



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ³ : B41J 5/10, 3/26	A1	(11) International Publication Number: WO 81/03641 (43) International Publication Date: 24 December 1981 (24.12.81)
<p>(21) International Application Number: PCT/NL81/00018</p> <p>(22) International Filing Date: 15 June 1981 (15.06.81)</p> <p>(31) Priority Application Number: 8003451</p> <p>(32) Priority Date: 13 June 1980 (13.06.80)</p> <p>(33) Priority Country: NL</p> <p>(71) Applicants; and (72) Inventors: BERKELMANS, Nicolaas, Martinus [NL/NL]; Hegge 12, NL-7314 JS Apeldoorn (NL). Den OUTER, Marius [NL/NL]; Varelseweg 50, NL-8077 RA Hulshorst (NL).</p> <p>(74) Agents: Van der BEEK, George, Frans et al.; Nederlandsch Octrooibureau, Johan de Wittlaan 15, P. O. Box 29720, NL-2502 LS The Hague (NL).</p>		<p>(81) Designated States: AT (European patent), AU, BR, CH (European patent), DE (European patent), DK, 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>
<p>(54) Title: WORD TYPEWRITER</p> <div data-bbox="453 1223 1166 1816" style="text-align: center;"> </div> <p>(57) Abstract</p> <p>A word typewriter for the display of written information, whereby on the keyboard in the middle a group of keys for the vowels and on either side thereof in image position a same group of keys is mounted for a limited number of consonants, the lower row of these letter keys being destined for the thumbs, whereby the positioning of the keys is selected such that by the simultaneous operation of two keys each time failing letters are formed, whereby the letter keys may also be used for signs or digits, whereby for the display on the one side of letters and on the other side of signs or digits a shift key (SK) is provided, and all keys are coupled to an electronic decoding and processing unit (3), which decodes the signals from the keys and subsequently supplies signals, representing standard letters, signs or digits, whereby the combination of two simultaneously-operated letter keys, which in form or sound recall the image of a failing letter, is processed into the standard display of said letter.</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	KP	Democratic People's Republic of Korea
AU	Australia	LI	Liechtenstein
BR	Brazil	LU	Luxembourg
CF	Central African Republic	MC	Monaco
CG	Congo	MG	Madagascar
CH	Switzerland	MW	Malawi
CM	Cameroon	NL	Netherlands
DE	Germany, Federal Republic of	NO	Norway
DK	Denmark	RO	Romania
FI	Finland	SE	Sweden
FR	France	SN	Senegal
GA	Gabon	SU	Soviet Union
GB	United Kingdom	TD	Chad
HU	Hungary	TG	Togo
JP	Japan	US	United States of America

- Word typewriter. -

The invention relates to a word or rapid typewriter for the display or processing of written or linguistic information, whereby on the keyboard in the middle a group of keys for the vowels and on either side thereof in image position a same group of keys for a limited number of consonants is mounted, the lower row of these letter keys being destined for the thumbs, whereby the positioning of the keys is selected such that by the simultaneous operation of two keys each time failing letters are formed, and whereby the letter keys may also be used for signs or digits. Such a word typewriter is known from the Dutch patent application 73.06584.

With such a word typewriter not only sequentially letter after letter but also a whole word or syllable may all at once be struck and printed. Such a polyphonemic input in this case is done with both hands, which means that all fingers take part in the stroking process. The general principle is based upon four main types of syllables, namely:

1. only a vowel, e.g. "o" (in e.g. over)
2. initial consonant + vowel, e.g. "so"
3. vowel + final consonant, e.g. "os"
4. initial consonant + vowel + final consonant, e.g. "sos".

These groups may be extended by adding more vowels or consonants, e.g.: "ou" instead of "o" or "u"; "stro" instead of "so"; "ar(t)s" instead of "as" or "os"; and "(s)treet" instead of "ses" or "sos"; etc.

In such a word typewriter monosyllabic words may be printed by one stroke. For that purpose two identical groups of consonants are available on the keyboard, and the vowels lie between said both groups, said vowels being mainly operated by the forefingers and possibly by the thumbs. Said known word typewriter is embodied such that syllables or words are displayed as much as possible by striking slit positions as few as possible, i.e. stroke positions in which a finger is placed on two keys. One has provided for a phonetic or form context between the letters failing on the keyboard and those which take their place and which belong to a slit position, which context is as logical as possible. The letters on the keys sometimes have a form deviating somewhat from the standard type, or use is made of small and of capital



letters such as to obtain symbolic suggestive forms recalling the standard forms.

