



Europäisches Patentamt
European Patent Office
Office européen des brevets

19

11 Publication number:

0 127 598
A2

12

EUROPEAN PATENT APPLICATION

21 Application number: 84850130.0

51 Int. Cl.³: G 09 F 13/00

22 Date of filing: 26.04.84

30 Priority: 29.04.83 SE 8302420

43 Date of publication of application:
05.12.84 Bulletin 84/49

84 Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

71 Applicant: AB MARILLO
Sävelundsgatan 13 F
S-441 38 Alingsås(SE)

72 Inventor: Lindblad, Sven-Olof
Köpmansgatan 60
S-441 41 Alingsås(SE)

74 Representative: Ryrlén, Evert et al,
ALFONS HEDBERGS PATENTBYRÅ AB Aschebergsgatan
35
S-411 33 Göteborg(SE)

54 A method and an installation for the manufacture of a display comprising light-emitting diodes.

57 A method and an installation for the manufacture of a diode holder. The method consists of forming dish-shaped reflectors in a blank (13) (for signs or the like) and making openings therein in which to mount diodes (1). In the openings the diodes are mounted such that owing to their wider rear portion they are wedged in position in the opening.

The installation comprises a machine frame (14) on which a slide member, consisting of two parallel rods (16), is horizontally movable. A punching and stamping means (19) is vertically movable on the slide member. The means comprises a pair of blocks the movements of which on either side of the blank (13) are synchronized and which blocks are formed with tools designed to shape the reflectors and to make the openings in the blank (13).

EP 0 127 598 A2

./...

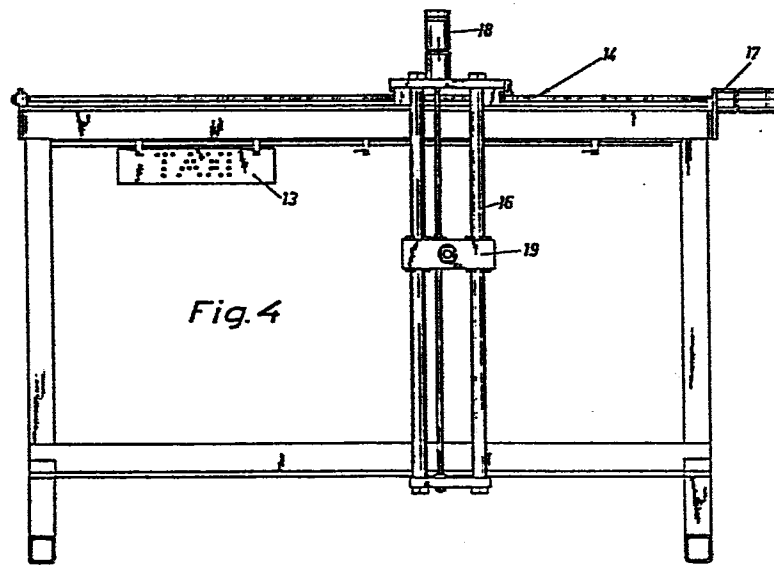


Fig. 4

A Method and an Installation for the Manufacture of a
Display Comprising Light-Emitting Diodes.

The present invention concerns a method and an
installation for the manufacture of a display comprising
5 light-emitting diodes. This display is described in
SE Application 8200913-5 and is suitable for use in a
variety of different applications, such as for signs for
advertisement or information, or as a blinker device to
be used in cars. The display comprises a number of light-
10 -emitting diodes, which form a desired pattern. The light-
-emitting diodes are mounted in dish-shaped reflectors
which are formed in a plate.

The purpose of the subject invention is to provide a
method and an installation by means of which it becomes
15 possible to manufacture said display according to SE Patent
Application 8200913-5 with maximum efficiency. This is
achieved in accordance with the teachings of the subject
invention by means of a method which is characterized by
the steps of mapping the selected pattern on a substratum,
20 determining the coordinate points relating to the positions
of the light-emitting diodes to form the selected pattern,
recording the coordinates thus determined and using the
recorded data thus received for controlling the movements
of means arranged to press impressions in a plate to
25 form the reflectors and to punch openings in said impres-
sions for reception therein of the diodes, inserting the
light-emitting diodes, which are formed with a wider
rear portion, into the reflector through the openings
therein, to a position wherein the diodes will be wedged
30 against the edges of the openings by means of their wider
rear portion and a mechanical bond be formed between the
diodes and the plate.

