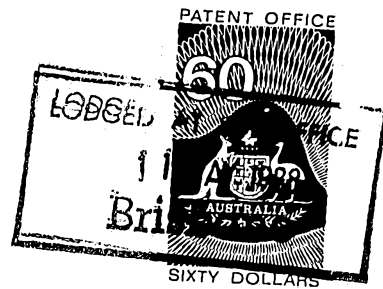


COMMONWEALTH OF AUSTRALIA

60 9604

Patents Act 1952

APPLICATION FOR A PATENT



We, **PAUL FRANCIS NICOLIA** and **LEZETTE SUSAN NICOLIA**

of **2/19 Turner Street, Maroochydore, Queensland, 4558, Australia**

hereby apply for the grant of a Patent for the Invention entitled:

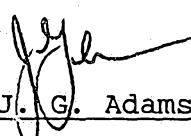
"IMPROVEMENTS IN EARTH-WORKING EQUIPMENT"

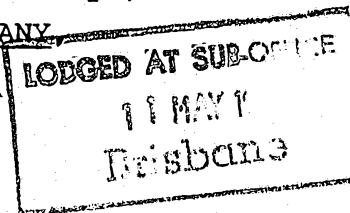
which is described in the accompanying Provisional Specification.

Our address for service is c/- **GRANT ADAMS & COMPANY, Patent Attorneys, 333 Adelaide Street, Brisbane, Queensland, 4000, Australia.**

DATED this eleventh day of May, 1988.

PAUL FRANCIS NICOLIA and
LEZETTE SUSAN NICOLIA,
by their Patent Attorneys,
GRANT ADAMS & COMPANY,


J. G. Adams.



TO:

The Commissioner of Patents,
COMMONWEALTH OF AUSTRALIA.

APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED12.2.91.....

COMMONWEALTH OF AUSTRALIAPatents Act 1952DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application made by PAUL FRANCIS NICOLIA and LEZETTE SUSAN NICOLIA for a patent for an invention entitled:

"IMPROVEMENTS IN EARTH WORKING EQUIPMENT"

We, PAUL FRANCIS NICOLIA and LEZETTE SUSAN NICOLIA, of 248 High Street, Coffs Harbour, New South Wales, 2450, Australia, do solemnly and sincerely declare as follows:-

1. We are the applicants.
2. I, the said PAUL FRANCIS NICOLIA, am the actual inventor of the invention and the LEZETTE SUSAN NICOLIA is the assignee of the inventor of a part interest in the invention.

DECLARED at Coffs Harbour, New South Wales, this ~~Sixteenth~~

day of January 1991.

.....P. Nicolia.....
(Paul Francis NICOLIA)

.....Lezette Susan Nicolia.....
(Lezette Susan NICOLIA)

GRANT ADAMS & COMPANY,
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TO:

The Commissioner of Patents,
COMMONWEALTH OF AUSTRALIA.

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IMPROVEMENTS IN EARTH-WORKING EQUIPMENT

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(74) Attorney or Agent
GRANT ADAMS & COMPANY, GPO Box 1413, BRISBANE QLD 4001

(56) Prior Art Documents
US 3670825

(57) Claim

1. A tiltable earthworking tool for attachment to an earth working machine comprising:

 a work head;

 a mounting means enabling the tool to be mounted on the machine, the work head being pivotally connected to the mounting means by a pivot means defining a tilting axis; and

 a telescopically extensible and retractable means to interconnect the work head and the mounting means to cause the work head to be rotated about the pivot means;

 the work head and mounting means being further interconnected by slidably interengaged pairs of arcuate guide members and guide follower means mounted therebetween;

 the pair of arcuate guide members comprising opposed members mounted to either of the work head or mounting means on opposite sides of the pivot means, their pair of interengaged guide follower means being

also each on opposite sides of the pivot means and mounted to either of the mounting means or the work head respectively;

the guide follower means having a substantially T-shape cross-section; and

the arcuate guide members and close fitted, complementary, substantially C-shape in cross-section, and engaged around the head of the T-shaped guide follower means.

