



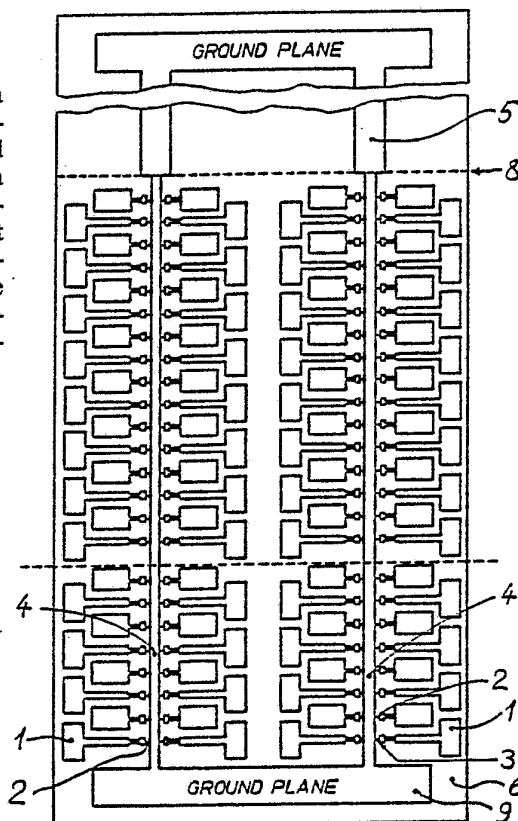
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/DK83/00062 (22) International Filing Date: 17 June 1983 (17.06.83) (31) Priority Application Numbers: 2731/82 1437/83 (32) Priority Dates: 17 June 1982 (17.06.82) 29 March 1983 (29.03.83) (33) Priority Country: DK (71) Applicant (for all designated States except US): GNT AUTOMATIC A/S [DK/DK]; Telefonvej 6, DK-2860 Søborg (DK). (72) Inventor; and (75) Inventor/Applicant (for US only) : FOLKMANN, Peter [DK/DK]; Engdragnet 7, DK-4140 Borup (DK). (74) Agent: BROCK-NANNESTAD, George; A/S LK- NES, Haraldsgade 53, DK-2100 Copenhagen OE (DK).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), BR, CH (European patent), DE (European patent), FI, FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent), US.</p> <p>Published <i>With international search report.</i></p>

(54) Title: A DATA STORE

(57) Abstract

A data store for reading by capacitive means consists of a number of programmable impedances, each having at least one resistive element which may be selectively destroyed. In a preferred embodiment the resistor is destroyed by capacitive coupling of a pulse of energy. The manufacture of the data store consists in depositing a conductive pattern on a carrying foil (6) with subsequent insulation. In an embodiment using a parallel combination of capacitors and destructible resistances as data elements the data store is advantageously manufactured by depositing a conductive pattern in one operation with subsequent folding in order that overlapping parts of the conductive pattern constitute the data elements.



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A Data Store

The invention relates to a data store for use with capacitive reading and containing capacitive coupling electrodes which establish galvanic connection to data elements which are made up as impedances.

Pre-payments of goods and services, e.g. a certain amount of telephone use may take place by means of so-called 'debit' cards. These are portable and durable data stores which contain data of two types. One type is data which serves to identify the 'debit' card to the electronic reader, the other type is data which represents the value of the card and which must be changed according to the use. That is, these data elements must be changed by the electronic reading station. It has been found expedient to use capacitive coupling to the data store which puts certain limits to the amount of energy that may be transferred to change one data element. In connection with the use of galvanic coupling it is well known to use the fusing of a conductor or the destruction of a dielectric; the former occurs using a high current, the latter with a high voltage. These methods have been used in the programming of semiconductor memories.

It is the purpose of the invention to provide a data store which contains data elements which give a definite indication of the condition of the data element using capacitive coupling and which data elements are efficiently re-codeable. This is obtained by a data element according to the invention which is characterized in that each impedance which constitutes a data element at least consists of a resistive link between the capacitive coupling electrodes.

In claim 2 a data store is indicated which gives a large variation following re-coding.



In claim 3 a data store is indicated which is particularly adapted to the capacitive coupling.

