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- (57) Claim

1. A hand-held detector for discriminating between areas of printed intelligence on a substrate comprising a sensor head adapted to be placed against the printed intelligence on the substrate and to give a sense perceptible indication dependent on the properties of the portion of the printed intelligence against which it is placed, thereby enabling a user to differentiate between areas on the basis of at least one non-visually distinguishable property thereof, the detector being configured to have two modes of operation, an active mode in which it can be used to differentiate between areas on the substrate, and a programming mode in which it can be given a set of instructions for operation in the active mode.

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PCT

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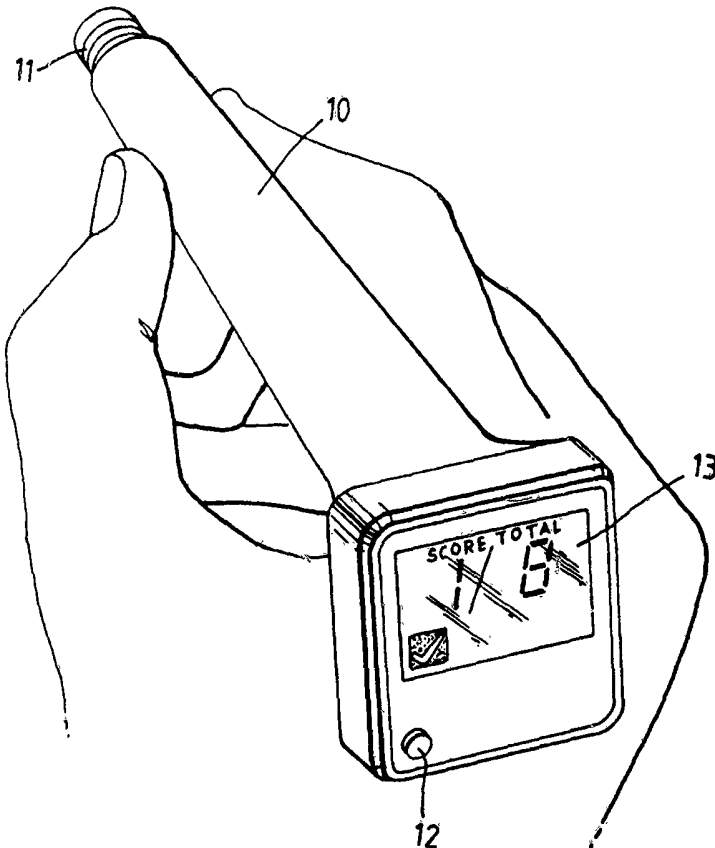
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<p>(21) International Application Number: PCT/GB88/00068 (22) International Filing Date: 5 February 1988 (05.02.88) (31) Priority Application Number: 8702728 (32) Priority Date: 6 February 1987 (06.02.87) (33) Priority Country: GB  (71) Applicant (for all designated States except US): PRICE/STERN/SLOAN, INC. [US/US]; 360 North La Cienega Boulevard, Los Angeles, CA 90048 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): FRAZER, Stephen, Oliver [GB/GB]; 124 Fordwych Road, London NW2 3PB (GB). RIDDIFORD, Martin, Philip [GB/GB]; 23 Elfindale Road, London SE24 (GB).</p>	<p>(74) Agent: GALLAFENT &amp; CO.; 8 Staple Inn, London WC1V 7QH (GB).  (81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent), US.  Published With international search report.  <b>A. O. J. P. 29 SEP 1988</b>  <b>AUSTRALIAN 24 AUG 1988 PATENT OFFICE</b></p>	

(54) Title: TEACHING AND AMUSEMENT APPARATUS

(57) Abstract

Known teaching and amusement apparatus comprises a self-contained electronic "pen" which is used in conjunction with specially printed material to provide an interactive system e.g. in the form of a worksheet or book having question and answer areas. The "pen" used senses differences in the infra-red radiation properties of the answer areas to indicate audibly whether a correct or an incorrect answer has been selected. The invention relates to an improved "pen" (10) which operates in an active mode and a programming mode. A switch (12) changes the mode of the "pen". In the programming mode, the "pen" is programmed to operate according to the printed material on which it is to be used. The "pen" (10) further includes a visual display (13) for indicating whether a correct or incorrect answer has been given.



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TEACHING AND AMUSEMENT APPARATUS

This invention relates to teaching and amusement apparatus.

Published European Specification 0099920 discloses teaching and amusement apparatus of considerable value. A self-contained electronic "pen" is used in conjunction with specially printed material to provide interactive teaching devices in the form of a book or worksheet having question and answer areas. The pen is used by the user in a self-teaching or amusement fashion. Reference should be made to that specification for further detail. Products embodying the invention described in that specification have been successfully commercialised under the Registered Trade Mark Questron and have secured substantial user acceptance.

However, such products are of limited application, and the range of activities which may be carried out using them is limited. The printing of the printed material may also require very close control to ensure it works properly, which, though achievable, is expensive and so increases the cost of the product. The problem is to extend the application of such devices without putting even greater constraints on the printing of the printed material.

The problem is solved in accordance with the invention, by providing in a new held detector for

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discriminating between areas of printed intelligence on a substrate comprising a sensor head adapted to be placed against the printed intelligence on the substrate and to give a sense perceptible indication dependent on the properties of the portion of the printed intelligence against which it is placed, thereby enabling a user to differentiate between areas on the basis of at least one non-visually distinguishable property thereof, means enabling it to operate in two modes, an active mode in which it can be used to differentiate between areas on the substrate, and a programming mode in which it can be given a set of instructions for operation in the active mode.

Such detectors have the major advantage that inexpensive manufacture of the printed material using standard printing techniques can be retained, and indeed the difficulties of providing material are eased, as if desired the discrimination effected by the detector can be on the basis of a visually distinguishable property, but the programmed instructions can compensate for that detectability to keep the amusement or learning activity interesting and challenging.

