

[54] **TIMEPIECE INDICATING TIME BY
GENERATED IMAGES IN SETS**

[76] Inventor: **Shunsei Kratomi**, 456 Maegawa,
Kanagawa-ken, Odawara-shi, Japan

[22] Filed: **Dec. 6, 1971**

[21] Appl. No.: **204,845**

[30] **Foreign Application Priority Data**
Dec. 19, 1970 Japan..... 45/108586

[52] U.S. Cl. **58/50 R, 35/39, 340/309.2**

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

[58] **Field of Search** **58/23 R, 50 R, 127 R,
58/148, 152; 35/39; 340/309.2, 309.4, 309.6**

[56] **References Cited**
UNITED STATES PATENTS

3,613,352	10/1971	Giersiepen	58/39.5
3,672,155	6/1972	Bergey et al.	58/50 R
3,574,992	4/1971	Ladas	58/50 R
3,664,116	5/1972	Emerson et al.	58/50 R
533,216	1/1895	Troelltsch	35/32

2,493,138 1/1950 Hathaway 35/39
3,364,599 1/1968 Polsky..... 35/39

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Edith C. Simmons Jackmon
Attorney—Robert D. Flynn, Leonard Holtz et al

[57] **ABSTRACT**

A timepiece wherein at least two sets of images are generated on an indicating panel, the number of images present and belonging to the first set indicating the hourly segments in the designation of the time, and the number of images present and belonging to the other one or two sets of images indicating the minute segments in the designation of the time. The images of each set are identified to the set by figure, color, concept, orientation or by any combination thereof. The images may be generated by means of various known means making use, for example, of lamps, lamps and image-printed transparent film, electroluminescent devices, light emissive diodes liquid crystal cells, or the like.