In claim 4 there is indicated a data store which allows re-coding on several levels for each data element.

In claim 5 a procedure for re-coding is indicated.

In claim 6 a manner of manufacture of a data store is indicated.

In claim 7 a similar manner of manufacture of a data store according to claim 4 is indicated.

In claim 8 a further expedient manner of manufacture is indicated.

In claim 9 a manner of manufacture is indicated which requires but one application of conductive material.

In claim 10 a manner of manufacture of a data store according to the invention is indicated which is particularly adapted to the manufacture of a data store having a stiff carrying foil.

The invention is to be further described with reference to the drawings, in which

Fig. 1 shows a data store according to the invention, and Fig. 2 shows details in a data store according to the invention.

In Fig. 1 is shown a data store which consists of the capacitive electrodes (9) and (1) which communicate with corresponding electrodes in the apparatus which is adapted for reading and re-coding (changing) the data elements. The data store has a resistive connection between these electrodes as shown at (3) and in greater detail on Fig. 2. In Fig. 2c it is

shown that the resistive parts (3), (3'), and (3'') are different and that the two former are adapted for being destroyed when re-coding. Hence in a first re-coding operation one change may be introduced and in a second re-coding a second change so that a data element which belongs to a certain position on the card may have more than two values. This is according to claim 4.

In data stores according to claims 4 and 7 the construction will be as shown on Fig. 1, having (8) as its upper edge, and an insulating covering that prevents corrosion and mechanical interference is required. In data stores which also have a capacitor in each data element the construction will be according to Fig. 1, having the upper part (above the line (8)) folded either forwards out of the plane of the paper and across the data element pattern, and in this case it is required to supply it with an insulating covering before folding, according to claim 8. In case the folding is performed backwards, then the insulation is established by the carrying foil (6) itself, but in that case the whole data store must subsequently be insulated on both sides, e.g. by casting in a resin or by lamination.

The data store may be advantageously manufactured by deposition of a resistive material in a uniform thickness. In this case only the parameters length and width remain for controlling the resistance and power capacity of the resistive connections (3), (3'), and (3''), however this is well known to the person skilled in the art and constitutes a simplification. The choice of the value of the resistor is partly controlled by the desired manner of changing; if the energy supplied has the character of a voltage, then the resistance must be small, but in case the energy has the character of a controlled current the resistance must be large, in order that sufficient energy shall be absorbed to obtain destruction. In order that sufficient energy shall be absorbed it has been shown to be expedient to let the data elements of



the data store be part of resonant circuits as frequency determining elements in order that over-voltages or over-currents occur at resonance.

As carrying foil (6) polyester, polyimides or similar materials well known in the electronics field have been shown to work well. However, there may be problems in cementing the two layers close to the fold (8), in that certain of the insulating foils are stiff. As the two conducting areas marked "GROUND PLANE" are large, their juxtaposition alone will bring about such a coupling between the two layers that the part of the material having the greatest inner stresses following cementing, i.e. the material adjacent to the fold (8), may be cut entirely away according to claim (10).

It is obvious that in case the characteristics defined in claim 4 are combined with those of claim 2 many more possibilities of combination are obtained, in that there will then be a capacity with individual loss angles as a carrier of information in each data element.



P A T E N T C L A I M S

1. A data store for use with capacitive reading, having capacitive electrodes (1) and (9) which establish galvanic connection to data elements constituted as impedances, characteristic in that each impedance at least consists of a resistive connection (3) between capacitive electrodes (1), (9).
2. A data store according to claim 1, characteristic in that each impedance is constituted as a parallel connection of a resistor (3) and a capacitor (2, 5).
3. A data store according to claim 2, characteristic in that it consists of a number of first electrodes (2), each being associated with a capacitive coupling electrode (1) and a common second electrode (5) which is connected to a particular coupling electrode (9), and in that a resistive connection (3) is established between first electrodes (2) and said second electrode (5).
4. A data store according to claim 1, characteristic in that each impedance is constituted as a parallel connection of 2 or more resistances, each having an individual overload capacity.
5. The use of a data store according to claim 1 in conjunction with the changing of a data element, characteristic in that energy is capacitively fed into the data store, said energy being sufficient to destroy the resistive part (3) of the data element impedance.
6. A procedure for the manufacture of a data store according to claim 3, characteristic in that a conductive pattern is deposited on an insulating carrying foil (6), said pattern constituting coupling electrodes, first electrodes, second electrode, data capacitors, and resistive connections, whereupon the insulating carrying foil

is folded in order that said second electrode overlaps all first electrodes in a generally uniform manner.

