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

(11) EP 0 717 335 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.06.1996 Bulletin 1996/25

(51) Int Cl.[6]: **G05G 1/14**, G05G 5/04

(21) Application number: **95402126.7**

(22) Date of filing: **21.09.1995**

(84) Designated Contracting States:
BE FR

(30) Priority: **12.12.1994 JP 332066/94**

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(54) Operation pedal stepping restricting device in working machine

(57) An operation pedal 14 can be changed over between a restricted state where an oscillation lever 21 disposed at the rear of and below the operation pedal 14 interferes with upper and lower pieces 20a,20b of a restricting member 20 provided on a side of the operation pedal 14 to restrict forward and backward stepping operations of the operation pedal 14, a half-restricted state where the oscillation lever 21 interferes with only the upper piece 20a to restrict the backward stepping of the operation pedal 14, and a non-restricted state where the operation lever 21 interferes with neither the upper piece 20a nor the lower piece 20b and the forward and backward stepping operations of the operation pedal 14 are thus allowed for by oscillation of the operation lever 21. The restricting device for restricting the stepping operation of the operation pedal 14 can thus be readily changed over between the restricted state and the non-restricted state.

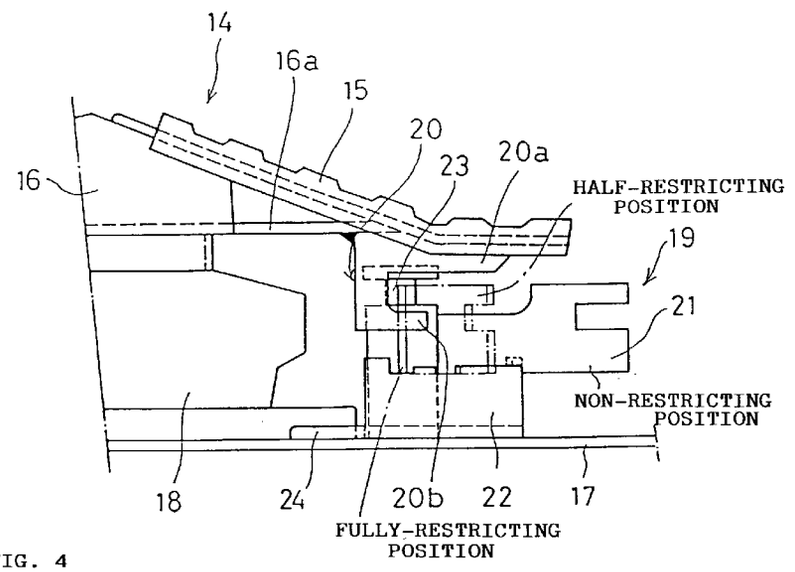

FIG. 4

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Description

The present invention relates to a stepping restricting device for an operation pedal in a working machine, such as a hydraulic shovel.

Working machines, such is hydraulic shovels, of the type which are constructed such that a working portion thereof is actuated on the basis of the stepping operation of an operation pedal disposed in front of an operator seat are known. While some operation pedals are for general use, others are used for optionally mounted attachments. Where such an attachment is not mounted or used, it is desirable that the operation pedal be locked. Where an attachment is mounted, a number of actuations of the working portion may differ depending on the type of attachment. Some attachments require change-over between a state where only the forward stepping is possible and a state where both forward and backward steppings are possible.

Fig. 9 illustrates a conventional mechanism for performing such a change-over operation. In this mechanism, an operation pedal 14 is provided in such a manner that it can be oscillated forward and backward about an oscillation axis 18a. A pedal support frame 27 having a through-hole 27b for full restriction and a through-hole 27c for half restriction protrudes from a machine body. A pedal frame 16 of the operation pedal 14 has a through-hole 16b for full restriction and an elongated hole 16c for half restriction. In this mechanism, change-over is performed in the manner described below: to achieve a fully-restricted state wherein forward and backward stepping operations of the operation pedal 14 are restricted, a restricting pin 28 is passed through the fully-restricting through-holes 16b and 27b. To achieve the half-restricted state wherein only forward stepping is allowed for, the restricting pin 28 is passed through the half-restricting hole 27c and the elongated hole 16c. To allow for forward and backward steppings, the restricting pin 28 is passed through an accommodation hole 27a formed in the pedal support frame 27.

However, the above-described change-over mechanism has problems in that change-over operation of the restricting pin 28 is troublesome and complicated, in that a pin 28a or a screw 28b for preventing release of the restricting pin 28 may be removed or lost, and in that the restricting pin 28 may also be lost when a chain 29 for connecting the restricting pin 28 to the pedal support frame 27 is cut. In addition, insertion and removal of the restricting pin 28 are conducted in front of the pedal where there is only a small space in the front portion of the cab, thus deteriorating workability.

