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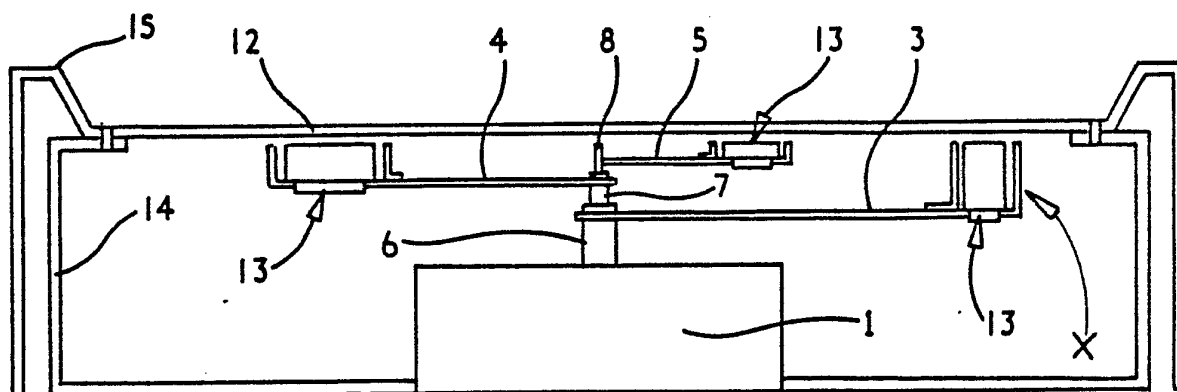
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(54) Title: INSTRUMENT DISPLAYS



(57) Abstract

An instrument such as clock or meter includes an actuating mechanism (1) which drives at least one driven member (13) which includes a magnet (20). The actuating mechanism (1) and driven member (13) are concealed behind a separator (12) and at least one indicator (9, 10, 11) is located on the presented face of the separator (12). Each indicator (9, 10, 11) includes a magnet (22) and the arrangement is such that, as a driven member (13) is moved across the concealed face of the separator (12), the associated indicator (9, 10, 11) is moved accordingly by magnetic attraction.

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INSTRUMENT DISPLAYS

Field of the Invention

This invention relates to instrument displays and, although it has particular application to clocks, the invention is also concerned with such instruments as weighing scales, thermometers,
5 barometers, liquid level indicators and the like.

In the following specification, the term "instrument" is used for any instrument or meter which displays an analogue quantity by mechanically moving an indicator over a dial or scale (which may or may not be calibrated), rather than by giving a digital
10 read-out. The term "dial" extends not only to circular instrument faces but to all shapes of instrument face whether planar or otherwise.

Description of the Prior Art

In conventional instruments, there is an actuating mechanism
15 which moves at least one member which is in the form of an indicator which moves across a dial. Clocks are designed in many different shapes and sizes. However they are almost all bound by the same constraints of including at least two moving members which are in the form of pointers or hands which
20 are mounted on a central shaft which extends from behind the dial of a clock face, where the drive mechanism is situated, to the front face of the clock.

A similar design, but with only one pointer, is used for many standard measuring instruments, for example speedometers.

5 A number of proposals have been made for clock designs which avoid the conventional design restraints. One example of such proposals is British Patent Specification Number 2138976 in which the external hour and minute hands are constituted by rotary indicator elements which are held in contact with the dial and are driven around the dial magnetically by magnetic drive elements located adjacent the opposite face of the dial.

10 The clock design of British Patent Specification is still subject to certain design constraints, in particular the dial has to be planar and some form of pivotal or other guide mounting for the hands is still required.

15 It is accordingly an object of the present invention to provide an improved form of instrument display which permits the introduction of innovative design concepts.

Summary of the Invention

20 According to one aspect of the invention there is provided an instrument including an actuating mechanism which drives at least one driven member, at least one indicator, and a separator mounted between the driven member and the indicator; the indicator and driven member each including a magnetic attraction member such that actuation of the actuating mechanism moves the driven member across one surface of the separator and hence, 25 by virtue of the magnetic attraction between the driven member and the indicator, moves the indicator across the opposite surface of the separator which provides a display dial with the actuating mechanism concealed behind the separator, the indicator being of laminar form and arranged for movement across said opposite surface of the separator without any pivotal mounting means 30 or other form of guidance apart from the magnetic attraction between the driven member and the indicator.

The indicator and driven member preferably include layers of low friction material on the surfaces thereof which are directed towards the separator so that low-friction face to face engagement with the separator is obtained and the spacing between the magnetic attraction members of the indicator and the driven member can be kept to a minimum.

It is possible for one only of the magnetic attraction members to be a magnet. It is preferred, however, that there should be a magnet on both the driven member and the indicator .