2. A tiltable earthworking tool as claimed in Claim 1 wherein the pivot means is a pin on the tilting axis located centrally of the work head and the telescopic extensible and retractable means is an hydraulic ram transverse the tilting axis engaged at angularly displaced respective points on the work head and the mounting means.

609604

This document contains the
amendments made under
Section 49 and is correct for
printing.

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AUSTRALIA.

COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

"IMPROVEMENTS IN EARTH-WORKING EQUIPMENT"

The following statement is a full description of the
invention including the best method of performing it known
to the applicant.

THIS INVENTION relates to improvements in earthworking equipment.

With conventional front-end loaders, bulldozers and back-hoes, it is not possible to tilt or
5 incline the earthworking tool (e.g. bucket or blade) relative to the prime-mover or the supporting arms or boom(s). This means it can be very difficult to produce the desired slope or fall in an area being excavated.

Various earthworking tools are to be found in
10 4463507 (Gaub); 4221267 (Asal); 3853181 (Yoshizaki); 3775877 (Gove); 3690386 (Magee); and 3670825 (Asal). A number of these enable tilting of the blade in the sense of the present invention. In particular 3670825 (Asal) describes a blade angling mechanism in which tilting on
15 a support pin is permitted with loads taken by radially spaced bearing blocks. Whilst the mechanism permits tilting, the structure is not such as to protect the bearing blocks from grit and does not prevent all the distortions that may occur in the mechanism to stress it
20 under load.

It is an object of the present invention to provide an apparatus to enable an earthworking tool to be inclined relative to the prime-mover.

Various preferred objects of the present
25 invention will become apparent from the following description.

In a broad aspect the present invention resides in a tiltable earthworking tool for attachment to an earthworking machine comprising:

- 30 a work head;
- a mounting means enabling the tool to be mounted on the machine, the work head being pivotally connected to the mounting means by a pivot means defining a tilting axis; and
- 35 a telescopically extensible and retractable means to interconnect the work head and the mounting



means to cause the work head to be rotated about the pivot means;

the work head and mounting means being further interconnected by slidably interengaged pairs of arcuate
5 guide members and guide follower means mounted therebetween;

the pair of arcuate guide members comprising opposed members mounted to either of the work head or mounting means on opposite sides of the pivot means,
10 their pair of interengaged guide follower means being also each on opposite sides of the pivot means and mounted to either of the mounting means or the work head respectively;

the guide follower means having a
15 substantially T-shape cross-section; and

the arcuate guide members ^{being} ~~and~~ close fitted, complementary, substantially C-shape in cross-section, and engaged around the head of the T-shaped guide follower means.

20 Preferably the pivot means is a pivot pin welded or otherwise fixed to the rear of the working tool e.g. a bucket or blade. Preferably the pivot pin is provided centrally of the width of the tool.

Preferably a pair of diametrically opposed
25 guides are provided on the tool, each guide preferably comprising a pair of spaced, substantially L-shaped members separated by a guide slot.

Preferably the mounting means is a plate centrally pivoted on the pivot pin with guide followers
30 adjacent each end.

Preferably the telescopic means is a hydraulic ram which preferably has its cylinder pivotally mounted on the tool and the distal end of its ram pivotally attached to the plate or to a lateral arm or extension
35 thereon.

In an alternative embodiment, the guides may



be provided on the mounting plate and the guide followers on the tool.

To enable the invention to be fully understood, a preferred embodiment will now be described
5 with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of the apparatus,



with some parts being omitted for clarity;

FIG. 2 is a plan view corresponding to FIG. 1;

FIG. 3 is a sectional side view taken on line A-A on FIG. 2; and

5 FIGS. 4 and 5 illustrate a second embodiment of the invention.

10 The apparatus 10 is provided to enable tiltable mounting of an earthworking tool, e.g. bucket 11 on a front-end loader, the lift arms 12 of which are shown in dashed lines in FIG. 3.