In view of the aforementioned problems, an object of the present invention is to provide an operation pedal stepping restricting device for restricting a stepping operation of an operation pedal in a working machine constructed such that a working portion is actuated on the basis of the stepping operation of the operation pedal disposed in front of an operator seat. The restricting device comprises an operation tool member which can be oscillated between a restricting position and a non-restricting position, and a restricting portion which does not interfere with the operation tool member at the non-restricting position but interferes with the operation tool member at the restricting position to restrict oscillation of the operation pedal.

In the present invention, change-over operation of the restricting device for restricting the stepping operation of the operation pedal is facilitated.

Fig. 1 is a schematic side elevational view of a hydraulic shovel;

Fig. 2 is a perspective view illustrating the interior of a cab;

Fig. 3 is a side elevational view of an operation pedal;

Fig. 4 is a side elevational view of a restricting device;

Fig. 5 is a plan view of the restricting device;

Fig. 6 is a cross-sectional view of the restricting device at a fully-restricting position;

Fig. 7 is a cross-sectional view of the restricting device at a half-restricting position;

Fig. 8 is a cross-sectional view of the restricting device at a non-restricting position;

Fig. 9 is a side elevational view of an operation pedal portion illustrating a conventional restricting device; and

Fig. 10 is a section taken along the line A-A of Fig. 9.

An embodiment of the present invention will be described below with reference to the accompanying drawings. In Fig. 1, a hydraulic shovel 1 includes a crawler type lower travel body 2, an upper swivel body 3 turnably supported on the lower travel body 2, a working portion 4 mounted on the front of the upper swivel body 3, and so on. These components are hydraulically actuated on the basis of the power of an engine. The basic construction of each of these components is a known one.

The working portion 4 includes a boom 5 whose proximal portion is supported on the upper swivel body 3 in such a manner that it can be oscillated up and down, an arm 6 supported on the distal end portion of the boom 5 in such a manner that it can be oscillated forward and backward and so on. Any of various attachments, including bucket, a crusher, a grapple and a hammer, can be mounted on the distal end portion of the arm 6. In this embodiment, a grapple 7 is mounted as the attachment.

In a cab 8 disposed in the upper swivel body 3 are provided various hydraulic operation tools, including right and left travelling levers 9R and 9L and right and left travelling pedals 10R and 10L used for travelling operations of the lower travel body 2, and right and left control levers 11R and 11L used for both swivel operation of the upper swivel body 3 and operations of the

boom 5 and arm 6, and various operation units, such as an operator seat 12 and a monitor panel 13. In addition, an operation pedal 14 used for actuating a hydraulic actuator (not shown) for the grapple 7 is provided in front of the operator seat 12. The present invention is carried out in the operation pedal 14.

The operation pedal 14 is made up of a pedal rubber 15, a pedal frame 16 and so on. A bottom surface portion of the pedal frame 16 is fixed, by bolts 18b, to an upper surface portion of an valve assembly 18 mounted in such a manner that it passes through a cab floor 17, in such a manner that it can be oscillated forward or backward about an oscillation axis 18a so that the pedal can be stepped forward or backward from a neutral position where the bottom surface portion of the pedal frame 16 is substantially parallel to the cab floor 17. A pilot valve (not shown) assembled in the valve assembly 18 is changed over according to the forward or backward stepping operation of the operation pedal 1, whereby an oil is supplied to the hydraulic actuator for the grapple 7 to operate the hydraulic actuator.

A restricting device 19 for restricting the stepping operation of the operation pedal 14 is used when an attachment A (which may be a bucket actuated on the basis of the operation of the controller lever 11), which does not require the stepping operation of the operation pedal 14, is mounted in place of the grapple 7 or when the pilot valve has only one changing-over operation portion to be changed over by the operation pedal 14 and thus an attachment B (which may be a hydraulic hammer) mounted in place of the grapple 7 requires only the forward stepping of the operation pedal 14. The restricting device 19 is made up of a restricting member 20 provided on the side of the operation pedal 14, an oscillation lever 21 (corresponding to an operation tool member according to the present invention) provided on the side of the cab floor 17, a positioning member 22, a lock bolt and so on, as will be described later.

The restricting member 20 has substantially a U-shaped form having a long upper piece 20a (corresponding to a first restricting portion according to the present invention) and a short lower piece 20b (corresponding to a second restricting portion according to the present invention). An upper portion of the upper piece 20a is fixed to a flange portion 16a formed at the rear end of the bottom portion of the pedal frame 16 in a state wherein an open side of the restricting member 20 is directed in a backward direction (toward the operator seat 12).

A base frame 24 is disposed below the restricting member 20. The base frame 24 is fixed to the cab floor 17 through washers 24a and bolts 24b. A shaft tube portion 25 is provided upright from the base frame 24 in such a manner that the axis is directed in a vertical direction. A boss tube portion 26 is fitted on the outer peripheral portion of the shaft tube portion 25 in such a manner as to be rotatable about the axis of the shaft tube portion 25 and movable up and down. The proximal end portion of the oscillation lever 21 is fixed to the boss tube portion 26 so that the oscillation lever 21 can be oscillated about the shaft tube portion 25.