The installation for performing the method of manu-
facturing the display comprising light-emitting diodes

in accordance with the invention is characterized by means for determining the coordinate relating to the positions of the light-emitting diodes, means for recording said coordinates and means for controlling the operations of stamping and punching sign blanks in response to being controlled by the data of the recorded coordinate positions, said means controlling the stamping and punching of said reflectors comprising punching and stamping means consisting of two blocks one of which comprises an abutment member and the other one a clamping jaw, a stamping die and a punching member, said two blocks being moved in synchronized relationship on either side of said sign blank.

The invention allows a display of the kind disclosed in SE Patent Application 8200913-5 to be manufactured in an efficient manner and be given the desired appearance.

Further characteristics of the invention will appear from the dependent claims.

The invention will be described in closer detail in the following with reference to the accompanying drawings, wherein Fig. 1 is a cross-sectional view through a light-emitting diode which is mounted according to the method of the invention in a display of the diode-holder type described in SE Patent Application 8200913-5, Fig. 2 is a plan view of a practical application of said display comprising light-emitting diodes, Fig. 3 is a general view giving an overall picture of the installation designed to perform the method in accordance with the invention. Fig. 4 is a front view of the machine part of the installation designed to manufacture the sign itself, Fig. 5 is an end view of the machine part of Fig. 4, and Figs. 6, 7a and 7b show details of this machine part.

Fig. 1 illustrates a light-emitting diode 1 which is positioned in a holder 2. The latter consists of a plate 3 of sheet metal. Preferably, the sheet metal is aluminium plate, which has been exposed to an anodizing treatment, whereby a reflective surface layer 4 forms on the plate.

The diode 1 is mounted in an opening formed in a dish-shaped reflector 5. Diodes typically have a slightly conical configuration, a shape which is a consequence of the fact that in the manufacture of the diodes it must be possible to release the latter from the mould in which they are formed. This conicity of the diodes is made use of in the present invention in that the diodes are mounted from below (in accordance with Fig. 1) in the opening formed in the reflector, in which opening they are wedged securely in position. This becomes possible because the size of the opening is made to match the size of the diode. The wedging force by means of which the diode is secured in the plate opening thus forms a mechanical bond or press fit by means of which the diode is securely retained in the plate 3. This mechanical bond may be strengthened by an adhesive applied to the edges of the opening. The dish-shaped reflector 5 may have a parabolic, semi-spherical or other suitable shape. The connections of the diode 1 consist of rigid rods 6, which extend along the lower face (according to Fig. 1) of the plate 3, which corresponds to the interior of the display. The diodes 1 are interconnected and connected to the source of current by soldering the rods 6 together or soldering them to wires. The manner of interconnection of the diodes and of their connection means to a source of current may be tailor-made to suit the particular needs of each individual application of the invention.

The tight and close abutment of the diode walls against the edges of the opening positively prevents water from leaking in between the walls and the edges into the interior of the display. A rear plate (not shown) is positioned on the bottom (according to Fig. 1) of the display thus forming a box-shaped construction. Also the rear plate could be provided with diodes to form a two-sided sign.

The rigid rods 6 extend along the walls of the display but spaced some distance therefrom, allowing air to circulate freely about the rods. This prevents condensation from forming on the rods 6. In this manner the generation of creeping currents is prevented.

Because of the configuration of the reflector 5 the light emitted from the diode 1 will be reflected in the form of a bundle of aligned beams. In this manner the comparatively weak light emitted from a light-emitting diode will be strengthened with regard to its effect and power in a direction straight outwards from the reflector. No separate transparent glass sheet or similar element need to be provided in front of the diodes since the electric connections and wires are well protected anyway.