A pivot pin 13 is received and engaged in a tubular mounting block 14 provided centrally on the outer face of the rear wall 15 of the bucket.

15 A pair of curved guide assemblies 16 are mounted on the rear wall 15. The guide assemblies are diametrically opposed and are of constant radial distance from the pivot pin 13.

20 Each guide assembly 16 includes an inner guide 17 and an outer guide 18 with opposed flanges 20 separated by a guide slot 21 having a C-shaped section.

25 A mounting plate 22 is pivotally mounted at its centre on the pivot pin 13 and has respective T-shaped guide followers 23 received in the guide slots 21, and engaged under the flanges 20, of the guide assemblies. Each guide follower extends across the width of enlarged end portion 24 of the mounting plate.

30 A hydraulic ram 25 has its cylinder 26 pivotally mounted at one end on the rear wall 15 of the bucket via a pivot pin 27. The distal end of the piston 28 is attached to a laterally extending arm 29 on the mounting plate 22 via a pivot pin 30. The ram may be connected to the hydraulic supply and controls for the back-hoe attachment for the machine.

35 Bifurcated brackets 31 on the mounting plate 22 receive the distal ends of the lifting arms 12 of the

machine and are provided with pivot pins (not shown).

The operation of the unit will now be described.

The bucket 11 is mounted on the lift arms 12 of the machine via the apparatus as shown. In the normal bucket mode, with the floor 32 of the bucket horizontal, the pivot pin 13 defines a substantially horizontal tilting axis. By extending or retracting the ram 25, the bucket 11 is caused to pivot about the pivot pin 13 relative to the mounting plate 22. By fitting an inclinometer on the bucket 11, the operator can set the bucket at the desired tilt or inclination to the horizontal.

When the bucket is tilted about the pivot pins on lifting arms 12 so that the floor 32 of the bucket is vertical, the tilting axis defined by pivot pin 13 is also vertical and so the bucket can be tilted laterally to the longitudinal axis of the machine i.e. when the bucket is used as a grader blade, the soil will be directed to the trailing side of the floor 32.

When the bucket is between the two positions described, it can be tilted relative to both the vertical and horizontal axes.

FIGS. 4 and 5 illustrate an embodiment in which the followers 47 and 48 are extended to engage in the slots of the guides 49 and 50 over a greater length. The blade 40 is mounted to a support plate or mounting means 41 on pin 51 with end supports 45 and 46 of the same general character as is set out above. The angle of tilt of blade 40 relative to support plate 41 about pivot 51 is governed by ram 42 which engages at opposite ends with lug 43 on blade 40 and lug 44 on support plate 41. The ram 42 is a double acting ram whose extent determines which way the ram is tilted.

As seen in FIG. 5, the followers 47 and 48 are

arcuate about the pivot 52 and are extended over a substantial arc. In this manner, the length of those surfaces of the guides and followers that are contacted together under load are, on average, greater than with the first embodiment. On average, the surface areas exposed to grit are reduced.

Whilst the guide means and their followers are illustrated with the followers fitted to the mounting means, and the guides attached to the tool, it should be apparent that the two might be workably reversed so far as their respective mountings are concerned.

The above proposal locks the followers in the guide slots against all but angular movement of the earthworking tool. This way less relative movement between the tool and its support is permitted under load to reduce stresses that can accelerate fractures.

The present invention provides a simple, yet effective means to tilt or incline the bucket or other earthworking tool relative to the earthworking machine and various changes and modifications may be made to the embodiment described without departing from the present invention.

