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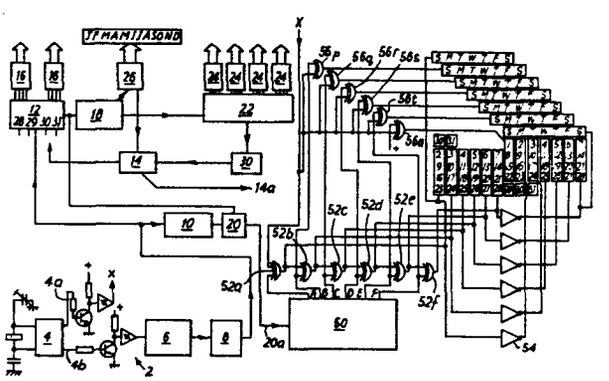
(54) A calendar device.

(57) An electronic calendar device comprises an array of thirteen liquid crystal devices each carrying a four-numeral column of a conventional calendar. By selecting an appropriate seven consecutive liquid crystal devices for display, the correct calendar display for a particular month can be generated. The numerals 29, 30 and 31 are carried on separate liquid crystal devices and can be energised when required for a particular month. Logic circuitry is provided to enable the calendar device to run rapidly forward or backward to provide calendars for selected months in the future or in the past.



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A Calendar device

This invention relates to calendars.

The manufacture of calendar clocks and watches which provide an indication of both the time and the date is well established, but with these devices it is still necessary to consult a conventional printed calendar in order to determine on which day of the week a particular date will fall. As is well known these printed calendars usually comprise twelve sheets, one for each month of the year, with each sheet having the dates of the month arranged in a rectangular array with seven columns or rows corresponding respectively with days of the week.

It is often inconvenient to consult a printed calendar and an electronic device which automatically provided the information normally gathered from a calendar would be desirable. There are, however, considerable difficulties involved in producing such a device, primarily as a result of the need for a 5 x 7 array of display elements, and if conventional techniques were to be employed with a 5 x 7 array of separately driven two digit character displays, the component cost would be prohibitive. This fact has been recognised by previous manufacturers and in the few cases where an attempt has been made to provide a calendar display, the difficulty has been avoided either

by departing considerably from the conventional calendar arrangement and inevitably diminishing the usefulness of the display, or by relying to such an extent on adjustments and settings by the user as to remove completely the convenience advantage of an electronic device.

It is an object of this invention to provide an electronic device which is economic to manufacture and yet capable of generating a true calendar display substantially without manual intervention.

Accordingly, the present invention consists in an electronic calendar device comprising a fixed array of numerals arranged for the display of selected portions thereof; means adapted to count clock pulses and to generate thereby calendar information and a display driver arranged to select on the basis of the calendar information an appropriate portion of the array for display as a calendar for the month.

Suitably, the numerals of the array are arranged in thirteen columns or thirteen rows, the portion selected for display by the display driver in a particular month comprising an appropriate seven consective columns or rows.

Advantageously, the thirteen columns or rows of the array are carried on respective and separately energisable display devices.

It will be appreciated that with the preferred form of the invention it is only necessary to select the appropriate seven consecutive rows or columns and to select as appropriate the 29, 30 and 31 characters, for a conventional calendar arrangement to be generated. This should be contrasted with the 35 numeric display elements, predominantly two digit, that would require to be separately driven if conventional techniques were employed.

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

Figure 1 is a diagram principally in block form showing the circuit of one electronic device according to the invention, and

Figure 2 is a block diagram illustrating a modification to the circuit of Figure 1.

Referring first to Figure 1, a clock 2 of generally conventional form comprises a quartz crystal oscillator 4 providing a 32 Hz signal at output 4a and a 0.5 Hz signal at output 4b. The 32 Hz signal is suitably amplified and shaped to provide a square wave signal X, the purpose of which will be described hereinafter. The 0.5 Hz signal at output 4b is fed, again after suitable

amplification and shaping, to series connected counters 6 and 8 which together perform a division by 30 x 60 x 24 to reduce the 0.5 Hz signal to one pulse per day.

