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

(11) Publication number: **0 308 223**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **88308539.1**

(51) Int. Cl.4: **G 06 M 7/00**

(22) Date of filing: **15.09.88**

(30) Priority: **16.09.87 GB 8721821**

(43) Date of publication of application:
22.03.89 Bulletin 89/12

(84) Designated Contracting States: **DE FR GB IT**

(71) Applicant: **MAINLINE TECHNOLOGY LIMITED**
6/12 Kelvin Campus West of Scotland Science Park
Glasgow G20 05B Scotland (GB)

(72) Inventor: **Gillan, Frank N., c/o Mainline Techn. Ltd**
6/12 Kelvin Campus, West of Scotland Science Park
Glasgow G20 05B (GB)

Gillan, Iris, c/o Mainline Technology Ltd
6/12 Kelvin Campus, West of Scotland Science Park
Glasgow G20 05B (GB)

(74) Representative: **Fitzpatrick, Alan James et al**
Fitzpatricks 4 West Regent Street
Glasgow G2 1RS Scotland (GB)

(54) **Counting articles.**

(57) Apparatus for detecting and counting articles on a product conveyor or the like includes an optical cell (20), comprising a light source and detector, and a reflector (22) mounted on spaced parallel faces of an arm (18), the light path between the cell (20) and reflector (22) extending transversely to the direction of travel of a conveyor carrying articles such as cylindrical cans (10) and at an angle to the horizontal. The disposition is such that the light path is blocked by the widest part of the can (10) but passes through the peripheral space between adjacent cans (10), thus allowing articles in abutment on a conveyor line to be detected. In a preferred embodiment first and second horizontally spaced pairs of cells and detectors are located on spaced parallel faces of the apparatus to assist in error detection.

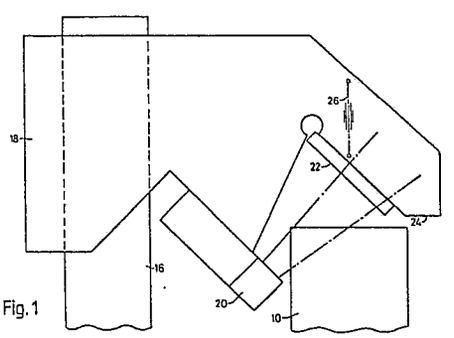

Fig.1

EP 0 308 223 A2

Description

Counting Articles

This invention relates to the counting of articles moving along a predetermined path, such as identical products on a conveyor belt. The invention is particularly, but not exclusively, of usefulness in monitoring the production rate of products in cans, jars and the like.

It is known to count objects on a conveyor belt using optical, magnetic or contact sensors. Optical sensors have advantages of no contact with the product, simplicity, and reliability. However, optical sensors have hitherto been difficult to use satisfactorily in situations where the articles to be counted are in mutual abutment on the conveyor.

An object of the present invention is to overcome or mitigate this problem.

A further object of the invention is to provide an apparatus which is compact, simple in structure, and flexible in use.

Accordingly, the present invention provides apparatus for detecting articles moving along a predetermined route, comprising a light source for providing a light beam, and a light detector for detecting the beam after it has traversed a predetermined path, the light source and detector being so arranged that said light beam path extends transverse to the longitudinal axis of said route and at an angle to the horizontal.

Preferably, the light source and detector are adjacent one another at one end of the light beam path and the other end of the light beam path is defined by a reflector. Preferably also, one end of said path is disposed below and to one side of the articles, and the other end above the articles.

Preferably also, said light path extends between first and second spaced parallel faces forming part of the apparatus.

Preferably also, an optical cell comprising the light source and detector is located on one of said first and second faces and a reflector is located opposite thereto on the other of said first and second faces.

The apparatus preferably includes first and second horizontally spaced light sources and detectors, wherein the spacing of the first and second sources and detectors is different from the minimum spacing between the centres of adjacent articles in the direction of travel.

It is further preferred that the apparatus includes data processing means responsive to signals received from said light detector or detectors, data input and output means and adjustable support means positionable adjacent said predetermined route.

An embodiment of the invention will now be described, by way of example only, with reference to the drawings, in which:

Fig. 1 is an elevation of an apparatus embodying the invention, and

Fig. 2 is a plan view of the apparatus.

Fig. 3 is a perspective view of a particularly preferred embodiment of the invention; and

Fig. 4 is a bottom view of a portion of the apparatus of Fig. 2.