The claims defining the invention are as follows:-

1. A tiltable earthworking tool for attachment to an earth working machine comprising:

a work head;

5 a mounting means enabling the tool to be mounted on the machine, the work head being pivotally connected to the mounting means by a pivot means defining a tilting axis; and

a telescopically extensible and retractable
10 means to interconnect the work head and the mounting means to cause the work head to be rotated about the pivot means;

the work head and mounting means being further interconnected by slidably interengaged pairs of arcuate
15 guide members and guide follower means mounted therebetween;

the pair of arcuate guide members comprising opposed members mounted to either of the work head or mounting means on opposite sides of the pivot means,
20 their pair of interengaged guide follower means being also each on opposite sides of the pivot means and mounted to either of the mounting means or the work head respectively;

the guide follower means having a
25 substantially T-shape cross-section; and

the arcuate guide members ^{being} ~~and~~ close fitted, complementary, substantially C-shape in cross-section, and engaged around the head of the T-shaped guide follower means.

30 2. A tiltable earthworking tool as claimed in Claim 1 wherein the pivot means is a pin on the tilting axis located centrally of the work head and the telescopic extensible and retractable means is an hydraulic ram transverse the tilting axis engaged at
35 angularly displaced respective points on the work head and the mounting means.



3. A tiltable earthworking tool as claimed in Claim 1 wherein the guide members are attached to the mouning means and the followers to the work head.

4. A tiltable earthworking tool as claimed in

5 any one of claims 1 to 3 wherein:

the arcuate guide members provide a track to guide and retain the guide follower means against all but rotative movement;

the track being open ended; and

10 the guide follower means being arcuately extended to substantially match the arcuate length of the guide members.

5. A tiltable earthworking tool substantailly as hereinbefore described with reference to the drawings.

15 DATED this fifth day of October 1990.

PAUL FRANCIS NICOLIA and
LEZETTE SUSAN NICOLIA,
By their Patent Attorneys,
GRANT ADAMS & COMPANY.



