

ELECTRONIC TIMER

This invention relates to an electronic timer, and more particularly to an oscillation counting timer for use in a sequence circuit device or the like.

5 There is well known an oscillation counting timer with a multiple time range which includes a pulse generator or oscillator, a frequency divider for receiving a pulse train generated from the pulse generator, and a counter for counting outputs from the frequency divider, dividing factors of the frequency divider being selected for a plurality of time ranges. Such a conventional timer has an operation panel marked with a plurality of time scales in accordance with the respective dividing factors, but has the disadvantages that if a great number of time ranges are required to be performed, the design of the operation panel is complicated with many different time scales and not practical in use.

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It is, therefore, a primary object of this invention to provide an electronic timer with a multiple time range in which a time scale on an operation panel is used in common for a plurality of time scales.

20 It is a further object of this invention to provide an electronic timer having a plurality of time ranges which can be externally selected with ease.

According to this invention, we _____
propose an electronic timer comprising an oscillator, a pair
of first and second factor selecting means each adjustable
externally of the timer for each determining a selecting
5 signal, frequency dividing means for dividing the output of
factors, and a pair of selecting means to each of which a
different one of the selecting signals can be applied for
respectively selecting a first divided output corresponding to
the first factor and a second divided output corresponding to
10 the second factor from the frequency dividing means via the
selecting means.

An embodiment of this invention is described by way of
example and with reference to the drawings, in which:

Fig. 1 is a block diagram of an electronic timer according to this invention;

Fig. 2 is a block diagram of a frequency divider for use in the timer of Fig. 1;

5 Fig. 3 is a front elevational view of the timer of Fig. 1;

Fig. 4 shows a time scale plate for mounting on the timer of Fig. 1;

10 Figs. 5 and 6 are partial perspective views showing an alternative timer, the time ranges of which are preset by a pair of key switches or a pair of angularly movable switches; and

Fig. 7 is a block diagram showing a multiplexer for use in the frequency divider of Fig. 2.

Referring to Fig. 1, there is shown an oscillation counting timer according to this invention, which includes
15 an oscillator 1 for generating outputs or a pulse train, a frequency divider 2 for dividing the frequency of a pulse train, a counter 3 which on counting a predetermined number of outputs of the divider 2 generates an output, an output circuit 4 which in response to the output from the counter 3
20 switches a load (not shown) connected thereto, a reset circuit 5, and a pair of time range setting switches 90 and 91 for each selecting one of a pair of dividing

factors of the divider 2. In Fig. 2 there is illustrated in detail the frequency divider 2 having an input terminal 6 connected to the oscillator 1 and an output terminal 7 connected to the counter 3. The frequency divider 2 consists of dividing circuits 12, 13 and 14 with the respective dividing factors $1/2$, $1/5$ and $1/2$, a multiplexer 15 for selecting one of signals divided by the factors $1/1$, $1/2$, $1/10$ and $1/20$ in accordance with a logic input applied to input terminals 8 and 9, dividing circuits 16, 17 and 18 with the respective dividing factors $1/60$, $1/60$ and $1/24$, and a multiplexer 19 for selecting one of signals divided by the factors $1/1$, $1/60$, $1/(60 \times 60)$ and $1/(60 \times 60 \times 24)$ in accordance with a logic input applied to input terminals 10 and 11. In Fig. 7 the multiplexer 15 is exemplarily illustrated in detail, which includes AND-gates 51 to 54, an OR-gate 55, and inverters 56 and 57. If both input terminals 15f and 15g are at low levels, a signal at terminal 15a appears at output terminal 15e. If the terminals 15f and 15g are at low and high levels, respectively, a signal at terminal 15b appears at the terminal 15e. Thus, by applying a high or low signal to the input terminals 15f and 15g, one of input signals at the terminals 15a to 15d is selected to appear at the terminal 15e. The multiplexer 19 employs the same circuit as that of Fig, 7, and by applying a high or low signal to input terminals 10 and 11, one of signals at terminals 19a to 19d is selected to appear at terminal 7. The outputs from the oscillator 1 are applied to the

respective terminals 15a, 15b, 15c and 15d with the dividing factors of 1/1, 1/2, 1/(2 x 5) and 1/(2 x 5 x 2), so that in accordance with the logic signals at the terminals 8 and 9, the multiplexer 15 selects a multiplying factor of a time range of the timer. The outputs from the multiplexer 15 are applied to the respective terminals 19a, 19b, 19c and 19d with the dividing factors of 1/1, 1/60, 1/(60 x 60) and 1/(60 x 60 x 24), so that in accordance with the logic signals at the terminals 10 and 11, the multiplexer 19 selects a time unit of a time range of the timer. The time range setting switch 90 is coupled to the terminals 8 and 9 to select a multiplying factor, and the switch 91 is coupled to the terminals 10 and 11 to select a time unit.