The one pulse per day signal from the clock 2 is supplied to a day counter 10 which performs a division by 7, and to a date counter 12 which can be programmed by month length selector 14 to divide by 28, 29, 30 or 31. The date counter 12 is arranged to drive a date display (not shown) through decoders 16 and, in addition, provides a one pulse per month signal to month counter 18 and to start of month store 20. The one pulse per month signal is used to update the start of month store 20 with the prevailing state of day counter 10 so that store 20 always holds the day of the week corresponding to the first day of the month.

Month counter 18 performs a division by 12 to generate a one pulse per year signal which is counted by year counter 22. This counter 22 drives a year display (not shown) through decoders 24. The month counter 18 also drives a 1 of 12 decoder 26 which in turn drives a month display 28, and provides month length selector 14 with the correct month of the year. The month length selector 14 also requires information as to whether the year is a leap year and this information is provided by a leap year detector 30 driven from the year counter 22. The

leap year detector 30 functions by separating the year number into a century number and a year number in the century. A leap year will be detected if the year number in the century is divisible by four and - in the case where the year number in the centure is zero - if the century number is divisible by four. This check for divisibility by four can be performed quite simply.

It will be appreciated that the portion of the circuit so far described is effective to provide calendar information in the form of the week day corresponding with the first day of the month at the output 20a of start of month store 20, and the number of days, 28, 29, 30 or 31, in the month at output 14a of the month length selector 14. The manner in which this calendar information is used to provide a calendar display will now be described.

The display portion of the circuit includes thirteen columns each carrying four numerals and each comprising a single liquid crystal display (LCD). With the exception of the numerals 29, 30 and 31 which because of variations in month length have to be treated separately, the thirteen four numeral columns represent all possible columns appearing in the conventional calendar arrangement. Separate LCD's carrying the numerals 29, 30 and 31 are positioned at the foot of the 1 8 15 22, 2 9 16 23 and

3 10 17 24 columns respectively. This follows the ordering of the remainder of the array. The additional 30 and 31 LCD's that are required to complete the array are, however, positioned at the top rather than at the foot of the appropriate columns 2 9 16 23 and 3 10 17 24 to avoid extending the array into six rows. This is a common practice in printed calendars.

Each LCD, that is to say each of the thirteen four numeral LCD's and the five single numeral LCD's, comprises a layer of liquid crystal sandwiched between front and back plate electrodes. The application of a potential difference between these electrodes causes a change in optical state of the liquid crystal and results in the display of the numeral or numerals carried by the device. In practice the LCD's of the display share a common wafer of liquid crystal and a common back plate; the separate LCD's being delimited by the dimensions of the front plate in each case.

The common back plate of the LCD's is supplied with the square wave voltage signal X provided by the clock circuit 2. Each front plate is driven, as will be described in more detail hereinafter, through an exclusive-OR gate one input of which also receives the square wave X. It will be appreciated that if the remaining input to the exclusive-OR gate is held at logic 1, the output of the

leap year detector 30 functions by separating the year number into a century number and a year number in the century. A leap year will be detected if the year number in the century is divisible by four and - in the case where the year number in the centure is zero - if the century number is divisible by four. This check for divisibility by four can be performed quite simply.

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Each LCD, that is to say each of the thirteen four numeral LCD's and the five single numeral LCD's, comprises a layer of liquid crystal sandwiched between front and back plate electrodes. The application of a potential difference between these electrodes causes a change in optical state of the liquid crystal and results in the display of the numeral or numerals carried by the device. In practice the LCD's of the display share a common wafer of liquid crystal and a common back plate; the separate LCD's being delimited by the dimensions of the front plate in each case.

The common back plate of the LCD's is supplied with the square wave voltage signal X provided by the clock circuit 2. Each front plate is driven, as will be described in more detail hereinafter, through an exclusive-OR gate one input of which also receives the square wave X. It will be appreciated that if the remaining input to the exclusive-OR gate is held at logic 1, the output of the

exclusive-OR gate, and thus the voltage at the front plate of the LCD, will be $\overline{X}$. Since the voltages at the front and back plates are then equal but out of phase, the liquid crystal will "see" a resulting potential difference and the corresponding numeral or numerals will be displayed. Conversely, if the second input of the exclusive-OR gate is held at logic 0, the front and back plate voltages will be equal and in phase and there will be no resultant potential difference across the liquid crystal. This method of driving liquid crystal devices is described and claimed in British Patent No. 1398237, but, whilst it has particular advantages and is preferred for use in the circuit according to this invention, the method forms no essential part of the invention.