An interfering piece 21a for interfering with the restricting member 20 provided on the side of the operation pedal 14 is formed at the distal end portion of the oscillation lever 21. When the oscillation lever 21 is positioned at a fully-restricting position where the distal end portion thereof is directed sideways, the interfering piece 21a is fitted between the upper and lower pieces 20a and 20b of the restricting member 20 and interferes with the bottom surface of the upper piece 20a and the upper surface of the lower piece 20b, whereby the forward and rearward steppings of the operation pedal 14 are restricted (see Fig. 6).

When the oscillation lever 21 is positioned at a half-restricting position where the distal end portion thereof is directed slantingly backward, the interfering piece 21a interferes with the bottom surface of the upper piece 20a but does not interfere with the short lower piece 20b, whereby the backward operation of the operation pedal 14 is restricted while the forward operation thereof is allowed for (see Fig. 7).

When the oscillation lever 21 is positioned at a non-restricting position where the distal end portion thereof is directed backward, the interfering piece 21a interferes neither the upper piece 20a nor the lower piece 20b, whereby the forward and backward stepping operations of the operation pedal 14 are allowed for (see Fig. 8).

The positioning member 22 for positioning the oscillation lever 21 at the fully-restricting position, the half-restricting position and non-restricting position is provided upward from the base frame 24 in an arc shape along the oscillation locus of the oscillator lever 21. The positioning member 22 has positioning recessed grooves 22a, 22b and 22c with which the lower portion of the oscillator lever 21 can engage at the fully-restricting position, the half-restricting position and the non-restricting position, respectively.

The locking bolt 23 (corresponding to the locking member according to the present invention) is screwed into a threaded hole 25a cut into an inner peripheral portion of the shaft tube portion 25 in such a manner as to be movable up and down. A flange portion 23a is provided at the upper end portion of the locking bolt 23 above the boss tube portion 26 so as to allow for upward and downward movement of the oscillation lever 21 by a distance corresponding to a clearance S between the upper end of the boss tube portion 26 and the bottom surface of the flange portion 23a. The oscillation lever 21 can be oscillated freely to either of the fully-restricting position, the half-restricting position and the non-restricting position without the positioning member 22 interfering with the oscillation lever 21 by moving the locking bolt 23 up until the clearance S becomes greater than the depth of the positioning recessed grooves 22a, 22b and 22c and then by moving the oscillation lever 21 up until the lower end thereof is located above the upper

end of the positioning member 22 in that state.

After the oscillation lever 21 has been oscillated to either of the fully-restricting position, the half-restricting position and the non-restricting position, it is moved down to allow the lower portion of the oscillation lever 21 to be brought into engagement with either of the positioning recessed grooves 22a, 22b and 22c. In that state, the locking bolt 23 is moved down until the bottom surface of the flange portion 23a comes contact with the upper end of the boss tube portion 26 to lock upward movement of the oscillation lever 21, whereby the oscillation lever 21 is positioned at either of the positioning recessed grooves 22a, 22b and 22c.

Since a clearance X between the oscillation lever 21 located at the fully-restricting position or the half-restricting position and the restricting member 20 is set to a value greater than an engagement depth Y of the oscillation lever 21 with the positioning recessed groove 22a or 22b (the depth of the positioning recessed groove 22a or 22b) (X > Y), upward and downward movement of the oscillation lever 21 is allowed at each position. This means that the operation pedal 14 can be oscillated by a distance corresponding to the clearance X even when it is in a restricted state. However, the clearance X is almost as small as play of the pilot valve and thus causes no problem in an actual operation.

Locking between the oscillation lever 21 and the positioning member 22 at each position is not limited to the use of the positioning recessed grooves 22a, 22b and 22c as employed in this embodiment, and any engagement structure, such as serration engagement or sawteeth like engagement, can be employed as long as it assures positioning during operation.

As mentioned above, in the present invention, positioning of the oscillation lever 21 at each position is conducted in the following manner: the locking bolt 23 is moved up, and then the oscillation lever 21 is oscillated in that state to either of the fully-restricting position where the interference piece 21a interferes with both the upper and lower pieces 20a and 20b of the restricting member 20 to restrict the forward and backward stepping operations of the operation pedal 14, the half-restricting position where the interference piece 21a interferes with only the upper piece 20a to restrict backward stepping operation of the operation pedal 14 and the non-restricting position where the interference piece 21a interferes with neither the upper piece 20a nor the lower piece 20b and forward and backward stepping operations of the operation pedal 14 are thus allowed for. Thereafter, the oscillation lever 21 is moved down at each position to bring it into engagement with the positioning recessed groove 22a, 22b or 22c of the positioning member 22, and then the locking bolt 23 is moved down to lock the upward movement of the oscillation lever 21.

