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Cuevas et al.

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[54] **BINARY CLOCK**

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[52] **U.S. Cl.** ..... **58/50 R,** 58/127 R

[51] **Int. Cl.** **G04b 19/30**

[58] **Field of Search** ..... 58/23 R, 50 R, 127 R; 340/309.1–309.5

[56] **References Cited**

UNITED STATES PATENTS

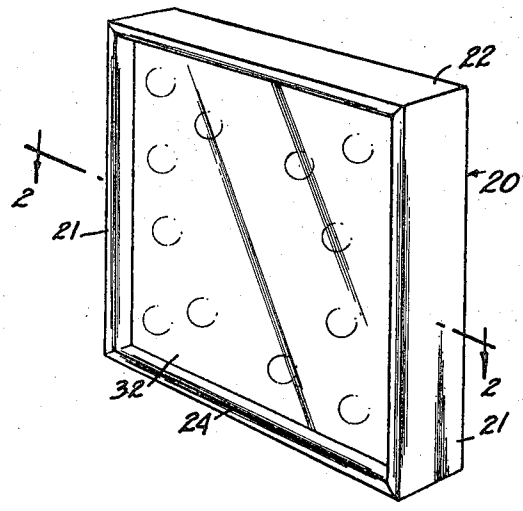
3,410,082	11/1968	Taylor et al.	58/23 R X
3,509,715	5/1970	De Koster	58/50 R
3,574,992	4/1971	Ladas	58/50 R
3,613,352	10/1971	Giersiepe	58/39.5
3,672,155	6/1972	Bergey et al.	58/85.5 X

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Edith Simmons Jackmon
Attorney, Agent, or Firm—B. J. Powell

[57] **ABSTRACT**

A binary clock including a housing mounting a first ordered array of light sources for indicating the hour of the day according to a binary numbering system; a second ordered array of light sources for indicating the 5 minute interval of the hour of the first array according to the binary numbering system; a third ordered array of light sources for indicating the minute within the 5 minute interval of the second array; and control means for selectively illuminating the first, second, and third arrays to indicate the time of day. The housing includes a mounting board on which the light sources of the first, second and third arrays are carried; a translucent masking member in front of the light sources to prevent viewing thereof until they are illuminated; side members carrying the mounting board and masking member and serving in conjunction with the mounting board and masking member to enclose the light sources; and a light absorbing covering within the enclosure except on the masking member.