Upon operation of this known word typewriter, however, one still obtains a shorthand script of e.g. separate syllables or words laying
5 vertically under each other. Also the above mentioned failing consonants are printed in this shorthand in a form resembling the form of the letters on the keys such that said consonants failing on the keyboard are not printed in standard form.

On the letter keys on this known word typewriter also signs or
10 punctuation marks and digits are indicated. Such a sign (mark) or digit may only be displayed by additionally striking each time a so called indicator key. In this way the signs, placed on the left group and right group of consonants respectively, are displayed by additionally striking the left and right key respectively of two additional thumb
15 keys which are provided with the accentuations ' and \. Each sign is displayed by the printed combination of the letter of the key carrying the desired sign and an accentuation. A fixed indicator key, e.g. the "i", is used for the digits 0 through 9 such that digits each time are displayed by the printed combination of the letter of the key carrying
20 the desired digit and the letter "i".

The object of the invention is to obviate these problems and to provide a word or rapid typewriter, by which a running and complete script is obtained in a very fast manner, in which script the consonants failing on the keyboard are displayed or processed in standard form
25 and also signs or digits are displayed in a very simple manner in standard form.

According to the invention this is obtained in a word typewriter of the type indicated in the preamble such that for the display on the one side of letters and on the other side of signs or digits
30 a shift key is provided, and that all keys are coupled to an electronic decoding and processing unit, which decodes the signals from the keys and subsequently supplies signals representing standard letters, signs or digits, the combination of two simultaneously struck letter keys, which in form or sound recall the image of a failing letter, being processed
35 into the standard display of said letter.

The above mentioned electronic decoding and processing unit may be embodied as a diode matrix and advantageously as a micro-computer.

With the aid of said word typewriter according to the invention



slit positions between keys, to be actuated by fingers other than the forefinger, which actuation results in some tension in the related fingers, can be avoided as much as possible. Also less workable syllable combinations which contain a R, may also be represented in
5 another manner and the number of required keys is limited by the combination of phonetic and/or form related letters in order to realise the consonants, failing on the keyboard both at the left and right side of the centre group of vowels.

The invention will now be further elucidated with reference
10 to the drawing, in which:
figure 1 is a view of the keyboard; and
figure 2 is a block diagram of the mutual connection of the keyboard with the decoding and processing unit and a display, printing or memory device.

15 The keyboard indicated in figure 1 resembles the keyboard indicated in the Dutch patent application 73.06584 with the exception, however, of some very important differences.

On the central vowel group of ten keys in the middle, the letter I (two times), O (two times), E (two times), U (once), A (once)
20 and Y (once) are displayed while also the mark , (= comma) is indicated.

At the left hand and the right side in image position a limited number of consonants are indicated, namely the consonants Z, F, S, P, T, C, K, J, r. These keys are positioned such that the keys Z, F, S
25 in principle can be operated by the little finger, the keys P, T, C can be operated by the ringfinger, the keys K, J, r can be operated by the middle finger, and the vowel keys in principle can be operated by the two forefingers.

Another row consisting of five thumb keys, is taken up below
30 the above mentioned group of letter keys, the middle key of which other row is destined for the vowel Y, and the two left keys of which are destined for the letters L, n and the two right keys of which are destined for the letters n, L.

Furthermore signs or digits are indicated on all above mentioned keys, which signs or digits are printed or processed with the
35 aid of an additional thumb key, the so called shift key (indicated by SK in figure 1) under the row of said five thumb keys, for shifting from letters to signs (marks) or digits and vice versa. Another sign



-4-

key is positioned at the left and at the right side respectively of this shift key which other sign keys respectively carry the accentuations / and \ .

5 Near the lower edge of the keyboard another pair of keys or in fact bars destined for the ball of the hands is positioned, namely at the left side the capital letter or ordinary letter h-bar, the so called capital (h)-bar (indicated by cap(h) in figure 1), and at the right side the linking-up and space bar, the so called syllable connector-bar (indicated by SC (space) in figure 1). In this case the decoding and
10 processing unit decodes the signals from the left hand ball bar destined for the display of capital letters or ordinary letter h respectively such that when this ball bar is pre-actuated separately the following syllable starts with a capital, and when said bar is actuated simultaneously with one or a plurality of other letter keys, representing
15 initial consonants, it is displayed as letter h.

