pin 39 fixed on the bracket 33 is fitted in the engaging groove 28 of the adapter 8.

[0031] In this state, the movement of the engaging pin

39 due to the relative rotation of the breaker 30 to the adapter 8 is an arc of a center corresponding to the connecting pin 43 (the pin mount holes 27 & 36); however, the engaging groove 28 is designed in the form of arc of a center corresponding to the pivot shaft insertion hole 22. In other words, the moving path of the engaging pin 39 is different from the arc path of the engaging groove 28, thus the engaging pin 39 does not come off from the engaging groove 28 due to the relative rotation, if any, of the breaker 30 with respect to the adapter 8. In this way, the breaker is securely held by the adapter 8.

[0032] Accordingly, in the above state, the adapter 8 and the breaker 30 are integrally driven by the operation of the hydraulic cylinder 10. As shown in Fig.1 with a solid line and phantom lines, the breaker 30 is rotated with respect to the arm 1; for instance, the breaker 30 is oriented in a downwardly facing posture as shown by the solid line for digging operation. Furthermore, the breaker's working position can be adjusted as shown in a phantom line pl by changing the angle of the boom 2 and the angle of the arm 1 with respect to the ground upon operating the boom cylinder 7 and the arm cylinder 6. The breaker's angle with respect to the arm 1 can be adjusted by the hydraulic cylinder 10.

[0033] In this state, the bucket 20 fixed onto the adapter 8 is so positioned that the breaking operation by the breaker 30 is not interfered.

[0034] When the operation is changed to the digging operation after finishing the breaking operation, the chisel 32 at the lead end of the breaker 30 is dismounted and the breaker 30 is being rotated to its retracted position as indicated by the phantom line in Fig. 2. By the rotation of the breaker 30 with respect to the arm 1, the lead end of the breaker 30 is automatically engaged with the fix member 45 provided under the arm 1. In this retracted position, the pin mount hole 37 of the bracket 33 of the breaker 30 is at the same position as the position of the pin mount hole 42 of the bracket 41 of the arm 1, then the connecting pin 42 is replaced for the pin mount holes 37 & 42.

[0035] The breaker 30 is fixed to the arm 1 by the connecting pin 43 used for the pin mount holes 37 & 42 and the fix member 45. Then the adapter 8 is driven to away from the breaker 30, causing the connecting pin 39 to slide along the engaging groove 28 that is in the arc shaped with a center corresponding to the pivot shaft insertion hole 22 (a rotation center of the adapter 8)to disengage the breaker 30 from the adapter 8.

[0036] Thereafter, the pin 16, used for connection of the lower end of the link 13 to the adapter 8, is replaced to the second connecting hole 24 from the first connecting hole 23, then the adapter 8 and the bucket 20 are driven by the hydraulic cylinder 10 for the digging operation. In this state, the rotation range of the adapter 8 is limited to the second rotation range as described in the foregoing section so that the sand, soil and the like shoveled in the bucket 20 will not interfere with the breaker 30 at its limit position indicated by a phantom line as shown in Fig. 4.

[0037] Furthermore, after the digging operation, if the breaking operation is required, the pin 16 is replaced back to the first connecting hole 23 of the adapter 8 to expand the rotation range (to the first rotation range) so that the adapter 8 is rotated to the retracted position where the pin mount hole 27 of the adapter 8 correspond to the pin mount hole 36 of the bracket 33 and the engaging groove 28 of the adapter 8 corresponds to the engaging pin 39 thus the pin 43 is placed in the pin mount holes 27 & 36 to complete the engagement of the breaker 30 to the adapter 8. Subsequently, the lead end of the breaker 30 is disengaged from the fix member 45 and the chisel 32 is mounted back to the lead end of the breaker 30 to enable the breaking operation.

[0038] In summing up the aforementioned embodiment of this invention, we had a digging and breaking apparatus comprising a bucket for a digging operation, a breaker for a breaking operation, an arm, an adapter rotatably mounted on the arm, and a drive unit for rotating the adapter. The apparatus is characterized **in that** the bucket and the breaker are mounted on the adapter; the angle between the arm and the breaker is adjustable by rotating the adapter during the breaking operation; **and** the breaker and the bucket are so positioned with respect to each other that the breaking operation is performed by the breaker without detaching the bucket from the adapter.