7. A procedure for the manufacture of a data store according to claim 4, characteristic in that a conductive pattern is deposited on an insulating carrying foil (6), said pattern constituting coupling electrodes and resistive connections.

8. A procedure for the manufacture of a data store according to claim 3, characteristic in that the conductive pattern is supplied with an insulating covering prior to folding.

9. A procedure according to claim 6 or 7, characteristic in that the conductive pattern consists of a resistive material.

10. A procedure according to claim 6 for the manufacture of a data store according to claim 2, characteristic in that the material which is deformed at the fold (8) is cut away subsequent to relative fixing of the folded parts.



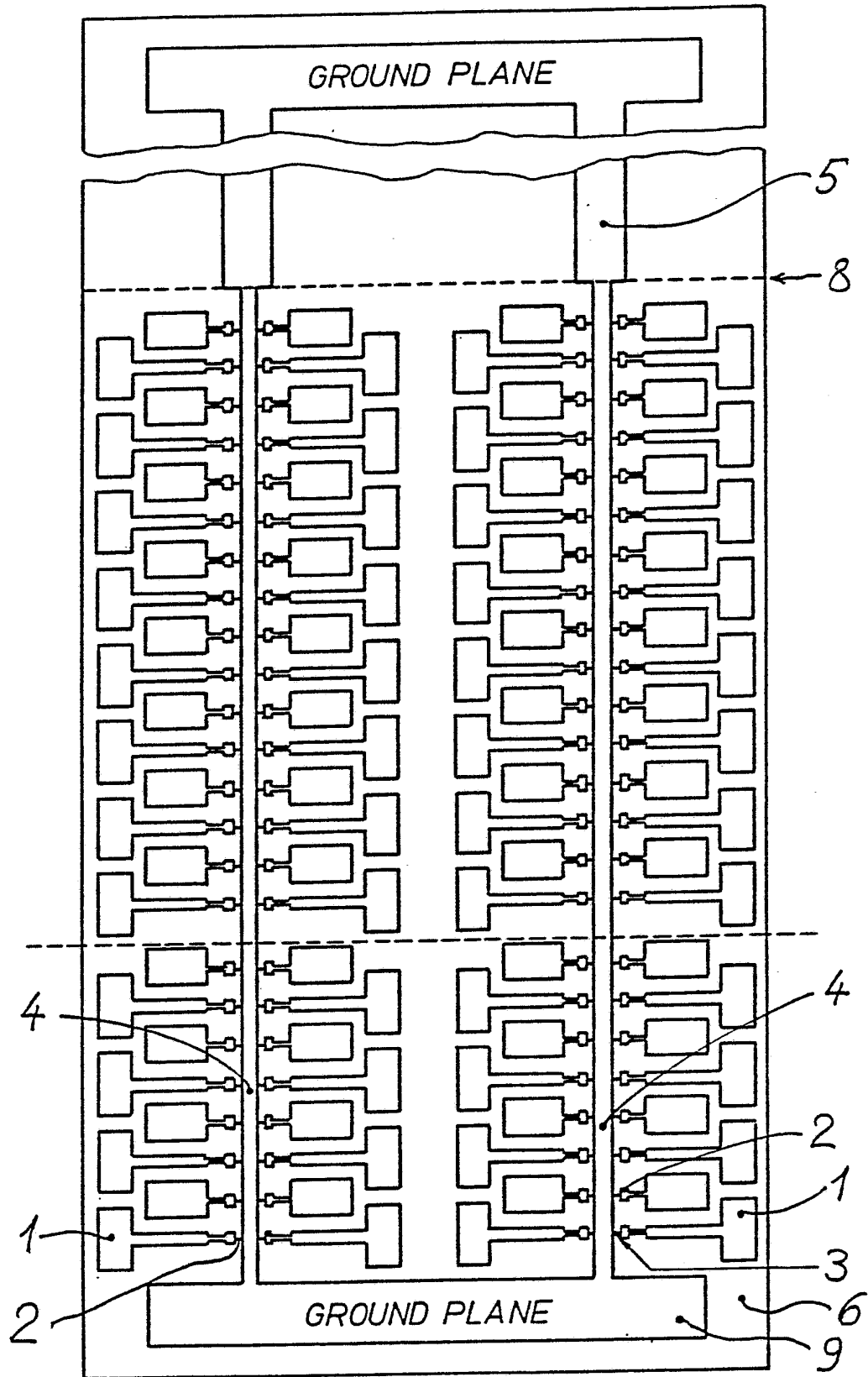


Fig. 1.



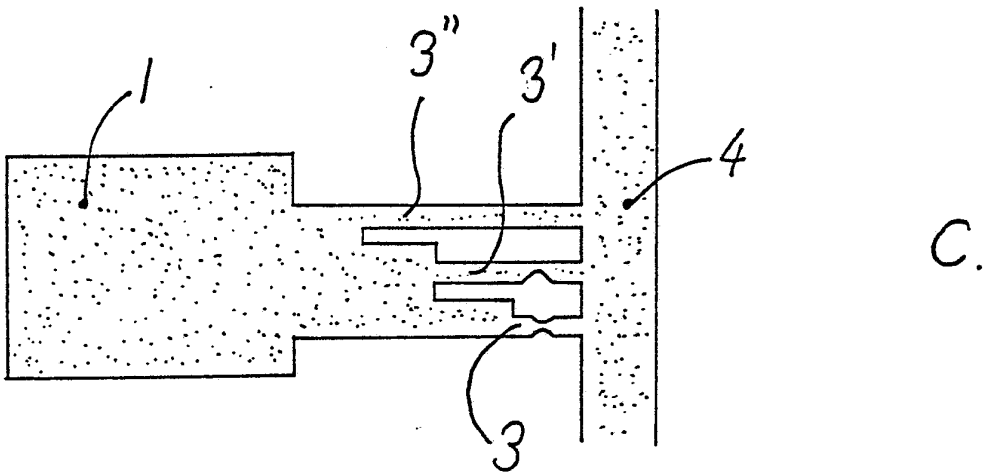
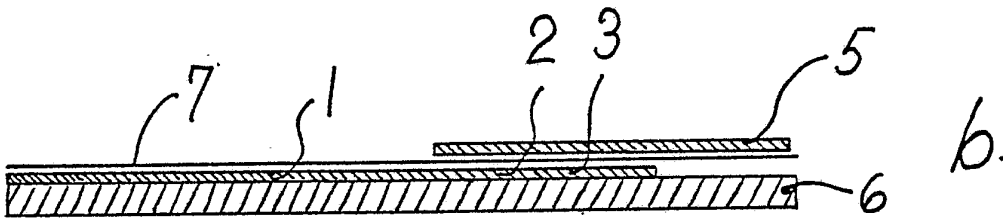
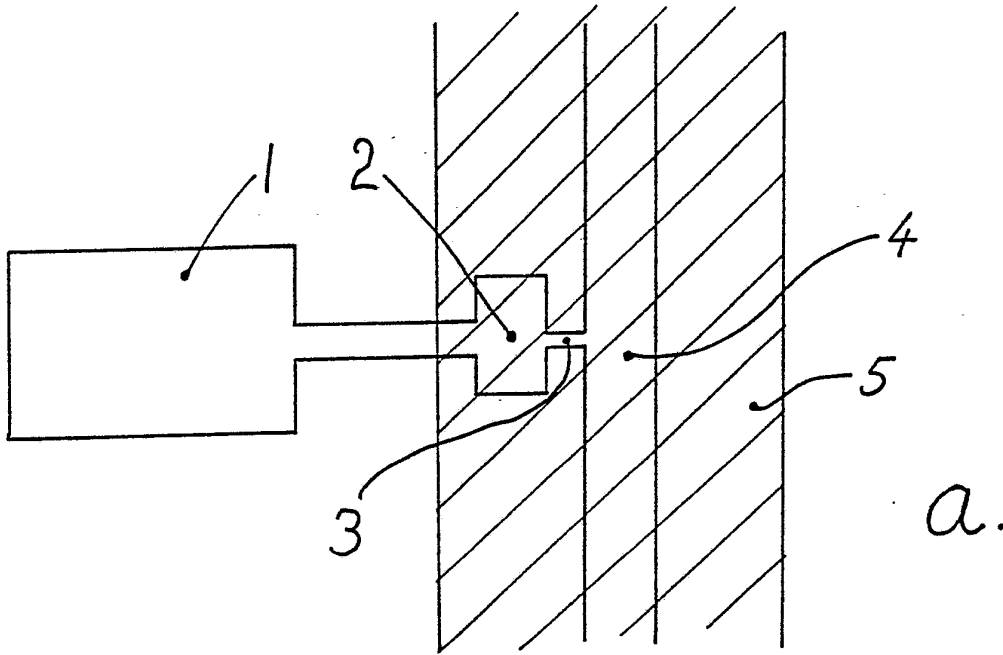