21 Claims, 19 Drawing Figures

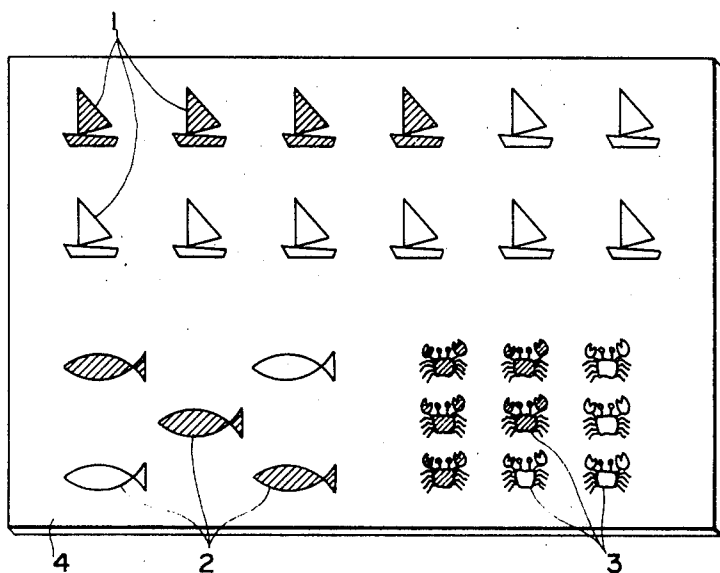


FIG. 1

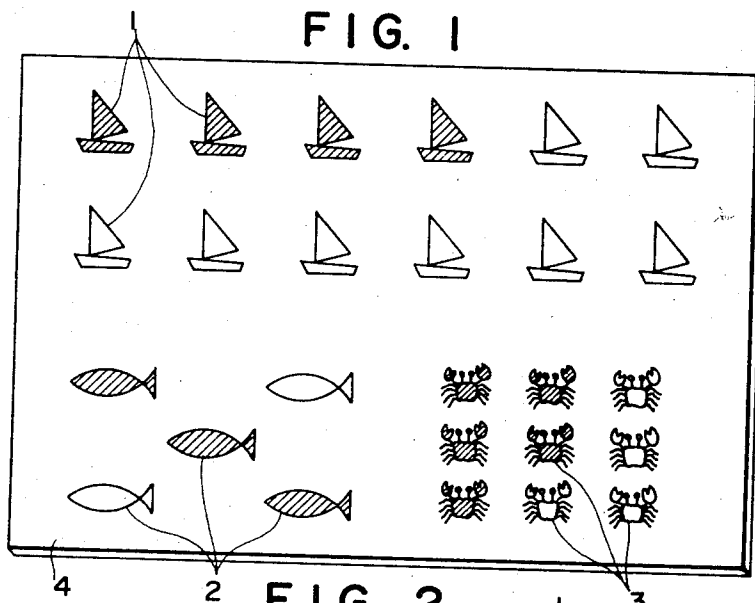


FIG. 2

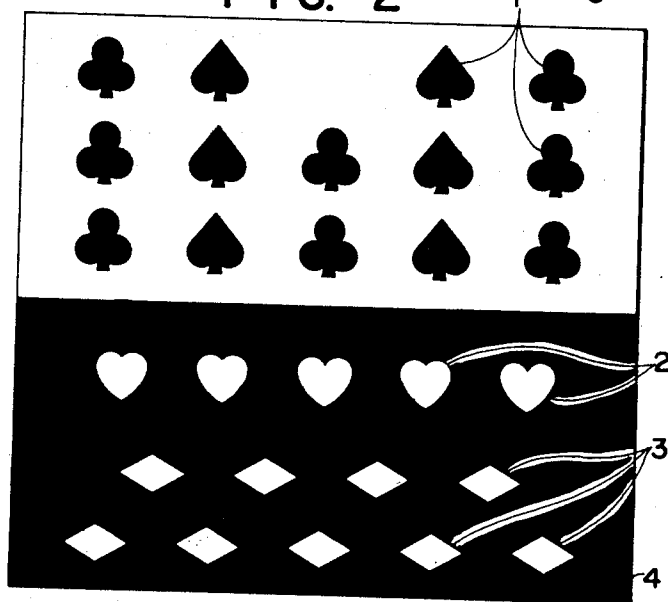


