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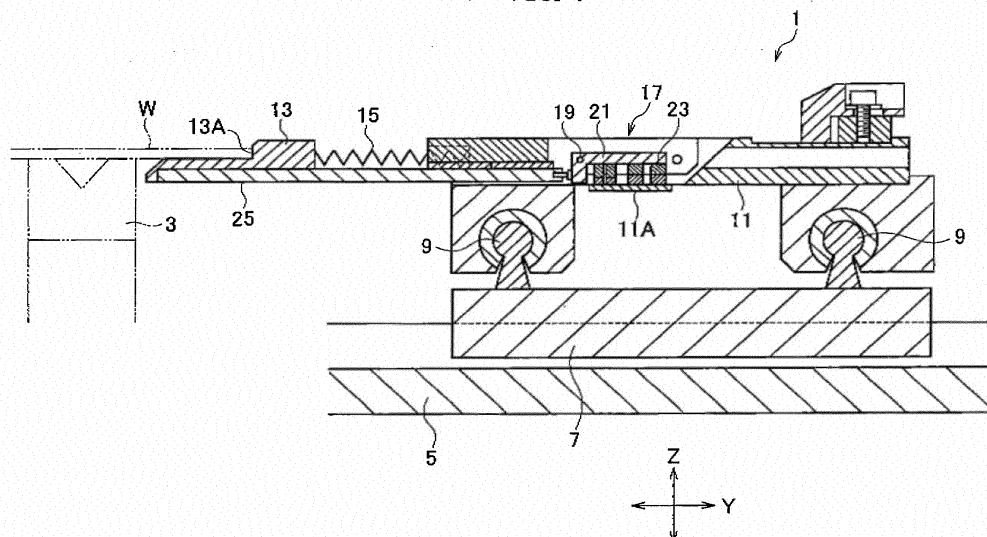
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(54) **BACK GAUGE APPARATUS**

(57) A back gauge apparatus (1) for a press brake includes a slide body (11) and a work contact member (13) arranged on the slide body (11) is movable in a front-rear direction, wherein the work contact member (13) has a work contact face (13a) and is biased frontward with a pushing force. The slide body (11) has a fixing unit (17) for fixing the work contact member (13) to the slide body (11) and release the fixation of the work contact member

(13) when the work contact members (13) is pressed rearward with a pressing force greater than the pushing force. The fixing unit (17) has a rotary lever (21) rotatably arranged on the slide body (11). A first end of the rotary lever (21) has a magnet (23) to magnetically fix the rotary lever (21) to the slide body (11). The work contact member (13) has a pressing member (25) to press a second end of the rotary lever (21) to release the magnetic fixation.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a back gauge apparatus installed in a press brake, and particularly, to a back gauge apparatus capable of detecting contact with an obstacle while being moved and positioned in a front-rear direction.

2. Description of Related Art

[0002] When a press brake carries out a bending process on a sheets-live work, a back gauge apparatus installed in the press brake is moved and positioned in a front-rear direction, and then, a rear end of the work is brought into contact with a work contact member of the back gauge apparatus so as to position the work. Once the work is correctly positioned, the press brake bends the work with upper and lower tools attached to the press brake.

[0003] When moved and positioned in the front-rear direction, the back gauge apparatus may sometimes hit a work to be positioned. When the back gauge apparatus is moved close to the lower tool, the back gauge apparatus may raise a risk of biting the hand of a worker between the back gauge apparatus and the lower tool. Related arts concerning the back gauge apparatus include Japanese Unexamined Patent Application Publication No. H09-253753 (Patent Literature 1).

SUMMARY OF THE INVENTION

[0004] The related art disclosed in Patent Literature 1 temporarily stops the back gauge apparatus or moves the same very slowly when the back gauge apparatus reaches a predetermined distance from the lower tool during the positioning of the back gauge apparatus in the front-rear direction. Thereafter, the related art resumes the positioning of the back gauge apparatus in the front-rear direction. This technique deteriorates productivity, and therefore, an improvement is needed.

