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

(11) EP 0 722 017 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.07.1996 Bulletin 1996/29

(51) Int Cl.[6]: **E02D 5/14**

(21) Application number: **96200037.8**

(22) Date of filing: **09.01.1996**

(84) Designated Contracting States:
BE DE DK FR GB IT NL

(30) Priority: **10.01.1995 NL 9500046**

(71) Applicant: **van Halteren, Tijmen**
NL-3751 ET Bunschoten (NL)

(72) Inventor: **Van de Corterlet, Johannes G.**
NL-3752 CW Bunschoten (NL)

(74) Representative: **Boelsma, Gerben Harm, Ir. et al**
van Exter Polak & Charlouis B.V.,
P.O. Box 3241
2280 GE Rijswijk (NL)

(54) A method for driving a sheet pile wall into the ground as well as a sheet pile to be used therewith

(57) The invention relates to a method for driving a sheet pile wall into the ground by successively driving sheet piles which slidingly engage one another by means of complementary longitudinal edge formations that comprise a catching and guiding groove, whereby each time a next sheet pile is lowered with its respective longitudinal edge formation from above into the longitudinal edge formation of a sheet pile that has already been driven into the ground, and whereby each time prior to the driving of a sheet pile a deformable strip is applied at at least one of the longitudinal edge formations of that strip, said strip being attached with one longitudinal edge to the part of the pile sheet that is situated adjacent the guiding groove in said longitudinal edge formation, in such a way, that the strip freely extends across the guiding groove. According to the invention this aim is achieved in that the strip is fastened to the sheet pile in such a position, that it extends from the fastening point directly to the confining edge of the guiding groove.

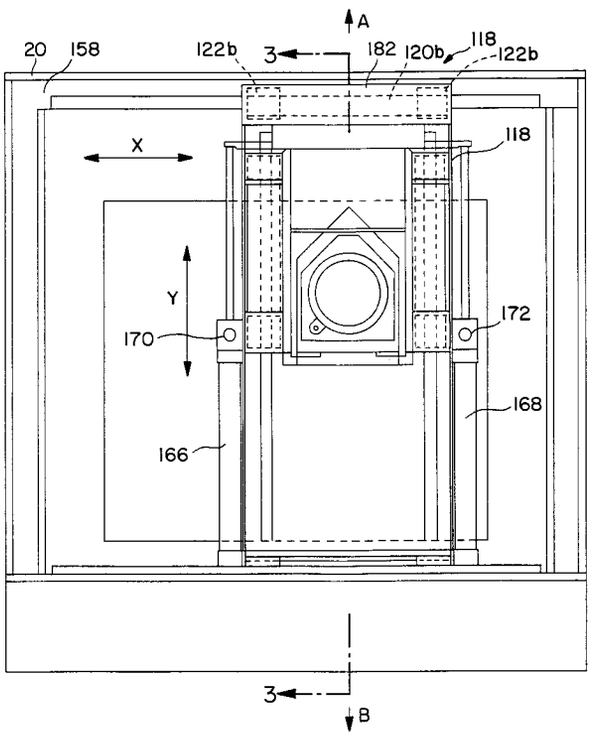

FIG. 2

EP 0 722 017 A1

Description

The invention relates to a method for driving a sheet pile wall into the ground by successively driving sheet piles which slidingly engage one another by means of complementary longitudinal edge formations that comprise a catching and guiding groove, whereby each time a next sheet pile is lowered with its respective longitudinal edge formation from above into the longitudinal edge formation of a sheet pile that has already been driven into the ground, and whereby each time prior to the driving of a sheet pile a deformable strip is applied at at least one of the longitudinal edge formations of that strip, said strip being attached with one longitudinal edge to the part of the pile sheet that is situated adjacent the guiding groove in said longitudinal edge formation, in such a way, that the strip freely extends across the guiding groove.

Such a method, with which in general pile sheets of steel having a trapezoidal cross-section are used, is disclosed in NL-A-8602762. The driving of the pile sheets is generally effected by hammering or vibration.

With this well-known method the strip welded to the pile sheet and extending therefrom has a bend, such, that the first part of the strip extends from the respective wall part of the pile sheet under a relatively steep angle and the second part of the strip extends from the bend towards and along the outer side of the guiding groove to bear on said outer side under a certain pretension.

With this well-known method it is the particular object to create a circumferentially closed hollow chamber at the longitudinal edge formation comprising the guiding groove, said hollow chamber being filled with a sealing substance prior to driving the next sheet pile onto the ground. Driving of the next pile sheet causes the free longitudinal edge portion of the deformable strip to slightly move away from the longitudinal edge formation of the driven pile sheet so as to become engaged with a wall portion of the pile sheet being driven that is turned away from the driven pile sheet. The force exerted by the free longitudinal edge portion of the deforming strip onto the longitudinal edge formation has a direction which substantially falls within the vertical plane of the pile sheet wall.

The invention aims at providing an improvement of this well-known method.

According to the invention this aim is achieved in that the strip is fastened to the sheet pile in such a position, that it extends from the fastening point directly to the confining edge of the guiding groove.

By having the deformable strip extend directly to the confining edge of the guiding groove the chance on getting derailed of the next pile sheet to be driven is substantially decreased.

For when driving the next pile sheet the strip slightly moving from the guiding groove will engage the backside of the longitudinal groove formation of said next pile sheet, so that the force applied by the strip onto said backside will be directed substantially perpendicular to the vertical plane of the sheet pile wall, i.e. in a direction opposite to the direction in which the next pile sheet under consideration would tend to be derailed.

Moreover the strip fastened in accordance with the method of the present invention provides the possibility of a really effective use of a sealing substance and thereby obtaining a 100% leakproof sheet pile wall. For the strip according to the invention has also the tendency to trap the sealing substance within the guiding groove, due to which the substance will be distributed uniformly around the incoming free longitudinal edge of the next pile sheet and will also uniformly flow outwardly between the free edge portion of the strip and the opposite groove bottom portion of said next pile sheet.