Fig. 2 shows one example of a suitable application of the light-emitting diode display in accordance with SE Patent Application 8200913-5. Fig. 2 illustrates a signal device 7 in the form of an elongate, rectangular holder 8 in which are formed a number of reflectors 5. In the manner shown in Fig. 1 one light-emitting diode 1 is mounted in each one of these reflectors. At each end of the holder a number of yellow light-emitting diodes 9 are provided. The light-emitting diodes 10, which are positioned intermediate the outermost groups 9 of light-emitting diodes, are red. The holder is intended to be

mounted for instance at the rear of cars, in which case the central red light-emitting diodes 10 serve as brake lights whereas the yellow light-emitting diodes 9 at each end of the holder serve as blinkers. A device of this kind could advantageously be mounted in the rear window of cars to supplement the conventional rear lights of the vehicle. In order to achieve the flashing function of the blinker diodes 9 a relay or similar means is coupled between the power source and the diodes.

A further example of an advantageous application of a light-emitting diode display of this type is shown at the left-hand part of Fig. 4. A conventional sign carries the text formed by light-emitting diodes. The latter are made to emit light continuously or to emit an intermittent light to illuminate the text. In this manner, the diodes may as illustrated cover the entire design to be illuminated or serve as outline-indicators.

The rods 6 may be cast into a filler compound of synthetic-resin material or the like. In this case the material must enclose the rods to prevent condensation from forming on the rods.

The installation illustrated in Fig. 3 designed to produce e.g. signs comprising light-emitting diodes, comprises a drawing board 11, a data processing computer part 12 and a machine part 14.

The device to be manufactured, in this case a sign, (see the plate or sign blank 13 in Fig. 5) carries symbols, e.g. the letters TAXI. The letters are to be made visible by means of light-emitting diodes and the power of the light-emitting diodes 1 is improved by mounting each diode in its individual reflector 5 as described in the foregoing.

The first stage of the manufacture of the sign 13 consists of applying a templet carrying the chosen text

on the drawing board 11 and to determine with the aid of rulers 15 the coordinates indicating the positions of the diodes. The coordinate positions are supplied to the computer 12 and are recorded in the latter on e.g. a floppy disc. In this connection should be pointed out that the drawing board 11, the computer 12 and the machine 14 are wired together. Such wiring is well known and therefore need not be shown on the drawings as this would unnecessarily clutter the latter and impair the clarity.

10 The computer 12 is thereafter employed to control the movements of a slide member in the machine 14, said slide member consisting of two parallel rods 16. The machine 14 comprises a motor 17 to effect the Y-axis coordinate movements and a motor 18 to effect the X-axis coordinate movements of the stamping and punching tool 19 proper, which is controlled by the computer 12 and comprises two blocks 20, 21. These means and their arrangement will be described in closer detail in the following with reference to Figs. 6, 7a and 7b.

20 As appears from Fig. 6 these blocks 20, 21 are arranged for movement on their respective rod 16 on either side of the sign 13. The block movements are synchronized so as to ensure that at all times the two blocks will be positioned opposite each other. The block 20 comprises an abutment member 22 (see Fig. 6) and will work against the side of the sign intended to form the rear face (the lower face according to Fig. 1). When the two blocks 20, 21 have been positioned as desired on either side of the sign blank 13 the abutment member 22 is moved to a position in abutment against the sheet metal of the sign blank. The abutment member 22 is operated by means of a piston 23 which is movable in a cylinder chamber 24.

30 The block 21 comprises a clamping jaw 25 operated by

means of a piston 26 which is movable in a cylindrical space 27. The clamping jaw 25 moves into abutment against the front face of the sign blank 13, whereby the latter will be clamped between the clamping jaw 25 and the abutment member 22. In this position a stamping die 28 mounted in the interior of the clamping jaw 25 will be forced forwards to make a dish-shaped impression in the sign blank to form the reflector 5. The die 28 is operated by means of a piston 29 movable inside a cylinder 30 (see Fig. 7b which is a continuation of Fig. 7a). Finally, the opening is punched in the reflector by means of a punching member 31 which is arranged for movement in the stamping die 28 and is operated by means of a piston 32 positioned in a cylinder 33 at the outer end of the block 21. When the formation of the reflector 5 including the central opening therein has been concluded the abutment member 22, the clamping jaw 25, the die 28 and the punching member 31 are moved apart and away from the sign blank 13, whereby the punching and stamping tool 19 without restraint may be moved by means of the motors 17, 18 to the next position in order to shape another reflector in the sign blank. Sensing means (not shown) are preferably provided to sense when the various parts have returned to the correct positions.