Each magnet may be of magnetic rubber sheet of, for example, two millimeters in thickness so that the weight of the indicator is kept as low as possible and hence the frictional resistance to movement of the indicator over the dial surface is minimised.

The actuating mechanism may be a standard clock mechanism which includes a shaft on which a number of pointers or clock hands are mounted. All the standard clock components will be mounted on one side of the separator/dial with a magnet mounted at the end of each clock hand but with the drive mechanism concealed behind the separator/dial so that only the moving indicators are visible.

It is preferable, however, to use a non-standard drive mechanism comprising a flexible elongate drive element on which the driven member is mounted. The drive element may be in the form of a continuous belt, band or cable which can be guided for movement along a non-circular path. The path can also be of non-planar configuration.

With this arrangement it is possible to provide, for example, a clock which includes an indicator which moves along a square or rectangular path. Moreover, it is also possible to arrange for the indicator to move along a non-planar path.

This non-planar and/or non-circular movement which is obtainable by the use of a flexible elongate drive element is of particular advantage in enabling a wide range of clock designs to be obtained.

5 Thus, according to a second aspect of the invention, there is provided a clock which includes an actuating mechanism which drives a flexible elongate drive element on which a driven member is mounted, at least one indicator, and a separator mounted between the driven member and the indicator; the
10 driven member and indicator being provided with interactive drive means such that, on actuation of the actuating mechanism to move the driven member across one surface of the separator, the indicator is moved across the opposite surface of the separator which provides a display dial with the actuating mechanism
15 concealed behind the separator.

Brief Description of the Drawings

Examples of instruments in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

20 Figure 1 is a schematic view of the actuating mechanism of a first instrument;

Figure 2 is a plan view of the instrument;

Figure 3 is a section through the instrument;

Figure 4 is an expanded detailed view of part X of Figure 3;

25 Figure 5 is a schematic perspective view of a second instrument in accordance with the invention;

Figure 6 is a perspective view of a combined clock and desk tidy;

Figure 7 is a partial view of a combined maximum/minimum thermometer; and

Figure 8 is a perspective view of a weighing scale.

Description of the Preferred Embodiments

The first instrument shown in Figures 1 to 4 includes an actuating mechanism 1 which is the movement of an alarm clock. The shafts 2 driven by the mechanism 1 are such that three separate hands, 3, 4 and 5 extend from an outer shaft 6, middle shaft 7 and an inner shaft 8 respectively. The "seconds" hand is hand 3 extending from the outer shaft 6, the "minutes" hand 4 extends from the middle shaft 7 and the "hour" hand 5 from the inner shaft 8. The hands 3, 4 and 5 are fitted to each outward drive shaft by being an interference fit and further secured with a drop of cyanoacrylate adhesive. The lengths of the hands 3, 4 and 5 vary, the seconds hand 3 being the longest and the hours hand 5 being the shortest.

Each hand 3, 4, 5 comprises a mechanically driven member. Each of the members is rotated about the central axis by the actuating mechanism 1. Co-operating with each of the hands is an indicator 9, 10 and 11 respectively. The indicators 9, 10 and 11 are mounted for movement in one plane above a substantially planar separator member 12.

Each of the hands 3, 4, 5 is made of aluminium strip and each hand includes a holder 13 at its end. Each holder is similar to that shown in Figure 4 in detail and comprises the end of the arm bent at right angles at its tip with two other pieces of aluminium strip bent and glued to the arm to produce an open box shape with no corners. The sizes of the holders 13 are different for each of the hands 3, 4, 5.

The actuating mechanism 1 and the movable members 3, 4, 5 are mounted on a bracket 14 which is attached to a housing 15, the housing 15 including the separator member 12. The bracket 14 is so arranged that the drive centre for the hands 3, 4, 5 is centralised relative to the housing 15 and the tips of the holders 13 maintain an approximately one millimetre gap behind the separator 12 as they revolve. The separator 12 is a substantially planar plastics component and lies between the moving members 3, 4, 5 and the indicator 9, 10 and 11, such that the actuating mechanism 1 and moving members 3, 4, 5 cannot be seen from the surface of the plastic separator 12 which faces outwardly of the clock.

Each holder 13 has mounted within it a magnetic attraction member 18 which comprises a wooden block 19 having glued to its separator facing side a piece of rubber magnetic material 20. Such magnetic rubber material is two millimetres thick. The face 21 of the magnet which faces towards the separator 12 is covered with polytetrafluoroethylene tape to reduce friction. Each indicator 9, 10, 11 is of approximately the same shape in plan as the holder 13 for each of the arms 3, 4, 5 respectively. Each indicator 9, 10 and 11 is a laminar shape of magnetic rubber sheet 22 with p.t.f.e on its inwardly facing surface 23 and coloured tape 24 on its outwardly facing surface. In this way each of the indicators 9, 10, 11 can have a different colour so that, with their differing sizes and colour, they are clearly distinguishable from each other. The hours hand 11 is a square

and the minutes hand 10 is an elongate rectangle. Both of these maintain their orientation relative to the centre of the separator 12. The seconds hand 9 is a small square indicator which tends to spin as it rotates around the centre of the separator 12.