FIG. 3

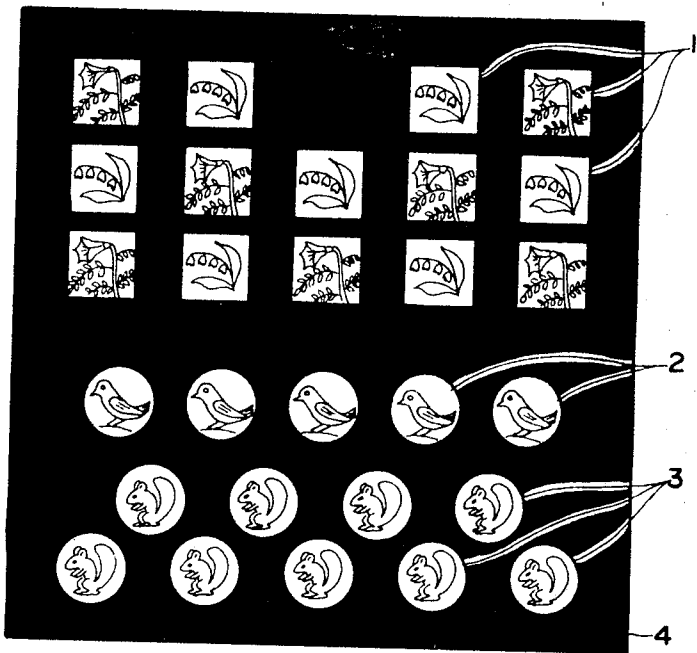


FIG. 4

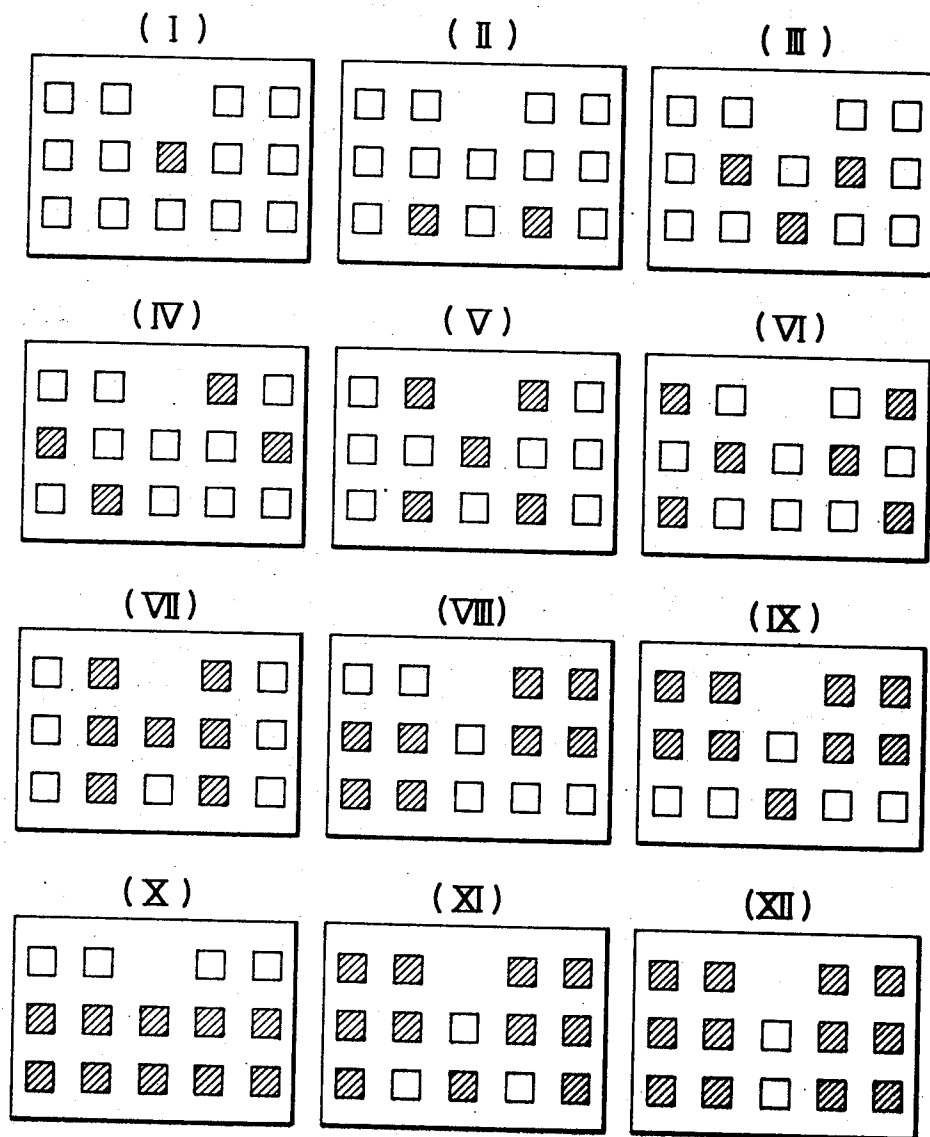


FIG. 5

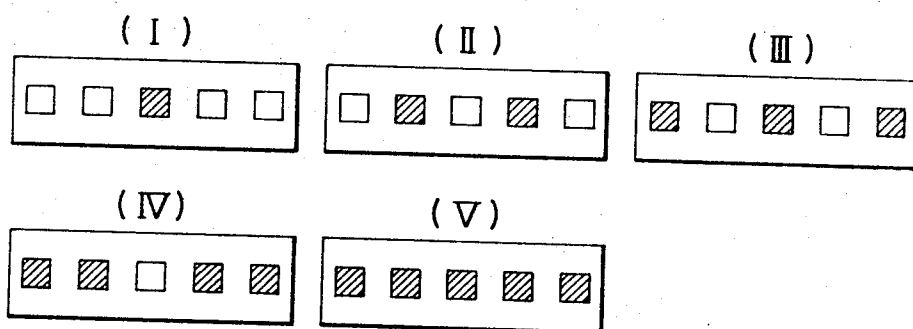


FIG. 6