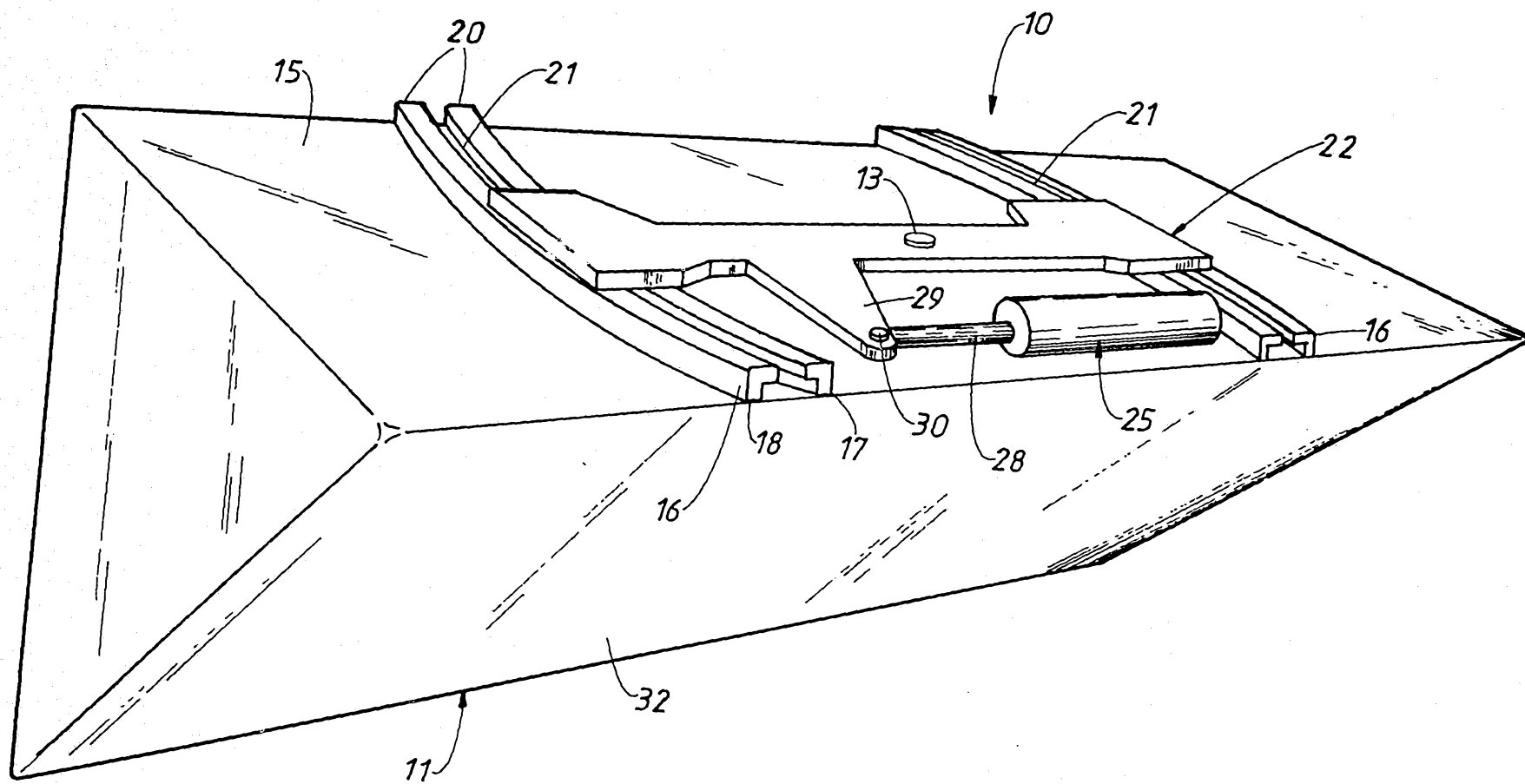


FIG. 1.