In the present invention, the operation pedal 14 can be changed over between the fully-restricted state where forward and backward stepping operations are restricted, the half-restricted state where the backward stepping operation is restricted and the non-restricted state where the forward and backward stepping operations are allowed for by oscillating the oscillation lever 21 to either of the fully-restricting position, the half-restricting position and non-restricting position and then by positioning the oscillation lever 21 at that position. Further, positioning and unlocking of the positioning of the oscillation lever 21 can be done by moving up and down the locking bolt 23, which is a simple and easy operation. Consequently, the changing-over operation is facilitated and disengagement or missing of the restricting pin, the separation-preventing pin or the screw is eliminated, as compared with a conventional structure in which the restricted state of the operation pedal is changed over by changing over the passage of the restricting pin.

Furthermore, since the restricting device 19 is disposed at the rear of the operation pedal 14, the operator can perform the oscillation operation of the oscillation lever 21 and the upward and downward movement operation of the locking bolt 23 from the operator seat 12. Thus, it is not necessary for the operator to perform the change-over operation in a narrow space located in front of the operation pedal, and workability is thus further enhanced.

As will be understood from the foregoing description, in the present invention, since the operation pedal can be changed over between the restricted state where the operation tool member interferes with the restricting portion to restrict the stepping operation of the operation pedal and the non-restricted state where the operation tool member does not interfere with the restricting portion and the stepping operation of the operation pedal is thus allowed for by oscillation of the operation tool member to the restricting position and to the non-restricting position, the change-over operation is facilitated, as compared with a conventional structure in which the restricted state of the operation pedal is changed over by changing over passage of the restriction pin, and disengagement or missing of the restricting pin, separation-preventing pin or screw is eliminated, thus enhancing workability.

Further, since the restricting device is disposed at the rear of the operation pedal, the operator can perform the oscillation operation of the operation tool member from the operator seat. Thus, it is not necessary for the operator to perform the chang-over operation in a narrow space located in front of the operation pedal, and workability is thus further enhanced.

Claims

1. A restricting device for restricting a stepping operation of an operation pedal (14) in a working machine constructed such that a working portion is actuated on the basis of the stepping operation of said

operation pedal (14) disposed in front of an operator seat (12), characterized in that it comprises :

an operation tool member (21) which can be oscillated between a restricting position and a non-restricting position; and
a restricting member (20) which does not interfere with said operation tool member (21) at said non-restricting position but interferes with said operation tool member (21) at said restricting position to restrict oscillation of said operation pedal (14).

2. The operation pedal stepping restricting device according to claim 1, wherein said operation pedal (14) is supported in such a manner that said operation pedal (14) can be oscillated forward and backward so that the operator can perform a forward stepping operation and a backward stepping operation of said operation pedal (14) from a neutral position, characterized in that said restricting position to which said operation tool member (21) is operated includes a fully-restricting position and a half-restricting position, and in that said restricting member (20) includes a first restricting portion (20a) which does not interfere with said operation tool member (21) at said non-restricting position and which interferes with said operation tool member (21) at said fully-restricting position or said half-restricting position to restrict one of said forward and backward oscillations of said operation pedal (14), and a second restricting portion (20b) which does not interfere with said operation tool member (21) at said non-restricting position or at said half-restricting position and interferes with said operation tool member (21) at said fully-restricting position to restrict the other oscillation of said operation pedal (14).

3. The operation pedal stepping restricting device according to either of claims 1 and 2, characterized in that said operation tool member (21) is disposed below and at the rear of said operation pedal (14) so that the operator can operate said operation tool member (21) from said operator seat (12).

4. The operation pedal stepping restricting device according to either of claims 1, 2 and 3, characterized in that said restricting member (20) is provided on a bottom surface of said operation pedal (14) integrally therewith.

5. The operation pedal stepping restricting device according to either of claims 2 and 4, characterized in that said restricting member (20) has a substantially U-shaped member having a long upper piece (20a), serving as said first restricting portion, and a short lower piece (20b), serving as said second restricting portion, and in that a distal end portion of said operation tool member (21) is provided with an interference piece (21a) which interferes with a bottom surface of said upper piece (20a) at said half-restricting position and which is fitted between said upper (20a) and lower (20b) pieces at said fully-restricting position and interferes with both said bottom surface of said upper piece (20a) and an upper surface of said lower piece (20b).

6. The operation pedal stepping restricting device according to either of claims 1, 2, 3 and 5, characterized in that said operation tool member (21) is supported on an oscillation shaft (25) in such a manner as to be movable in an axial direction of said shaft (25) so that said operation tool member (21) can move to a locked position where said operation tool member (21) is locked and positioned by a positioning member (22) and to an unlocked position where said operation tool member (21) is unlocked at each of said restricting position and said non-restricting position.

7. The operation pedal stepping restricting device according to claim 6, characterized in that said oscillation shaft (25) has a locking member (23) for locking movement of said operation tool member (21) locked by said positioning member (22) to said unlocked position.