The word typewriter according to the invention is also embodied such contrary to the usual typewriter that in connection with the decoding and processing unit a space occurs automatically after striking a syllable. As it is proved that monosyllabic words occur much more
20 frequently than polysyllabic words in normal text this method gives a considerable reduction in manipulation. When one wants to link-up or connect the syllables as required in a polysyllabic word, for example in "to harden", accordingly after "har" the syllable "den" has to be struck simultaneously with the right hand ball bar (linking-up or anti-
25 sponce bar in this case), by which actuation the two syllables are displayed in connected condition. It is also possible ^{to} sequentially strike letter after letter in which case the said right ball bar functions as space bar. By this, one is capable with the aid of the decoding and processing unit to combine the two possibilities, and such that in the
30 few cases in which it is required to separately strike the last letter of a syllable, e.g. in "fil-m" and "war-m", the right ball bar does not have to be actuated.

If at the end of a sentence the period is actuated, automatically the space is introduced via the decoding and processing unit, and
35 also the first letter of the following syllable is displayed as a capital. In case a capital and a space is not required after a period, such as in "e.g.", precisely one uses the left and right hand ball bars after "g." in order to avoid the printing of a capital and the generation of



a space.

Resuming it, both ball bars have important standard functions, namely the left bar for displaying a capital (and secondly an additional h) and the right bar for linking up syllables (and secondly for generating a space). When these bars are used beyond their main standard function, they have an inverse action. Namely in case of a period and preceding a single letter the left bar is used to avoid the display of said letter as a capital, and in case of sequential letter after letter display the right bar is used to separately display the space each time.

The major punctuation marks (period and comma) are simply obtained by the separate actuation of the O for the right hand (period) and the right j (comma) without the need in this case for actuating the shift key (SK).

Also the possibility is provided as mentioned earlier for displaying the following consonants at the beginning of a syllable: Z, S, F, P, T, C, K, J, r, L, n. These are eleven consonants. The failing nine consonants (for, the whole alphabet comprises 26-6=20 consonants) are obtained by combination of letters as follows:

20	B = P + J	H = J + L	V = L + r
	D = T + J	M = r + n	W = J + H
	G = C + J	Q = C + F	X = Z + K

If required other combinations of certain letters are possible, such as V = F + J and W = J + n.

Furthermore the following final consonants can be displayed with the aid of the keyboard: n, L, K, J, r, P, T, C, F, S, Z. These are eleven consonants.

The failing nine consonants again are obtained by mutual combinations, namely:

30	B = P + J	H = J + L	V = F + J
	D = T + J	M = r + n	W = J + H
	G = C + J	q = C + F	X = K + Z

Also in this case other combinations if required are possible, such as V = L + r and W = J + n.

This system of combinations is based on the phonetic and/or form context between the struck letters and the failing consonants. By an adapted graphic composition of the letters on the keys, as indica-



ted in figure 1, one can play in on this form context. For example the letter F may be indicated somewhat inclining backwards, by which the combination FJ optically approaches the letter form V.

An example of the avoidance of slit positions hereby for less suited fingers is the beginning syllable DR, GR, VR or WR. In order to strike this group one could place the middle finger on the slit between the J and the R. However, one can avoid this by striking the thumb key n (n) which by its form already recalls the n. In the said combinations this letter is represented or printed as a R due to the decoding and processing unit. Beginning consonant combinations DN, GN, BN, VN, and WN namely do not occur in the modern western languages. The letter W from the above mentioned initial combination WR is obtained in connection with the decoding and processing unit by simultaneously striking the J and the capital bar (cap (h)).

An example of the avoidance of tension in the fingers is the beginning consonant combination (S)PR, (S)TR or FR, which upon using the centrally placed r would not be so easy to operate. As an alternative R in this combination one can use the K besides the P on the upper row, which K got a somewhat special form (K), by which in the said combinations it recalls the R and which is displayed as a R due to the decoding and processing unit.

Further examples of the avoidance of tension or strain during the operation of the keys are the following combinations (in which - means: part of the syllable), which are correctly displayed as standard letter (s) with the aid of the decoding and processing unit:

<u>to be actuated</u>	<u>display</u>
- TZ	- TS
- PZ	- PT
- KT(S)	- CT(S)
30 OI	A (in basicposition)
- CZ	- CH
- GL	- GH
- GLZ	- GHT

In figure 2 a simple block diagramm is indicated of the manner in which the decoding and processing unit in the keyboard device and a further processing unit, such as a display-, printing- or memory unit, are connected to each other.



