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

(11) Publication number: **0 537 924 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **92309008.8**

(22) Date of filing: **02.10.92**

(51) Int. Cl.[5]: **A63H 3/28**, A63H 3/44, A63H 33/26

(30) Priority: **15.10.91 GB 9121900**

(43) Date of publication of application: **21.04.93 Bulletin 93/16**

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

(71) Applicant: **HASBRO INTERNATIONAL INC.**
2 Roundwood Avenue, Stockley Park
Uxbridge, Middlesex UB11 1AZ(GB)

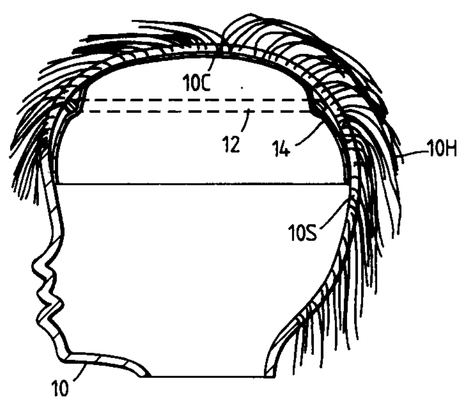
(72) Inventor: **Steele, David, c/o STEELE MICROSYSTEMS LIMITED**
Daventry Road
Newnham, Northants NN11 6HF(GB)

(74) Representative: **Skone James, Robert Edmund**
GILL JENNINGS & EVERY, Broadgate House,
7 Eldon Street
London EC2M 7LH (GB)

(54) Talking doll.

(57) A toy comprising the combination of a sound generating doll and a toy hair brush or comb (16). The doll has a head (10) which is formed of electrically insulative material and includes an inductive annular sensing coil (12) on or beneath a scalp portion (10S) of the head. At least a portion of the brush or comb (16) is metallic so that when it is used for brushing or combing the hair the inductance of the coil is altered, the alteration in inductance causing the doll to generate a sound.

Fig.1.



EP 0 537 924 A1

This invention relates to a child's toy comprising a sound generating, for example crying, laughing or talking, doll, and particularly a doll including a battery-powered electronic sound or speech generating circuit which can be triggered automatically during play.

According to this invention there is provided a toy comprising the combination of a sound generating doll and a toy hair brush or comb, wherein the doll has a head which is formed of electrically insulative material and includes an inductive annular sensing coil on or beneath a scalp portion of the head, at least a portion of the brush or comb being metallic so that when it is used for brushing or combing the hair the inductance of the coil is altered, the alteration in inductance causing the doll to generate a sound. Typically, the doll further includes electronic circuitry comprising a proximity detector circuit coupled to a coil and responsive to the alteration of the coil inductance, and a sound, preferably speech, generating circuit responsive to a trigger signal produced by the detector circuit.

It has been found that particularly good results are obtained if the coil is formed as an annulus extending around the head from the region of the forehead rearwardly to the back of the scalp portion so that the central axis of the coil is generally upright, the coil being either embedded in the material of the head or, in the case of a head comprising a thin shell of insulative material, secured to the inner surface of the shell. In the preferred embodiment, the coil comprises several turns of thin insulated wire formed approximately into a circle centred on the axis and having a diameter of at least 50mm.

Typically, the brush or comb includes or consists of an aluminium plate greater than 0.5mm in thickness and having one of its dimensions greater than or equal to 50mm. In the case of a brush, it is preferable that the metallic portion is lOmm or less from the ends of the bristles.

The proximity detector circuit may include an oscillator circuit the operating frequency of which depends on the inductance of the coil, and may further include a squaring circuit to produce an oscillating output signal in the form of a square wave for application to following digital circuitry.

In order to cause sounds to be generated in response to alterations in the coil inductance associated with the action of brushing or combing the doll's hair, the sound generating circuit preferably includes means for monitoring the frequency of the oscillating signal and for producing a trigger signal in response to a change in the frequency in one direction followed by a change in the frequency in the other direction within a predetermined time interval. These processes are carried out in the preferred embodiment using a micro-processor operating under software control, but equally may be performed by other digital or analogue circuitry.