Instead of applying the strip "on the site", just prior to driving the respective sheet piles into the ground, application in the factory will of course also be possible. Therefore the present invention also relates to a sheet pile comprising a longitudinal edge formation adapted for engagement with a second, similar pile sheet and comprising a groove for catching and guiding the free longitudinal edge of said second pile sheet, wherein at least adjacent one of the longitudinal edge formations of the pile sheet - along at least a part of the length of the pile sheet - a deformable strip is provided which has one of its longitudinal edges fastened to the pile sheet at a location adjacent said longitudinal edge formation and freely extends across the guiding groove.

In accordance with the present invention the pile sheet is characterized in that the strip is extending from the fastening location on the pile sheet directly towards the confining edge of the guiding groove.

The invention will be hereinafter further explained by way of example with reference to the accompanying drawing.

Fig. 1 shows a cross-sectional view of a pile sheet of steel, which is provided at one of its longitudinal edges with a deformable strip in accordance with the present invention;
fig. 2 shows a cross-sectional view of the mutual engagement of two adjacent pile sheets with one deformable strip;
fig. 3 is a cross-sectional view as shown in fig. 2, but with a deformable strip on both sides of the sheet pile connection and
fig. 4 is a perspective view, showing how a strip provided on a pile sheet already driven into the ground, is being deformed during driving of a next pile sheet.

With reference to the drawing (fig. 1) A designates a pile sheet of a common type having a trapezoidal cross-section. The longitudinal edge formations indicated at 1 comprise a catching and guiding groove with an undercut cross-section. The free, thickened longitudinal edges of the groove are indicated at 3.

The longitudinal edge formations 1 shown in the

drawing enable to have the pile sheet A enter into engagement with a second, similar pile sheet A' (vide the dash lines in fig. 1).

With the pile sheet A shown in fig. 1 a strip 3 of e. g. steel plate is fastened, by welding, with one longitudinal edge - at 6 - on the outer side of the right hand oblique trapezium side 5. The strip 4 extends across the guiding groove 2 and bears with its free longitudinal edge portion 4a turned away from the fastening weld 6 on or substantially on the free longitudinal edge 3 of the pile sheet A.

It is assumed that the pile sheet A of fig. 1 represents a pile sheet that has already been driven into the ground, and that a second pile sheet A' is being driven into the ground to the right of pile sheet A, such that the left hand longitudinal edge formation enters into sliding engagement with the right hand longitudinal edge formation of the pile sheet A.

The wall portion 7 forming the bottom of the guiding groove in the left hand longitudinal edge formation of the pile sheet A' will gradually lift the free longitudinal edge portion 4a of the strip 4 on the free longitudinal edge 3 of the pile sheet 8 - under progressive deformation of the strip 4 - due to which the strip will ultimately become pressed onto the outer side of the wall portion 8 along its entire length (height) (fig. 2).

Fig. 3 shows the case, in which pile sheets are used, which are provided on both longitudinal edges with a guiding groove covering strip. In this case it will also be possible to apply - on one side - a strip along the upper half of a pile sheet and cover the guiding groove on the other side of the pile sheet along the lower half.

The progressive deformation of the strip 3 during driving of the next pile sheet A' is shown in fig. 4.

It will be understood that when e.g. the strip covered guiding groove in the right hand longitudinal edge formation of a previously driven pile sheet has been filled with a sealing substance (for which purpose the guiding groove is closed at the lower end of the pile sheet), said substance will - when the next sheet is being driven on the right side of the previously driven pile sheet - initially be displaced towards the space indicated at 8 and be spread between the engaging surfaces of the respective longitudinal edge formation prior to being expelled at 9.

Claims

1. A method for driving a sheet pile wall into the ground by successively driving sheet piles which slidingly engage one another by means of complementary longitudinal edge formations that comprise a catching and guiding groove, whereby each time a next sheet pile is lowered with its respective longitudinal edge formation from above into the longitudinal edge formation of a sheet pile that has already been driven into the ground, and whereby each time prior to the driving of a sheet pile a deformable strip is applied at at least one of the longitudinal edge formations of that strip, said strip being attached with one longitudinal edge to the part of the pile sheet that is situated adjacent the guiding groove in said longitudinal edge formation, in such a way, that the strip freely extends across the guiding groove, characterized in that the strip is fastened to the sheet pile in such a position, that it extends from the fastening point directly to the confining edge of the guiding groove.

2. A method according to claim 1, characterized in that the strip is made of steel plate having a thickness of 1 - 2,5 mm and is fastened by welding.

3. A method according to claims 1-2, characterized in that a strip is provided on each longitudinal side of each pile sheet, said strip covering the respective guiding groove at least along a part of its length (height).

4. A sheet pile comprising a longitudinal edge formation adapted for engagement with a second, similar pile sheet and comprising a groove for catching and guiding the free longitudinal edge of said second pile sheet, wherein at least adjacent one of the longitudinal edge formations of the pile sheet - along at least a part of the length of the pile sheet - a deformable strip is provided which has one of its longitudinal edges fastened to the pile sheet at a location adjacent said longitudinal edge formation and freely extends across the guiding groove, characterized in that the strip is extending from the fastening location on the pile sheet directly towards the confining edge of the guiding groove.