4 Claims, 4 Drawing Figures



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SHEET 1 OF 2

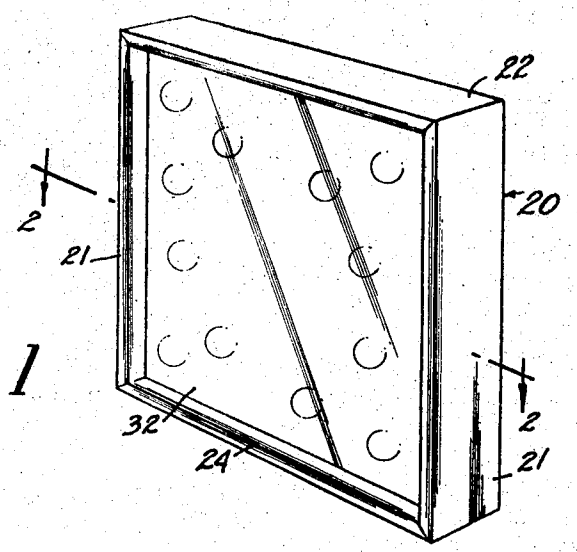


Fig 1

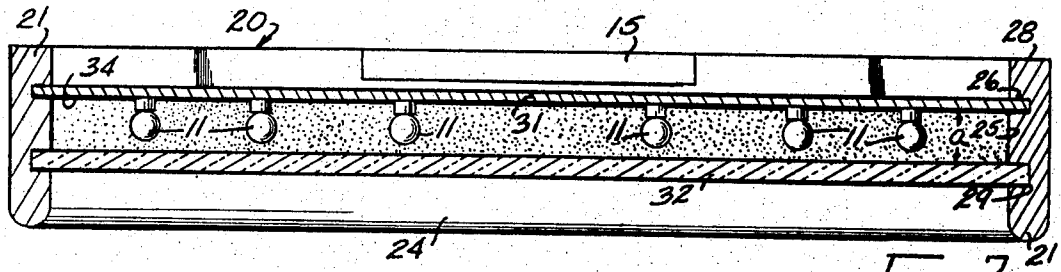


Fig 2

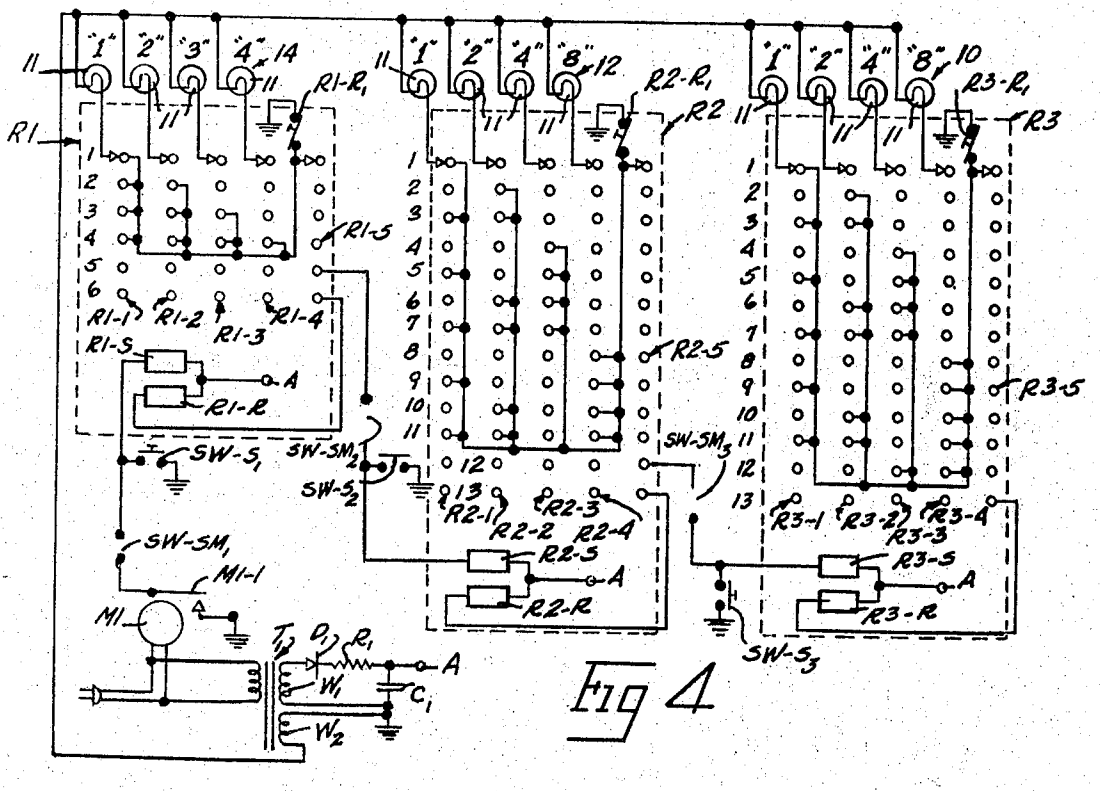


Fig 4

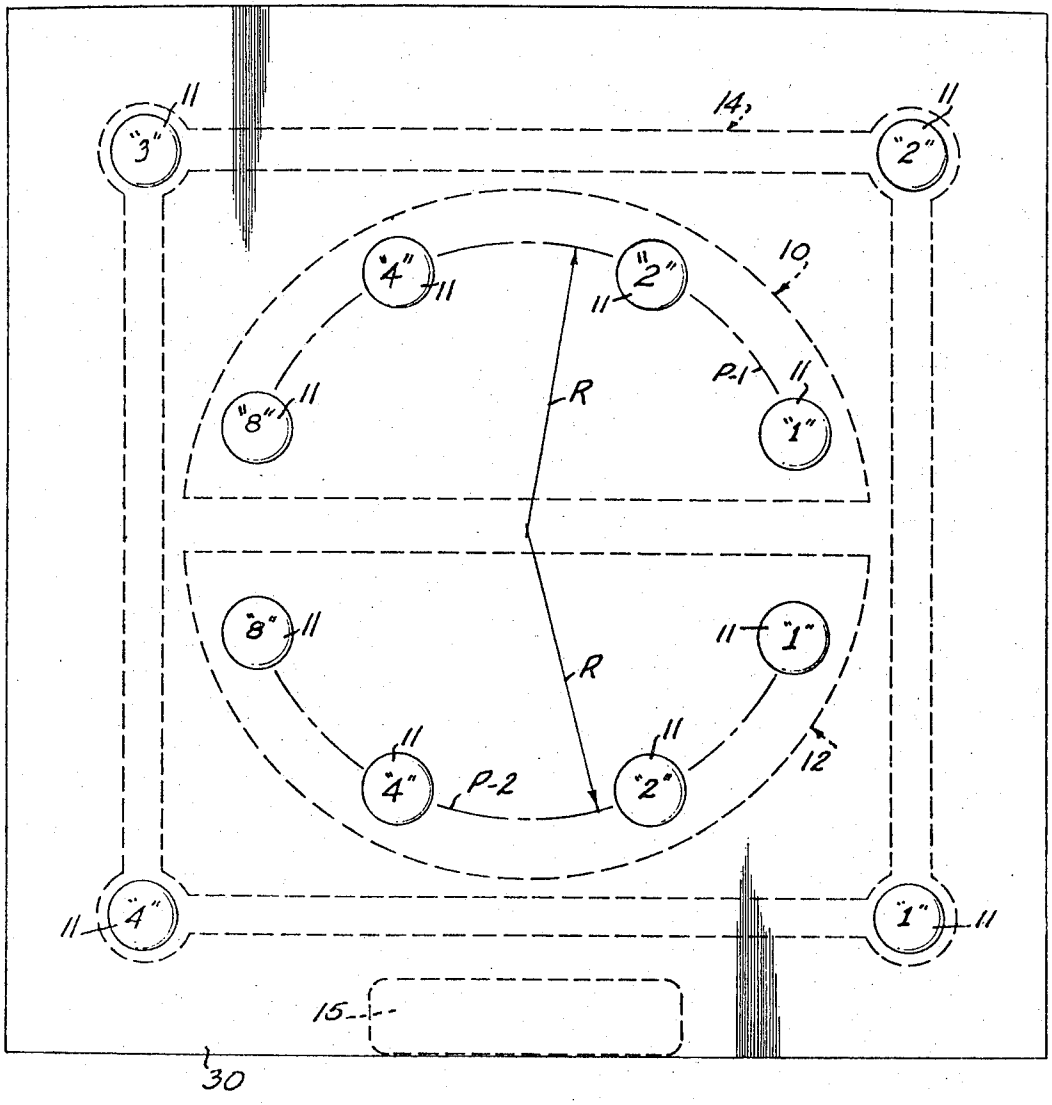


Fig 3

BINARY CLOCK

BACKGROUND OF THE INVENTION

Many time measuring devices are available on the market today. Because of the number of such devices available, there has been a tendency to standardize same as to the arrangement of the time readout provisions thereof. One such arrangement is the dial clock with the numbers thereon arranged in a circle about the dial and another arrangement uses a numerical display. Because of the standardization of such time measuring devices, bery little artistic uniqueness could be offered to the potential customer for such devics. Moreover, no provision was made with these prior art devices which allowed only the owner to determine the correct time when the time measuring device was visible to other persons.

SUMMARY OF THE INVENTION

These and other problems and disadvantages associated with prior art time measuring devices are overcome by the invention disclosed herein by providing a readout arrangement that can be easily varied to afford each customer an individually unique time measuring device. This flexibility also affords the owner to be the only person viewing same to determine the correct time.

The apparatus of the invention includes a first ordered array of light sources corresponding to a binary numbering system of **1–12,** a second ordered array of light sources corresponding to a binary numbering system of **1–12,** and time control means for selectively illuminating selected lingt sources to indicate the hour and for illuminating selected light sources to indicate the 5 minute interval past the hour. A third array of light sources corresponding to the numbers **1–4** may be provided and illuminated selectively by the time control means to indicate the particular minute within the particular 5 minute interval indicated by the second array of lights. Each of the arrays has four light sources therein.

The method of the invention includes the steps of illuminating a first ordered array of light sources to indicate the hour of the day using a binary numbering system and of illuminating a second ordered array of light sources to indicate the **5** minute interval of the hour of the day. The method may also include the step of illuminating a third ordered array of light sources to indicate the minute within the particular five minute interval indicated by the second array.