The invention will now be described by way of example with reference to the drawings in which:-

Figure 1 is a vertical cross-section through the head of a doll;

Figure 2 is a plan view of the head shown in Figure 1;

Figure 3 is a longitudinal cross-section of a toy hair brush;

Figure 4 is a circuit diagram of an oscillator circuit;

Figure 5 is a circuit diagram of a speech generating circuit; and

Figure 6 is a flow diagram illustrating software steps carried out by a microprocessor forming part of the speech generator circuit.

Referring to Figures 1 and 2, the head of a doll forming part of a toy in this example of the invention comprises a flexible shell 10 of electrically insulative material having scalp portion 1OS provided with artificial hair IOH. Mounted immediately beneath the scalp portion IOS of the shell 10 is an annular coil 12 which, in this embodiment of the invention, is held in place by a flexible plastics inner lining 14 bonded to the inside of the shell 10.

The coil is formed from several turns of thin enamelled wire and has an average diameter in the region of 75mm. The sizes of the coil 12 and the head of the doll are such that the enclosed area of the coil 12 forms a major part of the greatest horizontal cross-sectional area of the head. In this embodiment, the coil 12 lies immediately beneath the upper forehead part of the shell 10 and encircles the scalp portion IOS at a distance of lOmm to 20mm beneath the crown IOC of the head. However, variations in the position of the coil are possible within the scope of the invention and, indeed, more than one coil may be mounted in the head to give the required sensitivity over the whole of the scalp portion IOS.

Variations in the inductance of the coil 12 are brought about by brushing the hair IOH of the doll with a special brush 16, which is shown in Figure 3. The body of the brush may be wholly metallic, or it may have a metallic portion such as an aluminium plate 16P forming or adjacent a bristle-bearing surface 16S so as to be as close as possible to the scalp portion IOS of the doll's head when the hair is brushed. Preferably, the bristles 16B are in the region of 5mm to lOmm in length.

Referring now to Figure 4, the coil 12 is connected in an oscillator circuit 18 mounted within the doll's body (not shown) and in which it forms part of a parallel resonant circuit with a capacitor 20, the resonant frequency being between 20kHz and lOOkHz, preferably 50kHz. Oscillations are produced by positive feedback via capacitor 22 connected between the resonant circuit formed by coil 12 and capacitor 20 which are connected across the output of a dual stage amplifier 24. An oscillating signal is fed from the amplifier 24 to an output 26 of the oscillating circuit via a further amplifying stage 28. In practice, all three amplifier stages may be integrated circuit blocks in a single CMOS chip, the level of the Oscillating signal being such that at least the last 28 of the three amplifier stages produces a square wave signal oscillating between the voltage limits set by the supply voltage and having a frequency corresponding to the resonant frequency of the combination of coil 12 and capacitor 20.

A suitable speech generating circuit is shown in Figure 5. The main element of the circuit is a combined speech generating and processing integrated circuit chip 30 which, in this example, is that obtainable from Texas Instruments Limited under the type number TMS50ClO/ll. This device includes 8 ports PAO to PA7 which may be configured as inputs or outputs according to software programmed into the chip. The chip has an integral oscillator the frequency of which is set by a crystal 32, and the purpose of which is as a frequency source for speech generation. An initialisation input INIT is provided for program initialisation, and in this case is coupled to an RC network 34, 35 coupled between supply rails 36, 37 in order to perform initialisation whenever the circuitry is switched on. These supply rails 36, 37 constitute the output of a voltage regulator stage 38 which is powered from a battery 39. Switching on and switching off circuitry is provided in the form of a push button switch 40, transistors 42 and 43, and an automatic switch-off connection 45 coupled to one of the ports of the chip 30 which is configured as an output.

A speech signal output is provided by the chip 30 across outputs DAl and PBl to an amplifier 46 which drives a loudspeaker 48.

All the electronic circuitry, together with the battery 39, is mounted in the body of the doll (not shown).

The programmable integrated circuit chip 30 of the speech generating circuit is programmed to carry out a series of measuring and speech triggering steps according to the magnitude and sequence of changes in the inductance of the coil 12. These steps are illustrated in the flow diagram of Figure 6.