[0039] With the aforementioned apparatus, the bucket is tilted by rotating the adapter via the drive unit at the time of digging operation by the bucket. Similarly, at the time of breaking operation, the breaker's angle to the arm can be adjusted by rotating the adapter via the drive unit. During this angle adjustment of the breaker, the breaker is rotated along with the adapter by the drive unit, simplifying the operation of the breaker. In addition, the breaker and the bucket are so positioned that the bucket does not interfere with the operation of the breaker and the angle adjustment of the breaker with respect to the arm.

[0040] The apparatus as described may further include a connecting unit enabling a selection between a connecting state where the breaker is fixedly mounted onto the adapter and a disconnecting state where the breaker is free from the adapter and a fixing unit provided on the arm for fixing the breaker onto the adapter when the breaker is in the disconnecting state.

[0041] Thus constructed apparatus prevents the interference of the breaker with the bucket in such as tilting motion as the breaker can be fixed onto the arm at the time of digging operation by the bucket. Furthermore, the connecting unit preferably includes a connecting pin, a pair of pin insertion holes, for use in the connecting state, one is formed in the breaker and the other is formed at the corresponding position in the adapter and another pair of pin insertion holes, one is formed in the breaker and the other is formed at the corresponding position in the arm, for use in the disconnecting state

and the breaker is fixedly connected to the adapter when the connecting pin pierces the first pair of pin insertion holes and the breaker is disengageable from the adapter when the connecting pin pierces the second pair of pin insertion holes.

[0042] With this construction, the switching operation between the connecting state and the disconnecting state of the breaker can be easily performed by merely selecting the inserting holes by the connecting pin.

[0043] Yet, moreover, in the aforementioned apparatus, the fixing unit preferably includes a fixing member being pivotable between the engaging position of the breaker where the breaker, lying along the arm, is fixed onto the arm in the retracted position and the non-engaging position of the breaker and a biasing member for biasing the fixing member to the engaging position.

[0044] In this construction, the fixation and releasing of the breaker to/from the arm can be easily performed. Also, when the breaker is set to lie along the arm, this posture of the breaker is securely maintained by the bias member.

[0045] Furthermore, the above apparatus preferably has a rotation restrictor for allowing the selection of the rotation of the adapter with respect to the arm between a first rotation range in which the breaker is allowed to rotate up to its retracted position and a second rotation range in which the breaker is prohibited from rotating to its retracted.

[0046] With the above rotation restrictor, the breaker is put to the retracted position when the adapter is selected to rotate in the first rotation range, thus the fixation and release of the breaker to/from the arm can be easily done. In addition, when the bucket is used for digging operation with the breaker being fixed onto the arm, selection of the rotation range of the adapter to be the second rotation range prevents soil, sand, and the like on the bucket from interfering with the breaker.

[0047] Yet, furthermore, the drive unit preferably includes a link mechanism pivotally connected to the adapter via a pivot pin and a cylinder for rotating the adapter via the link mechanism and the above rotation restrictor is preferably included with a first hole and a second hole formed in the adapter and the pivot pin is selectively inserted to one of the first and the second holes to allow selection of the rotation of the breaker with respect to the arm between in the first rotation range and in the second rotation range.

[0048] In this structure, the alteration of the adapter's rotation range can be easily done by the replacement of the pin.

[0049] In the above embodiment, the chisel 32 is dismounted from the breaker main body 31 when fixing the breaker 30 in the retracted position to the arm 1; however, the chisel 32 may be kept with the breaker 30 when the arm 1 is designed to be long enough such that the chisel 32 mounted to the breaker main body 31 in the retracted position does not interfere with the movement of the boom 2. In this alternate case, the fix member 45 is set to engage the portion of the breaker main body 31 other than the chisel mount hole 40 in the aforementioned embodiment.

[0050] In the above embodiment, rotation ranges of the adapter 8 are controlled by selecting the pin connection position between the first connecting hole 23 and the second connecting hole 24 of the adapter 8; however, this may be done by adjusting the operation of the rotation of the bucket 20 at the time of digging operation. Although the present invention has been fully described by way of example with reference to the accompanying drawings, it is to be understood that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be construed as being therein.

Claims

1. A digging and breaking apparatus comprising a bucket for a digging operation, a breaker for a breaking operation, an arm, an adapter rotatably mounted on the arm, and a drive unit for rotating the adapter characterized **in that** the bucket and the breaker are mounted on the adapter; **in that** the angle between the arm and the breaker is adjustable by rotating the adapter during the breaking operation; **and in that** the breaker and the bucket are so positioned with respect to each other that the breaking operation is performed by the breaker without detaching the bucket from the adapter.