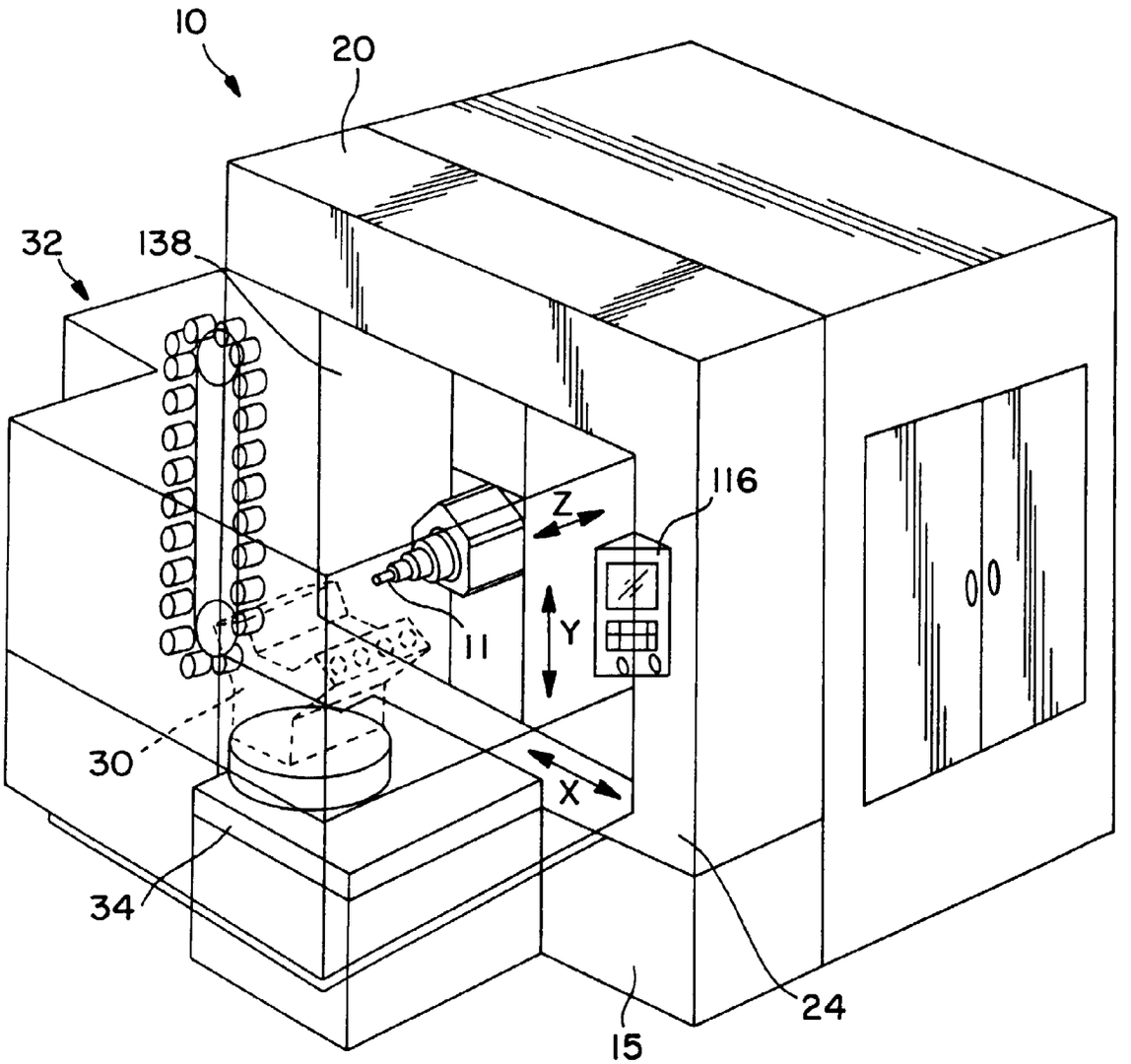

FIG. 1

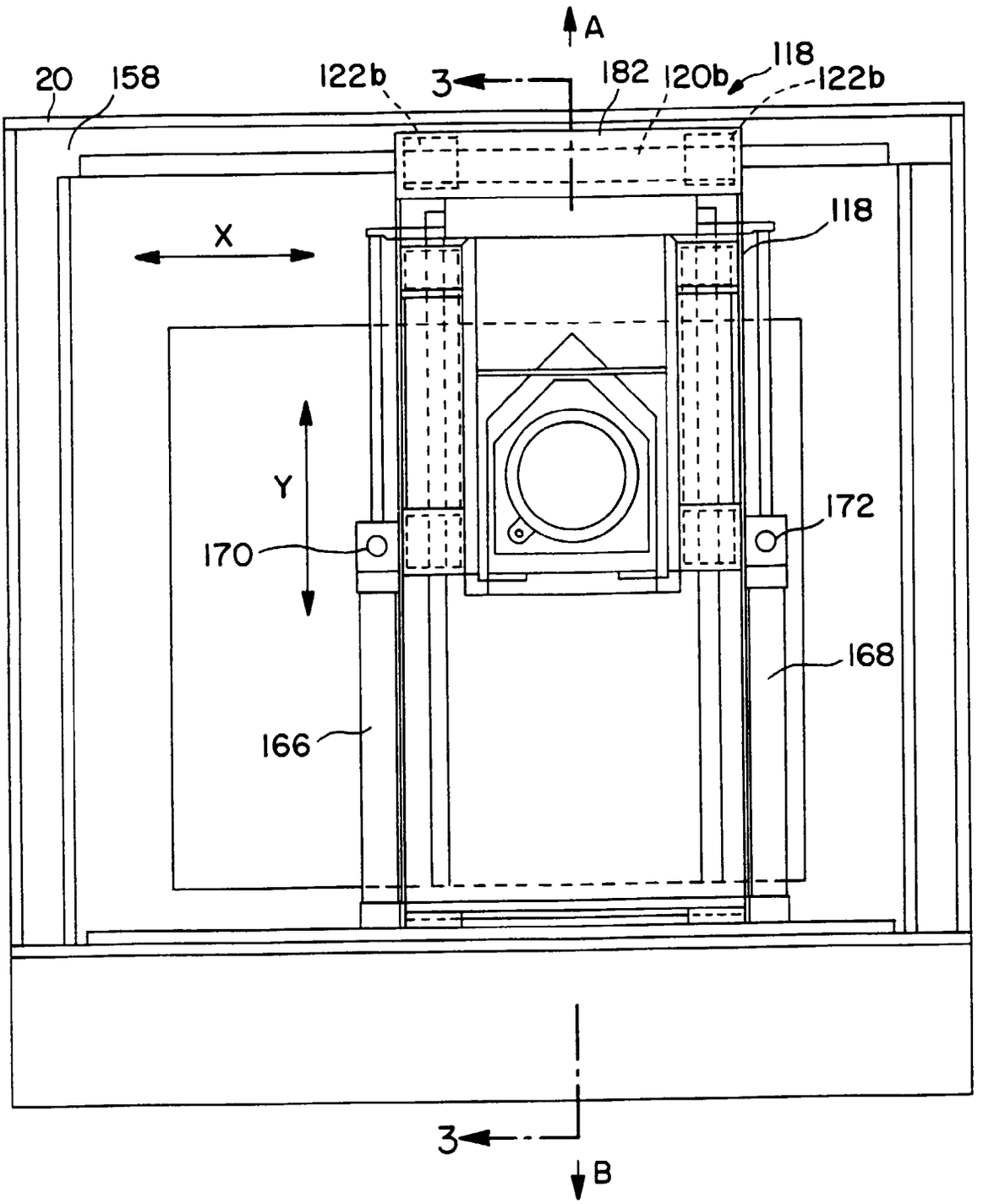

FIG. 2