When the reflectors 5 have been formed in the sign blank 13 the diodes are mounted in the openings of the reflectors and are forced into the latter until they are securely wedged therein and the mechanical bond (press fit) is established between the diodes 1 and the plate 3. It may be advisable to strengthen the bond by glueing in which case the glue is brushed onto the rear face (as seen in Fig. 1) of the sign blank. The rods 6 are bent to the desired positions and soldered together

as required according to the desired coupling diagramme. Finally, a rear plate is mounted to finish off the display.

The invention is not limited to the embodiments shown and described but a variety of modifications are possible within the scope of the appended claims. The
5 punching and stamping tool preferably are pneumatically operated but hydraulically operated means are likewise feasible. The required packings and seals and other required means of various types are well-known to the artisan
10 in the field and for this reason have not been described herein in order not to unnecessarily lengthen the description.

The coordinates may be determined by other means than rulers.

Claims

1. A method of manufacturing displays incorporating light-emitting diodes (1), wherein said light-emitting diodes (1) are disposed to form a selected pattern
5 and wherein reflectors (5) surround the individual light-emitting diodes, said method c h a r a c t e r -
i z e d b y

mapping the selected pattern on a substratum,
determining the coordinate points relating to the
10 positions of the light-emitting diodes (1) to form the selected pattern,

recording the coordinates thus determined and
utilizing the recorded data thus received for controlling
the movements of means arranged to press impressions
15 into a plate (13) to form said reflectors (5) and to punch openings in said impressions for reception therein of said diodes (1),

inserting the light-emitting diodes (1), which are formed with a wider rear portion, into said reflectors (5)
20 through the openings therein, to a position, wherein the diodes will be wedged against the edges of the opening by means of their wider rear portion and a mechanical bond be formed between the diodes and the plate (13).

2. An installation for performing the method
25 according to claim 1 of manufacturing displays incorporating light-emitting diodes and formed with impressions in which are positioned said light-emitting diodes (1) to form a selected pattern, said installation c h a r a c t e r -
i z e d b y

30 means (11) for determining the coordinates relating to the positions of said light-emitting diodes (1),
means (12) for recording said coordinates, and
means (14) for controlling the operations of stamping

and punching sign blanks (13) in response to being controlled by the data of said recorded coordinate positions, said means (14) controlling the stamping and punching of said reflectors comprising punching and stamping means consisting of two blocks (20, 21), one
5 (20), of which comprises an abutment member (22) and the other one (21) a clamping jaw (25), a stamping die (28) and a punching member (31), said two blocks (20, 21) being moved in synchronized relationship on either side
10 of said sign blank (13).

3. An installation as claimed in claim 2,
c h a r a c t e r i z e d i n t h a t s a i d
punching and stamping means (20, 21) are vertically movable
on a slide member which in turn is horizontally movable in
15 a machine frame.