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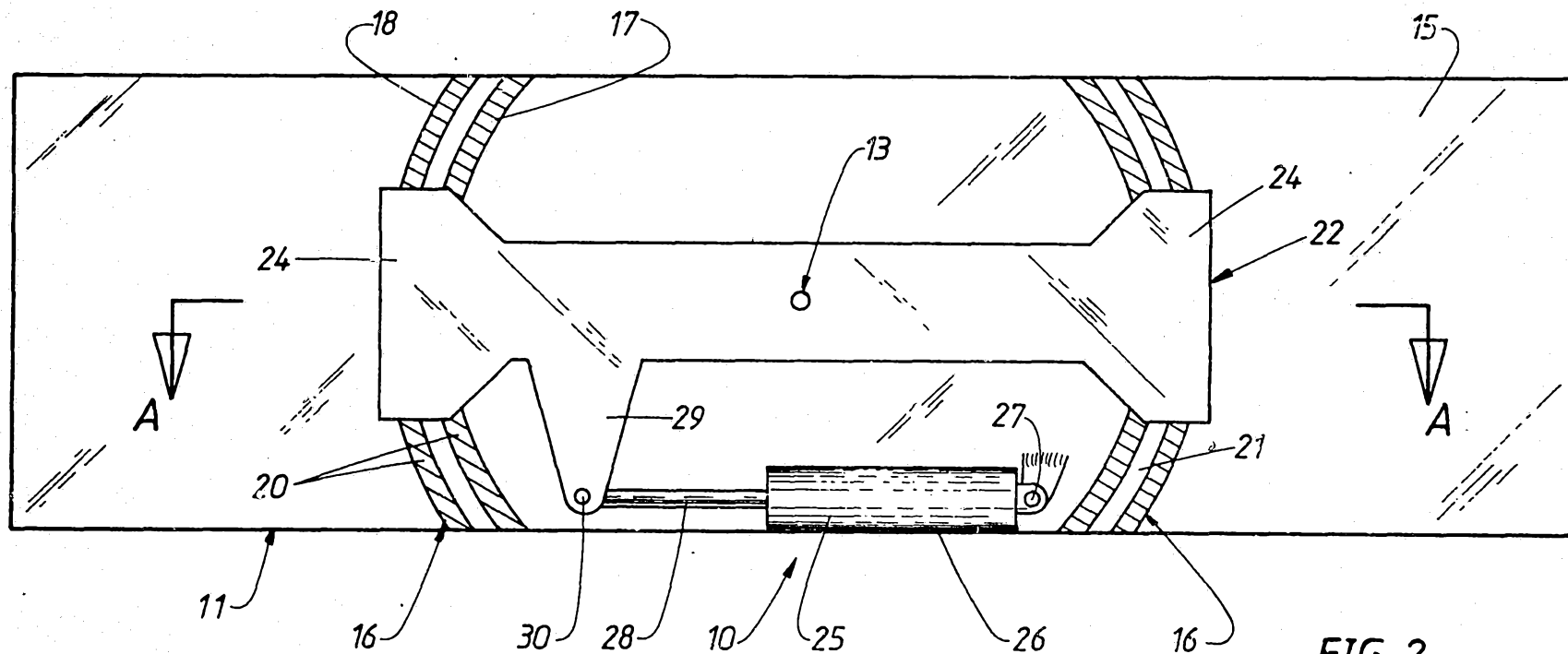
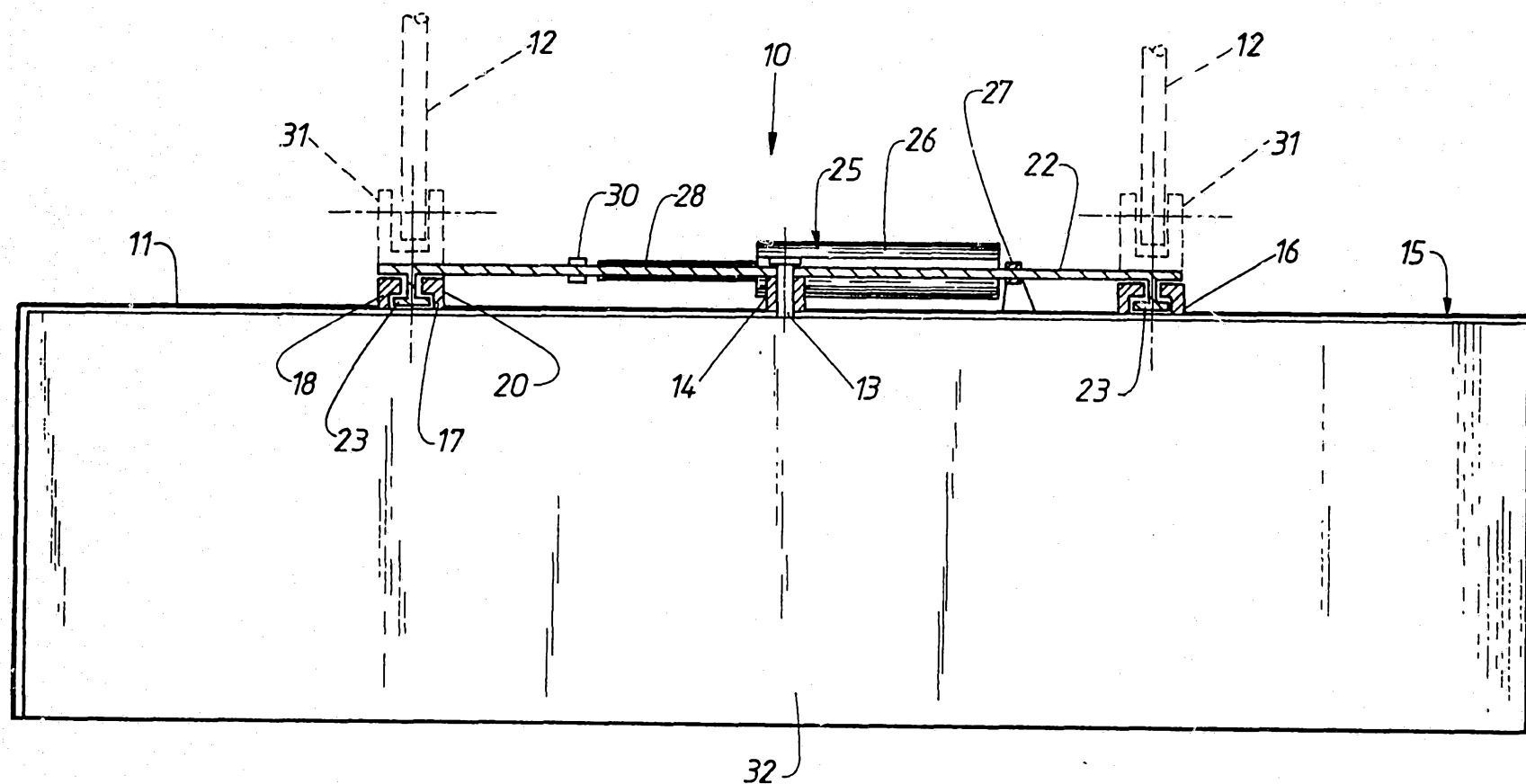