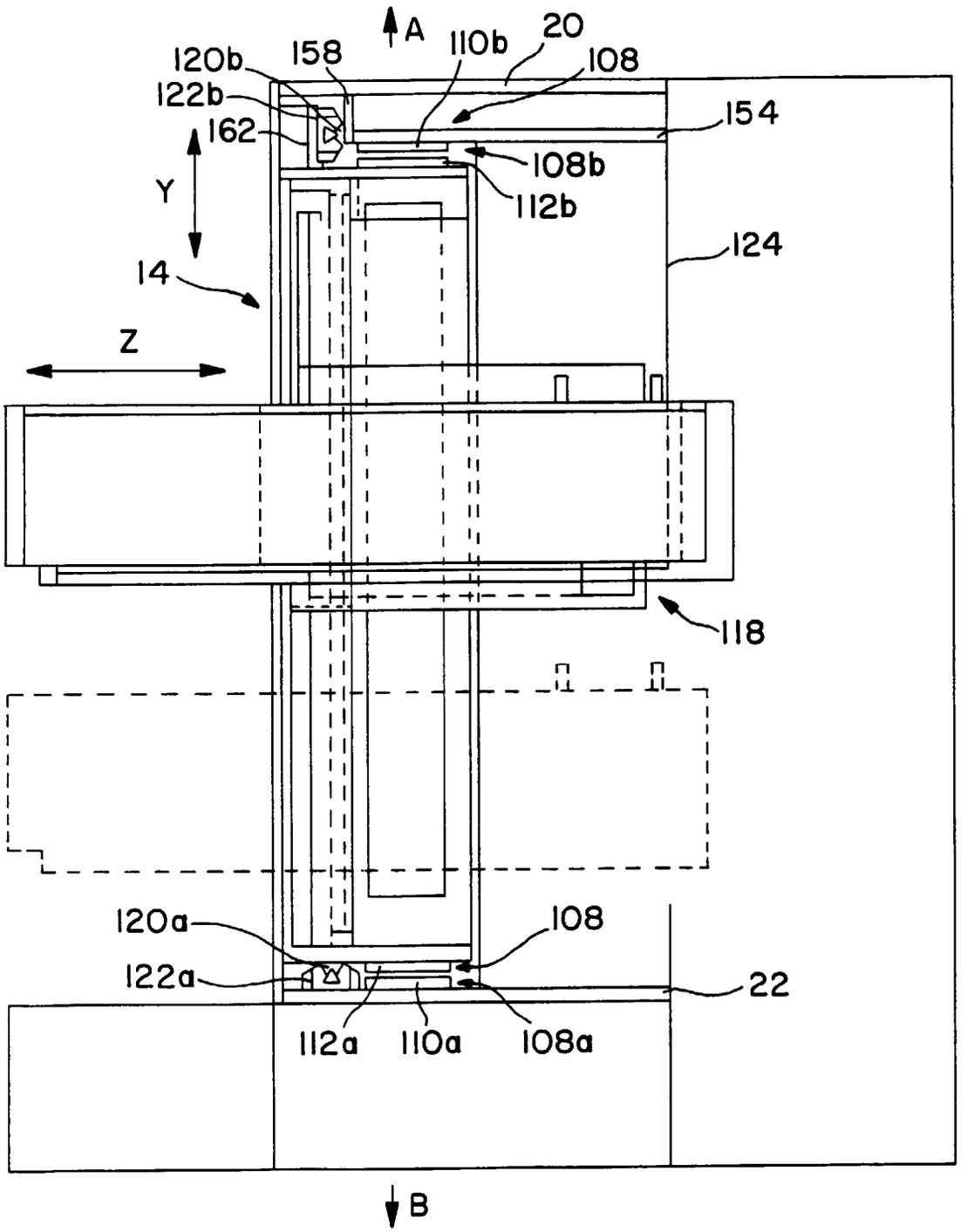
A
120b
158
110b
20
108
122b
154
162
108b
Y
112b
124
14
Z
118
120a
108
122a
22
112a
110a
108a
B