The binary signal at output 20a representing the day of the week corresponding with the start of the month, is supplied to a BCD to decimal decoder 50. The truth table for this decoder is as follows:-

TRUTH TABLE I

Start of Month	Output 20a	Decoder 50 A	B	C	D	E	F
Sunday	000	0	0	0	0	0	0
Monday	001	0	0	0	0	0	1
Tuesday	010	0	0	0	0	1	0
Wednesday	011	0	0	0	1	0	0
Thursday	100	0	0	1	0	0	0
Friday	101	0	1	0	0	0	0
Saturday	110	1	0	0	0	0	0

The six outputs of decoder 50 are taken to respective exclusive OR gates 52a to 52f. The first gate 52a receives as its second input the square wave X, the remaining gates each having the output of the preceding gate as their second input. The outputs of gates 52a to 52f are connected respectively to the front plates of the LCD's forming the first six columns of the display. For convenience, the columns will be referred to as column 1, column 2 etc according to their positions from left to right as shown in Figure 1. It will then be understood that the output of gate 52a is connected to column 1, the output of gate 52b to column 2 and so on up to gate 52f, the output of which is connected to column 6. In addition, the first six columns are respectively connected through NOT gates 54 with the last six columns, column 1 being connected with column 8 and so on.

A further series of exclusive OR gates 56p to 56u each receive as one input the square wave X. The second inputs of the first five gates 56p to 56t are respectively connected with outputs B to F of decoder 50. Gate 56u is continuously supplied with logic level 1 at its second input. The outputs of the first five gates 56p to 56t are used to control five of the seven LCD's 58 which provide the days of the week display. These week day display LCD's each bear the identical legend

S M T W T F S but are staggered so as to align with respective sets of seven consecutive columns. The uppermost week day display is connected in parallel with column 1, the next following five displays are connected respectively with outputs of gates 56p to 56t, whilst the lowermost week day display is connected in parallel with column 13. The output of gate 56u is connected with column 7 which, it will be noted, is not connected with any of the gates 52a to 52f or with any NOT gates 54.

The gates 52a to 52f serve the function of exclusive OR gates driving LCD's as described above. The interconnection of the gates, rather than the separate connection of each gate with its associated LCD enables the selection of seven consecutive columns without the need for any further logic circuitry save the NOT gates 54. The output states of the exclusive OR gates 52a to 52f can best be illustrated in a truth table.

TRUTH TABLE II

Decoder 10						o/p of exclusive OR gates 52					
A	B	C	D	E	F	a	b	c	d	e	f
0	0	0	0	0	0	X	X	X	X	X	X
0	0	0	0	0	1	X	X	X	X	X	$\overline{X}$
0	0	0	0	1	0	X	X	X	X	$\overline{X}$	$\overline{X}$
0	0	0	1	0	0	X	X	X	$\overline{X}$	$\overline{X}$	$\overline{X}$
0	0	1	0	0	0	X	X	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$
0	1	0	0	0	0	X	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$
1	0	0	0	0	0	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$

It will be noted that the effect of a logic 1 signal on any of the decoder outputs A to F is the inversion of the square wave at the output of not only the associated gate 52 but also those gates subsequent to the associated gate. It will be remembered that a particular column is displayed only when the front plate is supplied with $\overline{X}$ or the out of phase square wave and that columns 8 to 13 receive the inverse of the voltage supplied to columns 1 to 6 respectively. Since gate 56a receives the inputs A and 1, the output will remain $\overline{X}$ and column 7 will be displayed continuously. With these observations in mind, the selection of columns for display in accordance with the state of month store 20 can be understood from the following truth table, with 1 designating a display of a column and 0 designating no display:-

TRUTH TABLE III

Start of Month	Decoder 10 A	B	C	D	E	F	LCD Columns 1	2	3	4	5	6	7	8	9	10	11	12	13
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Monday	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0
Tuesday	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0
Wednesday	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0
Thursday	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0
Friday	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0
Saturday	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0

It can readily be seen from inspection of Figure 1 that the correct calendar displays (neglecting for the moment dates 29, 30 and 31) are in this way generated. Thus, to take the example of a month in which Wednesday is the first day, columns 4 to 10 inclusive will be displayed providing the following calendar display:-