Thus, the timer of Fig. 1 performs the sixteen time ranges as shown in the following table:

TABLE 1

Y	X	0.5	1	5	10
		(8=L 9=L)	(8=L 9=H)	(8=H 9=L)	(8=H 9=H)
SEC (10=L 11=L)		0.5 sec	1 sec	5 sec	10 sec
MIN (10=L 11=H)		0.5 min (30 sec)	1 min	5 min	10 min
HOURL (10=H 11=L)		0.5 hour (30 min)	1 hour	5 hour	10 hour
DAY (10=H 11=H)		0.5 day (12 hour)	1 day	5 day	10 day

X: Multiple Factor Y: Time Unit

In TABLE 1, the numerals "8" and "9" in the first row

and the numerals "10" and "11" in the first column represent terminals 8 and 9 and terminals 10 and 11 of Fig. 2, and "L" and "H" represent a low level signal and a high level signal applied to the respective terminals 8 to 11. For instance,
5 if the terminals 8 and 10 are supplied with a low level signal and the terminals 9 and 11 are supplied with a high level signal, the timer of Fig. 1 is set into the time range of 1 minute.

Fig. 3 is a front view of an operation panel of the
10 timer, which includes a window 21 for displaying a time multiplying factor ("5" in Fig. 3) and a window 22 for displaying a time unit ("sec" in Fig. 3). Thus, simply by changing the time multiplying factor and time unit in the windows 21 and 22, the time scale on the operation panel can
15 be used in common for the sixteen time ranges in TABLE 1. In Fig. 4 there is shown a time scale plate 40 for mounting the panel in Fig. 3 which is used in common for the sixteen time ranges.

In Fig. 5 there are shown setting keys 23 and 24 for use
20 with range setting switches 90 and 91. The setting keys 23 and 24 each correspond respectively to a multiplying factor and a time unit as listed in TABLE 1, and are marked with respective multiplying factors and time units. Moreover, they have distinct configurations of inserting portions (23a, 24a)
25 to specify their multiplying factors or time units. If the setting keys 23 and 24 are inserted respectively into each window 21, 22, their inserting portions 23a and 24a actuate the

1 respective switches 90 and 91 which are installed inside the
 windows 21 and 22 so that predetermined logic signals
 corresponding to the respective set keys 23 and 24 may be
 applied to the terminals 8 to 11.

5 Alternatively, the time range setting switches 90 and 91
 may employ a pair of angularly movable switches (31) and
 angularly movable indication disks (30) fixed to angularly
 movable shafts (31a) of the angularly movable switches (31)
 as shown in Fig. 6. The angularly movable switches (31) are
10 installed inside the windows 21 and 22. The angularly movable
 shafts (31a) of the switches are adapted to be angularly
 movable externally by a driver 34 so as to select a multiplying
 factor and a time unit for indication in the windows 21 and 22
 and for application of predetermined logic signals to the
15 terminals 8 to 11.

 Thus, the electronic timer according to this invention
 includes a pair of selecting circuits for selecting a time
 multiplying factor and a time unit, and a pair of switches
 for determining a logic signal as a selecting signal to be
20 applied to the selecting circuits, so that a single time
 scale plate on an operation panel of the timer can be used
 for a great number of time ranges in common.

 It should be understood that the above description is
 merely illustrative of this invention and that many changes
25 and modifications may be made by those skilled in the art
 without departing from the scope of the appended claims.

CLAIMS:

1. An electronic timer comprising an oscillator, a pair of first and second factor selecting means each adjustable externally of the timer for each determining a selecting
5 signal, frequency dividing means for dividing the output from the oscillator by a plurality of factors, and a pair of selecting means to each of which a different one of the selecting signals can be applied for respectively selecting a first divided output corresponding to the first
10 factor and a second divided output corresponding to the second factor from the frequency dividing means via the selecting means.
2. An electronic timer according to claim 1, wherein the first factor is a preselected time scale multiplication
15 factor and the second factor is a preselected time unit.
3. An electronic timer according to claim 1 or claim 2, wherein the selecting means each comprise a multiplexer.
4. An electronic timer according to claim 1, 2 or 3, wherein the first and second factor selecting means each
20 comprise a setting key having an inserting portion the configuration of which corresponds to respectively the multiplying factor and the time unit.
5. An electric timer according to claim 1, 2 or 3, wherein the first and second factor selecting means each



comprise an angularly movable switch, the angularly disposition of which determine respectively the multiplying factor and the time unit.

6. An electronic timer constructed and arranged as herein
5 described with reference to and as illustrated in any of
Figures 1 to 5 and 7 of the drawings.

7. An electronic timer constructed and arranged as herein
described with reference to and as illustrated in any of
Figures 1 to 4, 6 and 7 of the drawings.

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