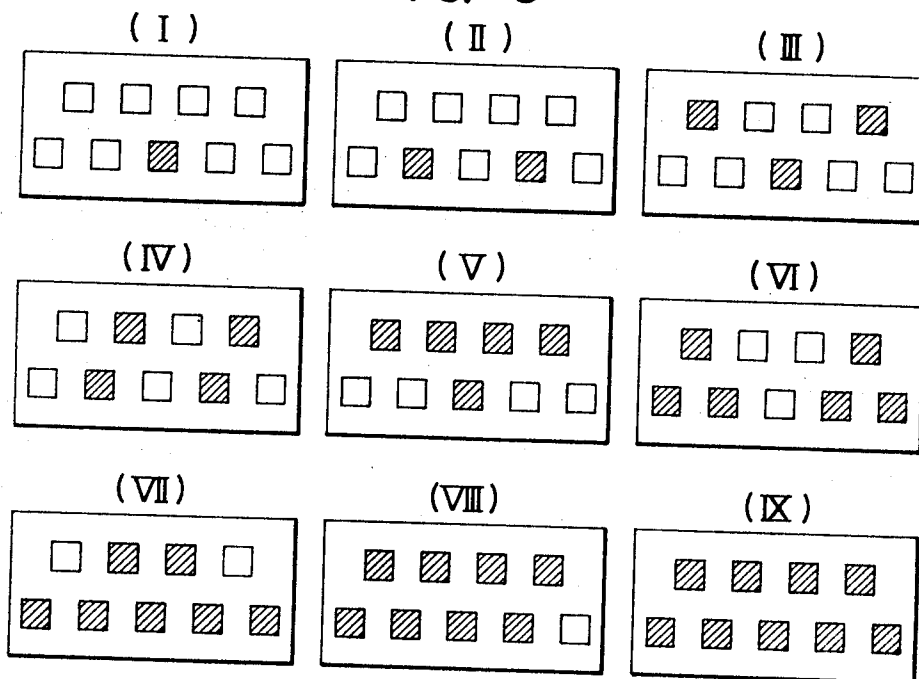


FIG. 7

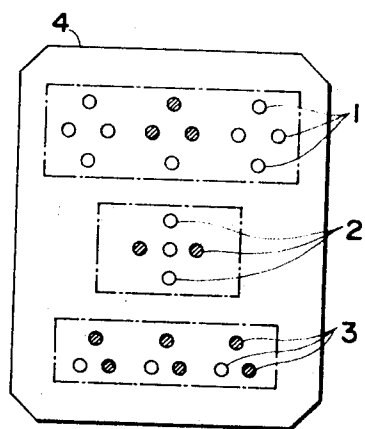


FIG. 8

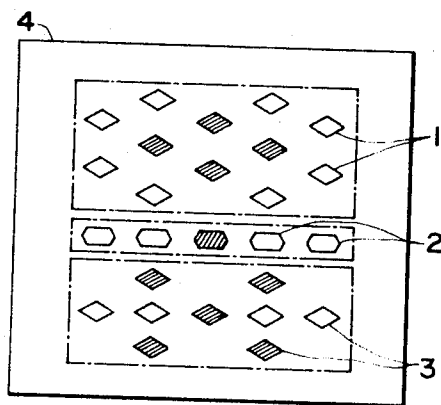


FIG. 9

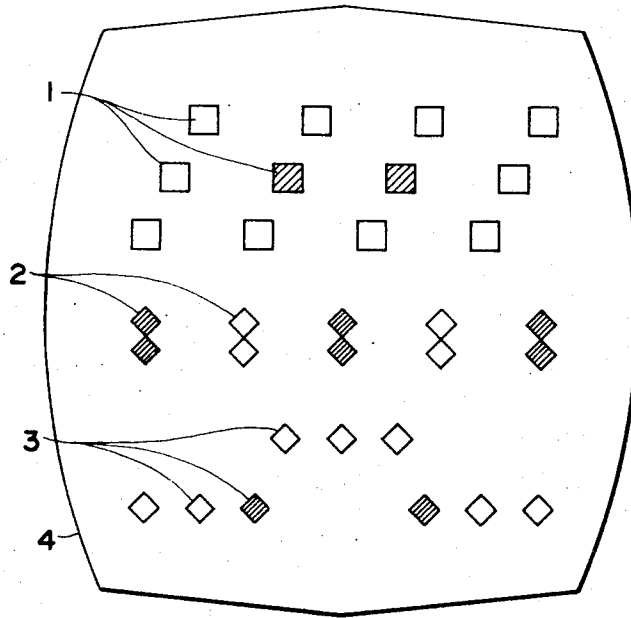