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

Since the eventual calendar display can vary in position relative to the complete array provided by the thirteen columns, it is necessary to ensure that the S M T W T F S legend appears in the correct position relative to the array. This is achieved by selecting the appropriate one of the seven week day displays 58. The uppermost display 58 is connected with column 1 and will be selected for display when and only when column 1 is selected for display. Similarly the lowermost display 58 is linked with column 13. For the remaining five week day displays there can clearly be no one-to-one relationship with any of the columns and it is for this reason that gates 56p to 56t are employed. The outputs of these gates will only be $\overline{X}$ - and the associated week day displays thus selected - when the corresponding

output B to F of decoder 50 is at logic 1. It can be seen from Truth Tables I and III that this relationship ensures that the correct week day display is selected.

To complete the display, the 29, 30 and 31 LCD's must be selected for display as appropriate. The information required for performing this selection is the length of the month, which is available at output 14a of the month length selector 14 and also the state (displayed or not displayed) of columns 1 and 2. This latter piece of information is necessary to enable the appropriate one of the two 30 displays and the two 31 displays to be chosen and is conveniently available at outputs A and B of decoder 50. In the following truth table the five single numeral displays are distinguished by the number of the column with which they are aligned.

TRUTH TABLE IV

Month Length				Decoder 50		30	31	29	30	31
28	29	30	31	A	B	1	2	7	8	9
1	0	0	0	1	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	1	0	0	0	1	0	0
0	1	0	0	0	1	0	0	1	0	0
0	1	0	0	0	0	0	0	1	0	0
0	0	1	0	1	0	1	0	1	0	0
0	0	1	0	0	1	0	0	1	1	0
0	0	1	0	0	0	0	0	1	1	0
0	0	0	1	1	0	1	1	1	0	0

Month Length				Decoder 50		30	31	29	30	31
28	29	30	31	A	B	1	2	7	8	9
0	0	0	1	0	1	0	1	1	1	0
0	0	0	1	0	0	0	0	1	1	1

The circuitry required to perform this logic function is straightforward and detailed description is considered unnecessary. It will be understood, however, that each of the single numeral LCD's is driven through an exclusive OR gate in a manner anologous with gates 56p to 56t.

Once set up, usually in the factory, the described circuit will continue to generate the correct calendar display for each month, for as long as it remains in operation. To allow for such contingencies as battery failure, resetting controls can be provided for setting up the correct time and date. Since resetting will be a comparatively rare procedure, these controls can be located internally of the device, though it would be convenient to have an external control providing a summertime adjustment. The internal resetting controls would be similar to those employed in an electronic watch though an additional,

normally redundant, display will be required of the state of the day counter since the state of this counter is not ascertainable from the normal display.

It will be understood that the array of numerals provided by the 13 columns and 5 single numeral LCD's is fixed inasmuch as the individual numerals remain in fixed relationship one to another. The numeral displays can therefore be printed,for example, and do not require to be 7 segment displays as would be the case if the array were a variable array.

In practice, an electronic calendar device according to this invention will normally be combined with an electronic clock. The full display of the combined clock and calendar devices might then comprise the time in hours, minutes, seconds; the date; the month; a summertime indicator; the year and the appropriate month's calendar. If desired, an additional display could be arranged to flash or light up when a particular date, which has been previously set up in memories provided for this purpose, is reached. Such an additional display could serve

as a useful reminder of one or more dates of particular importance.

A modification to the calendar device of Figure 1 is shown in Figure 2. The purpose of this modification is to enable the device to display selected calendars for months both future and past. Figure 2 shows only that part of the device which is responsible for counting clock pulses and providing calendar information for the display decoder. The remainder of the device is identical with that illustrated in Figure 1. Those elements of Figure 2 which correspond with elements of Figure 1 are referenced with the same numerals used in Figure 1 and will not be described in any detail. For a better understanding of the modification, the parts which remain unchanged from the Figure 1 embodiment are enclosed in chain dotted lines.