In the programming or learning mode, the detector is given a set of instructions which it uses to decide how to operate in an active mode. In the active mode the detector is used in conjunction with printed material to provide a wide variety of detailed responses, the detailed behaviour of the detector when used in conjunction with such printed material being conditioned by the data captured in its learning mode.

The most convenient way of putting the present invention to practice is of course by means of appropriate microelectronics, conveniently configured on a single chip, forming part of the detector. A simple switch or similar control may be used to switch the detector between learning and active modes, but the preferred mode of operation is to provide that on first being switched on

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the detector self-configures into a programming mode, and that it only changes to an active mode on receiving appropriate programming.

The preferred way of programming the detector is to provide, e.g. on the same sheet of printed material as the detector is to be used with in the active mode, a suitable code or the like which is "read" while the detector is in the learning mode and which is then used automatically by the detector to condition subsequent operations of the detector on that same sheet. This enables the coding for use in a learning mode and the material for use in an active mode to be printed on the same sheet and thus kept conveniently physically together and thus to minimise the occurrence in use of the detector learning to operate in one particular way which does not then correspond with the teaching or amusement data with which it is then used, i.e. it ensures that the detector and the paper are playing with the same rules.

Printed coding is most conveniently produced as a sequence of printed areas which are successively scanned by the detector unit. Depending upon the discrimination of the detector i.e. how many different sorts of printed area it can discriminate one from another, the code may be expressed in relatively few areas or more. If the detector is only able to discriminate between e.g. two levels of infra red reflectance (the technique described in the specification referred to above) then the coding must be expressed in a binary form. If the detector can distinguish three levels, a ternary code may be used and so on. Three levels represent an appropriate compromise enabling for example 81 different codes (three to the power 4) to be expressed by a sequence of 4 areas.

The detector specifically described and illustrated in the specification referred to above is in the form of a "pen" which produces output signals purely in the form of an audible signal, the precise audible signal varying

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dependent upon the infra-red reflectance sensed by the pen tip. It is preferred in accordance with the present invention to provide, in addition to an audible output, a visual output. In a particularly preferred form, the

5 detector, when configured as a pen, consists of an elongate body having set in one end, conveniently referred to as the pen tip, a suitable sensor and having set in its other end a display device in the form of a suitably small screen. The screen of choice is that of a liquid crystal

10 display, such as are used for example in digital watches. Such displays are relatively robust, require very little power to run, and are capable of producing a wide variety of effects by appropriate design and configuration. Thus areas of the display may be pre-patterned to enable the

15 display of one or several numbers or digits using the conventional seven bar configuration, while other areas of the display may be configured as suitable pictorial displays, for example a tick to indicate a correct answer, a cross to indicate a wrong answer and a set of stars to

20 indicate "lives". Further areas may be patterned to provide headings such as "SCORE", "TIME", "PROG", "TOTAL", "MIN", "SEC".

The detector may also be configured otherwise than as a pen. For example the detector may take the form of a

25 generally flat block or tile having set in one face a pictorial display screen and having set in an opposite face a sensor head. In use, such a detector is laid on top of the printed material with which it is used so that the sensor head may interact with printed matter on the

30 page, the results of that interaction being visible on the screen for the user. Adjacent the screen, a suitable switch may be advantageously incorporated with which a detection or sensing operation is carried out. The interior of the tile may contain the necessary

35 microelectronics and an appropriate power supply to operate those microelectronics, e.g. one or more

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electrical cells.

The precise way in which the detector operates will depend upon the internal programming of the micro circuitry in the detector. The amount of program material  
5 and its nature may vary very widely, but will usually be contained in appropriate non-volatile memory. Desirably, in order to keep the size and power requirements of the unit to a minimum, the electronics are configured on a suitable single chip. The programming or learning mode  
10 can be thought of as selecting one from a number of different pre-programmed modes of operation which will be used for the next activity to be carried out by the user of the device. The detailed programming for various different sorts of activity does not form part of the  
15 present invention, and may be effected in known fashion. By suitable programming, very wide range of amusement or teaching activities may be carried out using a relatively small number of basic programs.

In contrast to the teaching and amusement apparatus  
20 described in European specification 0099920, where much reliance was placed for successful operation of the inability of the human eye to detect differences in printed matter which were essentially available for detection to the detector pen there described, the  
25 detector of the present invention does not need to be used in conjunction with printed material configured in this way, though it may be so used. The ability to make use of a complex set of rules (the precise selection of which is controlled in the learning mode) means that sophisticated  
30 activities may be carried out with the user of the detector not being able to predict e.g. which of a number of differently printed areas corresponds to a "right" answer.

Indeed, in one area that of programming, it is advantageous not to attempt to disguise the program  
35 coding, rather than to print it in visually discriminating form. In a particularly preferred embodiment of the

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invention, a programming or learning code is both printed on suitable material and identified on that material, e.g. by a sequence of four digits and the microelectronics and display means in the detector is arranged to display that sequence of four digits at the end of the programming mode, thus enabling the user to check visually that correct programming has been accomplished.

The detail and sophistication of the programming may be very considerable. Thus, for example, a first coded sequence may prompt the detector to ask for a further coded sequence of information to be detected before it switches from the programming mode to the active mode.

The invention is illustrated by way of example with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic representation of a first work sheet or page of a book adapted for use with a detector according to the invention,

Figure 2 is a representation of an alternative worksheet corresponding to a word game,

Figure 3 is a perspective sketch of a hand holding a first form of detector according to the invention,

Figure 4 is a perspective view of a hand holding a second form of detector according to the invention

Figure 5 is an exploded view of the detector of Figure 3 showing its various components,

Figure 6 shows a variety of screen displays which may be achieved on the screen of the detector shown in Figure 3.