FIG. 3

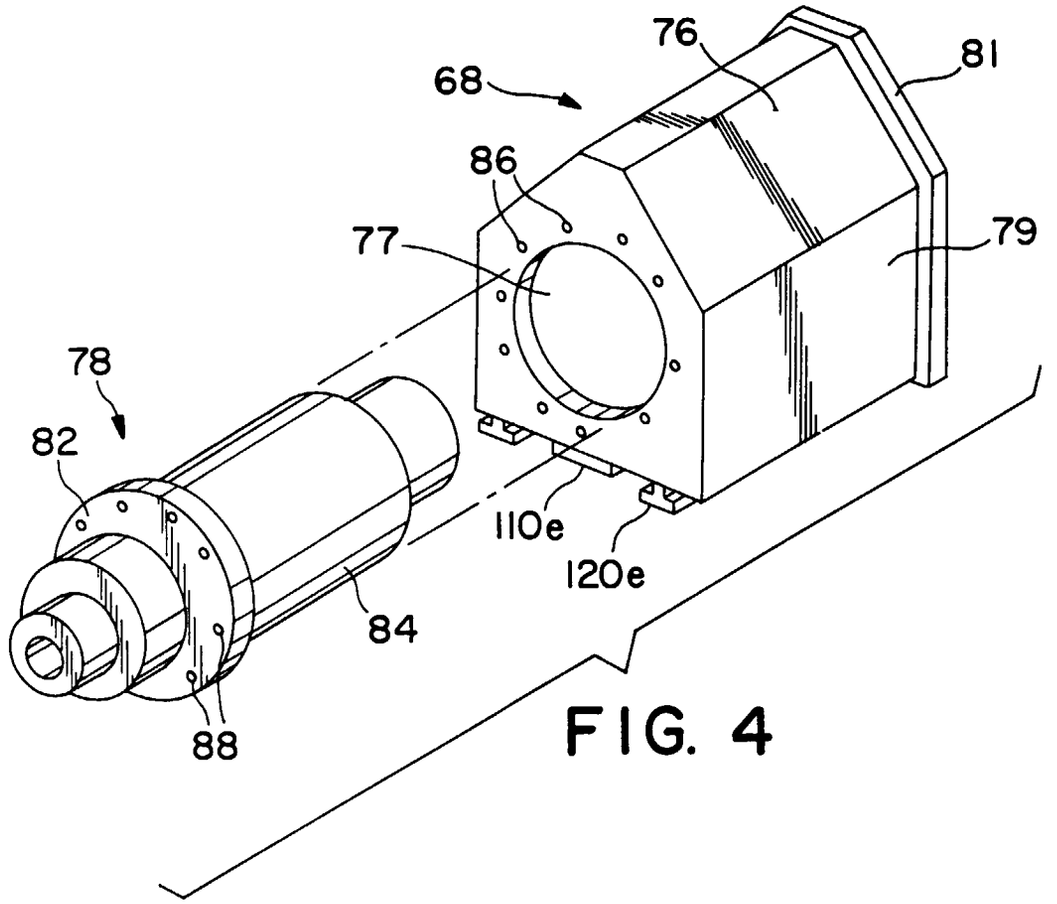

FIG. 4

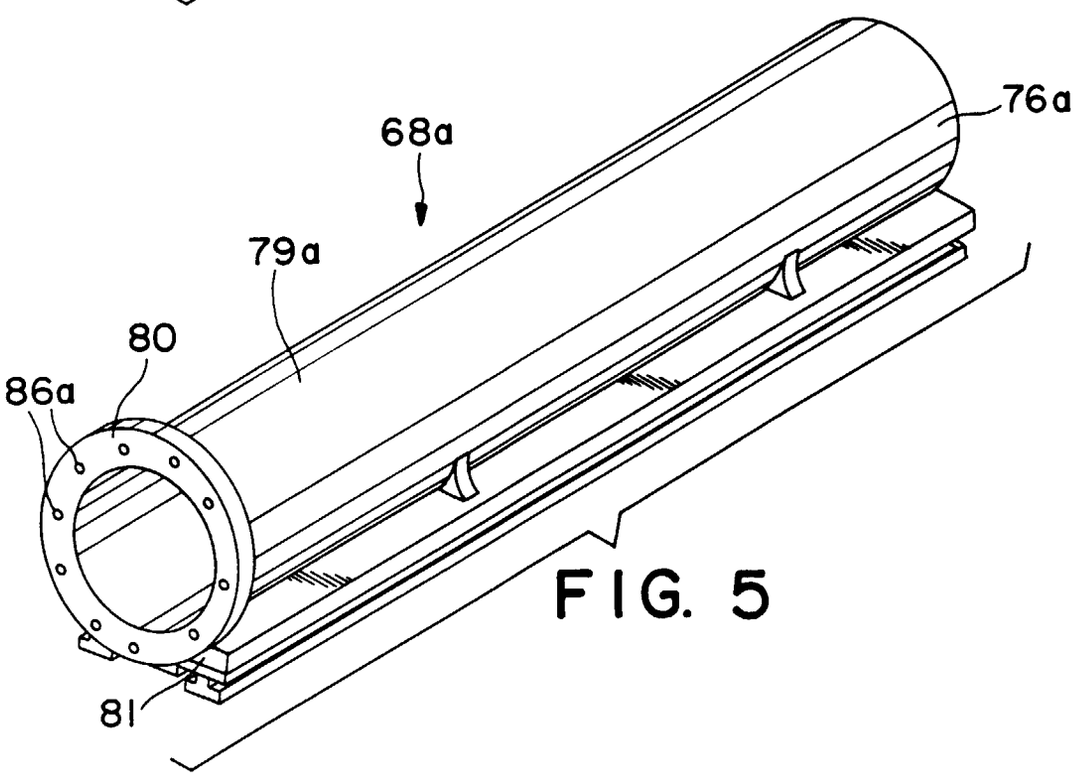

FIG. 5

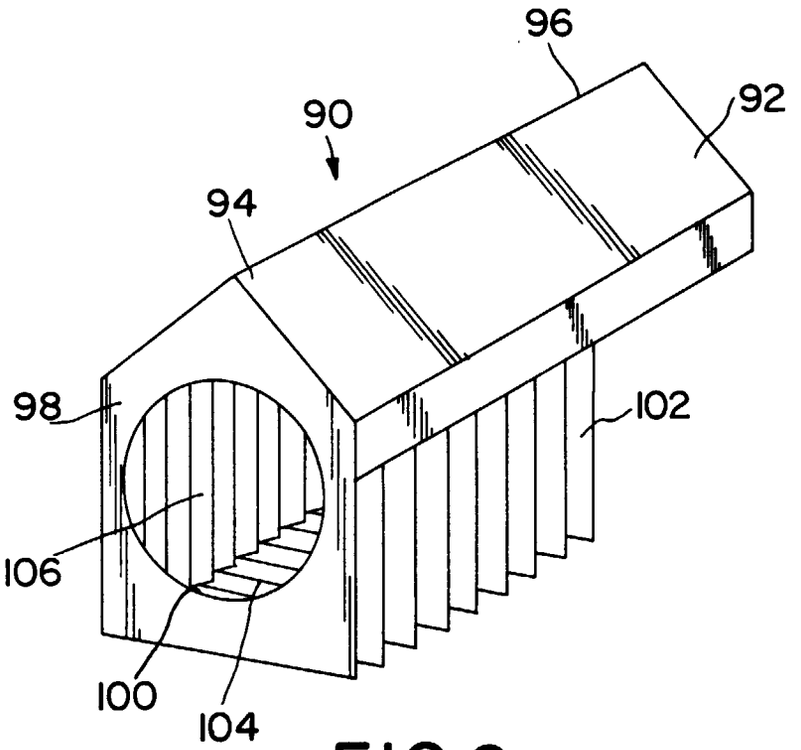

FIG.6