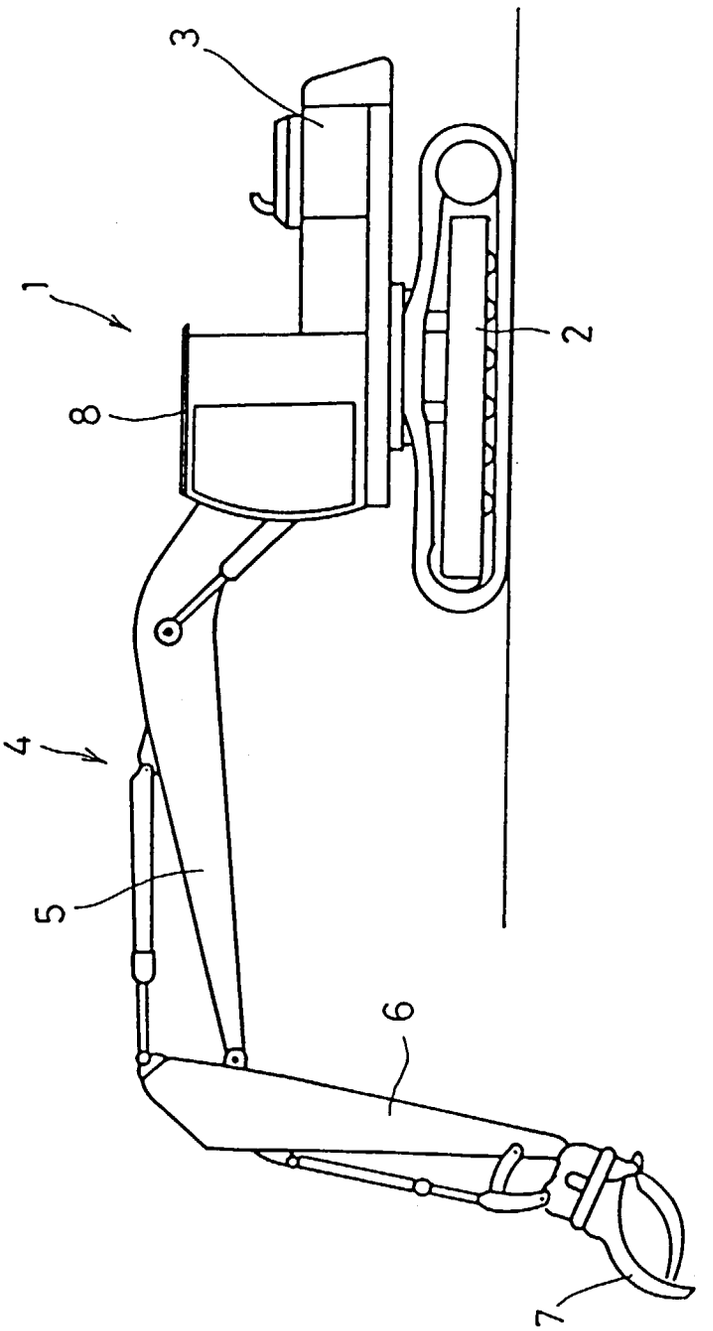

FIG. 1

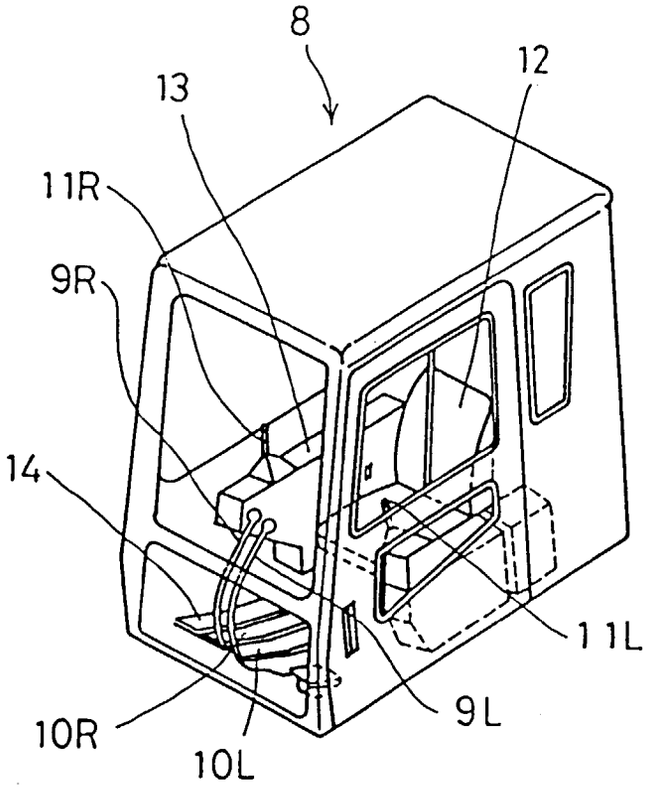

FIG. 2

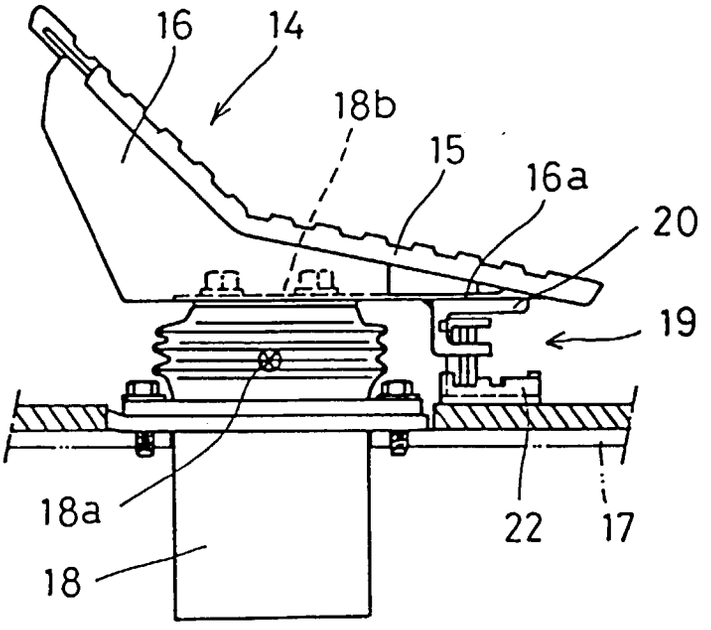

FIG. 3