For advancing the calendar display a switch 60 is arranged, when actuated by push button for example, to replace the one pulse per day clock signal with a 0.5 MHz signal. The forward movement is halted for, say, a half second pause at preselected intervals of a month, a year or a decade. For this purpose an advance movement control

unit 62 counts "monthly" pulses from the date counter and inhibits the forward movement for half a second when the preset count is reached. To ensure that the forward movement is always in multiples of calendar months, the control unit includes dividers by 12 and by 10 so that periods of 12 months and 120 months replace years and decades respectively. In order to select a calendar for a particular month in the future, the user merely presets in control unit 62, by push button for example, intervals of months, years or decades and holds down switch 60 until the desired month is displayed. Memories are provided (but not shown in Figure 2) to store the present date to which the display will return when reset.

Backward movement of the display is not so straightforward since the variable month length prevents direct backward counting. This problem is overcome by moving the display backward in discrete one year steps and then running forward if necessary to the desired month. To set the display back one year it is necessary to decrease the year count by one and to decrease the day and start of month counters by one or two days depending on whether the year which is being retraced includes February 29th. The manner in which this is achieved is shown in flow diagram at the foot of Figure 2.

If neither the present year (and this includes a year reached by a previous backward movement of the display) nor the preceding year are leap years, the result of both operations "is it leap year and in March to December" and "is it leap year and in January and February" will be no and the year counter, day counter and start of month counter will be set back by one. If the present date is later than February 29th in a leap year or if the date one year earlier is before February 29th in a leap year then the result of one of these two operations will be yes and the cycle will include an additional instruction to move the day and start of month counters back one. To permit more rapid backward movement the circuit includes a ten cycle generator which can be brought into operation to move the display back one decade. Once the month that is desired to be displayed has been passed, the backward movement is halted and the display moved forward as described above.

This invention has been described by way of example and a great many variations are possible without departing from the scope of the invention. The described circuitry for providing calendar information from clock pulses could be replaced by other equally suitable arrangements and the manner in which this information is decoded in the Figure 1 embodiment, though particularly advantageous in terms of

component economy, is not the only possibility, as will be evident to the skilled man. The invention merely requires that the decoder select on the basis of the calendar information an appropriate portion of the array for display. The use of 13 individual column LCD's, together with separated LCD's for dates 29, 30 and 31, represents a convenient method of enabling this selection, but it is not the only method. A variable mask could, for example, be positioned over a 13 column array to present only the appropriate 7 columns for display. Similarly a variety of methods for ensuring that the S M T W T F S legend is correctly orientated with the calendar display, could be employed.

As will be appreciated, a good deal of the described circuitry could if preferred be replaced by a suitably designed microprocessor.

CLAIMS

1. An electronic calendar device comprising a fixed array of numerals arranged for the display of selected portions thereof; means adapted to count clock pulses and to generate thereby calendar information and a display driver arranged to select on the basis of the calendar information an appropriate portion of the array for display as a calendar for the month.

2. A device according to Claim 1, wherein the numerals of the array are arranged in thirteen columns or thirteen rows, the portion selected for display by the display driver in a particular month comprising an appropriate seven consecutive columns or rows.

3. A device according to Claim 2, wherein the thirteen columns or rows of the array are carried on respective and separately energisable display devices.

4. A device according to Claim 3, wherein the display driver is arranged to energise the central display device continuously, the first six display devices being connected respectively with the last six display devices through invertors such that when a particular one of the first six display devices is not energised, the corresponding one of the last six display devices is energised.

5. A device according to Claim 4, wherein the display driver comprises decoder means having six outputs connected respectively with the first six display devices and having an input connected to receive as calendar information a signal denoting the day of the week corresponding with the first day of the month, the decoder means

being adapted to provide signals capable of energising the associated display devices at a selected number of outputs thereof which is dependent upon the state of said input signal.

6. A device according to Claim 5, wherein the decoder means comprises a decoder having six outputs and adapted to provide a signal at none or an appropriate one of said outputs in accordance with said input signal, and a chain of exclusive-OR logic gates each having an input connected with a decoder output and an output connected to a different one of the first six display devices, the second input of each succeeding gate being connected with the output of the preceding gate.

7. A device according to any one of the preceding claims, wherein the means adapted to count clock pulses and to generate thereby calendar information, comprises a day counter arranged to receive one pulse per day and to divide by 7; a programmable date counter arranged to receive one pulse per day, to divide by 28, 29, 30 or 31 as programmed and to supply one pulse per month to a month counter; month length selector means driven by said month counter and serving to programme the date counter; and a start of month store adapted on receipt of said month pulse from the programmable date counter to receive and store the content of the day counter, said calendar information comprising the content of the month length selector means and the content of the start of month store.