Referring first to Figure 1, this shows a printed page 1 bearing a number of different printed areas. For the particular amusing game presented, these consist of a title area 2, a rules area 3, a programming area 4, a pictorial area 5 and an inset area with printing on it 6.

The pictorial area 5 shows a large number of different fruits, vegetables and nuts. The inset printed area 6 is a shopping list listing certain fruits,

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vegetables and nuts.

The instruction area stating how the game is to be played reads as follows:

"You have been given a list of vegetables, fruits  
5 and nuts. How many, from the large selection available,  
appear on the list? Press the end of the wand against all  
of the fruits you think correspond to any of the names of  
the list. When you think you have found them all, press  
the end of the wand on the black triangle to discover  
10 whether you have been successful".

The black triangle is printed at the bottom of the page and is identified by reference numeral 7 in Figure 1.

Near the top of the page is an identified printed area 4, containing an instruction line, four printed areas  
15 of colour, and a diagram. The instruction wording  
instructs the user to program the detector by pressing it  
on each of the four colour areas, and those areas are  
themselves shaped to indicate the correct order in which  
the wand is to be pressed on them, as shown in Figure 1  
20 reading from left to right.

The way of playing the game shown in Figure 1 will be explained in more detail below.

Figure 2 shows a somewhat more sophisticated word game. As in Figure 1, there is a title area 2, a rules  
25 area 3 and a programming area 4. There is also a further programming area 4'. The reason for this is that there  
are two ways of playing the word game represented on Figure 2. In one mode of playing the game, the user could  
pick, using the detector, which of the five possible  
30 answers he selects as right and could then receive an  
immediate indication of whether that was so or not,  
allowing the user to select another area if the first  
proved to be a "wrong answer". Such an approach would be  
to use the word data to teach pairs of "opposites" to the  
35 learner.

An alternative way of using precisely the same sheet

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would be in an "examination mode" where the user would select the answer he thought right with the detector, simply making one selection for each question, and then, at the conclusion of having answered the fifteen  
5 questions, he would place the detector head over the star shape identified by 7' whereupon the display in the detector would show the percentage score achieved, rather than showing which particular questions had been answered correctly and which incorrectly.

10 Turning now to Figure 3, this shows a typical wand for use in the present invention. As can be seen, the wand is shaped like an elongate pen having an external casing 10 and an internal unit which has a sensor tip 11 at one end and, set in its other end face, an actuation  
15 button 12 and an LCD screen display 13. The end view of the pen shown in Figure 3 shows only some of the various patterned areas in the LCD display, but it will be appreciated that the display may include a large number of such areas, not all of which will be actuated in any given  
20 set of circumstances. As can be seen from the end view in Figure 3, the screen there illustrated shows two numerical digits separated by a "/". Titles consisting of the words SCORE and TOTAL, are selectively activated, as well as a symbol indicating "right" in this case a tick.

25 Figure 4 shows an alternative form of detector. This takes the form of a flat rectangular package consisting of a main portion 30 which is grasped by the hand of the user and a transparent projecting portion 31 which houses a detector head 32 which has a downward face  
30 adapted to sense a property such as infra-red reflectance on a surface onto which the detector unit is placed. The upper face of the unit when so placed has an LCD display 33, the display on which is as shown in the detector of Figure 3, and a pressure pad 34. Pressure pad 34 is an  
35 electrical contact switch which may be operated by the index finger 35 of the user. As explained below, with

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reference to Figure 5, a contact ring in sensor 11' enables the microelectronics inside the detector to operate when the detector of Figure 3 is pressed against paper. The detector of Figure 4 is operated in a  
5 different fashion: it is moved such that sensor head 33 lies over the desired printed area on the page, and switch 34 is then pressed. The microelectronics inside the detector of Figure 4 may be arranged to turn the detector on after a period of non-use when pressure pad 34 is first  
10 pressed, and to turn it on in the programming mode. Programming can then be effected and the game or teaching procedure followed. The microelectronics may be arranged to turn the display off if no pressure is applied to pad 34 for, e.g. greater than 120 seconds.

15 Figure 5 is an exploded view of the wand of Figure 3 showing its construction. As noted above it consists of an outer plastics moulded casing 10 into which is slidably fitted an inner moulding 52 which acts as a carrier for the various other components. Moulding 52 has two  
20 laterally projecting ribs which engage between pairs of ribs moulded on the interior of the sides of casing 10. These ribs allow the unit 52 to be slid in and out of casing 10, though normally, for reasons explained below, the extent of such sliding movement is restricted.

25 Mounted at the left hand of unit 52 as shown in Figure 5 are a number of components which constitute the sensor tip 11. Central to the operation is a combined infra red emitter 15, photo detector 16 unit which is set in a standard mounting 42. This sits in a moulded  
30 plastics component 41 which also receives a contact ring 43. Contact ring 43 enables it to be sensed when the pen is pressed down against a surface.

Located in the rear of moulded member 41 is a small printed circuit board 14 connected via a ribbon connector  
35 17 which passes underneath the main body of member 52 when the components are all assembled together to lead to a

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main printed circuit board 18.

Main printed circuit board 18 is mounted by means of four screws 47 on the end of moulded unit 52. Between unit 52 and printed circuit board 18 is mounted a piezo electric transducer 20 having a contact spring 21 on one face. Contact spring 21 contacts an appropriate conductive member of printed circuit board 18 when the components are assembled together.

Also attached by screws 47 is a moulded member 53 which acts to hold in place, relative to printed circuit board 18, two electrical contacting strips 54 known as zebra strips. These connect portions of printed circuit board 18 to contacts on the edges of the liquid crystal display 13.