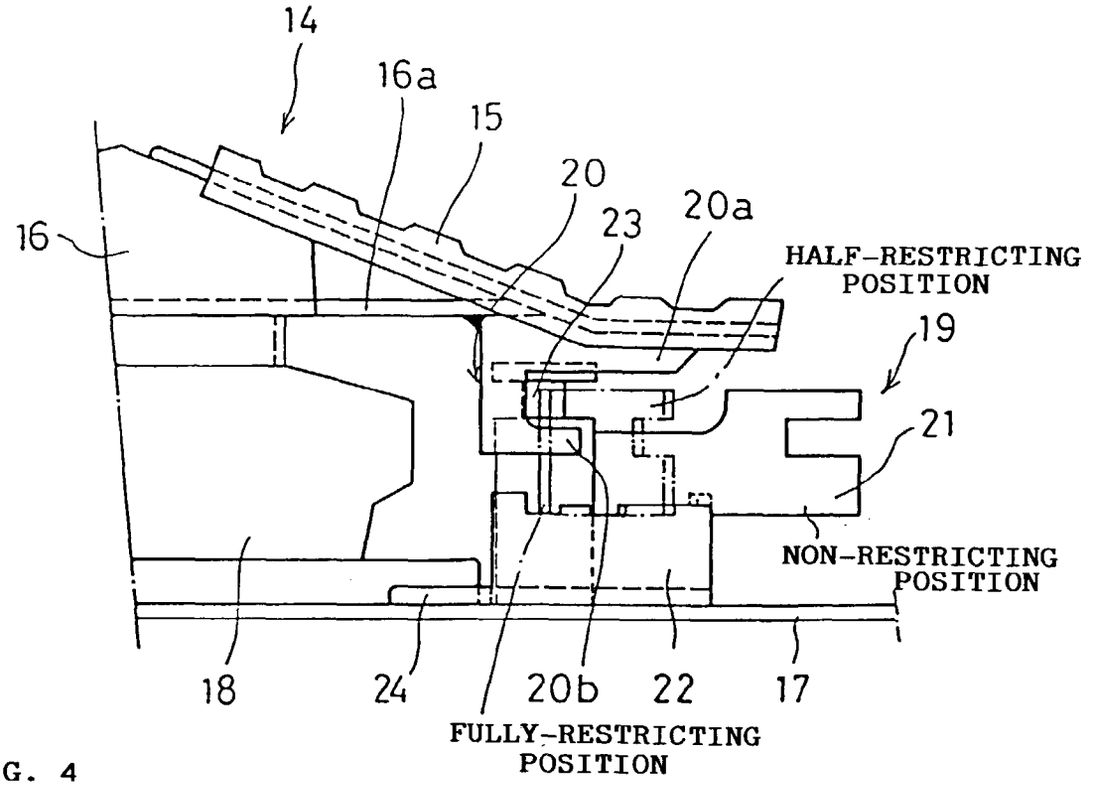
14
16a
15
20
23
20a
16
HALF-RESTRICTING POSITION
19
21
NON-RESTRICTING POSITION
18
24
20b
22
17
FULLY-RESTRICTING POSITION