5 The co-operating magnets 20 and 22 are arranged to have opposite poles so that they attract one another. As the actuating mechanism 1 rotates each of the hands 3, 4, 5, the indicators 9, 10 and 11 respectively are rotated at different speeds. In order to
10 reduce friction the inside and outside of the plastic separator 12 is sprayed with a lubricant spray.

In a second embodiment of the invention which is shown in Figure 5 schematically only, the actuating mechanism does not rotate a series of hands but moves a series of continuous belts
15 or bands 25 which describe a square path and on which are mounted mechanically driven members. In this way an indicator 26 on the opposite side of a separator 27 describes a square path which gives the clock a very unusual appearance.

In the particular arrangement shown in Figure 5, there are three
20 belts 25, and three indicators 26 indicating respectively the hours, minutes and seconds. Each of the indicators 26 is in the form of a piece of rubber magnetic material as described above in relation to Figure 4 and each indicator 26 is arranged for sliding movement over the presented surface of the separator
25 27. Each of the bands 25 carries a drive member corresponding to the magnetic attraction member 18 of Figure 4 and each drive member incorporates a piece of rubber magnetic material which is in sliding contact with the inside surface of the separator 27. In the particular arrangement shown in Figure 5, the belts
30 25 are guided so that each move in a square path under the control of a drive system (not shown). Each belt 25 moves in a single plane. If, however, it is desired that the indicators

26 should be moved over a non planar surface, the belts 25 will be replaced by flexible bands or cables and guide means will be provided for causing the driven members carried by the bands or cables to move along the appropriate paths.

5 Turning next to Figure 6, this shows a desk tidy which contains a drive system similar to that of Figure 5 and there are numbered scales on each side of the generally elongate housing 28 of the desk tidy. There are two sets of three indicators 29, 30 and 31 with the arrangement such that the indicators
10 29 which indicate the seconds are at mutually diametrically opposite positions. The indicators 30 which indicate the minutes are similarly at mutually diagonally opposite position, as are the indicators 31 which indicate the hours.

Each of the indicators 29, 30, 31 is in the form of a moulded
15 plastics block which contains a magnet. The minutes indicators 30 are larger than the seconds indicators 29 and the hours indicators 31 are, in turn, larger than the minutes indicators 30. The magnets within the indicators 29, 30, 31 are disposed at different spacings from the base of the desk tidy so that
20 they do not interfere with one another. The plastics blocks of the minutes indicators 30 are formed with cut-outs, i.e. they provide bridges, to allow for the unimpeded passage of the seconds indicators 29, and the hours indicators 31 are similarly provided by plastics blocks of bridge formation
25 to afford cut-outs through which both the minutes indicators 30 and seconds indicators 29 can pass.

It is to be noted that the indicators 29, 30, 31 travel continuously around the circumference of the desk tidy which provides a clock which can be viewed from both sides.

30 In a modification of the desk tidy construction shown in Figure 6, the drive to the indicators is a direct mechanical drive utilising driving elements which pass through slots in the

side wall of the housing or which project outwardly beneath the housing side wall.

The indicators 29, 30 and 31 are moved along the scales provided on the outside of the housing 28 by a magnetic drive system
5 corresponding to that shown in Figure 5.

Turning next to Figure 7, this shows a maximum/minimum thermometer in which an operating mechanism for a maximum/minimum thermometer is contained within a housing 32 and the indication of the maximum temperature is provided by an indicator 33
10 which slides over a scale 34. The indicator 33 is in the form of a triangular sheet of rubber magnetic material and a similar sheet of magnetic material is located in engagement with the inside surface of the corresponding wall of the housing 32 so that the indicator 33 is moved over the scale 34 to
15 provide an indication of the maximum temperature. The minimum temperature indicator 35 is likewise in the form of a triangular sheet of rubber magnetic material which is movable over a scale 36. The minimum indicator 35 is moved over the scale
20 36 by means of a similar sheet of magnetic material disposed on the inside surface of the wall of the housing 32 and driven by the conventional mechanism for a maximum/minimum thermometer.

Turning next to Figure 8, this shows a weighing scale which comprises a housing 37 of generally rectangular form and a
25 platform 38 on which a user can stand. An indicator 39 in the form of a strip of rubber magnetic material is arranged for movement over a scale which extends along three sides of the housing 37 and the indicator 39 is arranged so that it slides over the outer surface of the scale whilst a driven
30 member (also including a strip of rubber magnetic material) moves over the inner surface of the scale. The drive mechanism for moving the driven member will include an appropriate form of cable or band drive system.