CLAIMS

1. An electronic calendar device comprising a fixed array of numerals arranged for the display of selected portions thereof; means adapted to count clock pulses and to generate thereby calendar information and a display driver arranged to select on the basis of the calendar information an appropriate portion of the array for display as a calendar for the month.

2. A device according to Claim 1, wherein the numerals of the array are arranged in thirteen columns or thirteen rows, the portion selected for display by the display driver in a particular month comprising an appropriate seven consecutive columns or rows.

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being adapted to provide signals capable of energising the associated display devices at a selected number of outputs thereof which is dependent upon the state of said input signal.

6. A device according to Claim 5, wherein the decoder means comprises a decoder having six outputs and adapted to provide a signal at none or an appropriate one of said outputs in accordance with said input signal, and a chain of exclusive-OR logic gates each having an input connected with a decoder output and an output connected to a different one of the first six display devices, the second input of each succeeding gate being connected with the output of the preceding gate.

7. A device according to any one of the preceding claims, wherein the means adapted to count clock pulses and to generate thereby calendar information, comprises a day counter arranged to receive one pulse per day and to divide by 7; a programmable date counter arranged to receive one pulse per day, to divide by 28, 29, 30 or 31 as programmed and to supply one pulse per month to a month counter; month length selector means driven by said month counter and serving to programme the date counter; and a start of month store adapted on receipt of said month pulse from the programmable date counter to receive and store the content of the day counter, said calendar information comprising the content of the month length selector means and the content of the start of month store.

8. A device according to any one of the preceding claims, wherein the array comprises thirteen four-numeral rows or columns any seven of which can be separately selected for display in dependence upon the day of the week corresponding with the first day of the particular month and separate elements carrying the numerals 29, 30 and 31 and arranged at the end of the appropriate rows or columns, these separate elements being selected for display in dependence upon the length of the particular month.

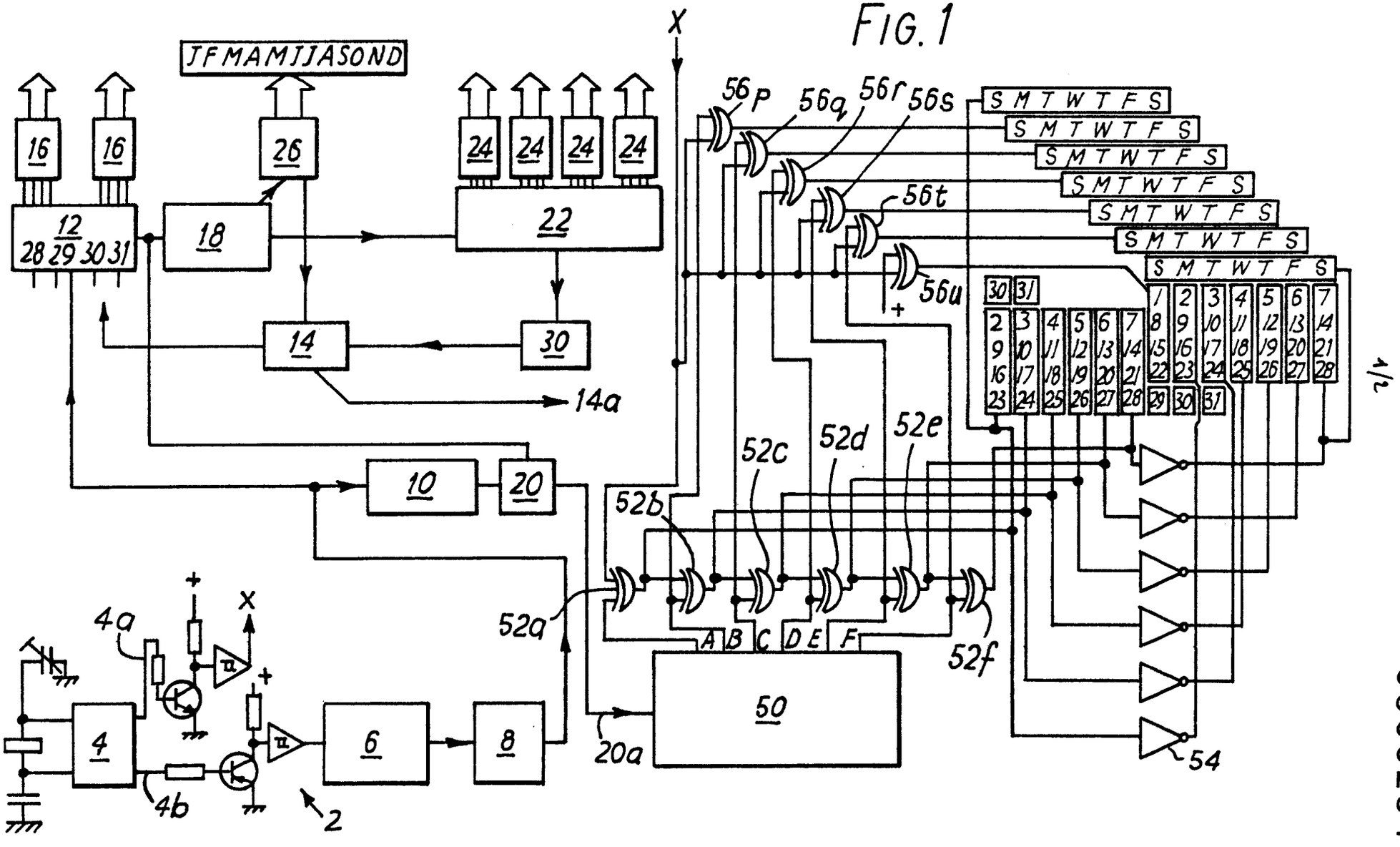
9. A device according to Claim 8, wherein there is one element carrying the numeral 29 and two elements carrying each of the numerals 30 and 31.