FIG. 4

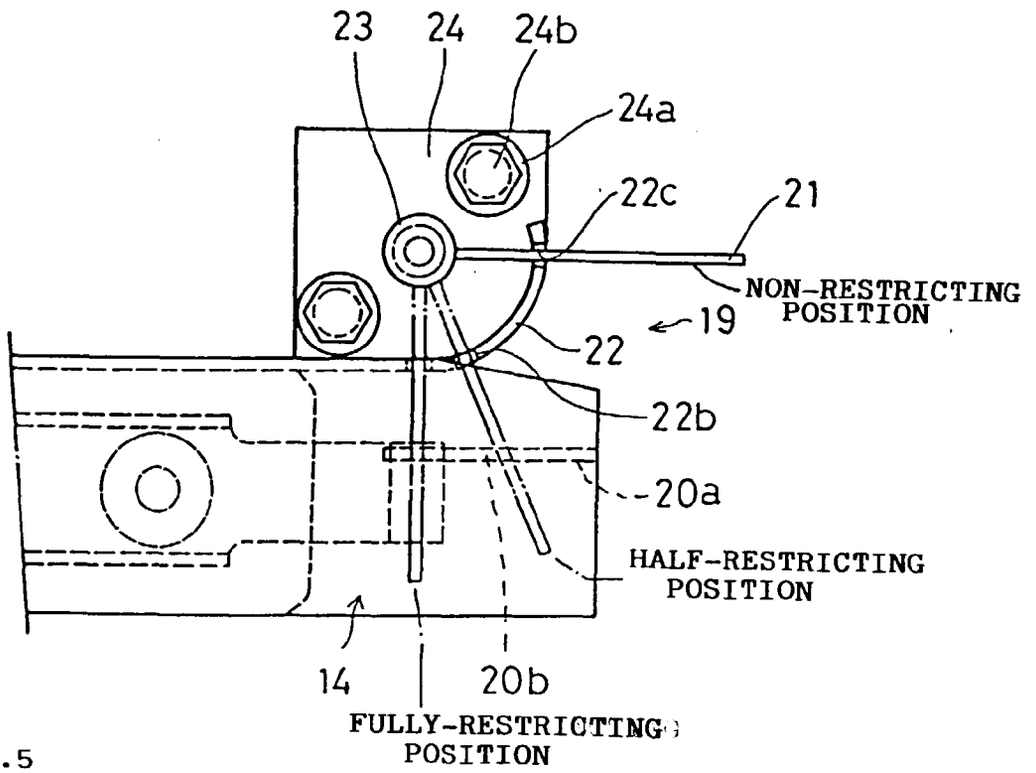
23
24
24b
24a
22c
21
NON-RESTRICTING POSITION
19
22
22b
20a
HALF-RESTRICTING POSITION
14
20b
FULLY-RESTRICTING POSITION

FIG.5

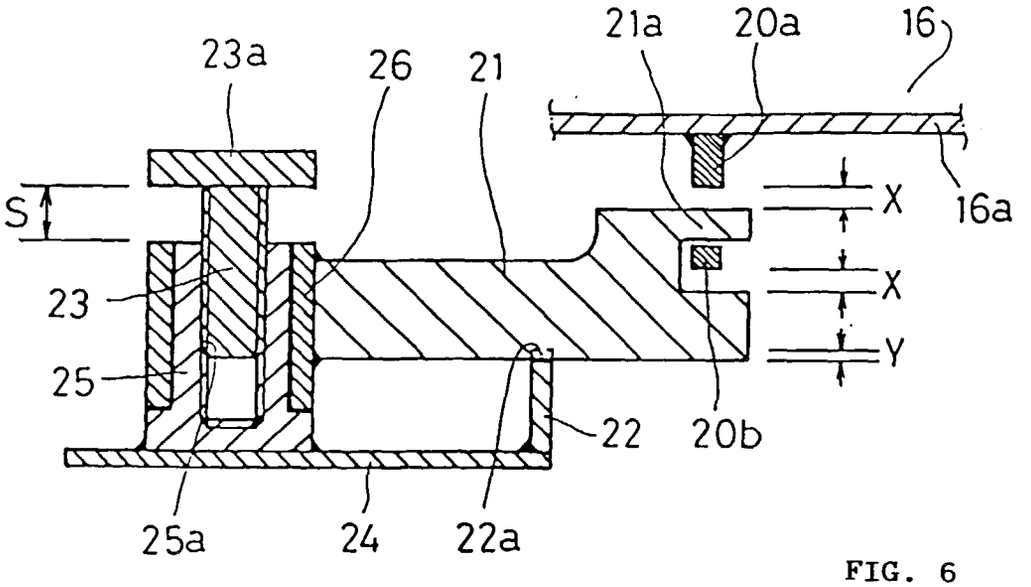
21a
20a
16
23a
26
21
S
X
16a
X
23
Y
25
22
20b
25a
24
22a