Fig.1

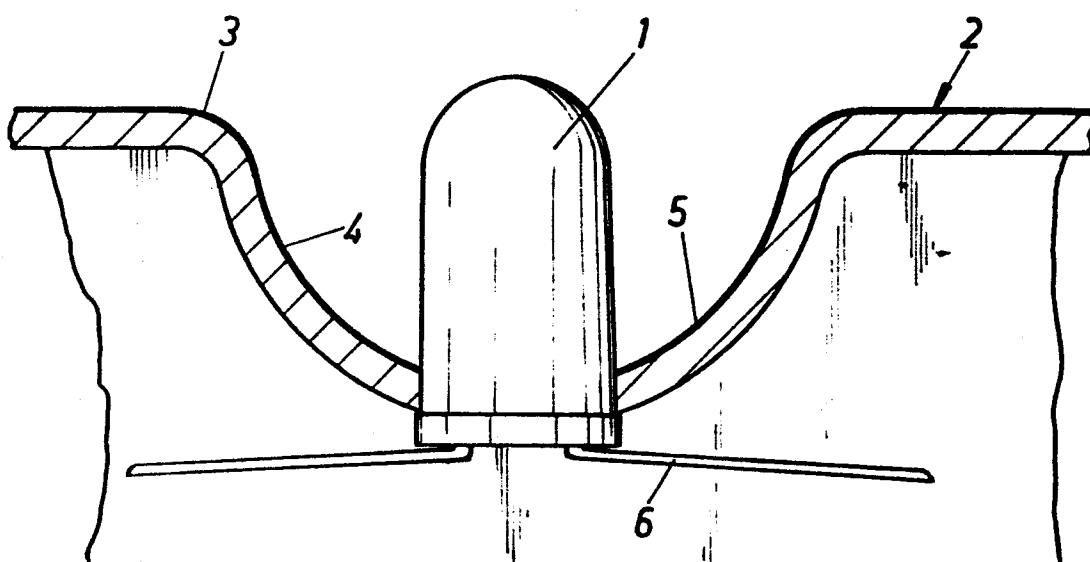
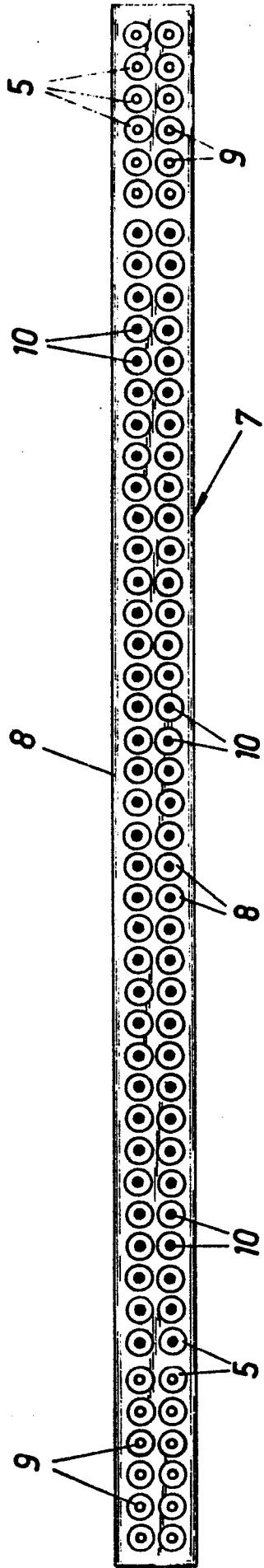