That crystal display is surrounded by a bezel 56 which has an aperture in it which serves to locate press button 12 in appropriate position over printed circuit board 18. Four threaded inserts 57 serve to maintain the printed circuit board 18 the bezel 56, and all the components shown between them in Figure 5, in fixed relationship one to another. The liquid crystal display is protected by a moulded inset window 58 which is a snap fit in the bezel 56.

The upper portion of moulded member 52 is in the form of a long channel which serves for the receipt of three electrical cells 24. These fit into the top of moulded member 52 and electrical contacts 40 and 59 are provided at the respective ends thereof.

As noted, member 52 has lateral ribs which can be used to locate the member and its associated components and slide them into the housing 10. A clip 25 is provided to render the unit of member 52 and its associated components captive within casing 10. Clip 25 is generally U-shaped and has two laterally projecting prongs 26, 27 which may locate in corresponding apertures in the sides of casing 10.

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The underside of moulded member 52 is so configured that with clip 25 in place, i.e. with lugs 26 and 27 engaged in the apertures in the side of casing 10, the travel of the unit is restricted. At one end, its travel is restricted by the abutment of members 53 and 56 on the end of casing 10. At this stage, the unit is in its fully inserted position and as shown in Figure 3. In order to change the batteries, when they have run down, the bezel 56 may be grasped and the whole unit withdrawn a certain extent. The extent of withdrawal is sufficient to enable one cell 24 to be removed sideways, whereafter the other cells 24 may slide along member 52 and be likewise removed. The fresh cells may be then inserted and the whole internals then pushed back into the outer casing 10. They may be held in the position shown in Figure 3 by appropriate snap fitting means e.g. co-acting members on the wider end of casing 10 and on the bezel 56.

Printed circuit board 18 carries appropriate micro circuitry enabling the unit to operate in a learning or programming mode and in a game playing mode. A programming mode may be initiated by pressing press button 12. This causes a screen display to appear as shown at the top left in Figure 6. Figure 6 shows four columns of screen displays each corresponding to a series of screen displays which appear in use of the wand. The left hand column shows the appearance during a programming sequence, the other three columns show appearances during various games playing sessions.

When the Prog/Reset button 12 is pressed, the initial display is of four blank spaces. If the sensor tip of the pen is now pressed successively on the four areas in area 4 in Figure 1, the infra red reflectance detector and associated circuitry will enable a signal to be fed to the circuitry corresponding to a four digit code. The code is a ternary code as illustrated, the infra red reflectance of the surface of each of the four

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areas in area Figure 6 being categorised as 1, 2 or 3. Thus as the four areas are successively contacted by the sensor end of the wand, four digits will appear in the LCD, as shown at the bottom of the left hand column in Figure 6. The four digits may then be compared with a check code printed in box 4 on the page shown in Figure 1. If the check code and the code then displayed on the screen match, then the wand is ready for use with the game printed on that page. If not, it is straightforward to press button 12 again and restart.

The check code, four positions, each with three variables, may be any one of 81 codes. The micro circuitry within may then cause the display to operate in conjunction with the signals from the sensor end of the pen to enable the user to play the game in question. In Figure 1, the user presses the pen tip successively on the various items which he or she thinks correspond to the names on the shopping list, and when they think they have worked all the way through, they press the end on black triangle 7.

Using the printing techniques described in European published Application 0099920, the various fruits, vegetables and nuts are differently infra red reflective, the infra red reflectivity of the printed images thereof differing as the items in question are or are not on the shopping list illustrated at area 6.

When the user is satisfied that he or she has selected all of the items on the shopping list, area 7 may then be pressed and this provides a third level of infra red reflectance which may then cause the display to give an appropriate indication.

As the player carries out the activity, the wand may provide, by means of the piezo electric transducer 20, an indication of whether the identified item is or is not on the shopping list. The audible indication may be cheerful if it is, and a low buzz indicating "Wrong" if it is not.

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At the same time, the tick or cross areas may be activated on the LCD. These are visible at the lower left and right hand corners of the display respectively and are shown in some of the indications shown in Figure 6.

5           When the pen is finally pressed on triangular area 7, a different sort of display may be provided e.g. a percentage of correct items identified, or the number of items correctly identified. Such a display may be accompanied by an appropriate audible indication, for  
10 example a cheerful one if the answers were mostly right, and a dull one if the answers were mostly wrong.

The sort of amusement game illustrated by Figure 1 is one example of a very wide range of amusement games which can be operated in similar fashion. Figure 2 shows  
15 a word game, where each question provides a word and five possible "opposites", one right and the rest wrong. The rules for selection, word or other games may vary very widely and the object of the game may be selected from a very wide range of possibilities. Multiple choice  
20 question and answer games such as that illustrated in Figure 2 may be operated in more than one way. A further embodiment is that the programming of the electronics may mean that to "win" you have to carry out your answers within a certain period of time. The programming may  
25 display time as it passes on the LCD, or, for example, display a decreasing amount of time left before the number of correct answers found is displayed. A sequence of displays which might arise during such a game is shown in the right hand column of Figure 6.

30           Tracking games, maze games, and find-the-spot type games can all be played. A particularly attractive and entertaining form of game provides the player with a number of lives, represented by stars on the display, which are lost if the pen does not find the right areas on  
35 the printed sheet. The detail and complexity of games which can be played with the apparatus of the present

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invention may be vary very widely indeed, the limits depending wholly upon the programming capacity of the micro electronics and the ingenuity of the programmer.

The circuitry may, of course, be arranged to operate  
5 in precisely the same way as the pen described in the European Patent Specification referred to above, by an appropriate selection of programming areas teaching the pen to operate in that way.