FIG. 6

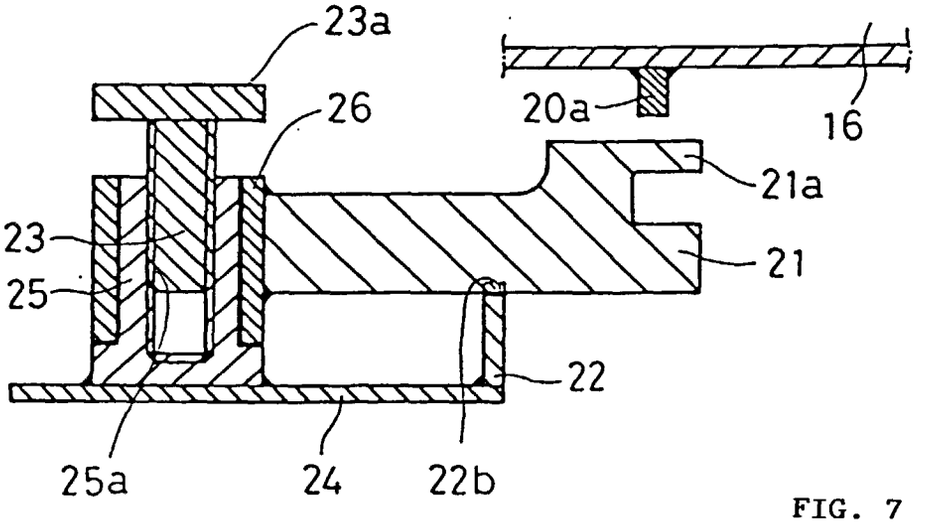
23a
20a
16
26
21a
23
21
25
22
25a
24
22b

FIG. 7

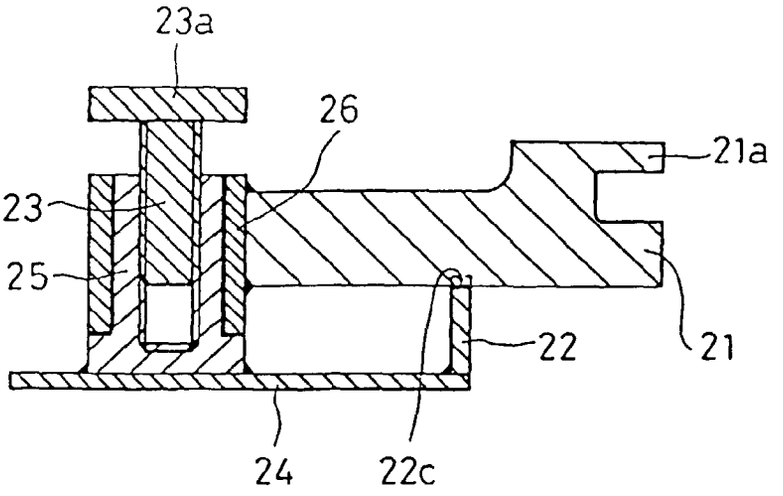

FIG. 8

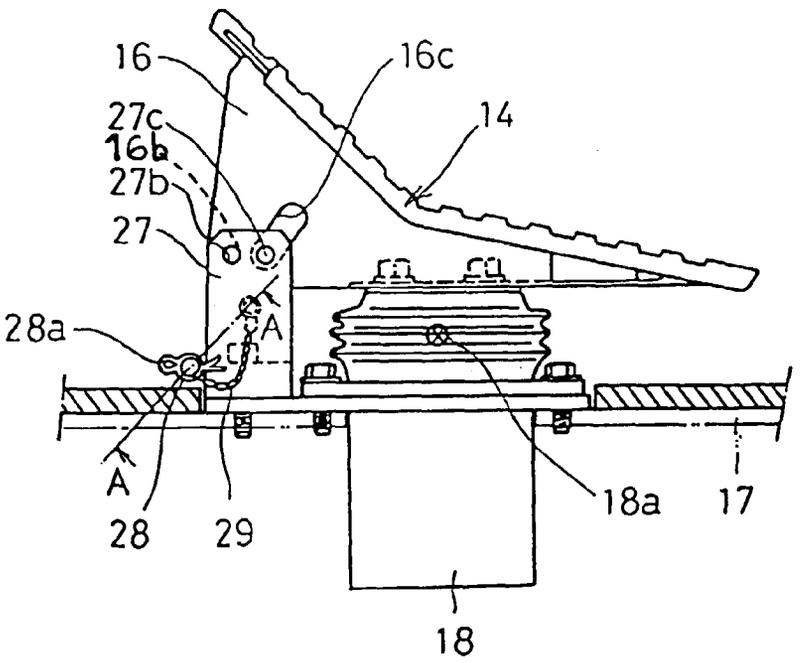

FIG. 9

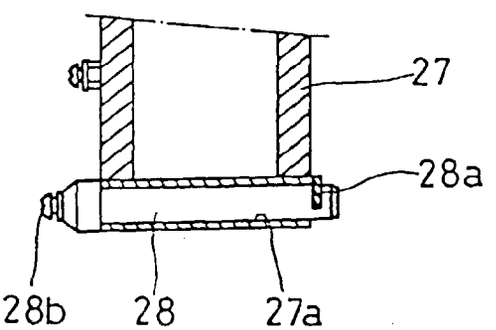

FIG. 10