Fig. 2.

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK83/00062

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC 3		
G 11 C 17/04, G 11 B 9/06, G 06 K 19/06		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
IPC 3	G 06 K 1/00,12, 7/00,06,08, 19/00,04-08, G 07 C 11/00, G 07 F 7/00,02,08,10, G 11 B 9/00,04,06, 11/00, ... G 11 C 11/00,21,24,46, 17/00-04 .../...	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category ⁶	Citation of Document , ¹⁵ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X,Y	US, A, 3 604 900 (SPRAGUE ELECTRIC COMPANY) 14 September 1971	
X,Y	US, A, 3 699 311 (REMVAC SYSTEMS CORP) 17 October 1972	
X,Y	US, A, 3 719 804 (INTERNATIONAL COMPUTERS LIMITED) 6 March 1973 & FR, 2 141 040 GB, 1 323 266	
X,Y	DE, A1, 2 812 388 (J MACHATE) 4 October 1979	
Y	US, A, 3 668 655 (COGAR CORP) 6 June 1972 & NL, 7 100 070 DE, 2 059 599	
Y	US, A, 3 810 147 (G J LICHTBLAU) 7 May 1974, see especially fig.3-5 & FR, 2 166 216 DE, 2 263 905 .../...	
<p>⁶ Special categories of cited documents: ¹⁸</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>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ¹⁹	Date of Mailing of this International Search Report ¹	
1983-09-16	1983-09-27	
International Searching Authority ¹	Signature of Authorized Officer ²⁰	
Swedish Patent Office	 Rune Larsson	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Fields searched (cont)

US CI	<u>194:4; 235:61.11, 61.11A,H, 61.12, 61.12R,C,N, 375,435,439,441,444,451, 487,488,492; 307:202,238; 340:149, 166,173,173R,CA,SP, 280,568,572; 365:46,52-54,63,94-96,100-102,148, 149</u>
National CI	21a ¹ :37/00,44; 42m:14; 43a:41/01,03

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers because they relate to subject matter ¹² not required to be searched by this Authority, namely:

2. Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ¹³, specifically:

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ¹¹

This International Searching Authority found multiple inventions in this international application as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
 No protest accompanied the payment of additional search fees.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No ¹⁸
	GB, 1 406 500 JP, 48 077 695	
A	DE, A1, 2 841 467 (N V PHILIPS GLOEILAMPEN-FABRIEKEN) 12 April 1979 see especially fig. 4-5 and 8-9	
A	IBM Technical Disclosure Bulletin, Vol 12, No 10, issued 1970 March, J N Cole, "Niobium oxide read-only memory", see page 1562	
A	DE, A1, 2 151 632 (RCA CORP) 27 April 1972	
A	FR, A1, 2 234 631 (MOTOROLA INC) 17 January 1975	
A	DE, A1, 2 600 289 (W GRIMM) 14 July 1977	
A	US, A, 3 935 431 (THE GREY LAB ESTABLISH- MENT) 27 January 1976	
P	WO, A1, 83/00255 (GNT AUTOMATIC A/S, P MEYER) 20 January 1983 see especially fig. 4	