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CLAIMS

1. A hand-held detector for discriminating between areas of printed intelligence on a substrate comprising a sensor head adapted to be placed against the printed intelligence on the substrate and to give a sense perceptible  
5 indication dependent on the properties of the portion of the printed intelligence against which it is placed, thereby enabling a user to differentiate between areas on the basis of at least one non-visually distinguishable property thereof, the detector being configured to have  
10 two modes of operation, an active mode in which it can be used to differentiate between areas on the substrate, and a programming mode in which it can be given a set of instructions for operation in the active mode.
- 15 2. A detector according to claim 1, wherein in the programming mode, the set of instructions may be derived from a code embodied in areas of printed material against which the sensor head is successively applied.
- 20 3. A detector according to claim 1 or 2, wherein the sensor head can discriminate between at least two sorts of printed intelligence.
4. A detector according to claim 3, wherein the sensor  
25 head can discriminate between three sorts of printed intelligence.
5. A detector according to any one of claims 1 to 4, wherein the sense perceptible indication is an audible  
30 output.
6. A detector according to any one of claims 1 to 5, wherein the sense perceptible indicator includes a visual output.

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7. A detector according to claim 6, wherein the visual output is provided on a small screen.
8. A detector according to claim 7, wherein the detector  
5 comprises a generally elongate body having a sensor head set in one end and a screen set in the other end.
9. A detector according to claim 8 wherein the detector is shaped substantially to be held like a pen.  
10
10. A detector according to claim 7 and comprising a generally flat body having a sensor head extending therefrom and a screen set in one face thereof.
- 15 11. A detector according to claim 10 wherein the flat body includes a transparent extension in which the detector head is set.
12. A detector according to any one of claims 7 to 11,  
20 wherein the screen is a liquid crystal display.
13. A detector according to claim 12, wherein the display is divided into pre-patterned areas which each contain either an alphanumeric display and/or a pictorial display.  
25
14. A detector according to any one of the preceding claims, wherein the sensor head is sensitive to infra-red radiation.

FIG.1.

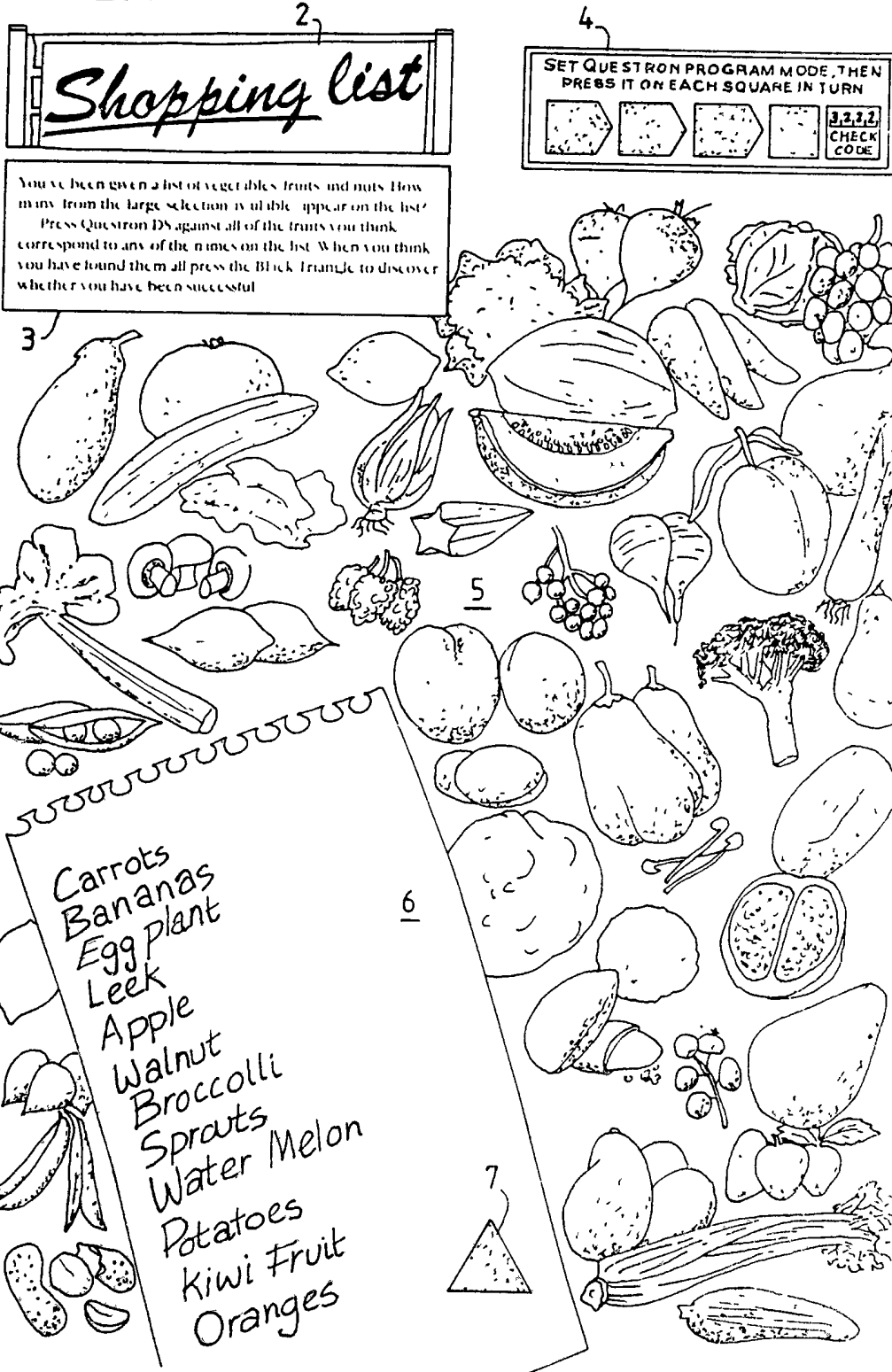


FIG. 2.