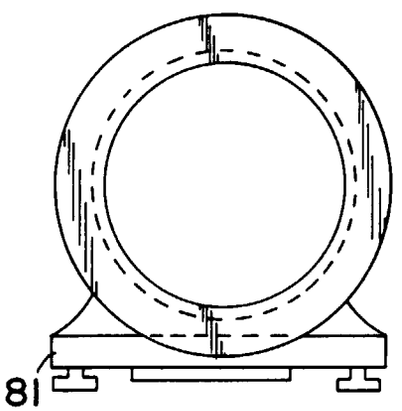

FIG.7

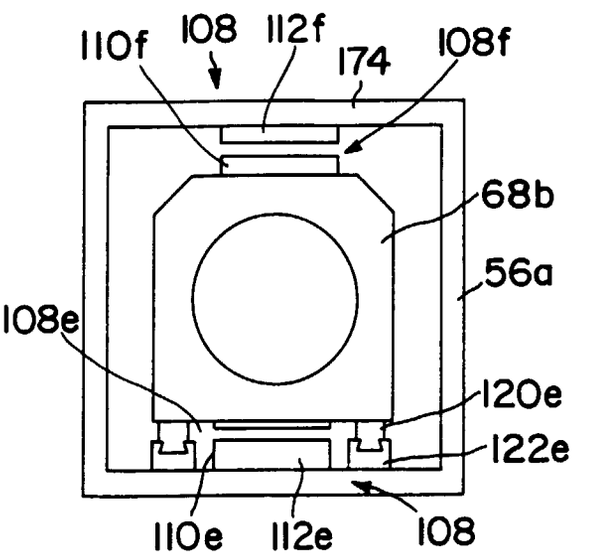

FIG.8

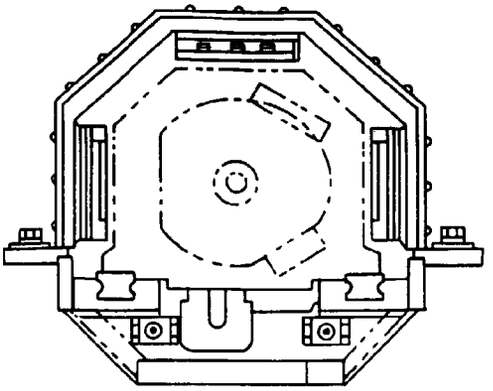

FIG.9
PRIOR ART