2. The apparatus as defined in claim 1, **characterized by** a connecting unit enabling a selection between a connecting state where the breaker is fixedly mounted onto the adapter and a disconnecting state where the breaker is rotatable with respect to the adapter and a fixing unit provided on the arm for fixing the breaker onto the arm when the breaker is in the disconnecting state.

3. The apparatus as defined in claim 2, **characterized in that** the connecting unit includes a connecting pin, a pair of pin insertion holes, for use in the connecting state, one is formed in the breaker and the other is formed at the corresponding position in the adapter and another pair of pin insertion holes, one is formed in the breaker and the other is formed at the corresponding position in the arm, for use in the disconnecting state and the breaker is fixedly connected to the adapter when the connecting pin pierces the first pair of pin insertion holes and the breaker is disengageable from the adapter when the connecting pin pierces the second pair of pin insertion holes.

4. The apparatus as defined in claim 2, **characterized**

in that the fixing unit includes a fix member being pivotable between an engaging position of the breaker where the breaker in a retracted position, lying along the arm, is fixed onto the arm and a non-engaging position of the breaker and a biasing member for biasing the fixing member to the engaging position.

5. The apparatus as defined in claims 1 to 4, **characterized by** a rotation restrictor for allowing the selection of the rotation of the adapter with respect to the arm between in a first rotation range and in a second rotation range where in the first rotation range, the breaker is allowed to rotate up to its retracted position and where in the second rotation range, the breaker is prohibited from rotating to its retracted position.

6. The apparatus as defined in claim 1, **characterized in that** the drive unit includes a link mechanism pivotally connected to the adapter via a pivot pin and a cylinder for rotating the adapter via the link mechanism and the rotation restrictor includes a first hole and a second hole formed in the adapter and the pivot pin is selectively inserted to one of the first and the second holes to allow selection of the rotation of the breaker with respect to the arm between in the first rotation range and in the second rotation range.

7. The apparatus as defined in claim 6, characterized in that the adapter is pivotally connected to the arm via a pivot shaft and the distance between the pivot shaft and the first hole is shorter than the distance between the pivot shaft and the second hole.