CLAIMS:

1. An instrument including an actuating mechanism which drives at least one driven member, at least one indicator, and a separator mounted between the driven member and the indicator; the indicator and driven member each including a magnetic attraction member such that actuation of the actuating mechanism moves
5 the driven member across one surface of the separator and hence, by virtue of the magnetic attraction between the driven member and the indicator, moves the indicator across the opposite surface of the separator which provides a display dial with the actuating mechanism concealed behind the separator, the indicator being
10 of laminar form and arranged for movement across said opposite surface of the separator without any pivotal mounting means or other form of guidance apart from the magnetic attraction between the driven member and the indicator.
2. An instrument according to Claim 1, wherein the indicator
15 and driven member include layers of low friction material on the surfaces thereof which are directed towards the separator so that low friction face to face engagement with the separator is obtained.
3. An instrument according to Claim 1, wherein both the
20 driven member and the indicator include a magnet.
4. An instrument according to Claim 3, wherein each magnet is of magnetic rubber sheet.
5. An instrument according to Claim 1, in the form of a
25 clock and wherein all the standard clock components are mounted on one side of the separator with a magnet mounted at the end of each clock hand but with the drive mechanism concealed behind the separator so that only the moving indicators are visible.

6. An instrument according to Claim 1, wherein the actuating mechanism comprises a flexible elongate drive element on which the driven member is mounted.

5 7. An instrument according to Claim 6, wherein the flexible elongate drive element is guided for movement along a non-circular and/or non-planar path.

10 8. A clock or other instrument which includes an actuating mechanism which drives a flexible drive element on which a driven member is mounted, at least one indicator, and a separator mounted between the driven member and the indicator; the driven member and indicator being provided with interactive drive means such that, on actuation of the actuating mechanism to move the driven member across one surface of the separator, the indicator is moved across the opposite surface of the separator which provides a display dial with the actuating mechanism
15 concealed behind the separator.

9. A clock or other instrument according to Claim 8, wherein the interactive drive means comprises a magnet on the driven member and a magnet on the indicator.

20 10. A clock or other instrument substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