Referring to Figure 6, initialisation of the microprocessor prompts a first inductance measurement step 100 which is performed by an oscillation counting routine (not shown in the drawings). In essence, the inductance measurement is performed by counting the number of pulses obtained from the oscillating circuit on port PA4 and occurring within a period of lOOms. The on-chip oscillator described above provides a convenient clock signal for this counting process. In the present example, the oscillator circuit runs at a nominal frequency of 50kHz, producing a count of 5000 during the lOOms interval. The coil inductance is thus measured as a count value which is then stored as REF (REF = measured inductance count).

At this point a cycle counter is set to zero (step 102) and the inductance is measured again in a second measuring step 104 which begins approximately lOOms after measuring step 100. The value resulting from measuring step 104 is then compared in step 106 with the value stored in step 100. If the value obtained from step 104 is less than the stored value (indicating an increase in inductance), the program reverts to step 102, the result of measuring step 104 forming the new REF value. If, however, the new value isgreater than the stored value, indicating a decrease in inductance due to the proximity of the brush, the program causes the microprocessor to perform another comparison step 108 to determine the magnitude of the difference between the new value and the stored value. If the difference is less than 2, the program reverts to step 104. On the other hand, if the new measured value is greater than the stored value by 2 or more (representing an inductance decrease of 0.04% or more), the cycle counter is incremented by 1 (step 110). Initially, the cycle counter will only have reached a value of 1 so that in the next step 112 the count is less than 2 and the program loops back to measuring step 104.

It will be seen that the program will only progress beyond count comparison step 112 if the measured value is greater than the stored value by 2 or more twice. In this way, the chance of noise-induced triggering of the speech generating circuit is reduced, so that this part of the program is responsive only to the change in inductance characteristic of the first part of a hair brushing stroke.

This change in inductance is not in itself sufficient to trigger speech generation. Rather the program is arranged to detect also the subsequent opposite change in inductance associated with a latter part of a hair brushing stroke. Thus, having detected two successive inductance values as described above, the program sets a second counter TOUTX to zero and resets the cycle counter to zero (steps 116 and 118). The purpose of counter TOUTX is to set a one second period for sensing a change in inductance in the opposite direction to the change detect above, as will be clear below. Unless, after incrementing TOUTX (120) TOUTX is equal to 10 (122), a further inductance measuring step 124 is performed, followed by a comparison step 126 in which the new measured value is compared with the stored value. On this occasion the comparison is to test whether the new value is less than the stored value. If it is not, the stored value REF is set to the measured value (step 128), and the program loops back to step 118. It will be seen that the program follows this loop until TOUTX has reached the value of 10 (as determined in count monitoring step 122) (in which case the program returns to START), or the measured value measured in step 124 is less than the last value of REF.

If tne value measured in the last measuring step 124 is less than REF, as determined in comparison step 126, a further comparison step 130 is performed to test whether the magnitude of the difference is equal to or greater than 2 (i.e. an increase in inductance of 0.04% or more), in which case the cycle counter is incremented by 1 in step 132 and the process from step 120 is repeated to confirm the increase in inductance so that the cycle counter reaches 2 in comparison step 134. If the difference between the measured value and the stored value REF in either occasion is less than 2, the program loops back to step 118.

The effect of steps 118 to 134 is to detect a brushing stroke only if the detected first part of the stroke (detected by steps 100 to 122) is followed within 1 second by a repeated inductance change of at least a predetermined magnitude in the opposite direction.

The resulting BRUSHING DETECTED output 136 constitutes a triggering signal for speech generation which is performed by the chip 40 in a conventional manner.

Typically, the chip 40 will store a number of different messages which can be replayed at random on each occasion that the BRUSHING DETECTED triggering signal is generated with the proviso that the same message is not immediately repeated.

Claims

1. A toy comprising the combination of a sound generating doll and a toy hair brush or comb (16), wherein the doll has a head (10) which is formed of electrically insulative material and includes an inductive annular sensing coil (12) on or beneath a scalp portion (10S) of the head, at least a portion of the brush or comb being metallic so that when it is used for brushing or combing the hair the inductance of the coil is altered, the alteration in inductance causing the doll to generate a sound.

2. A toy according to claim 1, further comprising a proximity detector circuit (18) coupled to the coil and responsive to the alteration of the coil inductance, and a sound, preferably speech, generating circuit (30) responsive to a trigger signal produced by the detector circuit.