FIG. 1

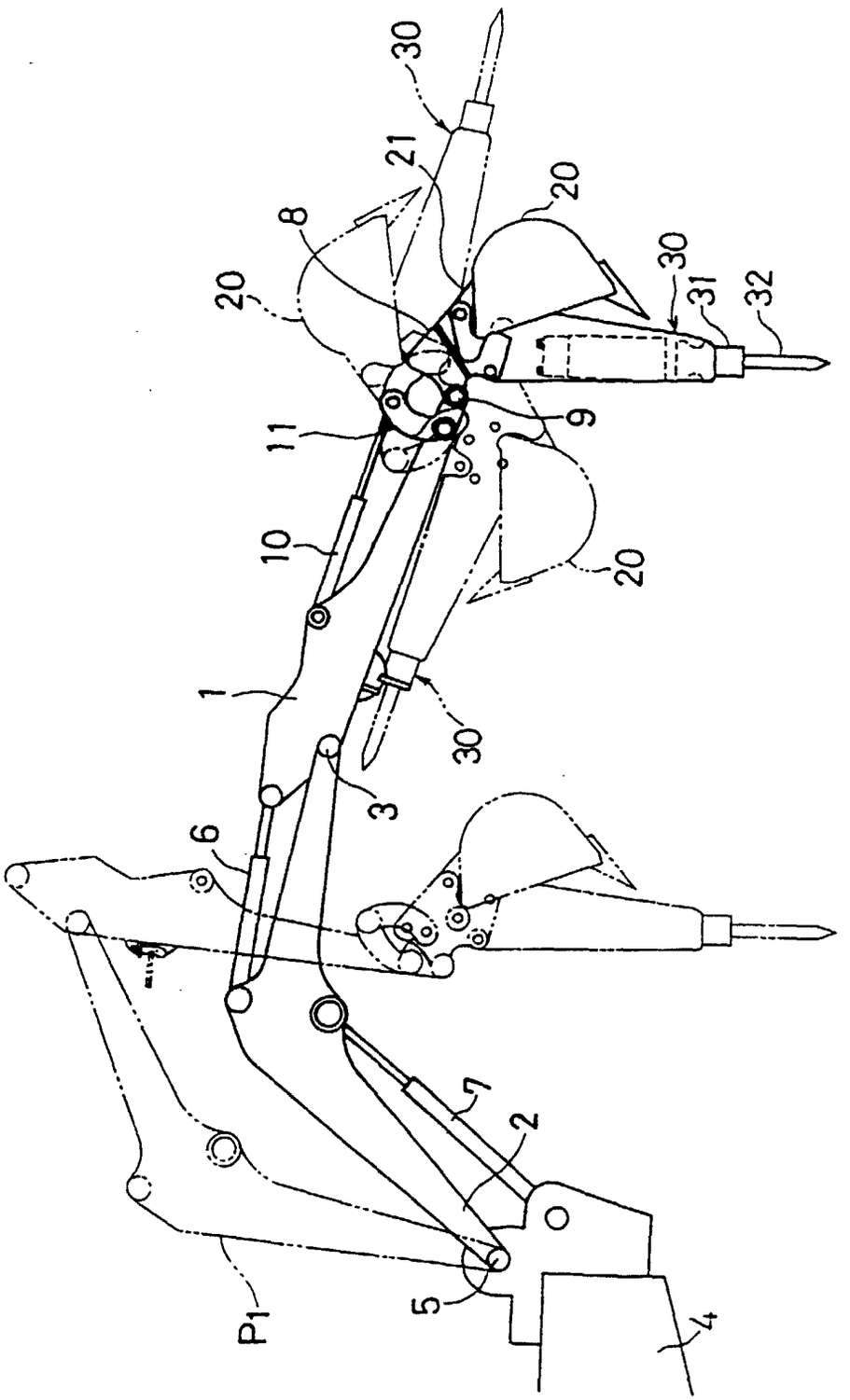


FIG. 2

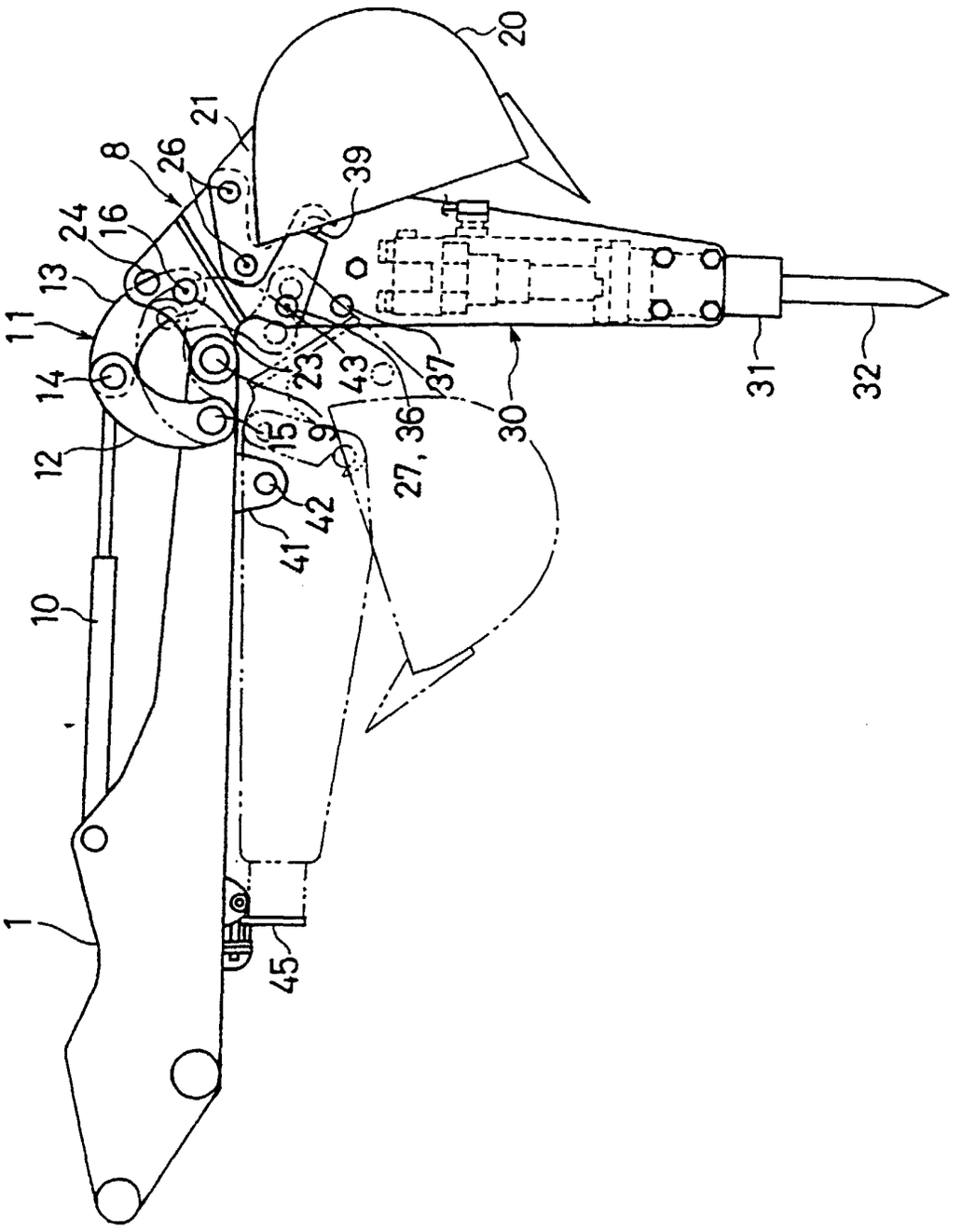


FIG. 3

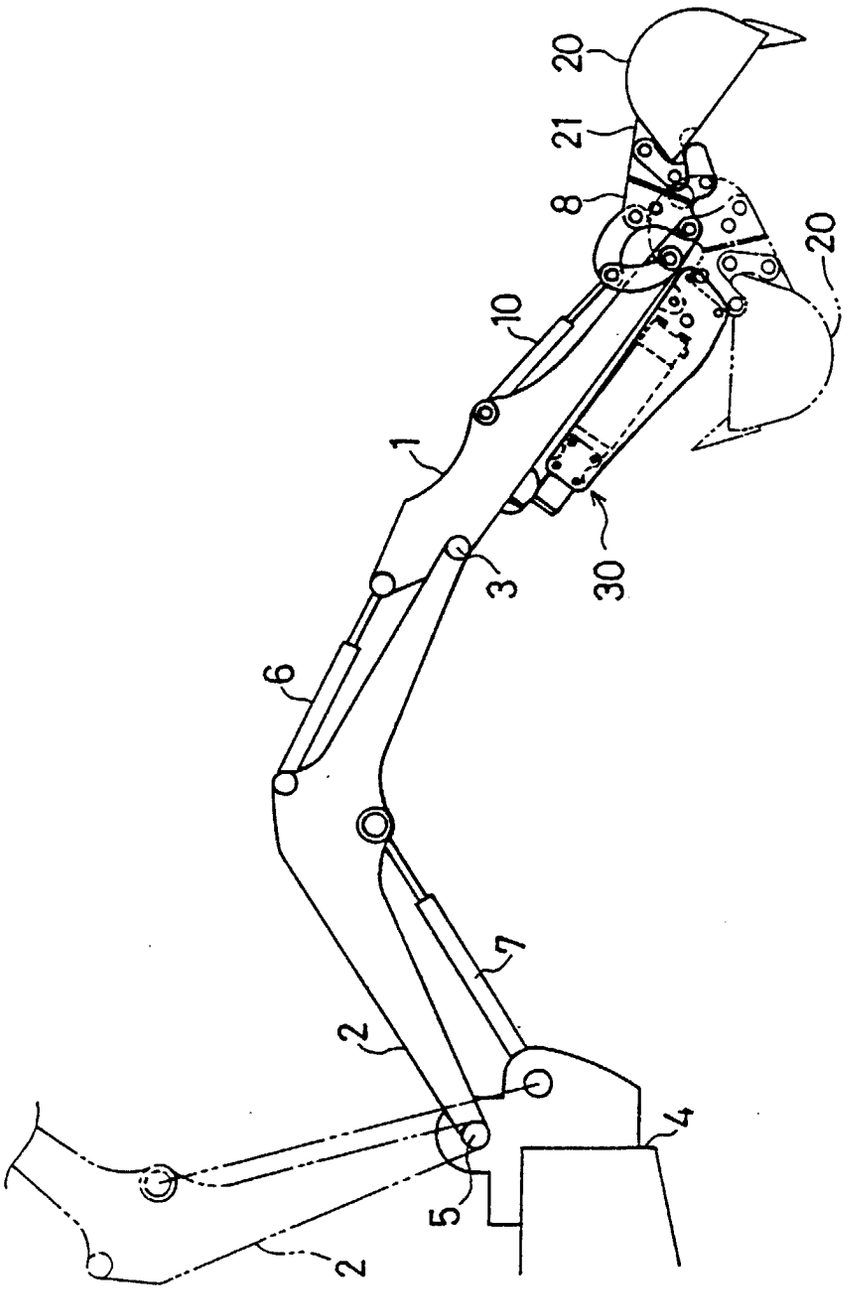


FIG. 4

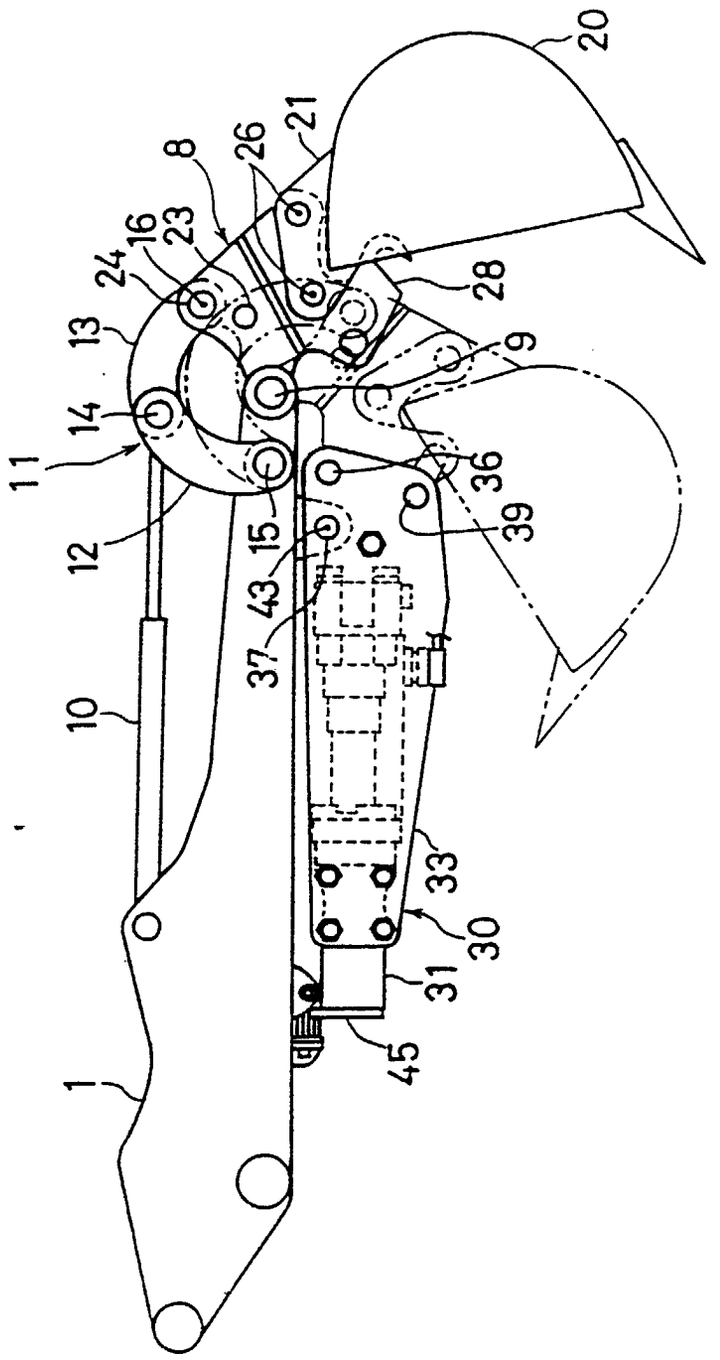


FIG. 5

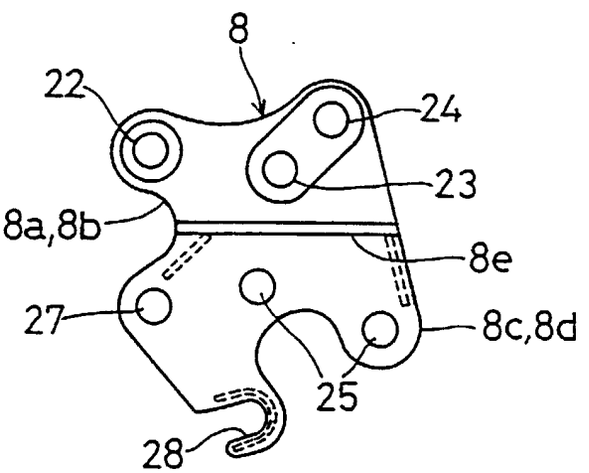


FIG. 6

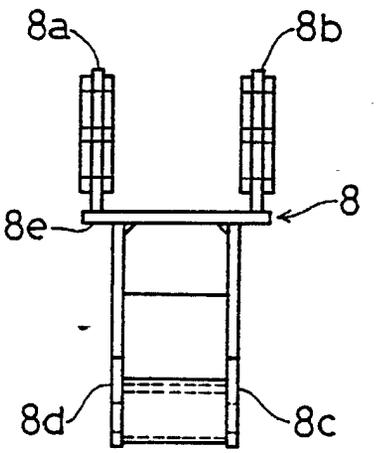