Figure 1

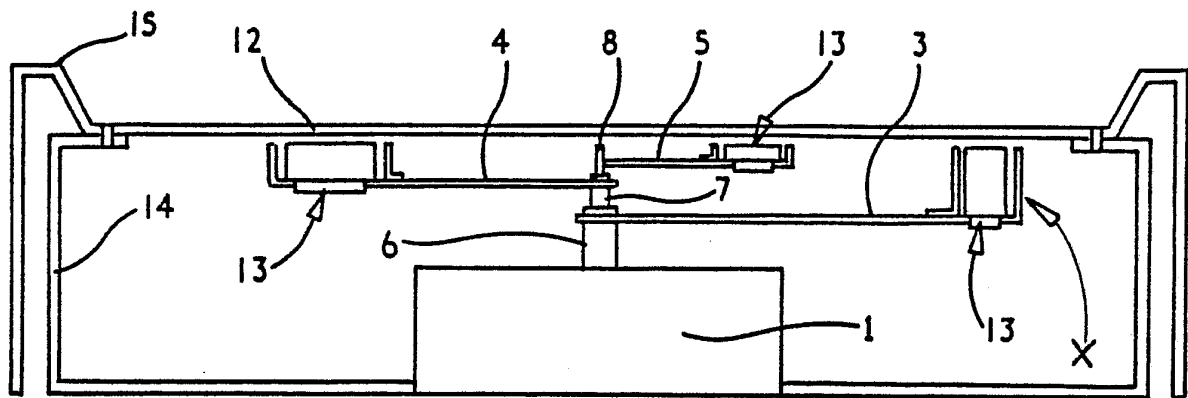
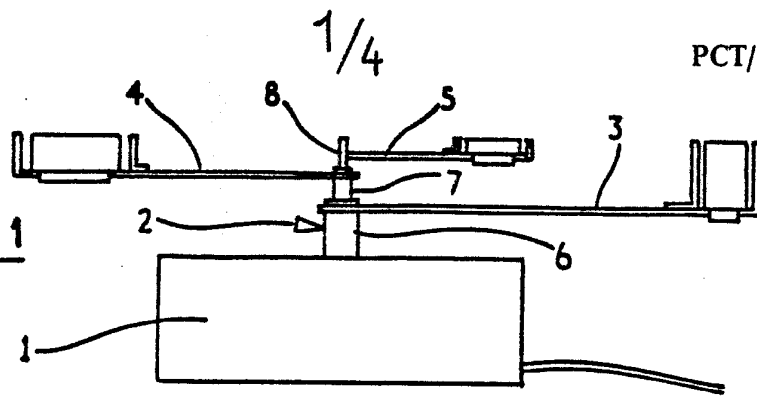
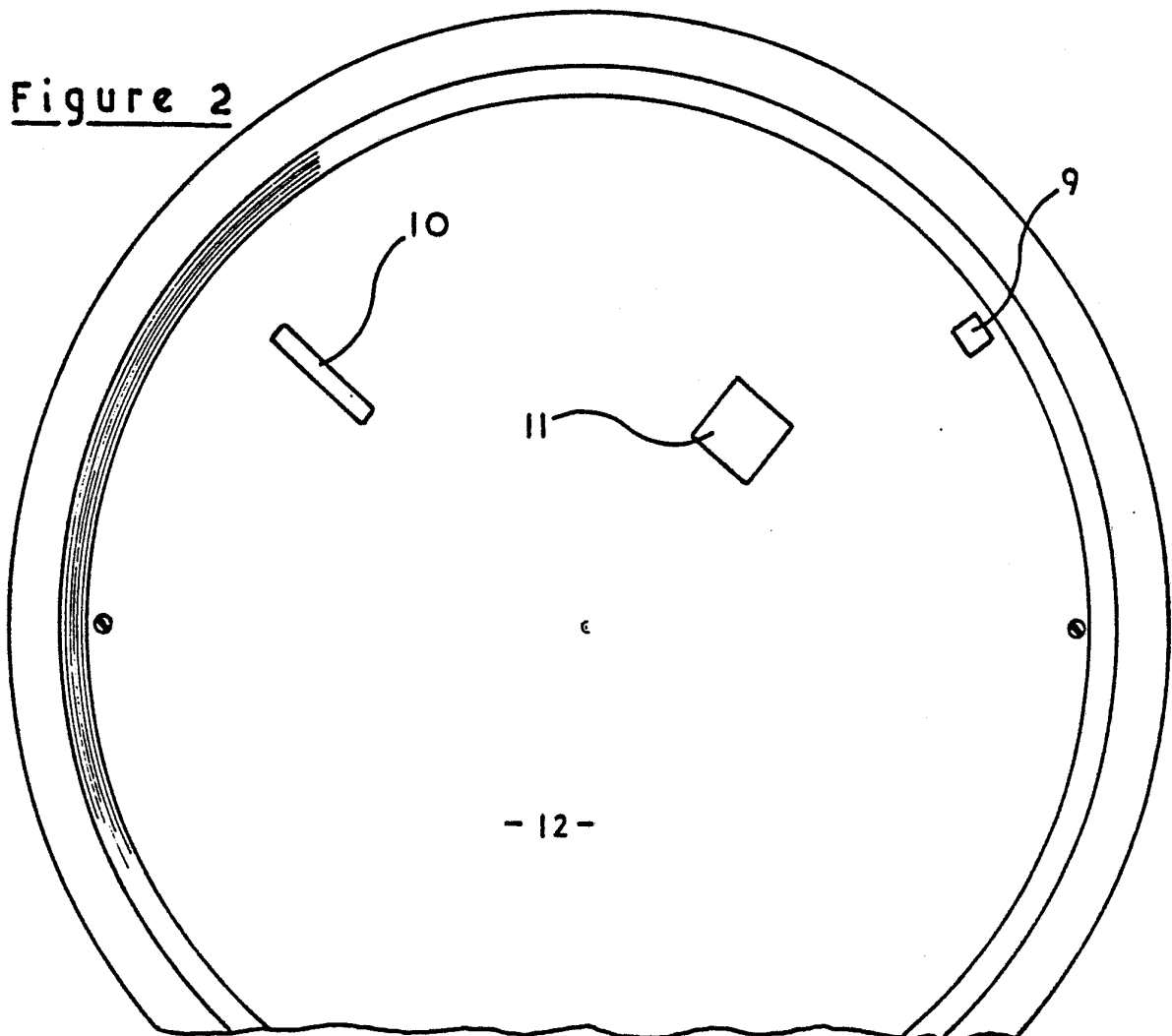