3. A toy according to claim 1 or claim 2, wherein the coil (12) is formed as an annulus extending around the head (10) from the region of the forehead rearwardly to the back of the scalp portion so that the central axis of the coil is generally upright, the coil being either embedded in the material of the head or, in the case of a head comprising a thin shell of insulative material, secured to the inner surface of the shell.

4. A toy according to any of the preceding claims, wherein the coil (12) comprises several turns of thin insulated wire formed approximately into a circle centred on the axis and having a diameter of at least 50 mm.

5. A toy according to any of the preceding claims, wherein the brush or comb (16) includes or consists of an aluminium plate greater than 0.5 mm in thickness and having one of its dimensions greater than or equal to 50 mm.

6. A toy according to any of the preceding claims, the toy including a brush (16) having a metallic portion (16P) being 10 mm or less from the ends of the bristles.

Fig.1.

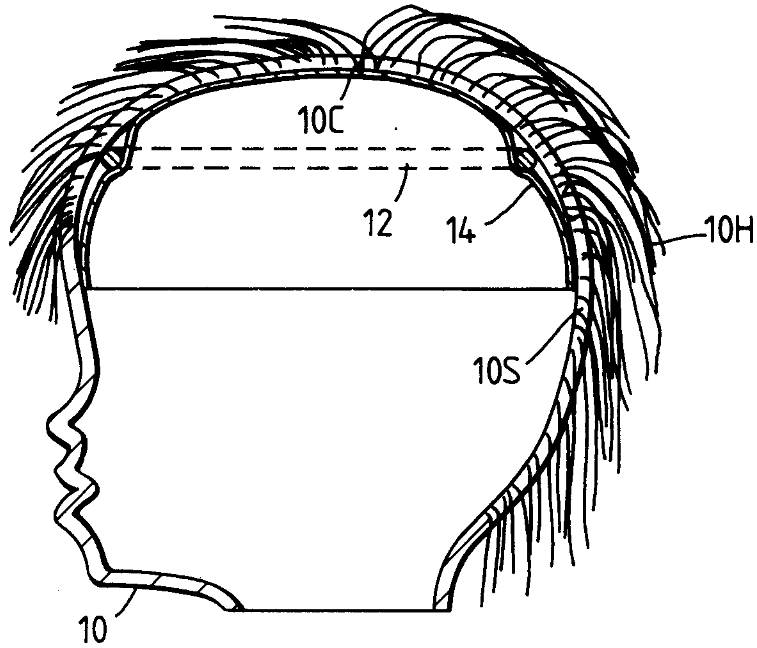


Fig.2.

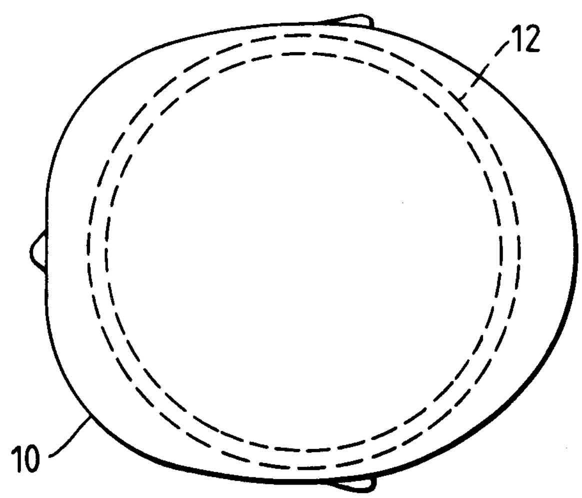


Fig.3.

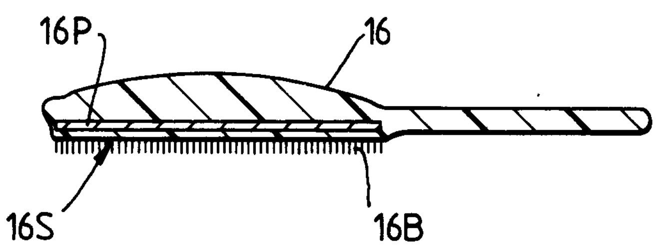


Fig.4.