FIG. 2

2 5 8 9 3 8 9 7



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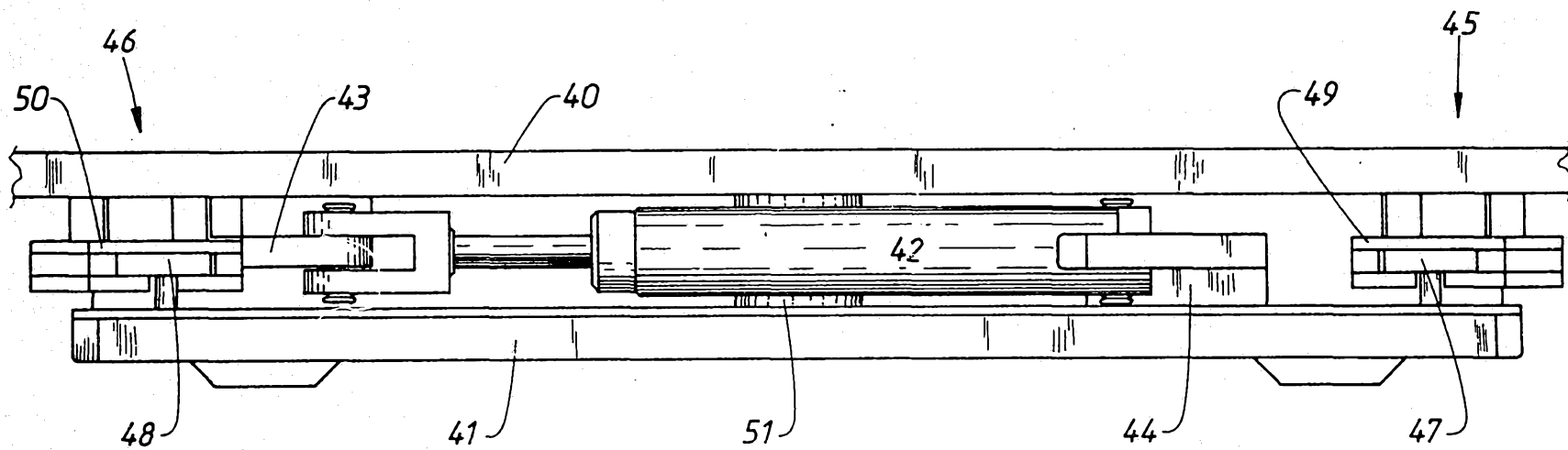