FIG. 7

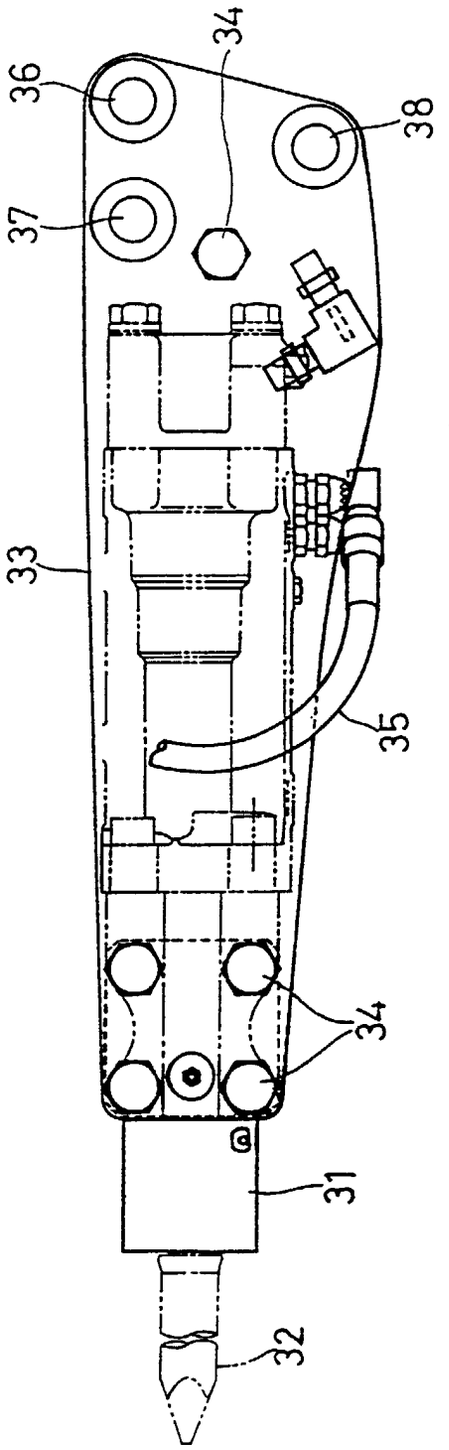


FIG. 8

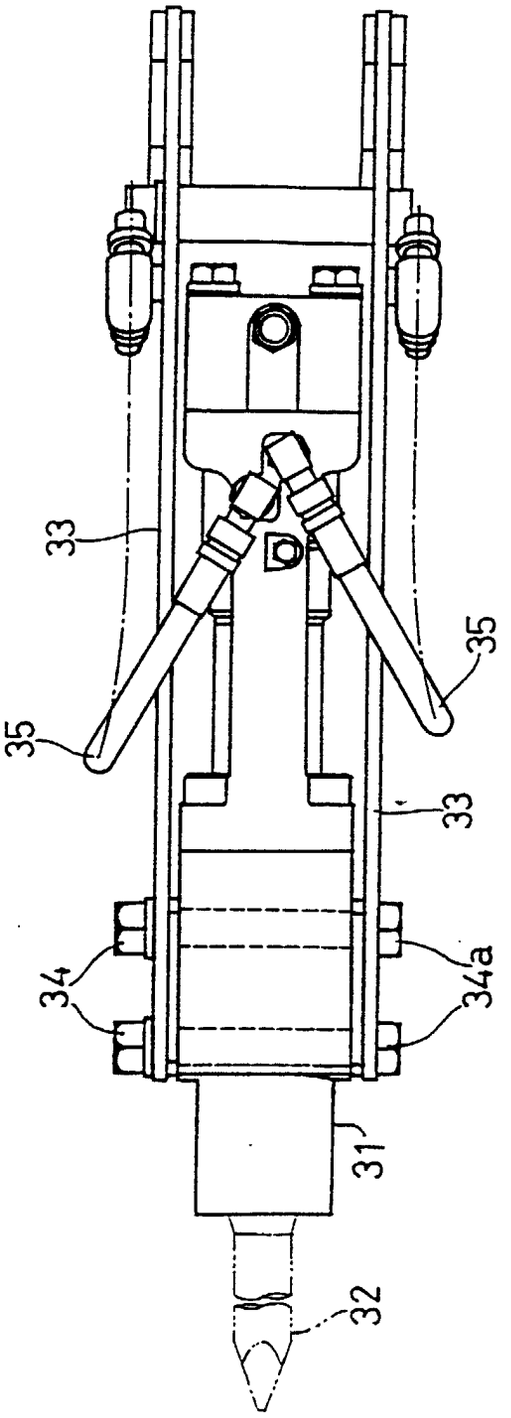


FIG. 9

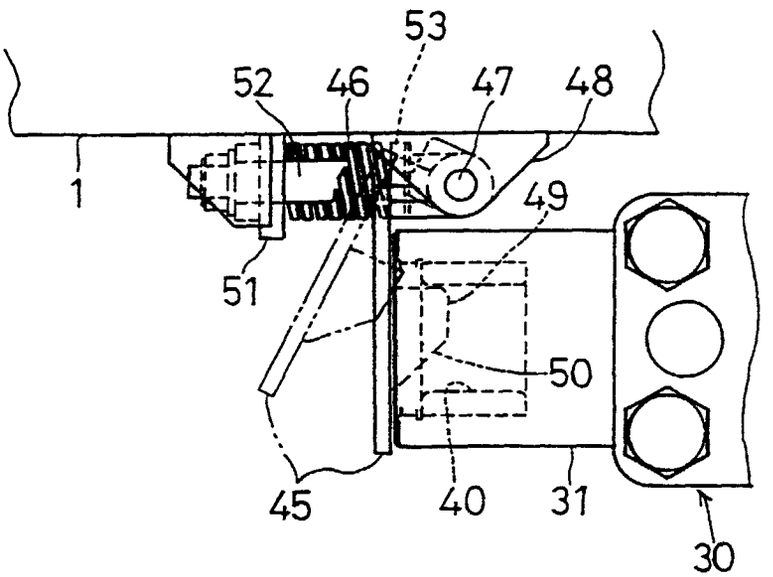
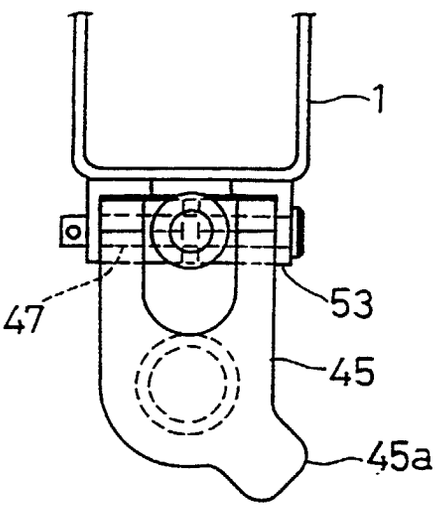


FIG. 10



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Application Number
EP 98 11 2894

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y A	FR 2 194 849 A (GUIBBERT JEAN) 1 March 1974 * page 1, line 18 - line 33 * * page 3, line 7 - page 5, line 4 * * figures 1-4 *	1 6	E02F3/96 E02F3/36
Y	WO 92 20875 A (WEBSTER EQUIPMENT LIMITED) 26 November 1992 * figures 18,19 * * see on page 7 and 8 the part of the description concerning figures 18 and 18 *	1	
A	FR 2 268 121 A (GUIBBERT JEAN) 14 November 1975 * figures * * page 5, line 37 - page 6, line 2 *	1-4,6	
A	US 3 915 501 A (COBB DELWIN E ET AL) 28 October 1975 * figures 1-3,5 *	1-4,6	
A	GB 1 172 537 A (BRIDEN) 3 December 1969 * figures *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E02F
A	US 4 466 494 A (HANSON CHARLES B) 21 August 1984		
A	US 4 087 010 A (STORMON HARRY J) 2 May 1978		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 December 1998	Guthmuller, J

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