[0005] In consideration of the problems of the related art, the present invention provides a back gauge apparatus capable of detecting an obstacle while positioning the back gauge apparatus and improving productivity.

[0006] According to an aspect of the present invention, the back gauge apparatus for a press brake includes a slide body and a work contact member that is arranged on the slide body so as to be movable in a front-rear direction, wherein the work contact member has a work contact face, and is pushed frontward with a pushing force. The slide body is provided with a fixing unit that is able to fix the work contact member to the slide body and release the fixation of the work contact member when the work contact member is pressed rearward with a

pressing force greater than the pushing force.

[0007] According to another aspect of the present invention, the back gauge apparatus for a press brake includes a slide body and a work contact member that is arranged on the slide body so as to be movable in a front-rear direction, wherein the work contact member has a work contact face, and is pushed frontward with a pushing force. The slide body is provided with a detector that detects when the work contact member is moved rearward against the pushing force.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is an explanatory sectional view illustrating a general structure of a back gauge apparatus according to an embodiment of the present invention; Fig. 2 is an explanatory sectional view illustrating a released state of a fixing unit of the back gauge apparatus according to the embodiment; and Fig. 3 is an explanatory view illustrating a modification of the fixing unit.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0009] A back gauge apparatus according to an embodiment of the present invention will be explained with reference to the drawings. A press brake with a back gauge apparatus is generally known, and therefore, the press brake itself will not be explained.

[0010] Figure 1 illustrates a back gauge apparatus 1 according to an embodiment of the present invention. The back gauge apparatus 1 is installed in a press brake (not illustrated) having a lower tool 3. Relative to the lower tool 3, the back gauge apparatus 1 is moved and positioned in a front-rear direction (a Y-axis direction) and a left-right direction (an X-axis direction). The press brake has a pair of left and right guide members 5 extending in the front-rear direction. The guide members 5 support left and right ends of a stretch 7 that elongates in the left-right direction and is movable in the front-rear direction. The stretch 7 has guide members 9 that extend in the left-right direction and support a slide body 11 of the back gauge apparatus 1. The slide body 11 is movable in the left-right direction along the guide members 9.

[0011] The stretch 7 is moved and positioned in the front-rear direction with a ball screw mechanism driven by a servomotor, or with a linear motor (not illustrated). The slide body 11 is moved and positioned in the left-right direction with a ball screw mechanism or a linear motor (not illustrated). The mechanism to move and position the stretch 7 in the front-rear direction and the mechanism to move and position the slide body 11 in the left-right direction are already known, and therefore, the mechanisms to move and position the back gauge apparatus 1 in the front-rear (Y-axis) and left-right (X-axis) directions will not be explained.

[0012] The slide body 11 of the back gauge apparatus 1 has a work contact member 13 that is movable in the front-rear direction and has a work contact face 13A which a rear end of a work W comes into contact with. Arranged between the work contact member 13 and the slide body 11 is a pushing unit 15 made of a resilient member such as a coil spring to bias the work contact member 13 frontward (leftward in Fig. 1). There is a stopper (not illustrated) to prevent the work contact member 13 from dropping frontward from the slide body 11 due to the pushing force of the pushing unit 15.

[0013] The slide body 11 is provided with a fixing unit 17 to fix the work contact member 13 to the slide body 11 against the pushing force of the pushing unit 15, thereby preventing the work contact member 13 from moving rearward. More precisely, the slide body 11 has a pivot 19 that rotatably supports an L-shaped rotary lever 21. A first end of the rotary lever 21 has a magnet 23 that magnetically attracts a part 11A of the slide body 11. In a normal state, the rotary lever 21 is magnetically attached to the part 11A due to the action of the magnet 23.

[0014] To release the attracted state of the rotary lever 21, the work contact member 13 integrally has a pressing member 25 to press a second end of the rotary lever 21 rearward. More precisely, when the work contact member 13 is at a foremost position pushed by the pushing unit 15, a rear end of the pressing member 25 is in contact with the second end of the rotary lever 21.