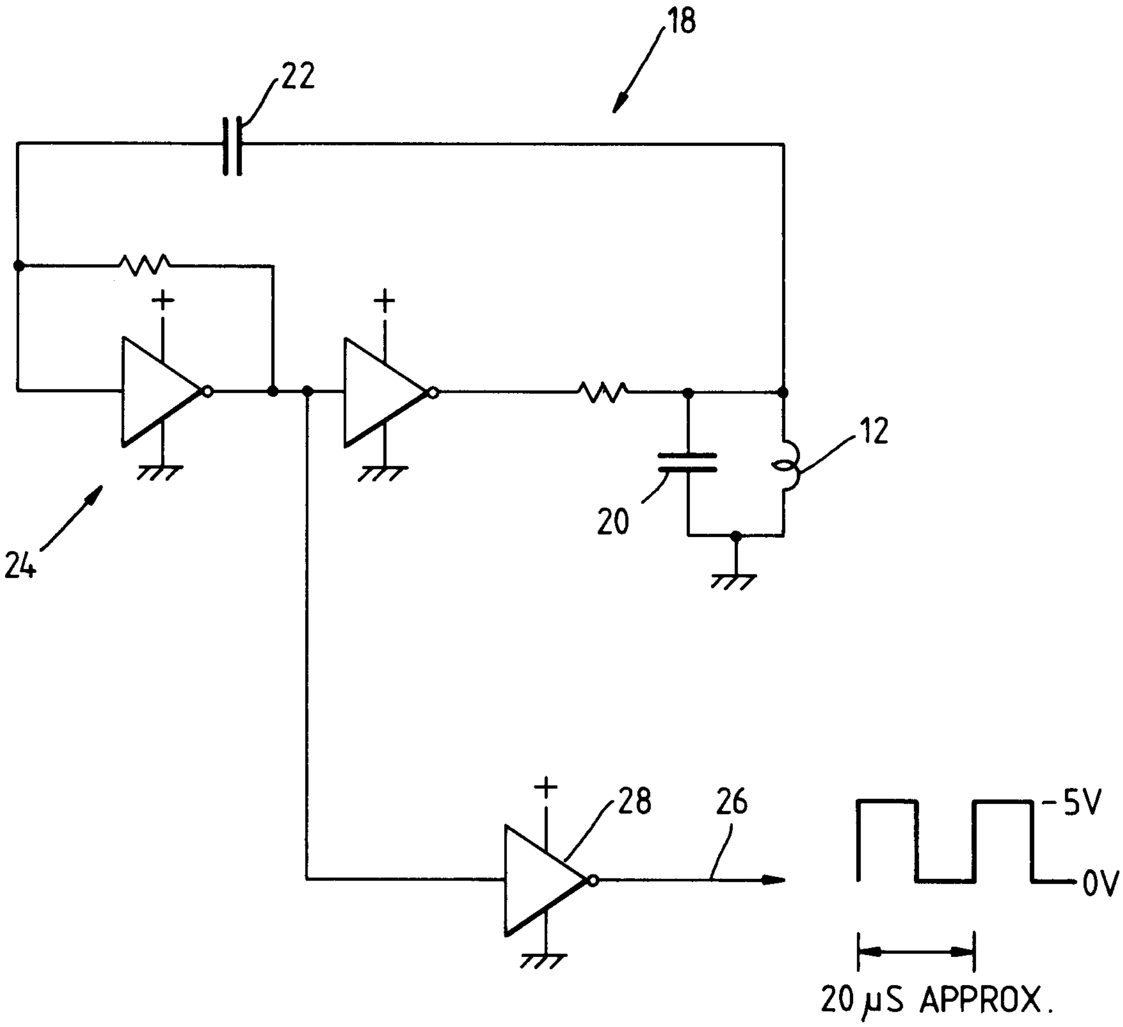


Fig. 5.