2

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# OPPOSITES

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3

Find the word which is opposite in meaning to the word in CAPITAL letters  
You have 2 minutes to answer the 15 questions once

1. CONTINUOUS. (A) small (B) unusual (C) monotonous (D) exclusive (E) periodic  
▶  A ▶  B ▶  C ▶  D ▶  E
2. ZANY. (A) soft (B) ornamental (C) unpopular (D) serious (E) desolate  
▶  A ▶  B ▶  C ▶  D ▶  E
3. ENDANGER. (A) assess (B) cleanse (C) protest (D) reveal (E) pierce  
▶  A ▶  B ▶  C ▶  D ▶  E
4. DEMOTE. (A) advance (B) intensity (C) vacate (D) purify (E) aggravate  
▶  A ▶  B ▶  C ▶  D ▶  E
5. AFFIRM. (A) hasten (B) distribute (C) simplify (D) protect (E) question  
▶  A ▶  B ▶  C ▶  D ▶  E
6. CORRECT. (A) inessential (B) permanent (C) improper (D) attractive (E) unorthodox  
▶  A ▶  B ▶  C ▶  D ▶  E
7. VENTURESOME. (A) timid (B) abrupt (C) unadaptable (D) mulinous (E) leisurely  
▶  A ▶  B ▶  C ▶  D ▶  E
8. OPAQUE. (A) impertinent (B) transparent (C) invisible (D) descriptive (E) tested  
▶  A ▶  B ▶  C ▶  D ▶  E

FOR EXAM MODE PRESS THIS CODE FIRST

SET QUESTRON PROGRAM MODE, THEN PRESS IT ON EACH SQUARE IN TURN

▶  ▶  ▶  ▶  ▶  **9321**  
CHECK CODE

GAME MODE

SET QUESTRON PROGRAM MODE, THEN PRESS IT ON EACH SQUARE IN TURN

▶  ▶  ▶  ▶  ▶  **0312**  
CHECK CODE

7/ PRESS FOR % SCORE

9. ENDORSE. (A) condemn (B) speak quietly (C) refer (D) reconsider (E) seem intelligent  
▶  A ▶  B ▶  C ▶  D ▶  E
10. NEGLIGIBLE. (A) ungainly (B) uncommitted (C) unaccompanied (D) substantial (E) foregone  
▶  A ▶  B ▶  C ▶  D ▶  E
11. GRAVE. (A) tardy (B) grateful (C) remorseful (D) innocuate (E) flippant  
▶  A ▶  B ▶  C ▶  D ▶  E
12. EVERYDAY. (A) infrequent (B) unusual (C) preceding (D) outrageous (E) innate  
▶  A ▶  B ▶  C ▶  D ▶  E
13. SOPORIFIC. (A) exciting (B) likely to happen (C) greedy (D) blameworthy (E) easy to annoy  
▶  A ▶  B ▶  C ▶  D ▶  E
14. COALESCENCE. (A) strife (B) slow recovery (C) division (D) noble behaviour (E) irreverence  
▶  A ▶  B ▶  C ▶  D ▶  E
15. SQUANDER. (A) use sparingly (B) preoccupy (C) befriend quickly (D) acclimate (E) travel directly  
▶  A ▶  B ▶  C ▶  D ▶  E

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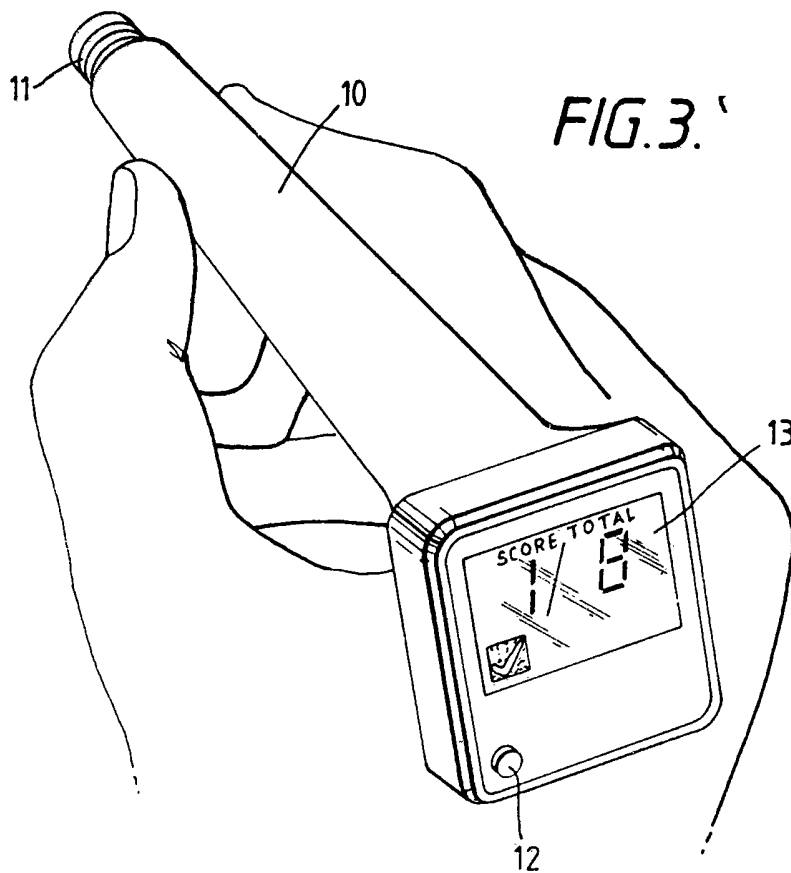
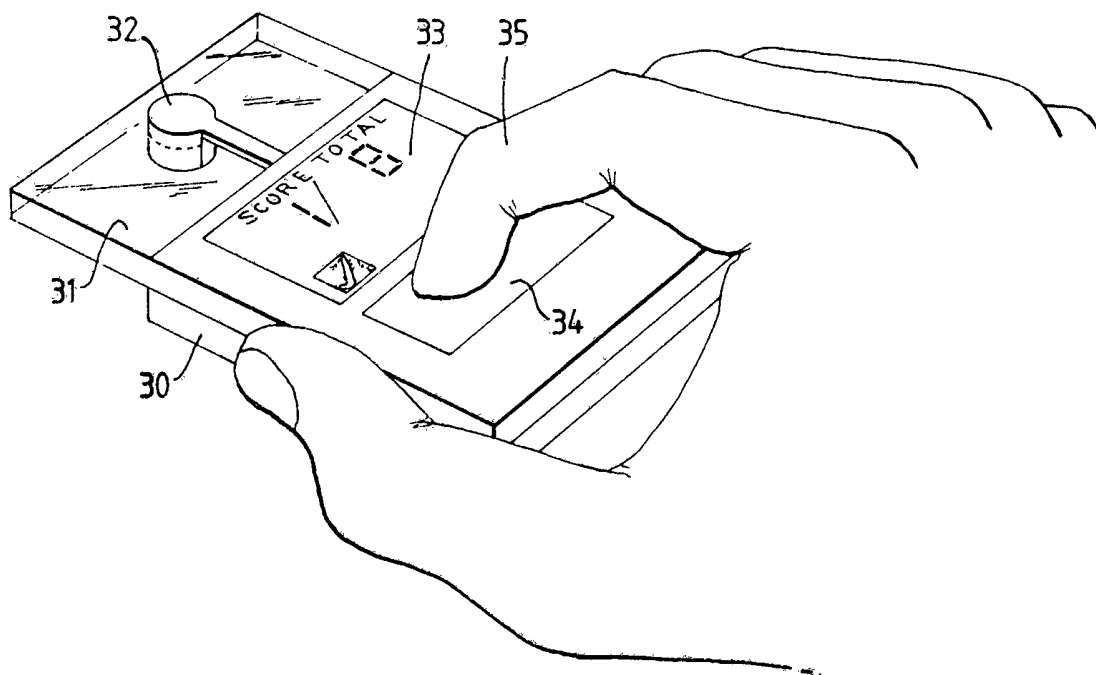