[0015] When the work contact member 13 is pressed rearward against the pushing force of the pushing unit 15 and when the pressing force applied to the work contact member 13 reaches a level to release the fixation of the rotary lever 21 realized by the magnetic attraction of the magnet 23, the fixation of the rotary lever 21 is released as illustrated in Fig. 2. If the work contact member 13 is further moved rearward relative to the fixing unit 17, the pushing unit 15 gradually contracts.

[0016] When the back gauge apparatus 1 is moved frontward (leftward in Figs. 1 and 2) and positioned in the front-rear direction, the work contact member 13 may come into contact with a work W simply placed on the lower tool 3 or an obstacle such as the hand of a worker put behind the lower tool 3. In this case, the work contact member 13 is pressed rearward. If the back gauge apparatus 1 is further moved frontward under this situation, the work contact member 13 more intensely pushes the obstacle frontward.

[0017] The magnetic fixation by the magnet 23 is set in advance to be released if the pressing force of the work contact member 13 acting on the obstacle reaches a predetermined value of, for example, 150 N. Namely, the magnetic fixation by the magnet 23 is released if the pressing force acting on the obstacle reaches the predetermined force of, for example, 150 N. In other words, until the pressing force that relatively pushes the work contact member 13 rearward reaches the predetermined value, the work contact member 13 is kept immobile.

[0018] When the work W is positioned by bringing the

work W into contact with the work contact face 13A, force applied by the work W onto the work contact member 13 is not so strong to move the work contact member 13 rearward. Namely, the work contact member 13 is stationary to correctly position the work W.

[0019] If the work contact member 13 comes into contact with an obstacle during a front-rear movement of the back gauge apparatus 1 and if the magnetic fixation by the magnet 23 is released thereby, force that pushes the work contact member 13 frontward suddenly drops to the pushing force of the pushing unit 15, e.g., 50 N. If the work contact member 13 is further pressed rearward by the obstacle after the release of the magnetic fixation by the magnet 23, the pushing unit 15 gradually contracts to gradually increase pressing force applied to the obstacle.

[0020] As is understood from the above explanation, if the work contact member 13 comes into contact with, during a front-rear movement of the back gauge apparatus 1, the hand of a worker or any other obstacle such as a work W held by the worker, the work contact member 13 presses the obstacle with a given force. When the magnetic fixation by the magnet 23 is released, the pressing force acting on the obstacle suddenly drops. Since the frontward pressing force acting on the worker's hand or the work suddenly drops, the worker is able to easily sense that the work contact member 13 has come into contact with the obstacle and easily take necessary steps.

[0021] The back gauge apparatus 1 may have a detector to detect when the magnetic fixation by the magnet 23 is released. The detector may be a sensor to detect when the rotary lever 21 is turned, or a sensor to detect when the work contact member 13 is relatively moved rearward against the pushing force of the pushing unit 15. With such a detector, it is possible to detect when the work contact member 13 comes into contact with an obstacle, or when the fixation of the fixing unit 17 is released. It is possible to make a configuration that immediately stops the advancing of the work contact member 13 when the detector detects the release of the fixation of the fixing unit 17.

[0022] As is understood from the above explanation, the work contact member 13 is fixed by magnetic attraction of the magnet 23. When a work W to be positioned is brought into contact with the work contact member 13, the work contact member 13 is stationary against the pressing force of the work W, and therefore, the work W is correctly positioned. Even if the work contact member 13 approaches close to the lower tool 3, it is not necessary to temporarily stop or slow down the work contact member 13 and there is no risk of biting an obstacle between the lower tool 3 and the work contact member 13. Accordingly, the back gauge apparatus 1 of the embodiment is capable of speedily positioning the work W and improving productivity.

[0023] The present invention is not limited to the above-mentioned embodiment. The present invention al-

lows modifications to realize other embodiments. For example, the magnet 23 attached to the rotary lever 21 of the fixing unit 17 may be replaced with a sucking unit 27 such as a sucker as illustrated in Fig. 3. This modification also provides effects similar to those of the embodiment mentioned above.