-7-

The keyboard 1 is connected via an input circuit 2 to the decoding and processing unit 3. The electronic unit 3 reads the state of each of the keys with the aid of said input circuit, i.e. in order to determine whether a key is struck or not. On the basis of certain decoding rules provided in the diode matrix subsequently certain letters, signs or digits finally are supplied via the output circuit 4 to the display, printing or memory device 5.

The decoding and processing unit may be embodied as a micro-computer. The electronic unit is connected to the keyboard and the further processing unit 5 via an input/output circuit 2, 4 respectively. In regular timing intervals the keyboard is read out by the electronic unit, during which information about the state of the keyboard is received which information is converted into a string of characters.

Each time when it is established, that after the actuation of one or a plurality of keys, no further key is actuated anymore, this is signalled. This happens therefor on the point of time that all keys are released. This is called the signal "new-syllable". In a memory field LGA (= syllable display) it is indicated which keys are actuated since the last signal "new-syllable". Upon each signal "new-syllable" the contents of the memory field LGA are put in a cyclic buffer TBBuf (= keyboard buffer) which cyclic buffer may hold a plurality of these contents.

Regularly it is investigated whether there are LGA-contents yet in this cyclic buffer TBBuf. In case the buffer TBBuf is not empty the oldest LGA-contents present in the buffer is removed from this buffer and is decoded. That means that one or a plurality of letters, signs or digits are generated in accordance with the applicable rules therefore. These characters are stored in a further memory in the decoding and processing unit and may subsequently be used for several purposes. For example they may be supplied via a data communication interface to a word processor, a further memory, such as a tape or magnetic disk, for later editing and/or printing, for displaying on a visual display device or as sub-title in a television image. The present device together with an acquainted operator is fast enough so as to make simultaneous translations.

The letters, signs or digits displayed for example on a display device, may yet be erased with the aid of special keyboard functions, the operation of CR RC (= to correct) keys. This gives a cor-



rection possibility for the characters displayed on the display device.

When the cyclic buffer TBBuf is empty, the decoded contents of the memory field LGA is displayed in the last positions of the display device. This gives the operator of the keyboard a direct feedback to his strokes. For the rest, this action with an empty TBBuf, is not essential for the operation of the typewriter according to the invention.

The above indicated series of operations is normally repeated tens to hundreds of times per second. The use of a cyclic buffer gives also the possibility to conclude from time to time operations which are somewhat longer, e.g. the printing of a line on a display device, duration $\pm 0,5$ seconds, without any erasion of syllables inputted during this period. For these syllables are put automatically in the cyclic buffer.

The timing intervals, during which the keyboard is read out, are selected such that they are small in relation to the speed the operator operates the keyboard (during each stroke the keyboard is at least read out a few times), but they are large in relation to the time that contact vibration may occur after striking or releasing of a key (characteristic for most keys are times between two and fifteen msec.). In the present prototypes an interval time of 50 msec. is selected.

Apart from the generation^{of} a series of letters, signs (or marks) or digits, the decoding and processing unit may provide for special operations with the aid of key combinations specially assigned for this purpose. The switching to a new line, the switching of language (decoding rules) e.e., by which the keyboard is operated, etc.

As mentioned above also digits in standard form may be displayed via the keyboard. Advantageously these digits are indicated on the keys of the centrally placed vowel group such that the digit 0 is positioned on the middle thumb letter key and the digits 1, 2, 3 and 4, 5, 6 and 7, 8, 9 successively are positioned on the three rows of three vowel keys. In this manner this block of digits has a form resembling a usual pocket calculator.

The word typewriter may advantageously be embodied such that the left two and the right two thumb letter keys respectively are provided with the signs +, -, :, x, and that the decoding and processing unit is provided with a computation circuit which in combi-



nation with a calculation function key outside the keyboard, realises the calculations adding, subtracting, deviding and multiplying together with the keys carrying said signs and digits.

5 With this word or rapid typewriter according to the invention
running and complete linguistic information of letters and/or signs and
digits is displayed or processed in a very fast manner in standard form
by the logic and simple construction of the keyboard in connection with
the shift key thereon and the decoding and processing unit, whereby
failing letters are formed, difficult combinations are facilitated and
10 slit positions are avoided.