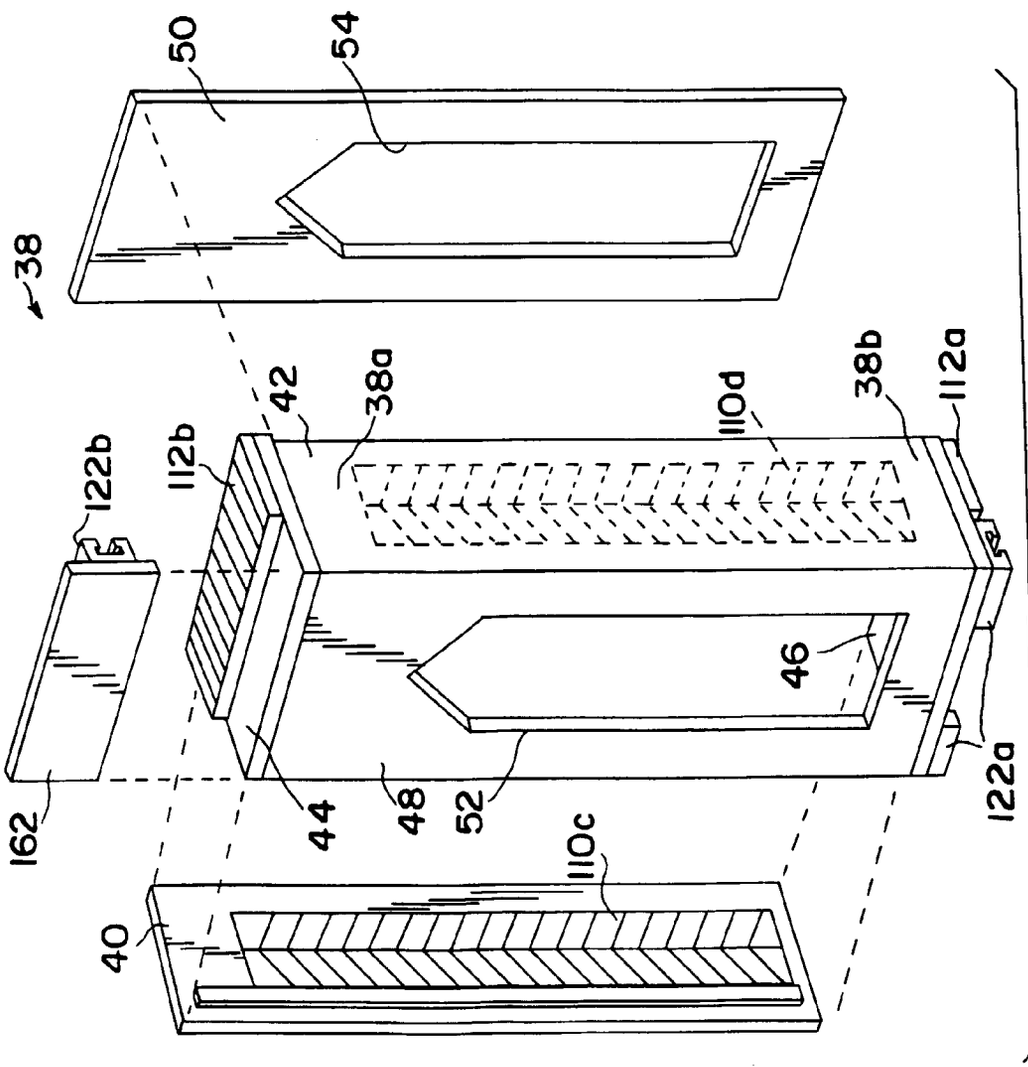

FIG.10

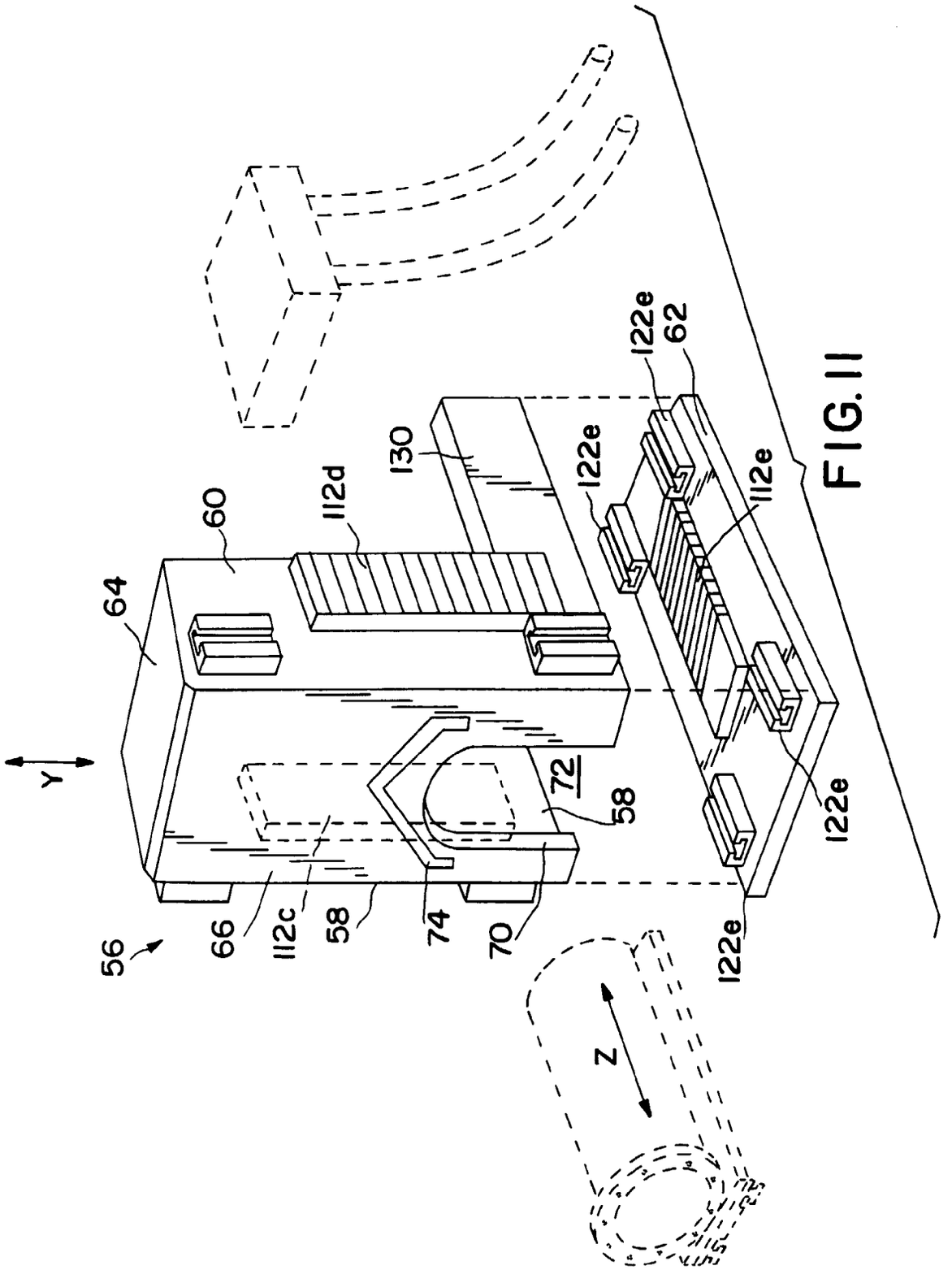
122e
62
130
122e
112e
112d
60
64
72
58
122e
Y
56
66
112c
58
74
70
122e
Z