[0024] In the embodiment mentioned above, the rotary lever 21 of the fixing unit 17 turns in the up-down direction. Instead, the rotary lever 21 may be configured to turn horizontally.

[0025] In this way, the back gauge apparatus according to the present invention includes a slide body and a work contact member arranged on the slide body. The work contact member is movable in a front-rear direction and is pushed frontward with a predetermined pushing force. The slide body is provided with a fixing unit that is able to fix the work contact member to the slide body and release the fixation of the work contact member if the work contact member is pushed rearward with a pressing force greater than the predetermined pushing force.

[0026] Accordingly, when the work contact member comes into contact with an obstacle without regard to a front-rear moving position of the back gauge apparatus and when the fixation of the fixing unit is released, the work contact member relatively moves rearward against the pushing force of the pushing unit. Namely, the pressing force of the back gauge apparatus acting on the obstacle changes in two steps. A worker who is holding the obstacle, therefore, is able to know that the back gauge apparatus has come into contact with the obstacle and easily deal with the matter.

Claims

1. A back gauge apparatus (1) for a press brake, comprising:

a slide body (11) and a work contact member (13) that is arranged on the slide body (11) so as to be movable in a front-rear direction, **characterized in that:**

the work contact member (13) has a work contact face (13A) and is biased frontward (Y) with a pushing force; and
the slide body (11) is provided with a fixing unit (17) that is able to fix the work contact member (13) to the slide body (11) and release the fixation of the work contact member (13) when the work contact member (13) is pressed rearward (Y) with a pressing force greater than the pushing force.

2. The back gauge apparatus of claim 1, **characterized in that:**

the fixing unit (17) has a rotary lever (21) that is

rotatably arranged on the slide body (11);
a first end of the rotary lever (21) is provided with a magnet (23) that magnetically fixes the rotary lever (21) to the slide body (11); and
the work contact member (13) is provided with a pressing member (25) to press a second end of the rotary lever (21) to release the magnetic fixation by the magnet.

3. The back gauge apparatus of claim 1, **characterized in that:**

the fixing unit (17) has a rotary lever (21) that is rotatably arranged on the slide body (11);
a first end of the rotary lever (21) is provided with a sucking unit (27) that fixes the rotary lever (21) to the slide body (11) by suction; and
the work contact member (13) is provided with a pressing member (25) to press a second end of the rotary lever (21) to release the sucking fixation by the sucking unit (27).

4. A back gauge apparatus (1) for a press brake, comprising a slide body (11) and a work contact member (13) that is arranged on the slide body (11) so as to be movable in a front-rear direction, **characterized in that:**

the work contact member (13) has a work contact face (13A) and is biased frontward (Y) with a pushing force; and
the slide body (11) is provided with a detector that detects when the work contact member (13) is moved rearward (Y) against the pushing force.