FIG. 10

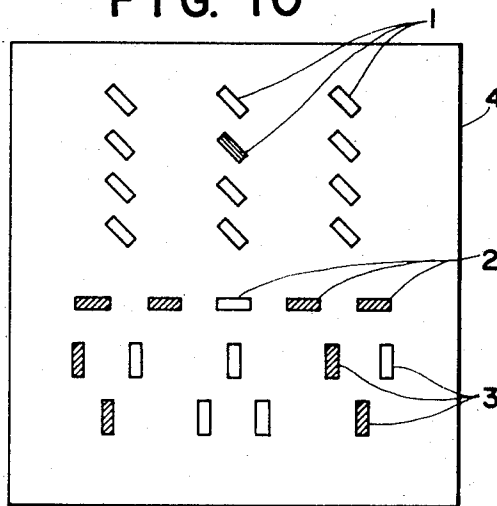


FIG. 11

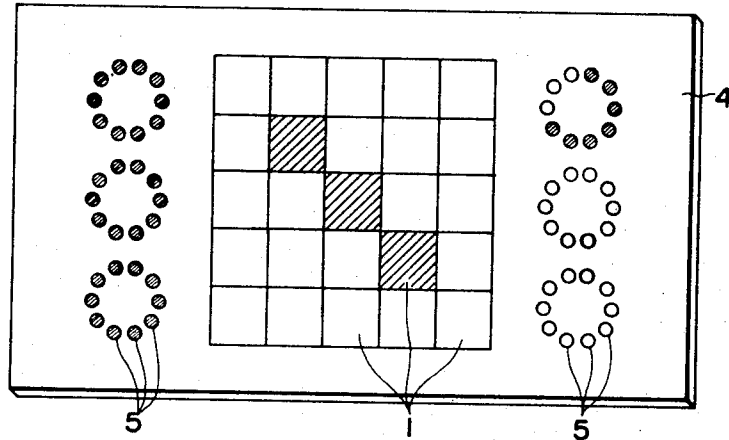


FIG. 12

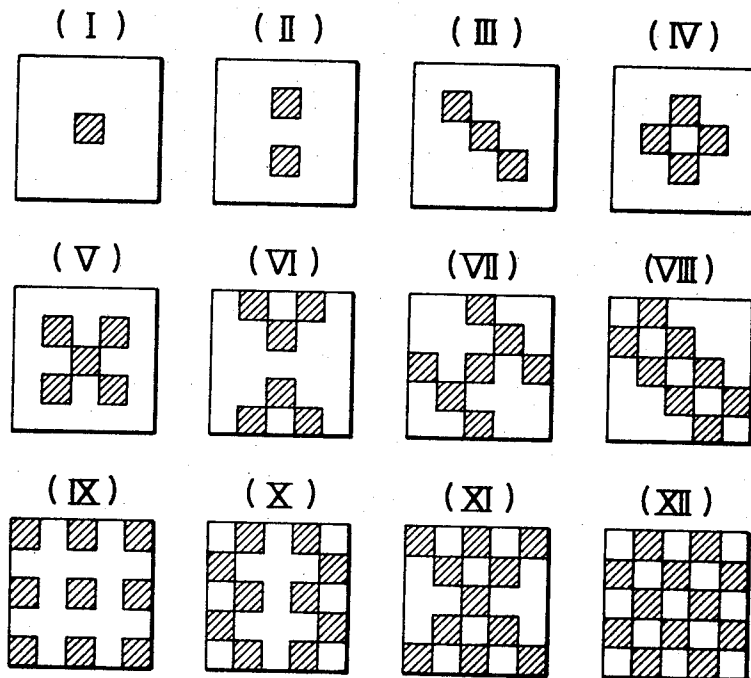


FIG. 13