C L A I M S

1. A word typewriter for the display of written information, whereby on the keyboard in the middle a group of keys for the vowels and on either side thereof in image position a same group of keys is mounted for a limited number of consonants, the lower row of these
5 letter keys being destined for the thumbs, whereby the positioning of the keys is selected such that by the simultaneous operation of two keys each time failing letters are formed, and whereby the letter keys may also be used for signs or digits, characterized in that for the display on the one side of letters and on the other side of signs or
10 digits a shift key is provided, and that all keys are coupled to an electronic decoding and processing unit, which decodes the signals from the keys and subsequently supplies signals, representing standard letters, signs or digits, whereby the combination of two simultaneously operated letter keys, which in form or sound recall the image of a
15 failing letter, is processed into the standard display of said letter.

2. A word typewriter according to claim 1, whereby under the row of thumb keys another row of at least two thumb keys for signs is provided, characterized in that the shift key is provided in the middle under said two thumb keys for signs.

20 3. A word typewriter according to claim 1 or 2, whereby near the lower edge of the keyboard a bar for capital- or ordinary-letter display, said bar being destined for the ball of the hand, is provided, characterized in that the decoding and processing unit decodes the ball bar for capital- or ordinary-letter display such, that when
25 said ball bar is separately pre-operated the following syllable starts with a capital, and when said ball bar is operated simultaneously with one or a plurality of other letter keys, representing initial consonants, it is displayed as letter h.

4. A word typewriter according to one of the preceding claims,
30 whereby near the lower edge of the keyboard a bar for linking-up or space display, said bar being destined for the ball of the hand, is provided, characterized in that the decoding and processing unit decodes said ball bar for linking-up or space display such, that when said ball bar is operated simultaneously with a syllable or separately
35 when operating letter after letter, than the said syllable is displayed linked-up with the preceding syllable or the said letters in the



letter after letter display are displayed with space therebetween.

5. A keyboard device according to one of the preceding claims, whereby on a number of letter keys also the digits 0 through 9 are provided, characterized in that the digits are divided over the middle
5 vowel group such that the digit 0 is placed on the middle thumb letter key, and the digits 1, 2, 3, and 4, 5, 6 and 7, 8, 9 successively are placed on the three rows of three vowel keys.

6. A keyboard device according to claim 5, whereby the row of
10 thumb letter keys consists of five keys, characterized in that on the left two and on the right two thumb letter keys respectively the signs +, -, :, x are provided, and that the decoding and processing unit comprises a computation circuit, which in combination with a calculation function key outside the keyboard realises the calculations adding, subtracting, dividing, and multiplying together with the keys carrying
15 said signs and digits.



1/1

fig-1

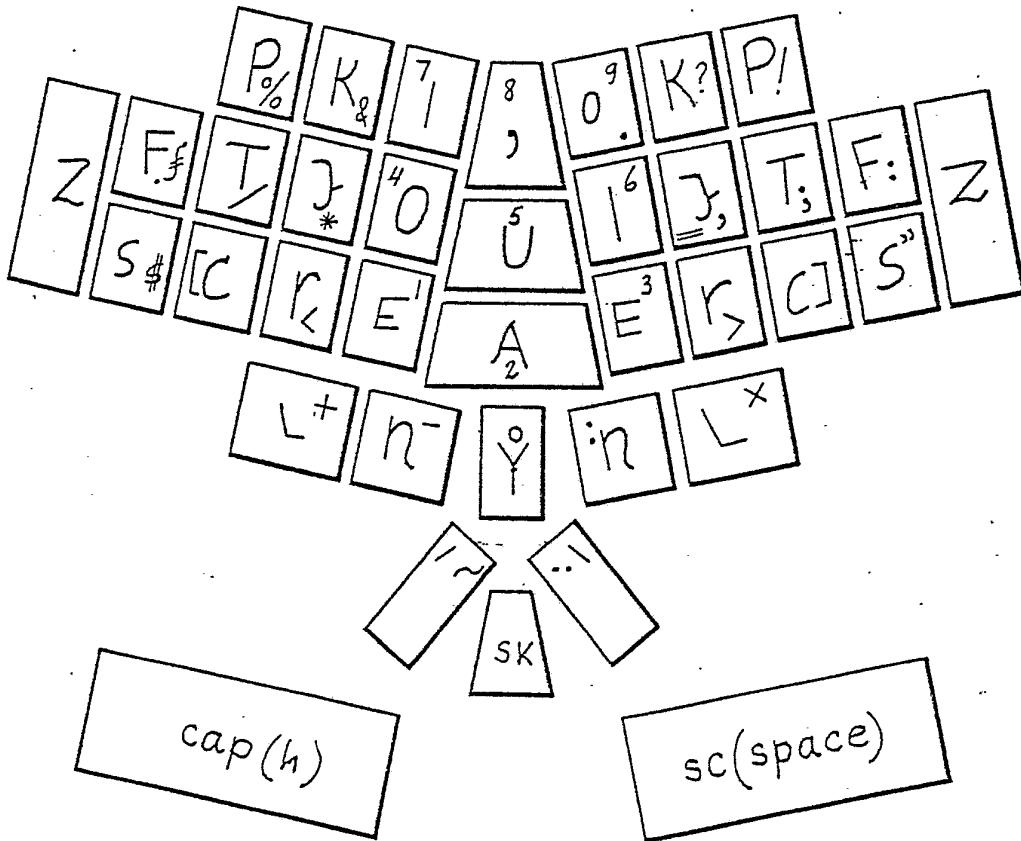
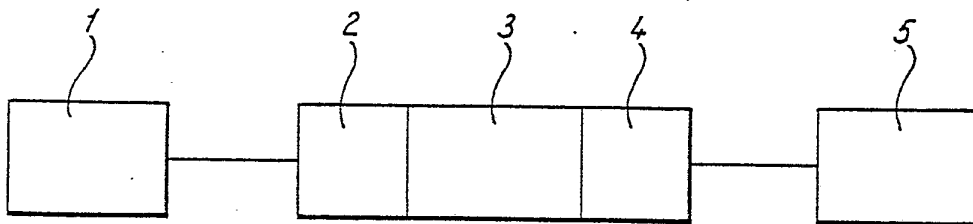