FIG. 1

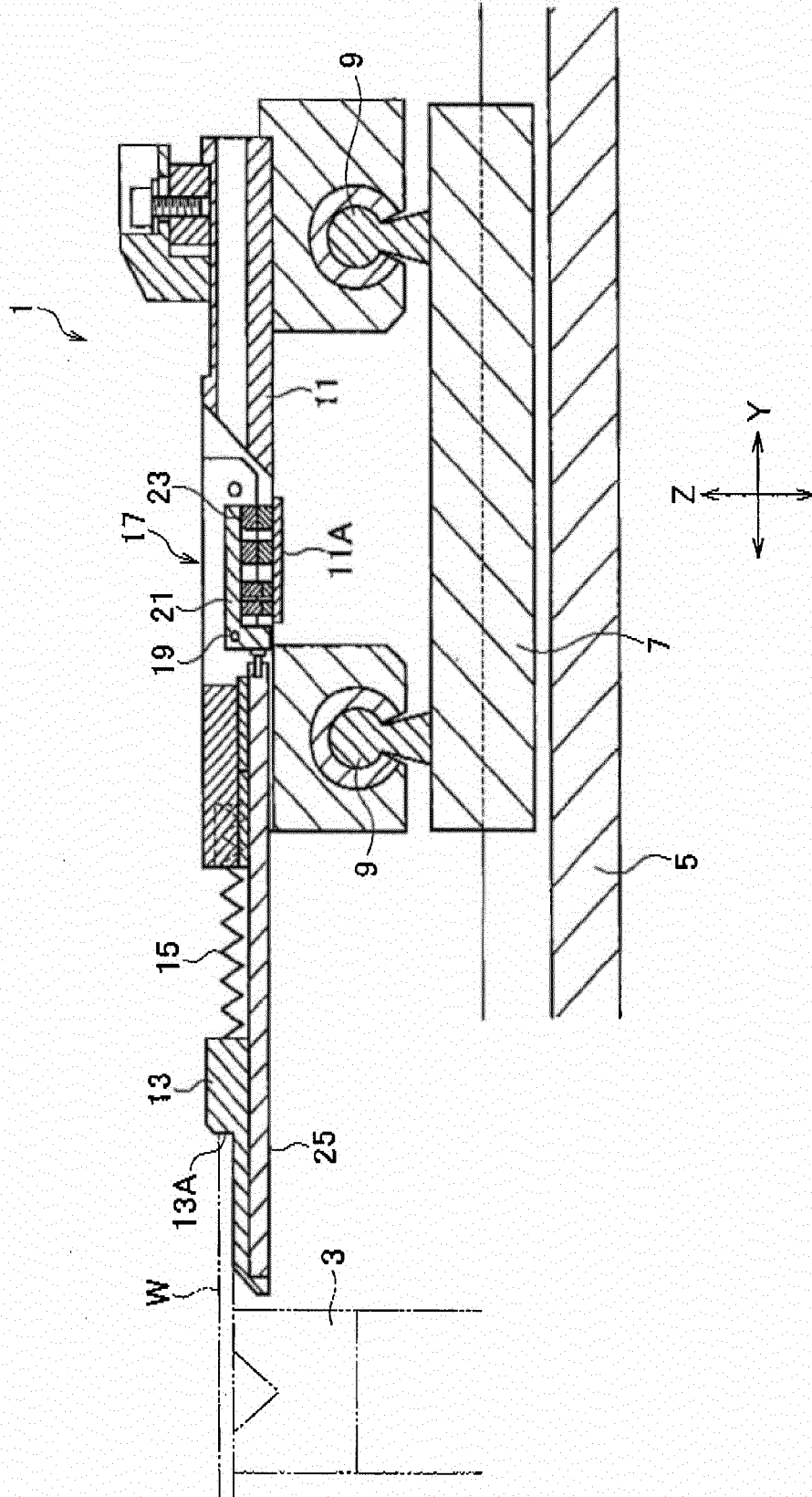


FIG. 2

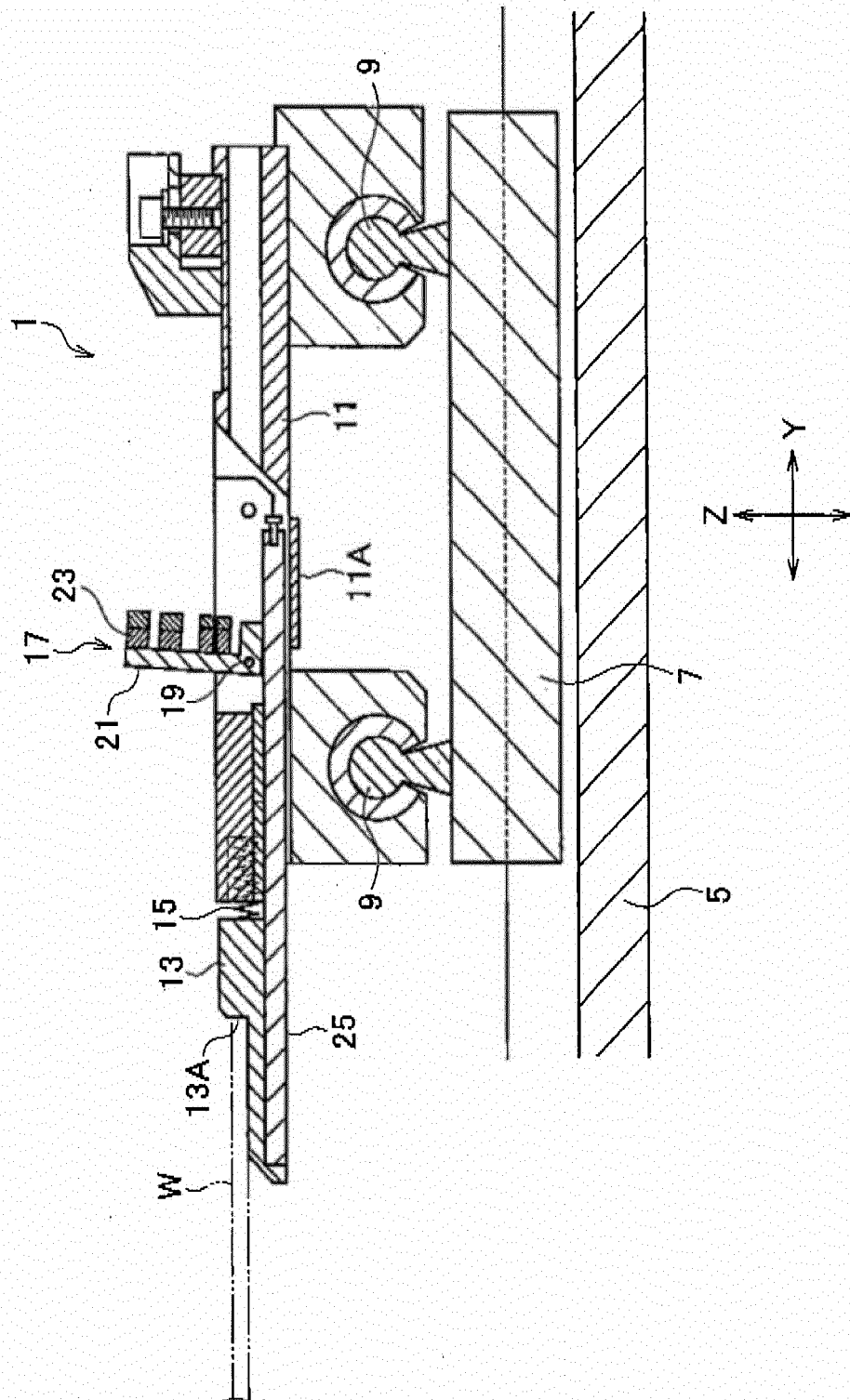
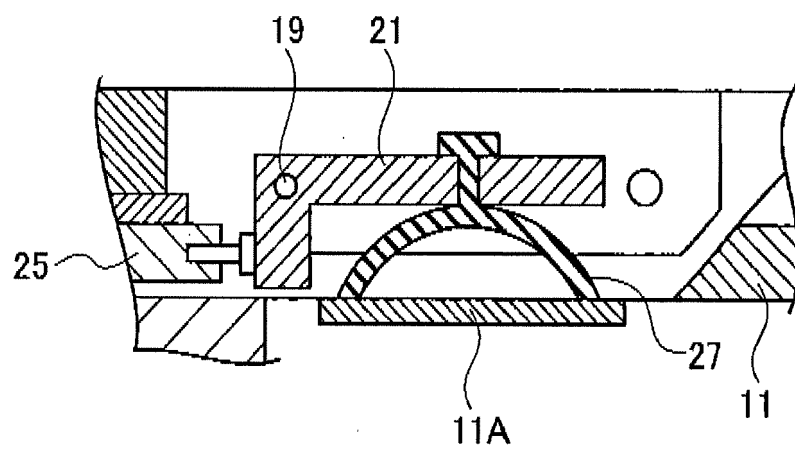


FIG. 3





EUROPEAN SEARCH REPORT

Application Number
EP 15 15 7268

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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