FIG. 4

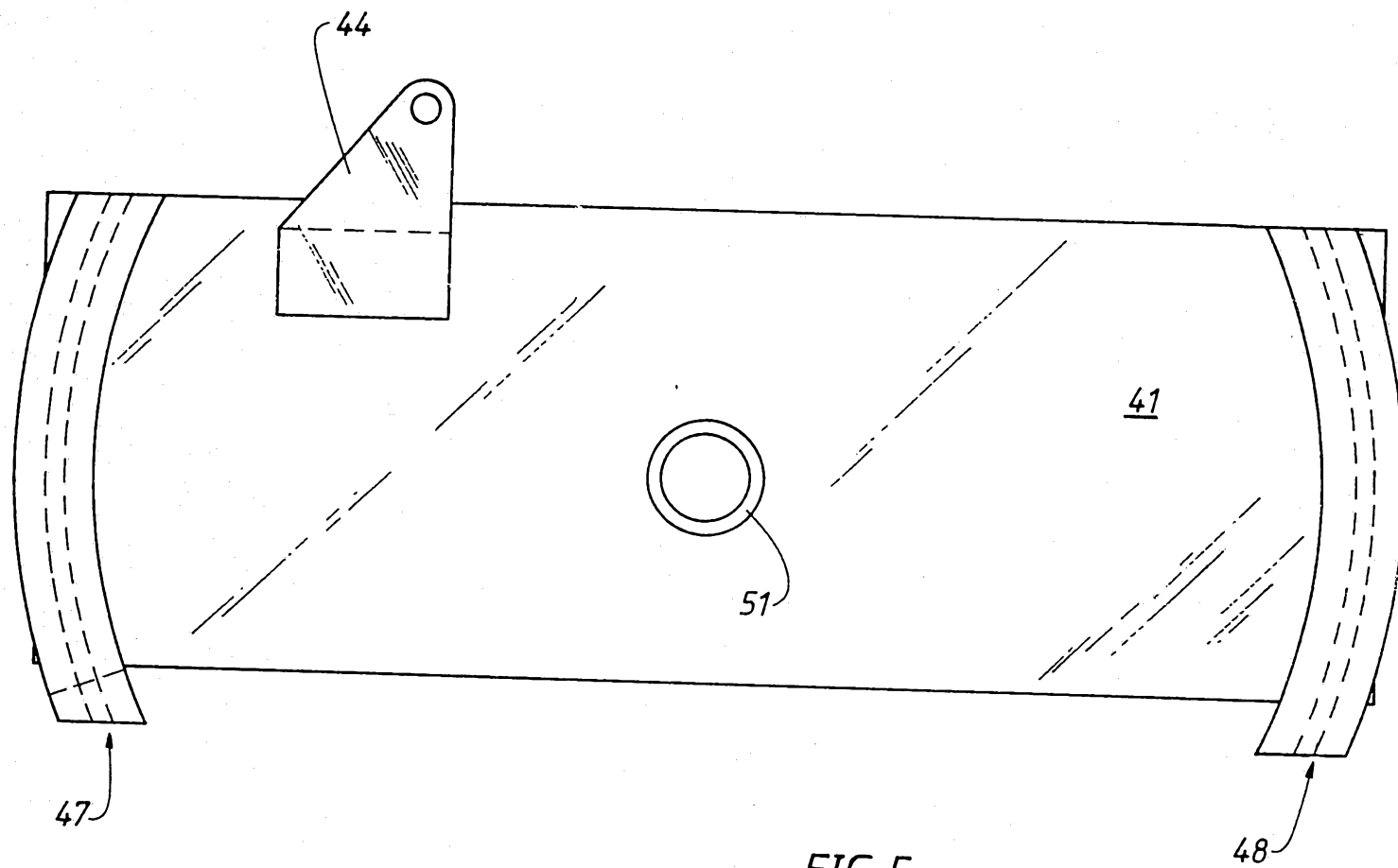


FIG. 5