fig-2



INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 81/00018

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 <div style="text-align: center; font-size: 1.2em;">Int.Cl.³ B 41 J 5/10; B 41 J 3/26</div>						
II. FIELDS SEARCHED <div style="text-align: center; font-size: 0.8em;">Minimum Documentation Searched ⁴</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 5px;">Classification System</td> <td style="padding: 5px;">Classification Symbols</td> </tr> <tr> <td style="padding: 5px;">Int.Cl.³</td> <td style="padding: 5px;">B 41 J; G 06 C</td> </tr> </table>			Classification System	Classification Symbols	Int.Cl. ³	B 41 J; G 06 C
Classification System	Classification Symbols					
Int.Cl. ³	B 41 J; G 06 C					
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵ 						
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. ¹³				
A	US, A, 3945482, published March 23, 1976 see the whole document, H. Einbinder -- FR, A, 875817, published October 6, 1942 see page 2, line 31 to page 3, line 62; figures 1,2, C.C.M. Palanque -- FR, A, 2388678, published November 24, 1978 see page 2, line 14 to page 5, line 32; figures 1-3, Z.U.V. Progress -----	1,2 3				
<p>¹⁶ Special categories of cited documents:</p> <table style="width: 100%; font-size: 0.8em;"> <tr> <td style="width: 50%;"> "A" document defining the general state of the art "E" earlier document but published on or after the international filing date "L" document cited for special reason other than those referred to in the other categories "O" document referring to an oral disclosure, use, exhibition or other means </td> <td style="width: 50%;"> "P" document published prior to the international filing date but on or after the priority date claimed "T" later document published on or 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 "X" document of particular relevance </td> </tr> </table>			"A" document defining the general state of the art "E" earlier document but published on or after the international filing date "L" document cited for special reason other than those referred to in the other categories "O" document referring to an oral disclosure, use, exhibition or other means	"P" document published prior to the international filing date but on or after the priority date claimed "T" later document published on or 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 "X" document of particular relevance		
"A" document defining the general state of the art "E" earlier document but published on or after the international filing date "L" document cited for special reason other than those referred to in the other categories "O" document referring to an oral disclosure, use, exhibition or other means	"P" document published prior to the international filing date but on or after the priority date claimed "T" later document published on or 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 "X" document of particular relevance					
IV. CERTIFICATION						
Date of the Actual Completion of the International Search ³ 25th August 1981		Date of Mailing of this International Search Report ³ 3rd September 1981				
International Searching Authority ¹ EUROPEAN PATENT OFFICE Branch at The Hague P.O.Box 5818 Patentlaan, 2 2280 HV RIJSWIJK (ZH) The Netherlands		Signature of Authorized Officer ²⁰ G.L.M. Kruydenberg				