Packaged products such as cans indicated at 10 move along a conveyor 12 between guides 14. The cans 10 are in mutual abutment, and thus it would not be possible to count them by means of a horizontal light beam.

A column 16 mounts a pair of arms 18 extending above the path of movement of the cans 10. Each arm 18 is shaped to provide parallel mounting surfaces for an optical cell 20 and a reflector 22. The optical cell 20 includes a light source (eg. a monochromatic light-emitting diode) and a light-sensitive device (eg. a photodiode). The disposition is such that light is blocked by the wider part of a passing can 10 but is transmitted and reflected unimpeded between the optical cell 20 and reflector 22 when the peripheral space between abutting cans 10 is adjacent the arm 18. To assist in setting up the apparatus for this purpose, the arm 18 is provided with a horizontal datum face 24 for measuring the vertical spacing, and a vertical mark 26 for alignment with the central axis of movement of the cans 10.

The optical cell 20 thus gives an output pulse for each product passing. Means for counting and processing such pulses will be readily apparent to those skilled in the art.

A single optical cell 20 and reflector 22 would give a usable count in normal circumstances, but would be prone to false counts caused, for example, by an extraneous object (eg. an operator's hand) interrupting the path of the light beam. It is therefore preferred to use the double arrangement shown. The arms 18 are set at a distance apart D which is different to (either greater or less than) the minimum spacing P between the centres of adjacent cans 10. The pulse outputs can be processed to check that:

(1) the pulses occur in an order corresponding to the direction of travel, and

(2) the time period where the beam is obscured is within an allowable range set in dependence on product dimensions and container speed.

Means of carrying out such checks will be readily apparent. They may be dedicated electronic circuits or, preferably, achieved by digital processing in a suitably programmed computer.

Figs. 3 and 4 illustrate the construction of a particularly preferred embodiment of the invention. The apparatus comprises a counting unit 30 mounted upon an adjustable stand 32 positionable alongside a conveyor (not shown). The unit 30 consists of a fascia plate 34, having a top portion 36 in which control and input/output devices, indicator lamps etc (described in more detail below) are mounted and a side portion 38 extending at right angles thereto, and a box member 40 affixed to the underside of the top portion 36 of the fascia plate 34. The box member 40 includes a front panel 42 spaced from and parallel to the side portion 38 of the fascia plate.

As is best seen in Fig. 4, first and second,

horizontally spaced optical cells 44 are located on the front panel 42 and first and second reflectors 46 are positioned opposite the optical cells 44 on the inner surface 48 of the side portion 38 of the fascia plate 34.

This unit 30 is mounted on first and second parallel arms 50 of the stand 32. The arms 50 extend upwardly at an angle (preferably approximately 45°) to the horizontal such that the optical axis between the optical cells 44 and reflectors 46 is at an angle to the conveyor, as in the embodiment of Figs. 1 and 2.

The box member 40 encloses the electronic components of the unit 30, including microprocessor means etc, and may be provided with sockets 52, 54 for power supply and data leads and the like. The fascia plate is provided with an alphanumeric display 56 (such as a gas plasma or LCD display) for displaying information, instructions, prompts, input data etc, a keypad 58 for input of numerical codes and menu selection, and any other control switches, status lamps or the like which may be necessary or desirable.

The unit 30 operates under software or firmware control, either using integral microcomputer means or, preferably, a remote host computer, which might control a large number of such units in a practical production environment. The software may, for example, automatically reset the counting and error checking parameters of the unit 30 to suit a wide range of articles of differing shapes and sizes in response to codes entered by the operator of the unit 30.

In the present embodiment, the adjustable stand comprises the angled arms 50, which extend from the top of vertical box section members 60. These in turn are slidably located within vertical members 62 of a box-section H-frame and may be clamped in any desired position by means of knobs 64. A wide variety of stand configurations are of course possible, and adjustment of the stand could be automated by means of stepper motors or the like (in a manner which will be readily apparent to those skilled in the art), allowing positional adjustment of the unit 30 also to be placed under automatic software control.

The angled disposition of the optical sensor ent provides the basis for a compact and reliable counting unit which, in combination with its adjustable stand, is transportable, easily installed and adjusted to suit a wide range of conveyor lines, and which is susceptible of computer control to allow complete flexibility of use with a wide variety of different articles.

Although the preferred embodiments have been described with reference to cylindrical cans, the invention is equally applicable to other products, for example bottles or sacks. It has been found that the invention can equally be used with cartons and the like of generally rectangular form provided there is some radiusing at the corners.