FIG. 4.



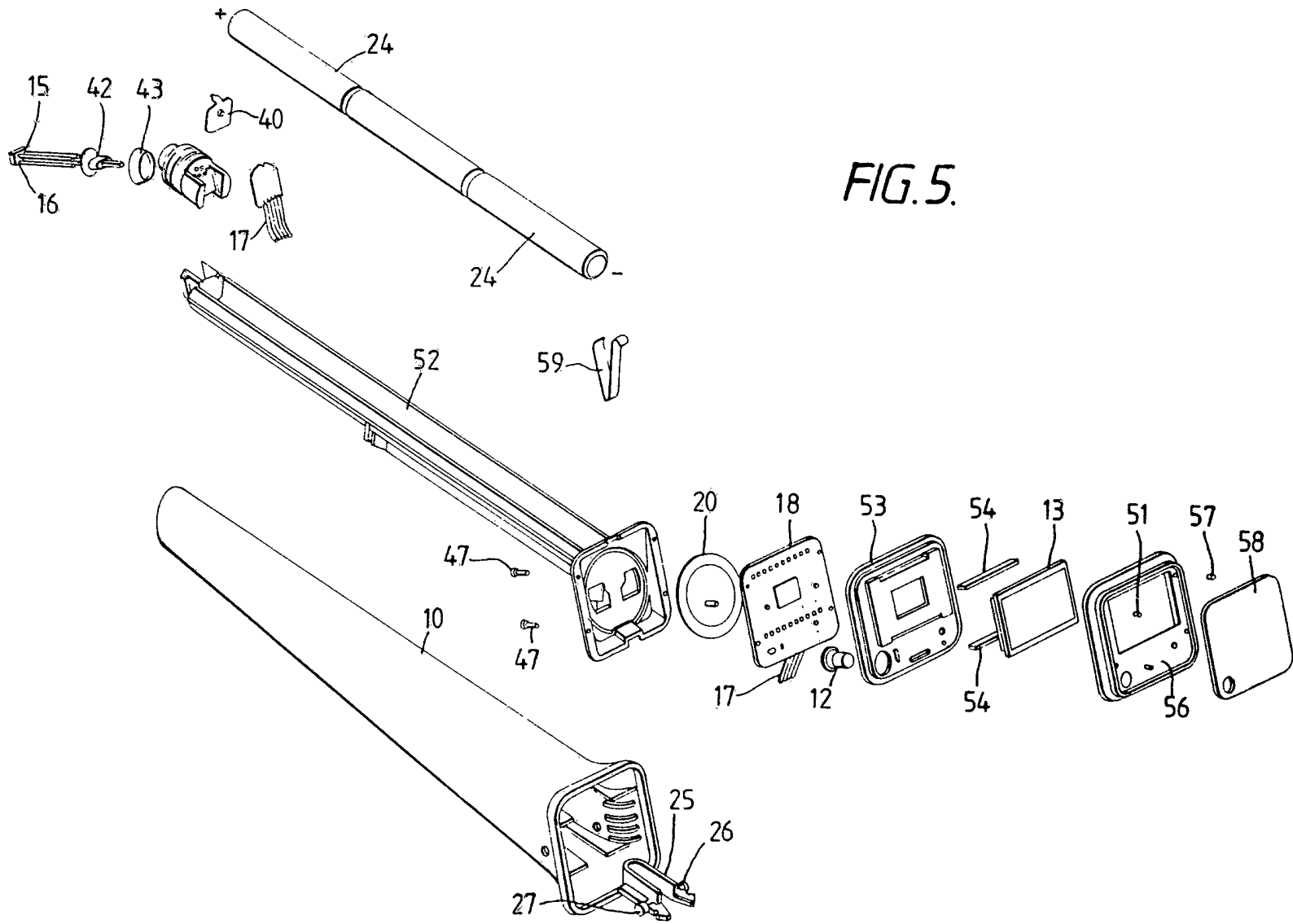
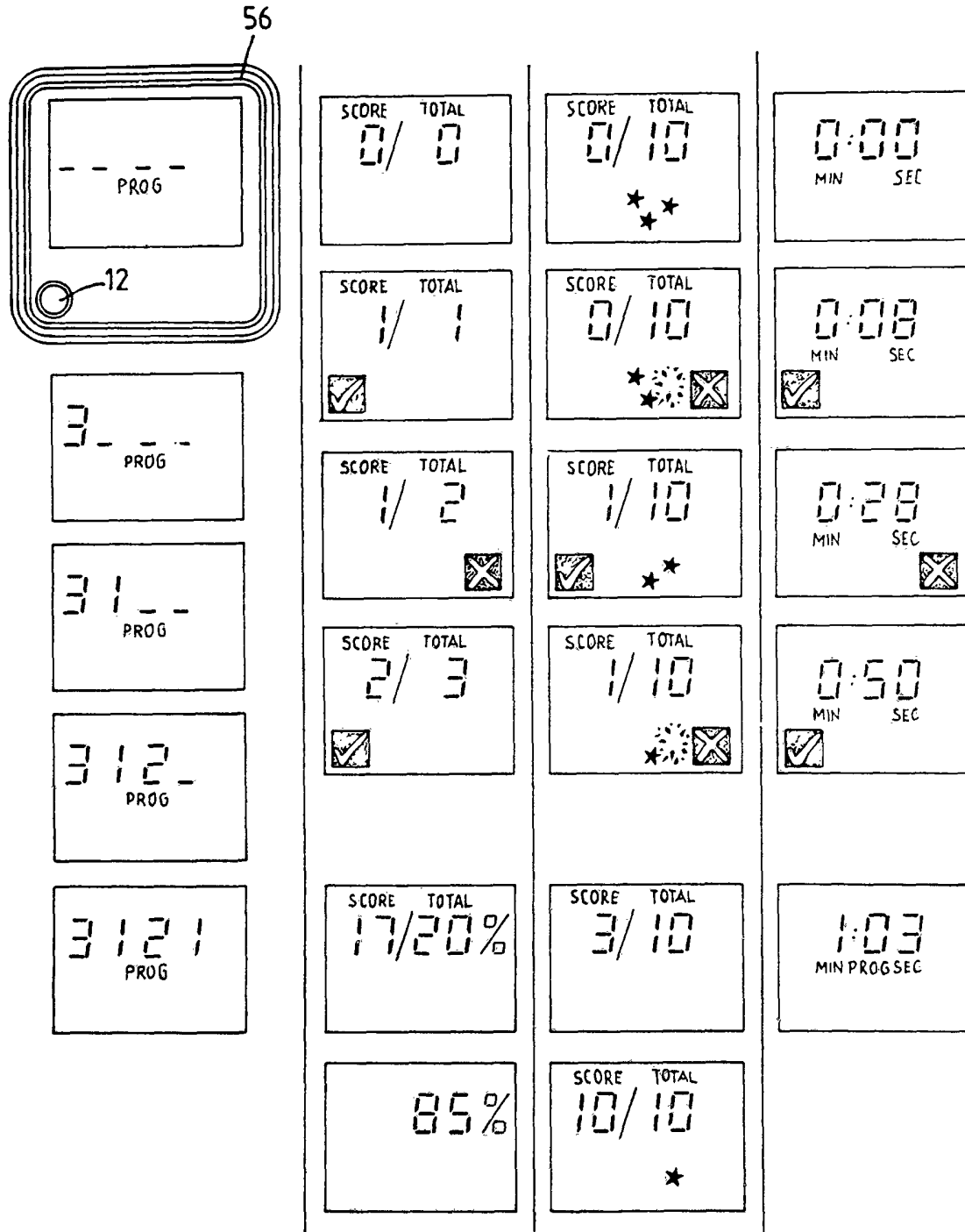


FIG. 5.

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FIG. 6.



## INTERNATIONAL SEARCH REPORT

International Application No **PCT/GB 88/00068**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>4</sup> : <b>G 09 B 7/06</b>		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC <sup>4</sup>	<b>G 09 B</b>	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	WO, A, 83/02842 (PRICE/STERN/SLOAN PUBLISHERS INC.) 18 August 1981 see the whole document cited in the application --	1-3,5,6, 9-11,14
A	EP, A, 0059318 (TEXAS INSTRUMENTS) 8 September 1982 see page 16; page 17, claims 12,13; figures 1,9-11 --	1-5,8-11, 14
A	IEEE Spectrum, volume 19, no. 2, February 1982, (New York, US), G.A. Frantz et al.: "Design case history: speak & spell learns to talk", pages 45-49 see the whole document --	5-7,12,13
A	WO, A, 84/02995 (S. NARAYANAN) 2 August 1984 see page 2, lines 20-37, page 3, lines 30-36; page 6, lines 30-37; page 7, lines 1-5; page 11 -----	1-14
<p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
3rd May 1988		10 JUN 1988
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		 <b>P.C.G. VAN DER PUTTEN</b>

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

GB 8800068  
SA 20632

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office (EPO) file on 31/05/88. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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		CA-A- 1182635	19-02-85
		AU-B- 549840	13-02-86
		US-A- 4604065	05-08-86
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		EP-A- 0134815	27-03-85
		JP-T- 60500737	16-05-85
		US-A- 4525148	25-06-85
		CA-A- 1232445	09-02-88