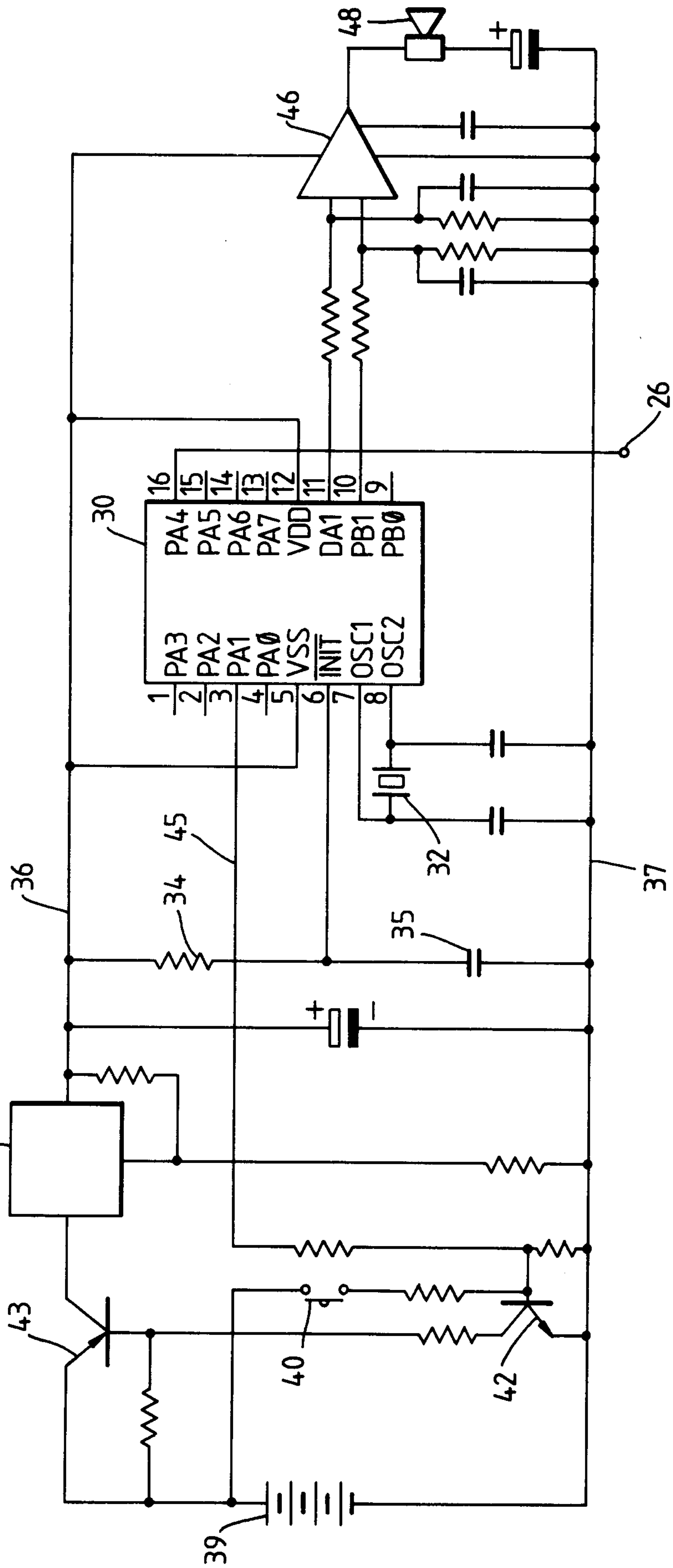
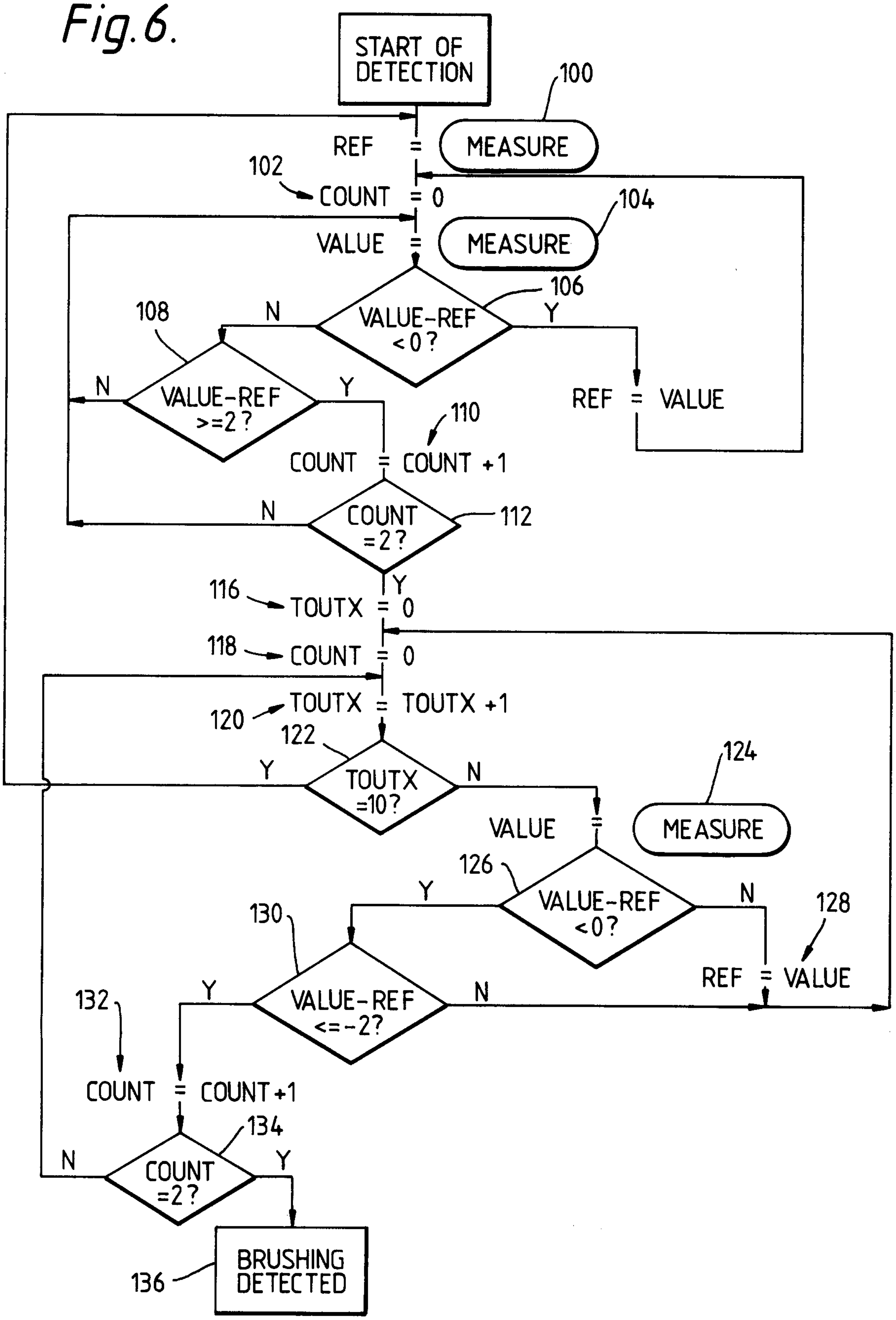