Fig. 2



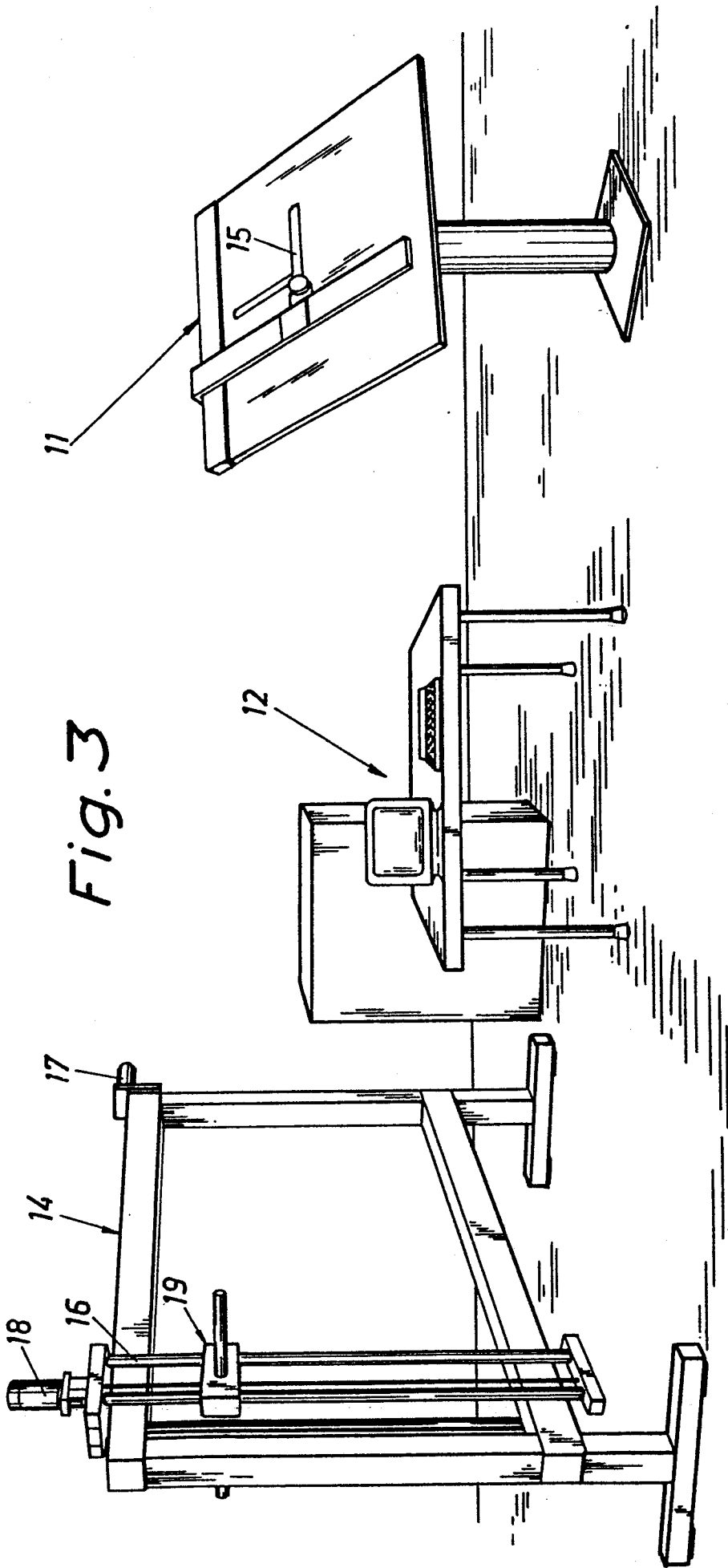


Fig. 3

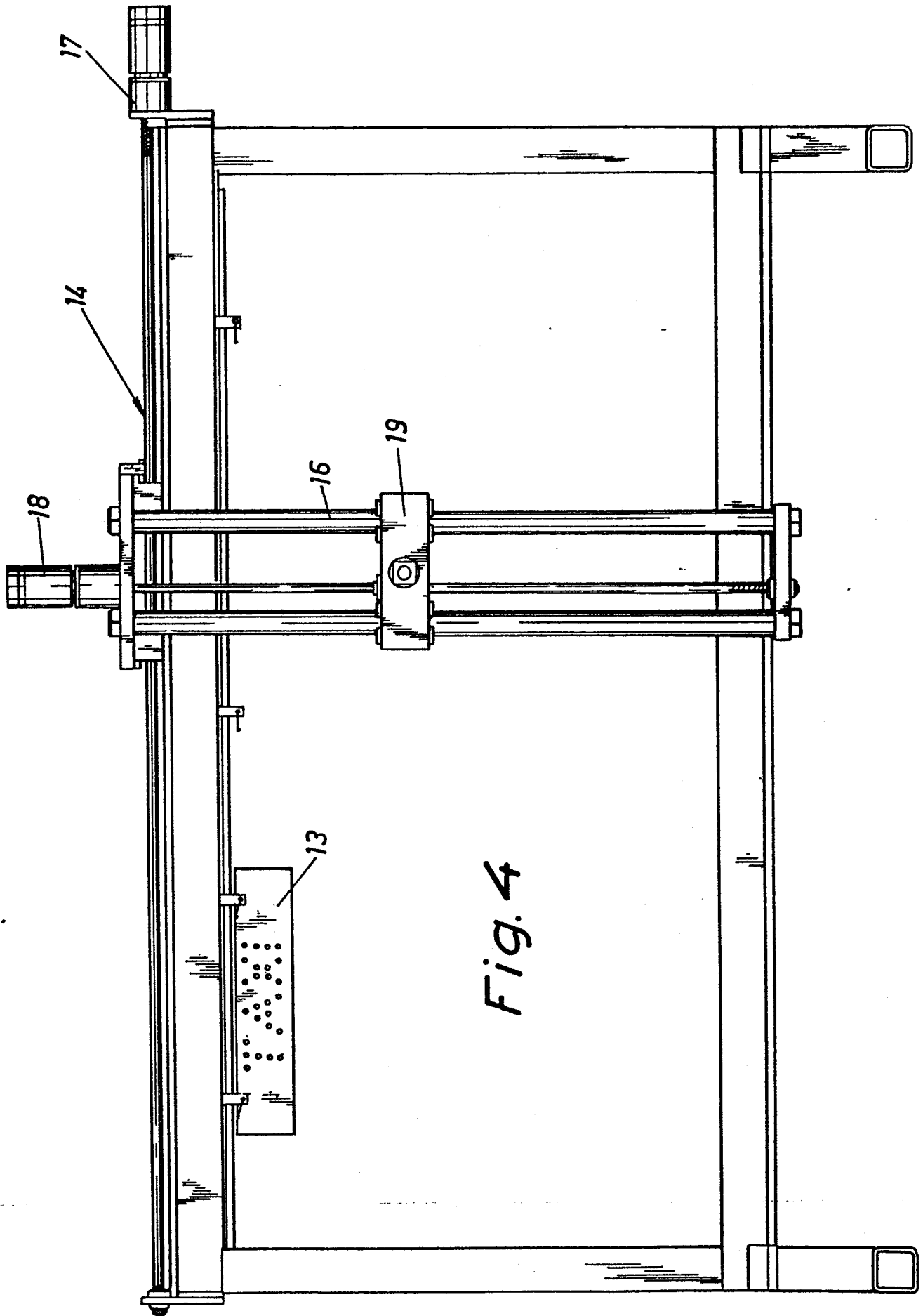