FIG. 11

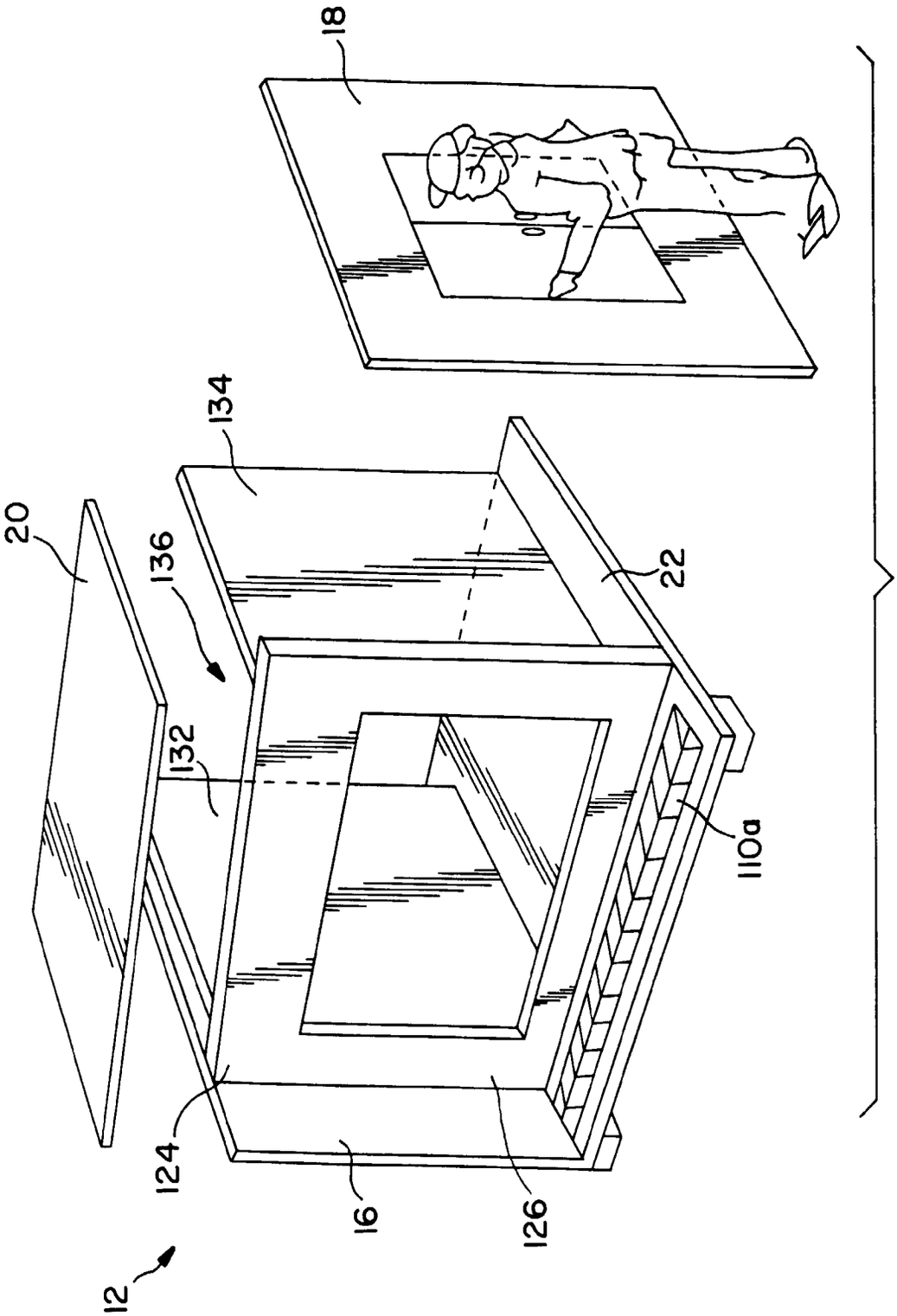

FIG. 12

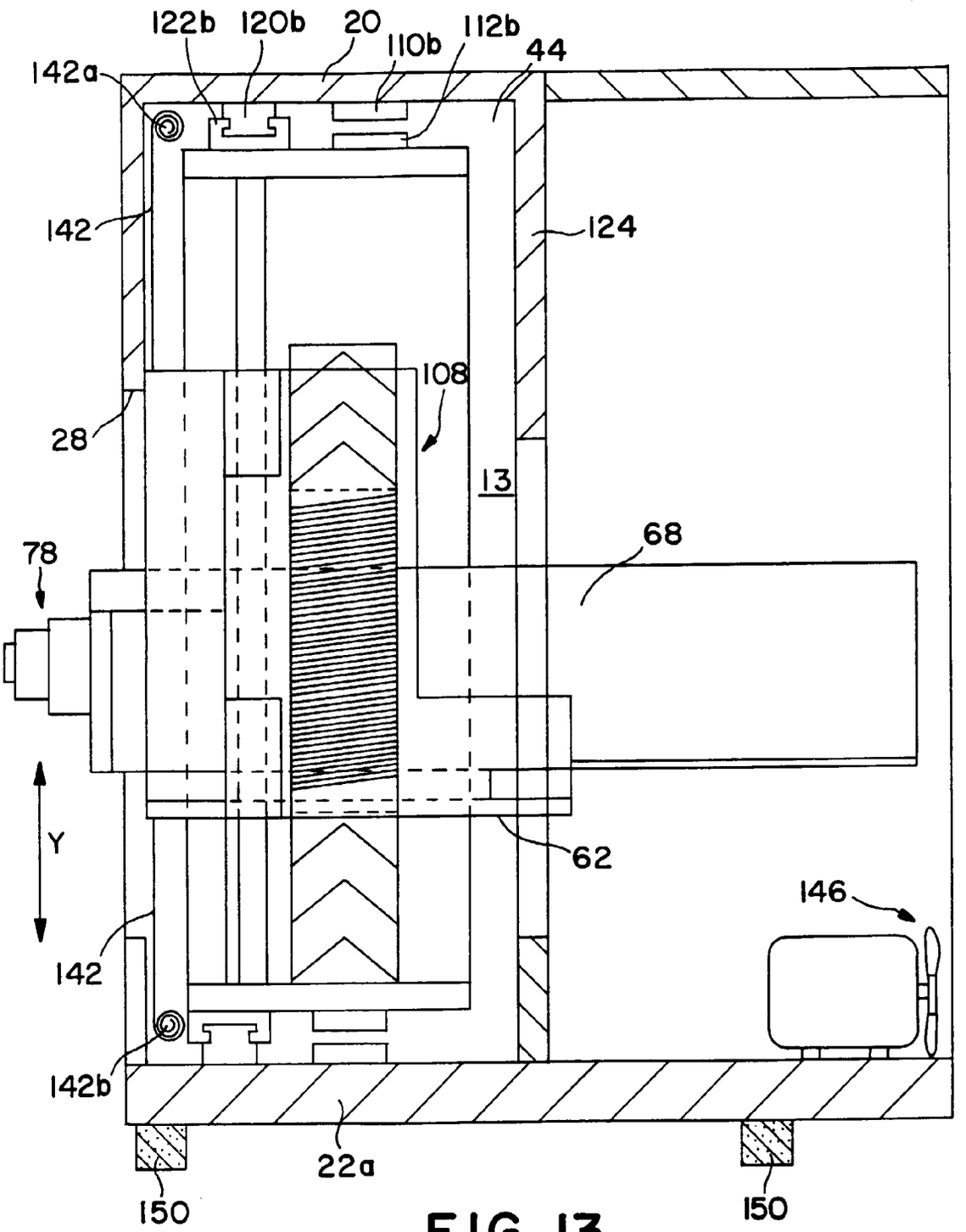
122b
120b
20
110b
112b
44
142a
142
124
108
28
13
68
78
Y
62
146
142
142b
22a
150
150

FIG. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 0037

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)
X	FR-A-2 197 439 (CENTRE DE RECHERCHES DE PONT-A-MOUSSON) * page 2, line 16 - page 3, line 33; figure 1 *	4	E02D5/14
D,A	NL-A-8 602 762 (VAN HATTUM EN BLANKENVOORT) * page 3, line 6 - page 4, line 22; figures 1-3 *	1-4	
A	GB-A-2 228 760 (UNIVERSITY OF WATERLOO) * figures 6,7 *	1,4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 April 1996	Kergueno, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)