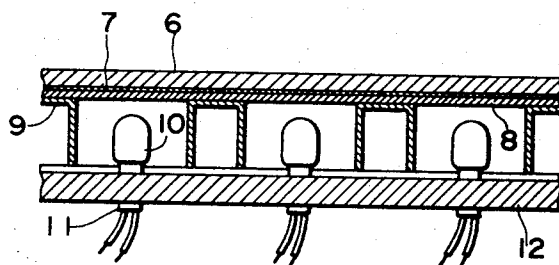


FIG. 14

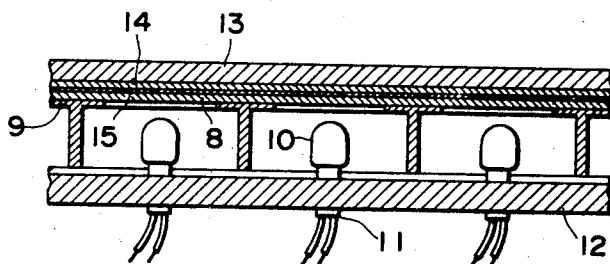


FIG. 15

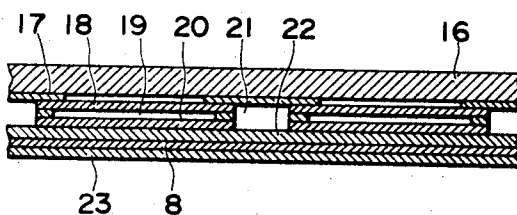


FIG. 16