Modifications may of course be made to the apparatus described above, within the scope of the invention. For example, the reflector could be dispensed with, and the light source and detector arranged at opposite sides of the product path.

Claims

1. An apparatus for detecting articles moving along a predetermined route, comprising a light source for providing a light beam, and a light detector for detecting the beam after it has traversed a predetermined path, the light source and detector being so arranged that said light beam path extends transverse to the longitudinal axis of said route and at an angle to the horizontal.

2. The apparatus of claim 1 wherein the light source and detector are adjacent one another at one end of the light beam path and the other end of the light beam path is defined by a reflector.

3. The apparatus of claim 1 or claim 2 wherein one end of said path is disposed below and to one side of the articles, and the other end above the articles.

4. The apparatus of any of claims 1 to 3 wherein said light path extends between first and second spaced parallel faces forming part of the apparatus.

5. The apparatus of claim 4 wherein an optical cell comprising the light source and detector is located on one of said first and second faces and a reflector is located opposite thereto on the other of said first and second faces.

6. The apparatus of any preceding claim including first and second horizontally spaced light sources and detectors, wherein the spacing of the first and second sources and detectors is different from the minimum spacing between the centres of adjacent articles, in the direction of travel.

7. The apparatus of any preceding claim further including data processing means responsive to signals received from said light detector or detectors and including data input and output means.

8. The apparatus of claim 7 wherein said data input and output means includes an alphanumeric visual display and a keypad.

9. the apparatus of any preceding claim further including adjustable support means positionable adjacent said predetermined route.