These and other features and advantages of the invention disclosed herein will be more fully understood upon consideration of the following detailed description and accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the invention embodied in a wall clock;

FIG. **2** is a cross-sectional view taken along line **2—2** in FIG. **1**;

FIG. **3** is a schematic layout diagram illustrating the light array patterns; and,

FIG. **4** is an electrical schematic drawing of the time control circuit of the invention.

These figures and the following detailed description illustrate specific embodiments of the invention, however, the inventive concept is not limited thereto since it may be embodied in other forms.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Referring to FIG. **3,** the invention includes generally a first array **10** of light sources **11,** a second array **12** of light sources **11,** a third array **14** of light sources **11,** and a time control means **15** for selectively illuminating the light sources **11** in each array.

There are four light sources **11** in the first array **10** and are arranged to correspond to a binary numbering system of **1–12.** Thus, the sources **11** in array **10** correspond to the values "1", "2", "4", and "8" as indicated light sources **11** disclosed are conventional light bulbs, other types of light sources may be used. Likewise the second array **12** has four light sources **11** that correspond to "1", "2", "4", and "8" as indicated on each for a binary numbering system of **1–12.**

The third array **14** also has four light sources **11,** however, they are arranged to correspond to the conventional numbering system of **1–4** as indicated by the values "1", "2", "3", and "4" thereon.

While various arrangements may be used, the invention is shown with the first array **10** arranged along a first arcuate path P–**1** and the array **12** along a second arcuate path P–**2,** both having a radius R. The array **10** is located directly under array **11** so that paths P–**1** and P–**2** form a circle with sources **11** equally spaced therealong. To facilitate reading the display by the light sources **11,** each array **10** and **12** is ordered so that the value of each light source **11** in array **10** increases from the right when reading clockwise in FIG. **3** and the value of each light source **11** in array **12** increases from the right when reading counterclockwise in FIG. **3.** The light sources **11** in the array **14** are also ordered with the value of each increasing from the right lower corner and moving counterclockwise as seen in FIG. **3.** It will also be noted that the array **14** is arranged in a square about the arrays **10** and **12.**

In illustrating the operation of the invention, the time control circuit **15** illuminates the appropriate light sources **11** in array **10** to indicate the hour, the light sources **11** in array **12** to indicate the 5 minute interval past the hour, and the light sources **11** in array **14** to indicate the minute within the 5 minute interval shown by array **12.** For example, to indicate 3:21, the "2" and "1" value light sources **11** in array **10** would bee illuminated to give a total value of three; the "4" value light source **11** in array **12** would be illuminated to indicate the fourth 5 minute interval past the hour or 20 minutes past the hour; and the "1" value light source **11** in array **14** would be illuminated to indicate 1 minute within the 5 minute interval to give a total reading 3:21. To indicate 10:32, the "8" and "2" value light sources **11** in array **10,** the "4" and "2" value light sources **11** in array **12,** and the "1" and "2" value light sources in array **14** would be illuminated.

Referring now to FIGS. **1** and **2,** it will be seen that the arrays **10, 12** and **14** are carried by a housing **20** having a generally square configuration. Housing **20** includes a pair of parallel vertical side members **21** joined at their their ends by a top member **22** and a bottom member **24** to provide an open square frame. The

inside edges **25** of members **21, 22** and **24** are provided with aligned rear recesses **26** parallel to and spaced inwardly of the rear edges **28** of members **21, 22** and **24.** Front recesses **29** are provided on the inside edges **25** parallel to recesses **26** and spaced forwardly thereof by a distance *a*.

A light mounting board **30** is carried in rear recesses **26** and mounts the light sources **11** on the front surface **31** thereof in the aforementioned arrays **10, 12** and **14.** A masking member **32** is carried in front recesses **29** over the light sources **11** with the distance a being sufficient to position member **32** sufficiently forward of board **30** to clear the light sources **11.**

The masking member **32** is constructed of a translucent sheet material effective to substantially prevent the viewer from seeing light sources **11** until they are illuminated. Any of a number of materials may be used for same, however, a commercially available smoked plastic sheet has been found satisfactory.