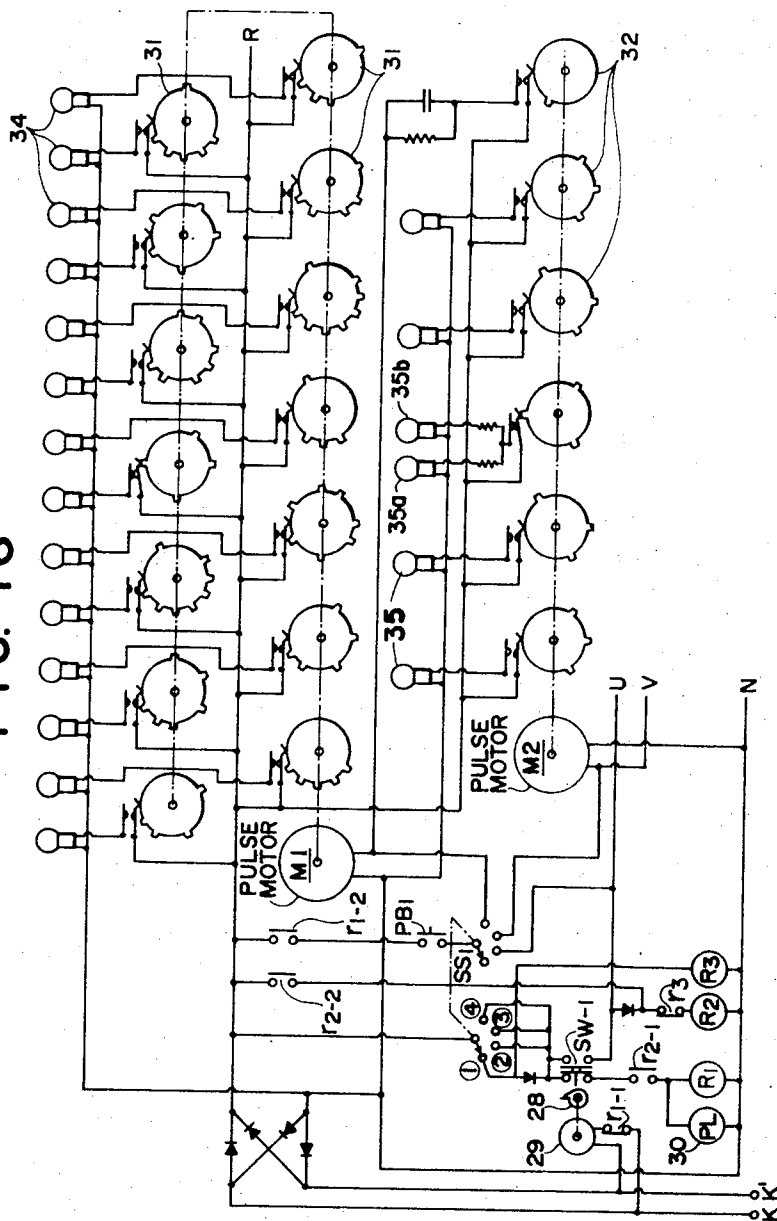


FIG. 17

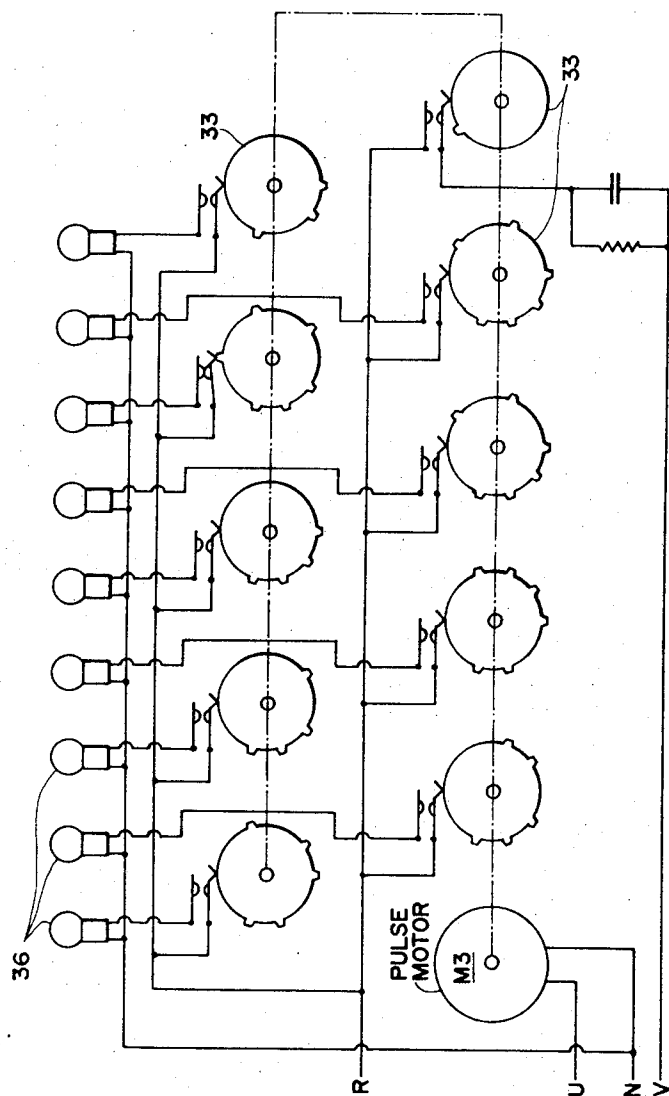


FIG. 18

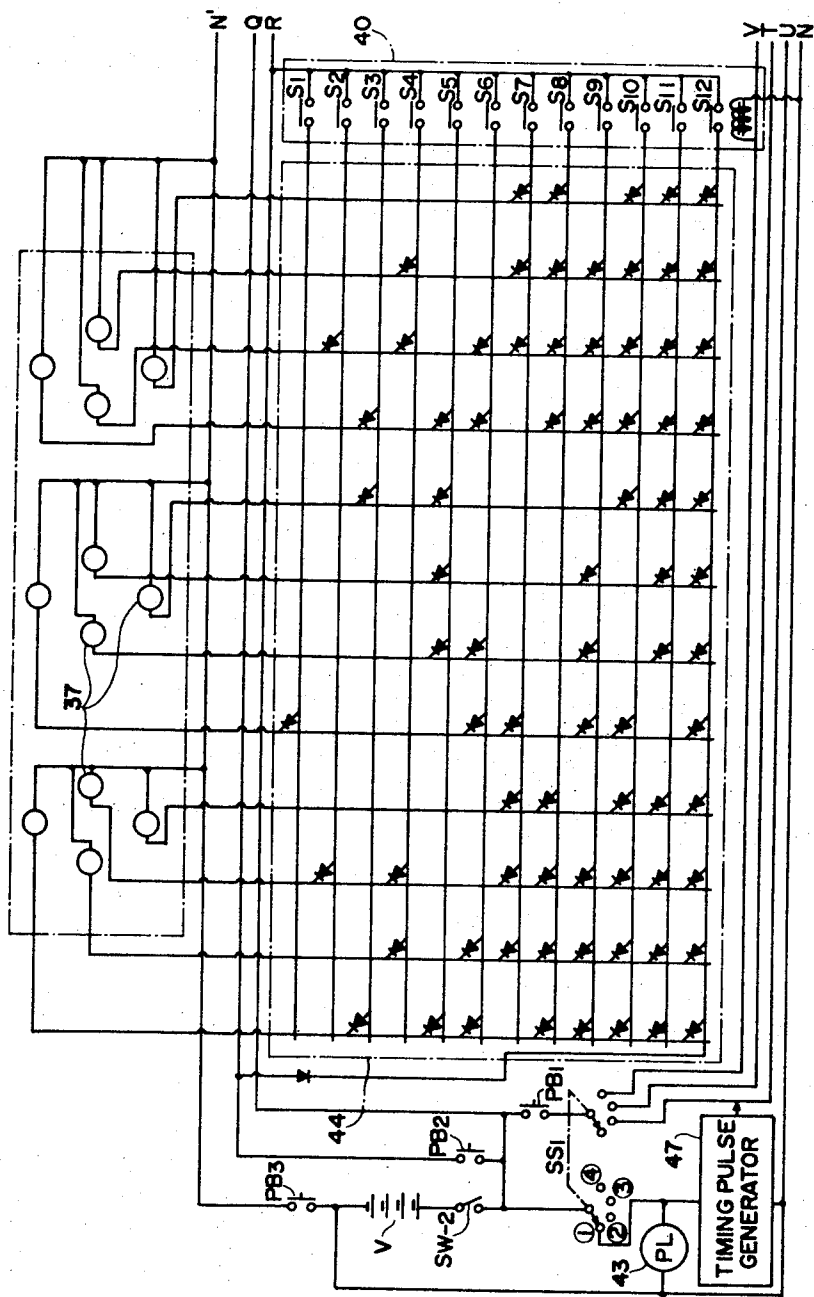
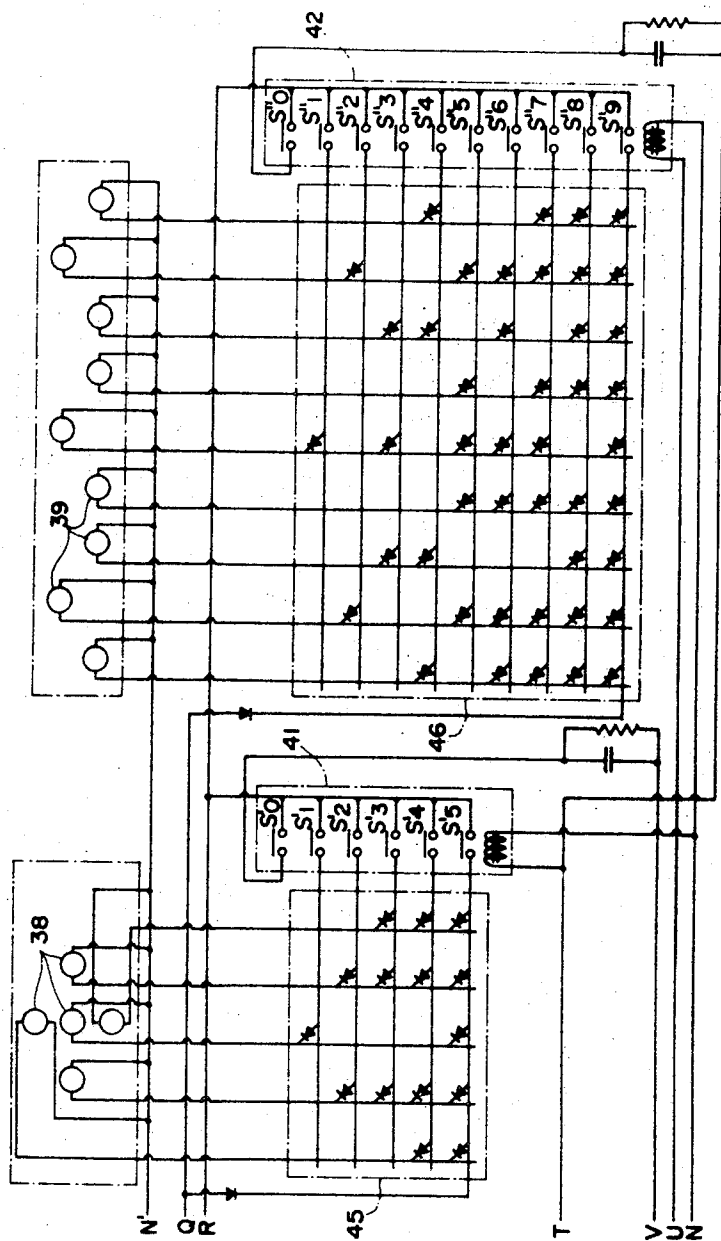