48
46
26
30
16 15 14 13 12 11 10 9
PA4 PA5 PA6 PA7 VDD DA1 PB1 PBØ
PA3 PA2 PA1 PAØ VSS INIT OSC1 OSC2
1 2 3 4 5 6 7 8
36
34
45
35
32
37
38
43
40
42
39

Fig.6.


START OF DETECTION
100
REF
MEASURE
102
COUNT = 0
104
VALUE
MEASURE
106
VALUE-REF <0 ?
N
Y
108
VALUE-REF >=2 ?
N
Y
REF = VALUE
110
COUNT = COUNT +1
COUNT =2 ?
112
N
Y
116
TOUTX = 0
118
COUNT = 0
120
TOUTX = TOUTX +1
122
TOUTX =10 ?
Y
N
124
VALUE
MEASURE
126
VALUE-REF <0 ?
Y
N
128
130
VALUE-REF <=-2?
Y
N
REF = VALUE
132
COUNT = COUNT+1
134
COUNT =2 ?
N
Y
BRUSHING DETECTED
136

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 9008

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 297 066 (DE MASE) * the whole document * ---	1,2,5,6	A63H3/28 A63H3/44 A63H33/26
Y	US-A-4 626 621 (HIYAMA) abstract ---	1,2,5,6	
A	US-A-4 917 647 (WETHERELL) * the whole document * ---	1	
A	US-A-4 683 459 (EDSON) * the whole document * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A63H G08B G01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 JANUARY 1993	VANRUNXT J.

CATEGORY OF CITED DOCUMENTS

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

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

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)