The front surface **31** of board **30** and those portions of the inside edges **25** of members **21, 22** and **24** may be painted a dark, light absorbing color or coated with a light absorbing material **34** as seen in FIG. **2** to insure that the light sources **11** are not seen until illuminated.

CONTROL CIRCUIT

While various control circuits may be used to operate the invention, the circuit shown in FIG. **4** illustrates an electromechanical version. As seen in the schematic, the minute array **14** of light sources **11** are controlled through a stepping relay **R1,** the 5 minute array **12** of light sources **11** are controlled through the stepping relay **R2,** and the hour array **10** of light sources **11** are controlled through the stepping relay **R3.** Relay **R1** is is a 5 pole, 6 position stepping relay and relays **R2** and **R3** are 5 pole, 13 position stepping relays. The poles of relay **R1** are numbered **R1–1** through **R1–5** and the positions numbered **1–6.** The positions and poles of relays **R2** and **R3** are likewise numbered. Each of the relays **R1, R2** and **R3** have a stepping coil for operating the movable contact of each pole through the positions and a release coil for returning the movable contacts to position **1.** A normally closed set of contacts are operated by each stepping coil. The stepping coils are referenced **R1–S, R2–S,** and **R3–S,** the release coils **R1–R, R2–R** and **R3–R,** and the associated contacts **R1–R, R2–R,** and **R3–R.**

As seen in FIG. **4,** one side of the "1" light **11** of array **14** is connected to the movable contact of pole **R1–1,** one side of the "2" light **11** to the movable contact of pole **R1–2,** one side of the "3" light **11** to the movable contact of pole **R1–3,** and one side of the "4" light **11** to the movable contact of pole **R1–4.** The movable contact of pole **R1–5** is connected to ground through normally closed contacts $R1–R_1$. The fixed contact at positions **1–4** of pole **R1–1,** at positions **2–4** of pole **R1–2,** at positions **3** and **4** of pole **R1–3** and at position **4** of pole **R1–4** are also connected to ground through contacts $R1–R_1$. The fixed contact at position **5** of pole **R1–5** is connected to relay **R2** as will be explained and the fixed contact at position **6** of pole **R1–5** is connected to one side of release coil **R1–R.**

The relays **R1, R2** and **R3** are driven by a **1** rpm synchronous motor **M1** connected to a conventional 115 volt AC power source. A set of contacts **M1–1** are associated with motor **M1** which causes the contacts **M1–1** to be closed momentarily on each revolution of motor **M1.** A power supply circuit **40** is connected to the 115 volt AC power source through a transformer T_1 having a first output winding W_1 and a second output winding W_2. The first output winding W_1 is connected to a rectifier circuit **41** having a diode D_1, a resistor R_1 and a capacitor C_1. The hot output A of circuit **41** is connected to the hot sides of each of the stepping coils and release coils of relays **R1, R2** and **R3** and is shown as 48 volts DC. The second winding W_2 is connected to one side of each of the lights **11** in arrays **10, 12** and **14.**

The ground side of stepping coil **R1–S** is connected to ground through a normally closed set mode toggle switch $SW–SM_1$ and contacts **M1–1** of motor **M1.** The ground side of coil **R1–S** is also connected to ground through normally open pushbutton set switch **SW–S.**

The "1", "2", "4" and "8" value light **11** of the 5 minute array **12** are connected respectively to the movable contacts of poles **R2–1, R2–2, R2–3** and **R2–4** of relay **R2** with the movable contact of pole **R2–5** connected to ground through normally closed contacts $R2–R_1$. The fixed contacts at positions **1, 3, 5, 7, 9** and **11** of pole **R2–1;** at positions **2, 3, 6, 7, 10** and **11** of pole **R2–2;** at positions **8–11** of pole **R2–4** are also connected to ground through contacts $R2–R_1$. The fixed contact at position **12** of pole **R2–5** is connected to relay **R3** as will be explained and the fixed contact at position **13** of pole **R2–5** is connected to the ground side of the release coil **R2–R.** The ground side of the stepping coil **R2–S** is connected to the fixed contact at position **5** of pole **R1–5** of relay **R1** through the normally closed set mode toggle switch $SW–SM_2$ and is also connected to ground through the normally open set pushbutton switch $SW–S_2$.