10. A device according to any one of the preceding claims, further comprising a plurality of days of the week displays, each such display carrying a fixed legend denoting the days of the week, the display driver serving to select one of the days of the week displays such that the selected display is in alignment with the selected portion of the array of numerals.

11. A device according to any one of the preceding claims, further comprising control means enabling the clock pulses to be replaced for a predetermined interval by a high frequency signal, the device thereby advancing rapidly to provide calendars for selected months in the future.

12. A device according to Claim 11, wherein the control means is further adapted to set back the device a selected number of years whereby, in connection with rapid advancement where necessary over a portion of a year, calendars may be provided for selected months in the past.

FIG. 1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56p
56q
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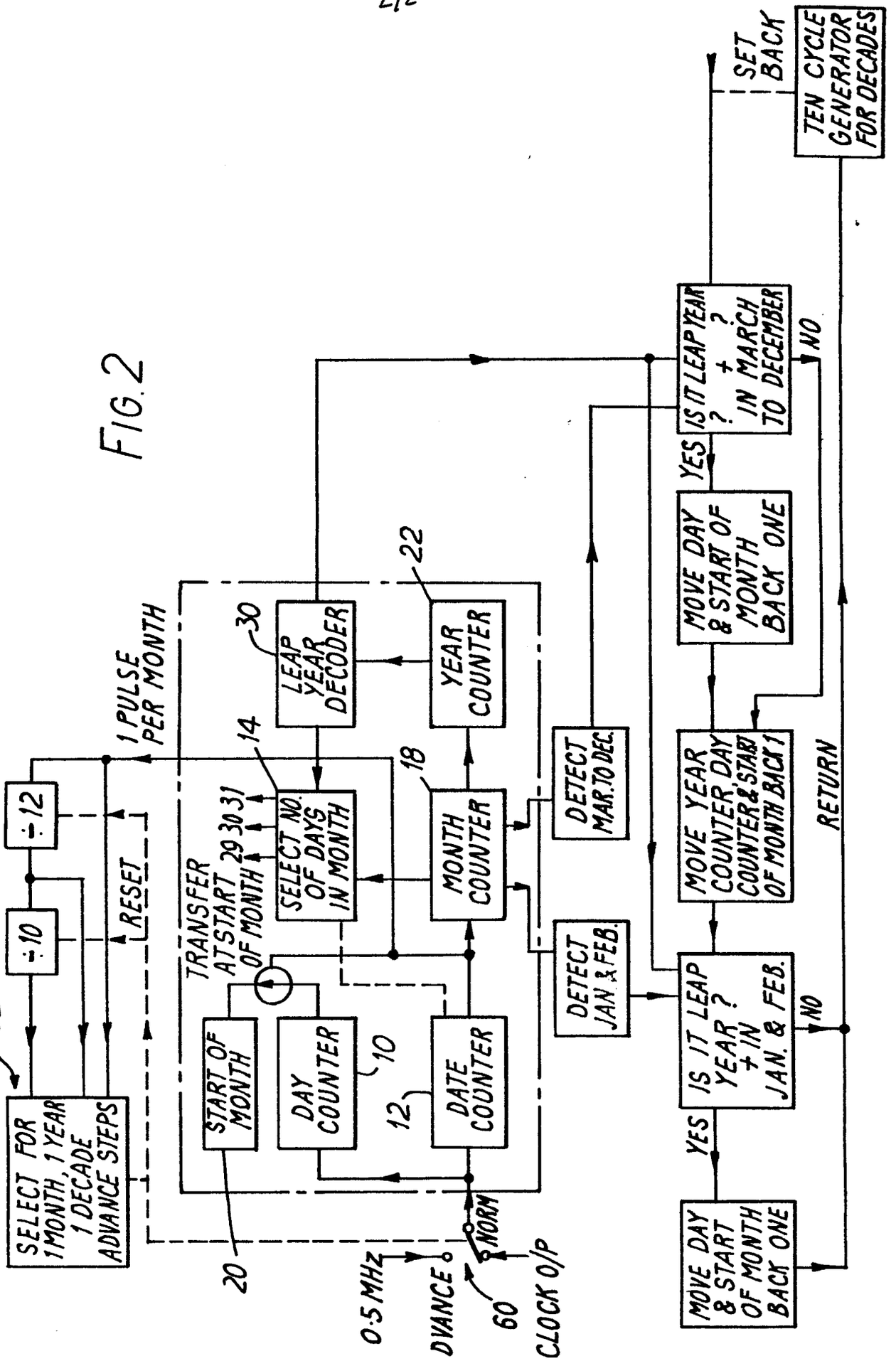
56s
56t
56u
S M T W T F S
52b
52c
52d
52e
52f
A B C D E F
50
20a
52a
54
4a
4
4b
6
8
2
1/2
00082234

FIG. 2


SELECT FOR 1 MONTH, 1 YEAR 1 DECADE ADVANCE STEPS