Figure 3

Figure 2



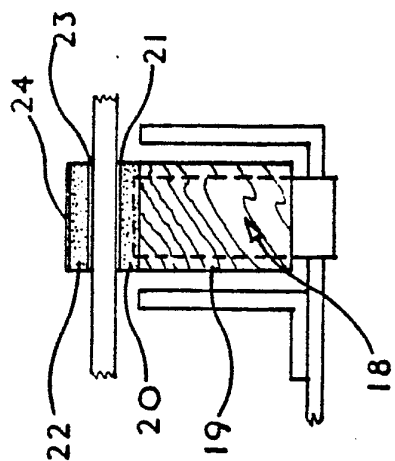


Figure 4

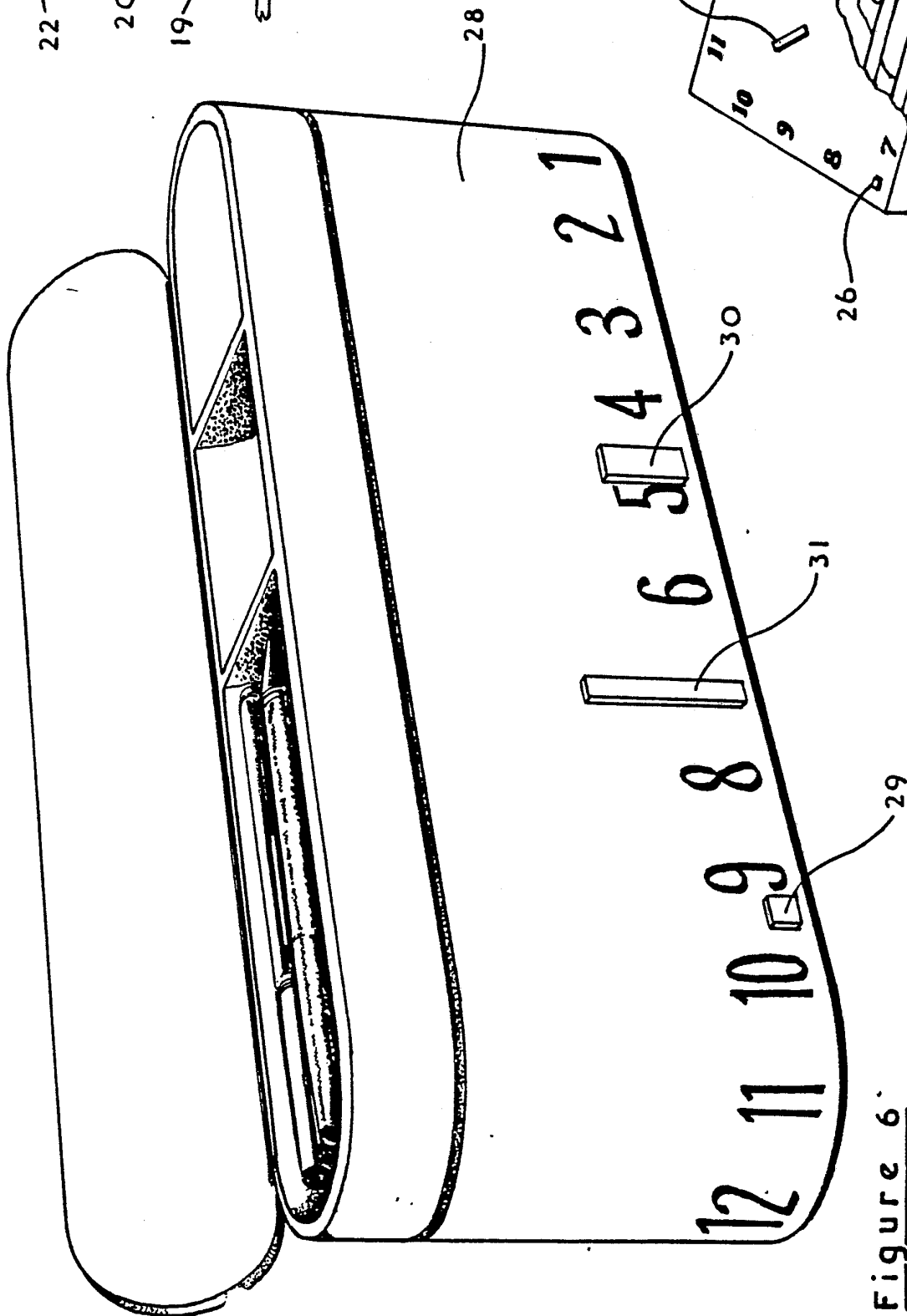


Figure 6

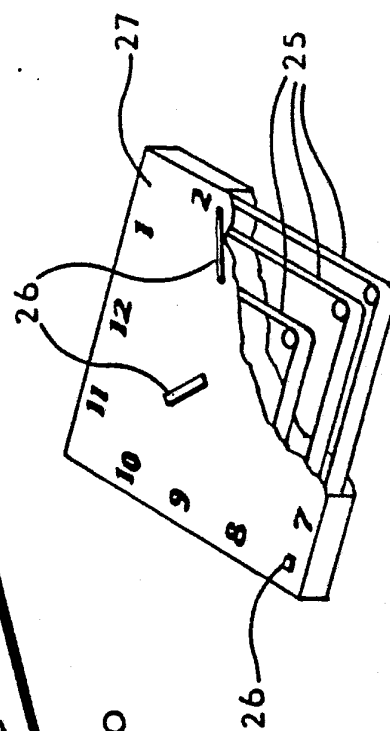


Figure 5

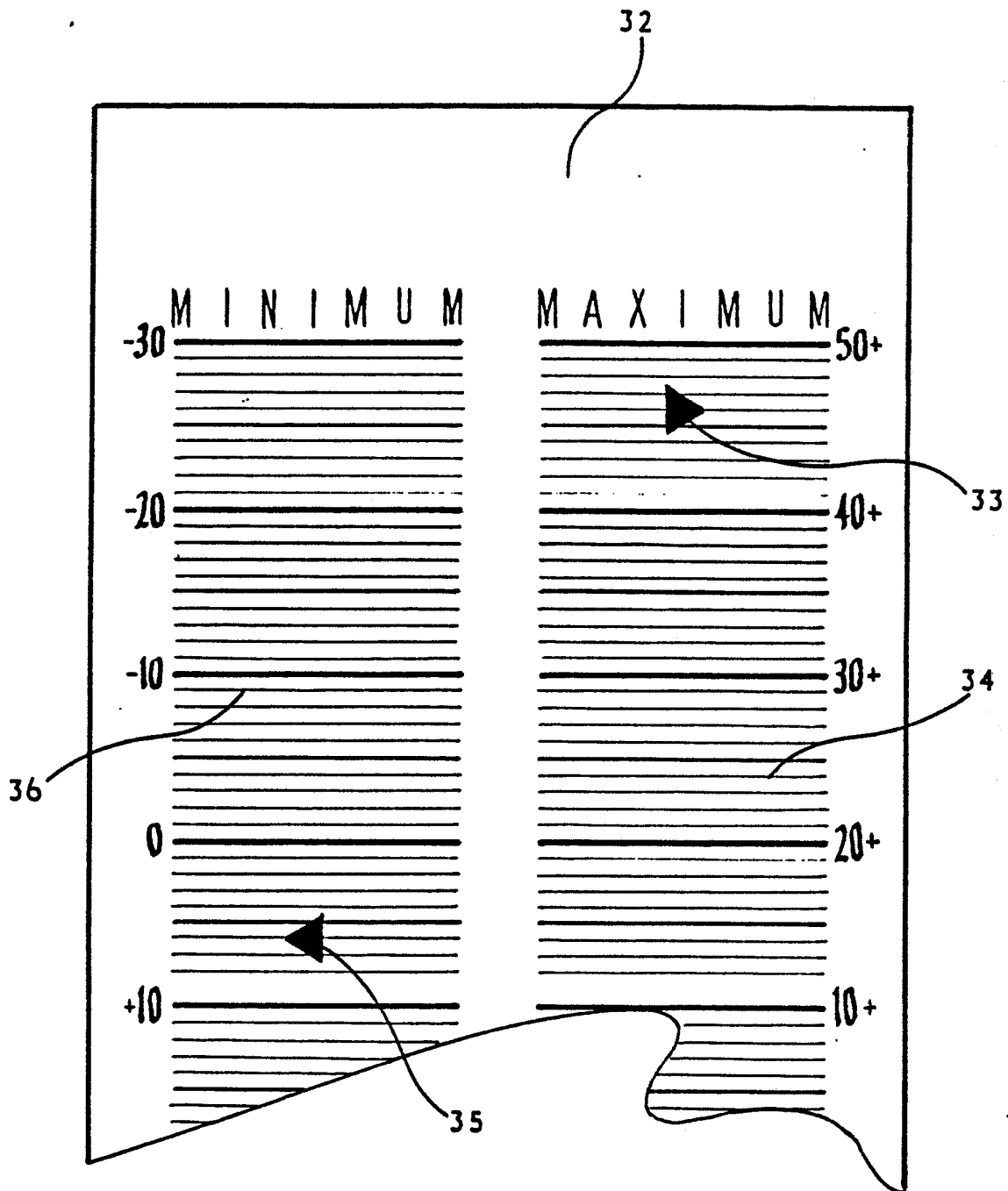


Figure 7

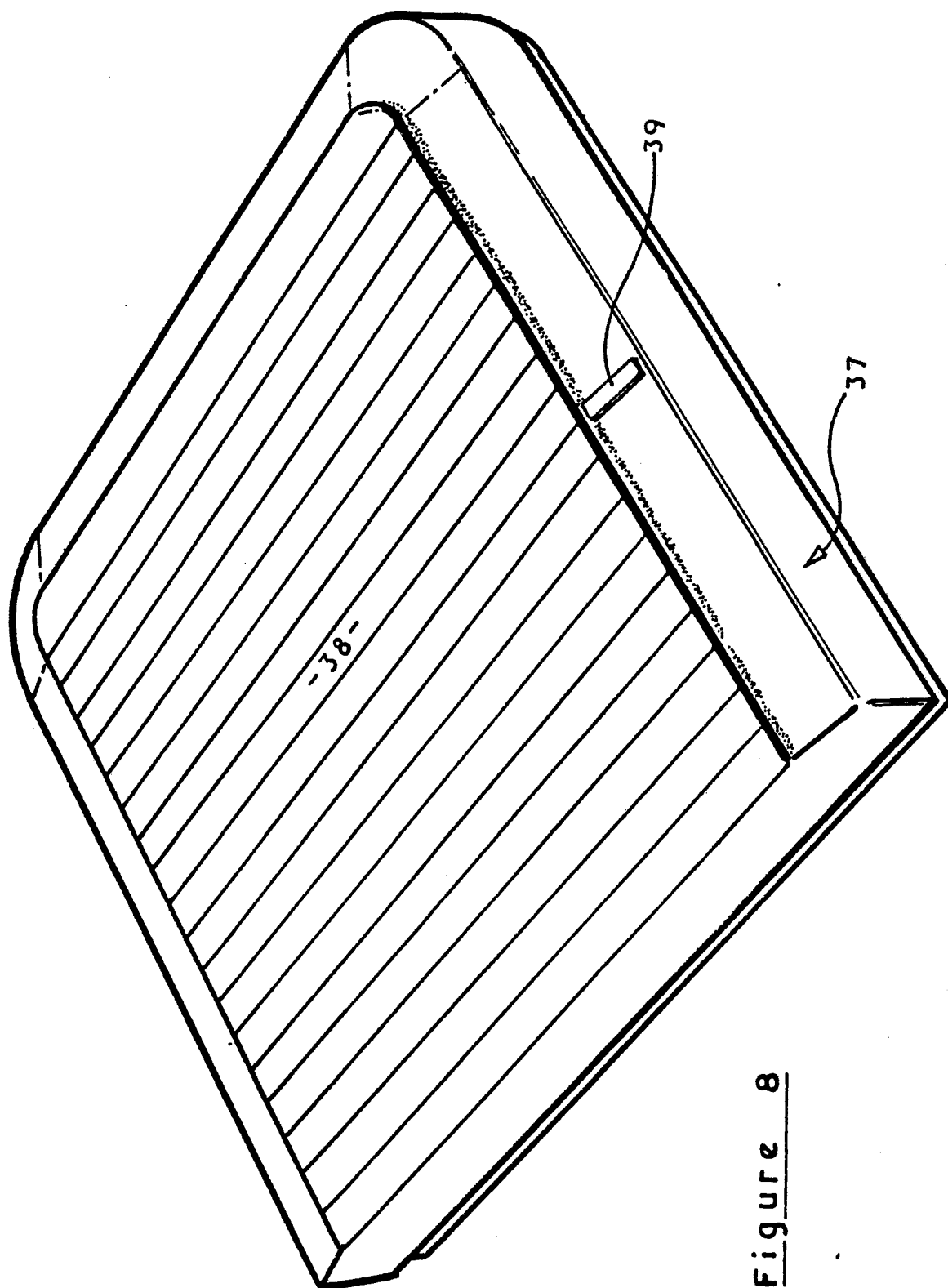
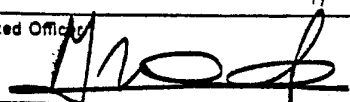


Figure 8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 87/00427

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁴		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : G 04 B 45/04; G 01 D 5/06		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴	G 04 B; G 01 D; A 63 F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ⁶	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	DE, U, 8434517 (WALLMEIER) 11 April 1985, see page 2, lines 1-31; figure --	1,3,5,10
X	DE, A, 2547657 (JUNG) 28 April 1977, see page 7, lines 3-13 and 20-24; figures 1,2 --	1-5,10
X	US, A, 298557 (DIOLOT) 13 May 1884, see the whole document --	1,3,5,10
X	FR, A, 2166301 (AUSSENARD) 17 August 1973, see page 2, lines 13-27 --	1,3,5-10
A	FR, A, 1007433 (DELAGNEAU) 6 May 1952, see the whole document -----	1,6-8,10
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IV. CERTIFICATION		
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15th September 1987		- 9 OCT 1987
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		M. VAN MOL 

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO.

PCT/GB 87/00427 (SA 17579)

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-U- 8434517	11/04/85	None	
DE-A- 2547657	28/04/77	None	
US-A- 298557		None	
FR-A- 2166301	17/08/73	None	
FR-A- 1007433		- None	

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