The "1", "2", "4" and "8" value lights **11** of the hour array **10** are connected respectively to the movable contacts of poles **R3–1, R3–2, R3–3** and **R3–4** with the movable contacts of pole **R3–5** connected to ground through the normally closed contacts $R3–R_1$. The fixed contacts at positions **1, 3, 5, 7, 9** and **11** of pole **R3–1;** at positions **2, 3, 6, 7, 10** and **11** of pole **R3–2;** at positions **4–7** and **12** of pole **R3–3;** and at positione **8–12** of pole **R3–4** are also connected to ground through contacts $R3-R_1$. The fixed contact at position **13** of pole **R3–5** is connected to the ground side of release coil **R3–R.** The ground side of stepping coil **R3–S** is connected to the fixed contact at position **12** of pole **R3–5** of relay **R2** through the normally closed set mode toggle switch $SW–SM_3$ and also to ground through the normally open set pushbutton switch $SW–S_3$.

In operation, the relay R_1 is stepped one position each time motor **M1** closes contacts **M1–1.** This causes the appropriate lights **11** of the array **14** to be illuminated to indicate the minute in each 5 minute interval. Once the light **11** is illuminated, it remains illuminated for the remainder of the 5 minute interval. When relay **R1** is stepped to position **5,** it causes relay **R2** to step one position to indicate the next 5 minute interval. When relay **R1** is stepped to position **6,** the release coil **R1–R** is energized to return the movable contacts to their original start position. Likewise when relay **R2** is stepped to position **12,** the relay **R3** is stepped one position to indicate the next hour interval and when it is stepped to position **13,** it is reset. When relay **R3** is stepped to position **13,** it is likewise reset.

To set the clock, set mode switches $SW–SM_1$, $SW–SM_2$ and $SW–SM_3$ are opened to prevent auto-

matic operation of relays R1, R2 and R3. Then set switches SW–S_1, SW–S_2 and SW–S_3 are manually operated to independently step relays R1, R2 and R3 to the desired position. Set mode switches SW–SM_1, SW–SM_2 and SW–SM_3 are then closed so that motor M1 again controls the operation of the relays.

While specific embodiments of the invention have been disclosed herein, it is to be understood that full use may be made of modifications, substitutions and equivalents without departing from the scope of the inventive concept.

What is claimed as invention is:

1. A clock comprising:

an open front enclosure;

a translucent masking member closing the open front of said enclosure which is dark in the absence of illumination therebehind;

a first ordered array of four light sources mounted in said enclosure behind said masking member corresponding to the binary number of 1, 2, 4 and 8;

a second ordered array of four light sources mounted in said enclosure behind said masking member corresponding to the binary numbers of 1, 2, 4, and 8, said first and second arrays separated from each other and located along a common circular path;

a third ordered array of four light sources mounted in said enclosure behind said masking member corresponding to the conventional arabic numbers of 1, 2, 3 and 4, said third array arranged in a square about said first and second arrays; and,

timing means for selectively illuminating said light sources of said first array to indicate the hour by binary numbers in each 12 hour interval of the day, illuminating said light sources of said second array to indicate the 5 minute interval by binary numbers within the hour, and illuminating said light sources of said third array to indicate the minute by arabic numbers within the 5 minute interval.

2. The clock of claim 1 further including set means for selectively setting said timing means to start illuminating said light sources at a prescribed time.

3. The clock of claim 2 wherein said timing means includes a first stepping relay operatively associated with said light sources of said third array, a second stepping relay operatively associated with said light sources of said second array, a third stepping relay operatively associated with said light sources to said first array, and a timer; said third relay operated by said second relay, said second relay operated by said first relay and said first relay operated by said timer to illuminate said light sources; said set means including first switch means for selectively disconnecting said relays from each other and from said timer; and second switch means for independently and manually operating each of said relays to set the clock.

4. A method of indicating time comprising the steps of:

a. selectively illuminating a four light source array corresponding to the binary numbers of 1, 2, 4 and 8 to indicate the hour of the day;

b. selectively illuminating a second four light source array corresponding to the binary numbers 1, 2, 4 and 8 to indicate the particular five minute interval within the hour of the day; and,

c. selectively illuminating a third four light source array arranged according to the arabic numbers 1, 2, 3 and 4 to indicate the particular minute within the five minute interval indicated on said second array.

* * * * *