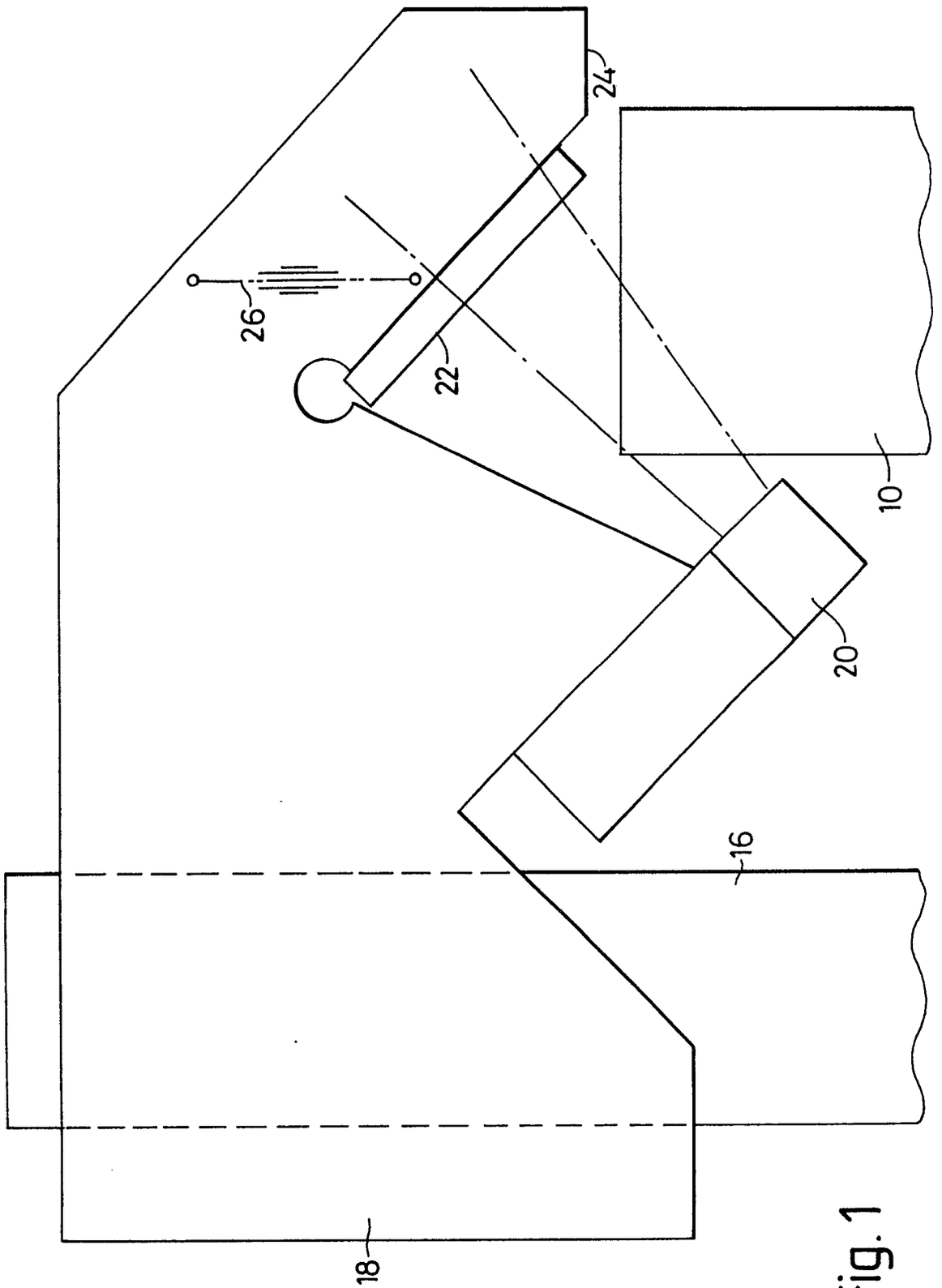

Fig. 1

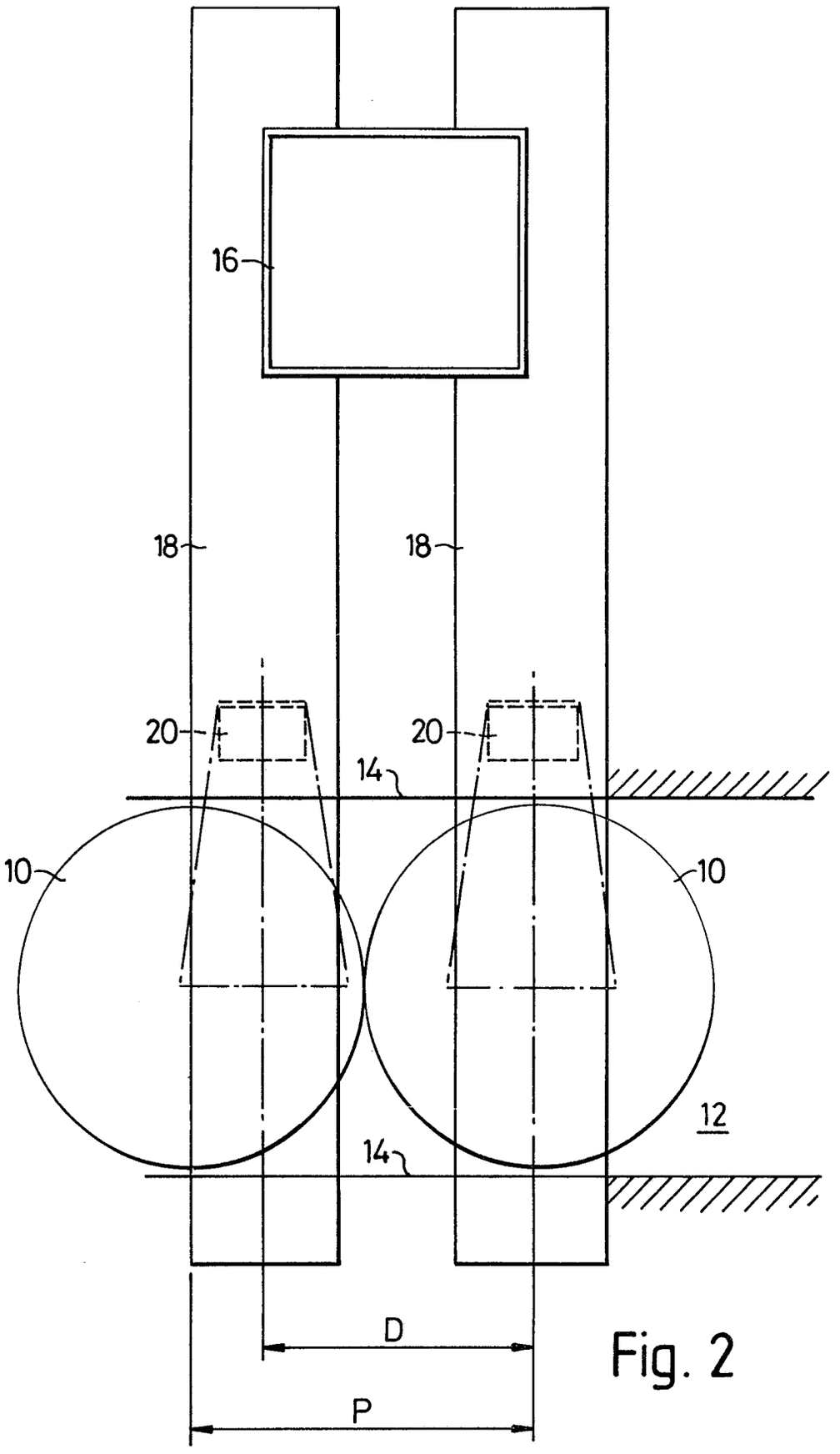

Fig. 2

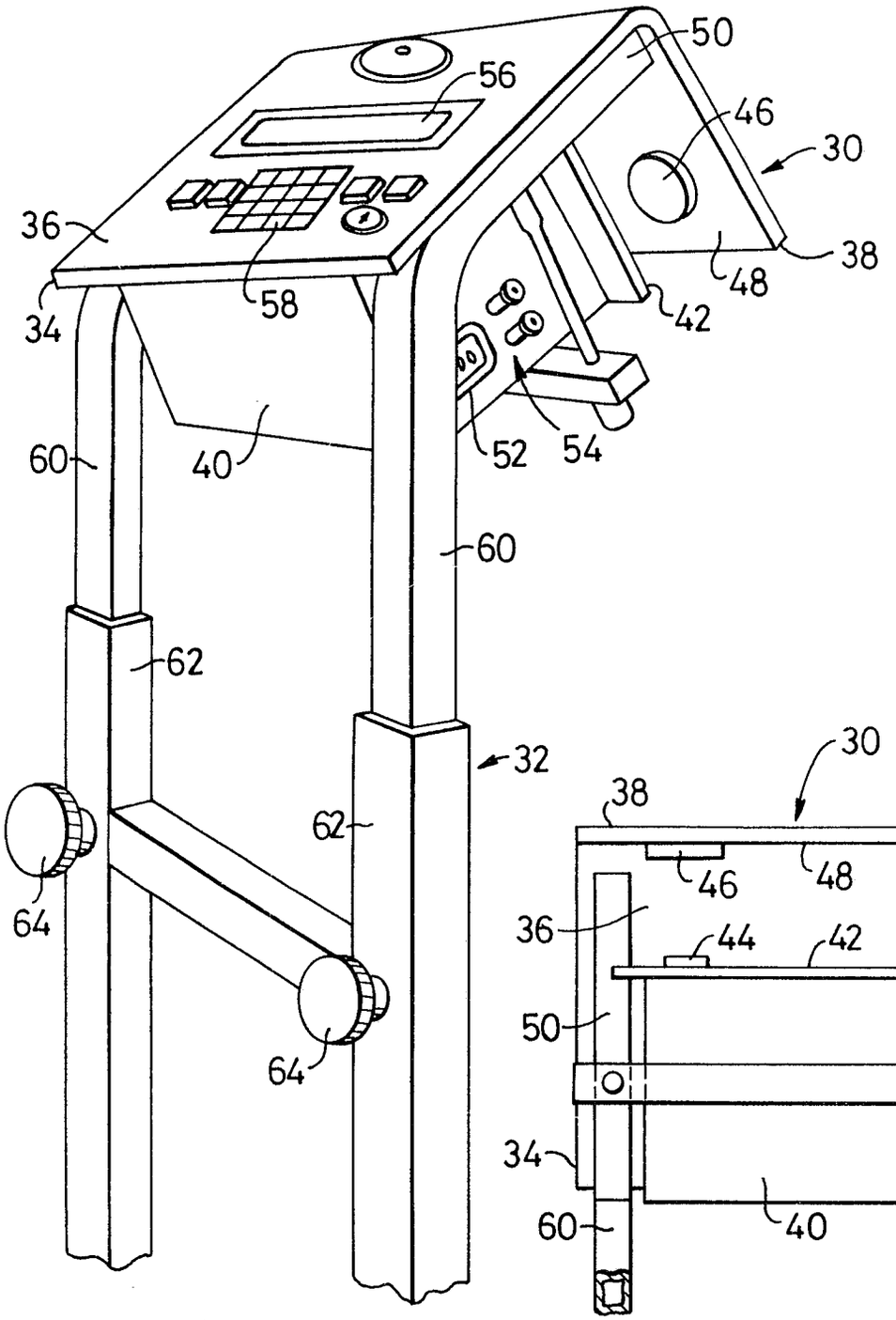
50
56
46
30
36
38
48
58
42
34
52
54
60
40
60
62
32
62
64
64

Fig. 3

30
38
46
48
46
36
44
42
44
50
50
34
40
60
60

Fig. 4