62
÷ 10
÷ 12
RESET
1 PULSE PER MONTH
TRANSFER AT START OF MONTH
START OF MONTH
DAY COUNTER
10
DATE COUNTER
12
20
SELECT NO. OF DAYS IN MONTH
29 30 31
14
MONTH COUNTER
18
LEAP YEAR DECODER
30
YEAR COUNTER
22
0·5 MHz
ADVANCE
NORM
60
CLOCK O/P
DETECT JAN. & FEB.
DETECT MAR. TO DEC.
IS IT LEAP YEAR ? + IN JAN. & FEB.
NO
YES
MOVE DAY & START OF MONTH BACK ONE
MOVE YEAR COUNTER, DAY COUNTER & START OF MONTH BACK 1
RETURN
IS IT LEAP YEAR ? + MARCH TO DECEMBER
NO
YES
MOVE DAY & START OF MONTH BACK ONE
SET BACK
TEN CYCLE GENERATOR FOR DECADES

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	PATENT ABSTRACTS OF JAPAN, vol. 2, no. 92, July 28, 1978, page 4325E78 & JP - A - 53 57067	1-3,8-10
	US - A - 3 792 541 (R.L. ENGLE) * Claims *	11-12
	FR - A - 2 156 015 (KABUSHIKI KAISHA DAINI SEIKOSHA) * Claims; figures 1-4 * & US - A - 3 797 222	1,7
	US - E - 29 250 (K. TANAKA) * Column 6, line 23 - column 7, line 37; figure 2 * & US - A - 3 738 099	1

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

G 09 D 3/12
G 04 G 9/02

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

G 09 D 3/12
G 04 G 9/02
G 04 G 9/04
9/10
9/12

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26-10-1979	CARDON