Fig. 4

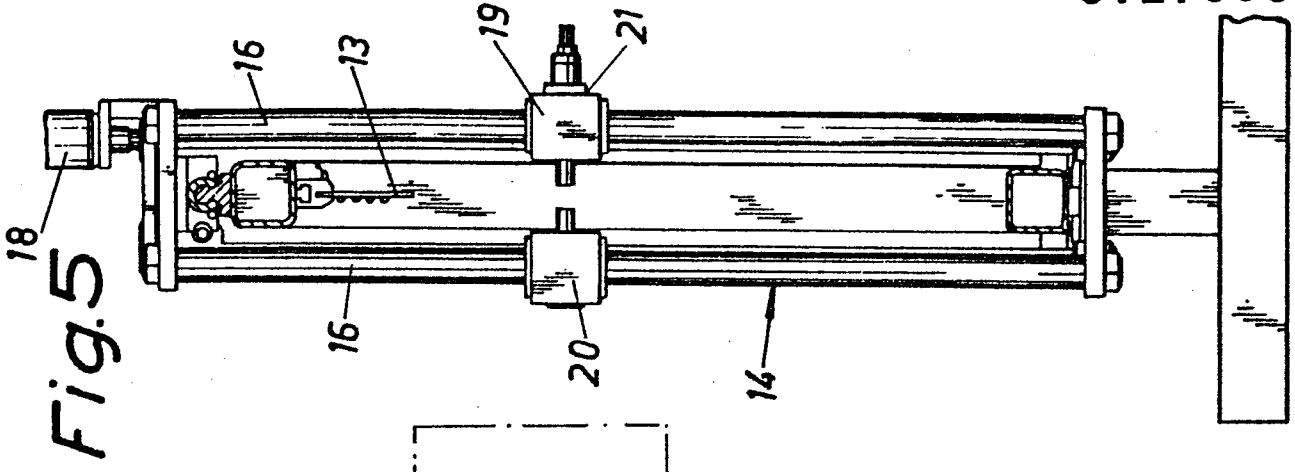


Fig. 5

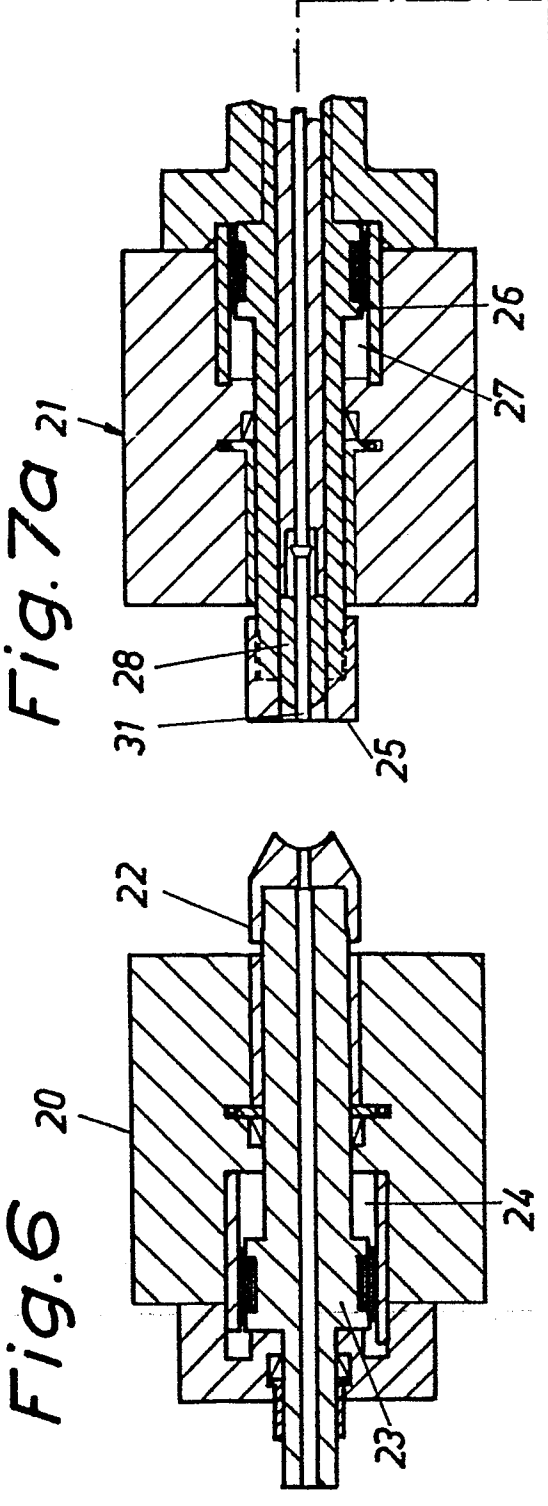


Fig. 6

Fig. 7a

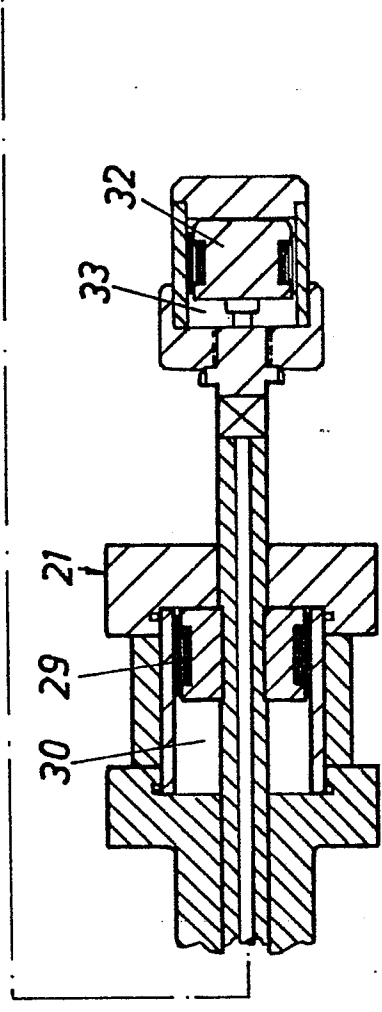


Fig. 7b

5/5