FIG. 19



TIMEPIECE INDICATING TIME BY GENERATED IMAGES IN SETS

BRIEF SUMMARY OF THE INVENTION

The present invention relates to a timepiece which indicates the time by respective numbers of images in sets generated on its indicating panel and eliminates the requirement for hands and dial or numerals.

The conventional timepiece having hands and dial has the inherent disadvantage that it is difficult for small children to learn to read the time. A small child having average intelligence may be able to count at only three years of age, while a five year old child may still not be able to read the time on the conventional timepiece. The digital clock has a similar disadvantage, but to a lesser degree. In contrast, the timepiece of the present invention can be read by a child who can only count.

The main object of the present invention is to provide a timepiece in which both the hands and dial and the monotonous indication by numerals are eliminated, and wherein time indication is by its image arrays which can be decorative by themselves.

The images to indicate the time in the timepiece of the present invention can be generated by electrical means and no mechanical devices may be required. Hence, the present invention gives electrical and electronic engineers a great incentive to bring their latest achievements into timepiece designing. The present invention may thus enable the production of a genuine electronic watch consisting of solid state components only.

SUMMARY OF THE INVENTION

Briefly, the timepiece in accordance with the present invention generates at least two sets of images on an indicating panel. The number of images present and belonging to the first set indicates the hourly segments in the designation of the time, and the number of images present and belonging to other one or two other sets of images indicates the minute segments in the designation of the time. Each image is explicitly identified to its set by figure, color, concept, orientation or by any combination thereof. The images may be generated by means of various known means making use, for example, of lamps, lamps and image-printed transparent film, electroluminescent devices, light emissive diodes, liquid crystal cells, or the like.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Each of

FIGS. 1 to 3 and 7 to 11 shows a full array of images to indicate the time on the indicating panel of an embodiment of the timepiece in accordance with the invention;

FIGS. 4 to 6, belonging together and relating to the embodiments of the timepieces of FIGS. 2 and 3, show patterns of image arrays corresponding to the hourly, the ten-minute and the minute segments in designation of the time, respectively;

FIG. 12, relating to the embodiment of the timepiece of FIG. 11, shows patterns of image arrays corresponding to the hourly segments in designation of the time;

FIGS. 13 to 15 show cross sections of typical indicating panel assemblies according to the present invention;

FIGS. 16 and 17, belonging together and relating to the embodiments of the timepieces of FIGS. 2 and 3, show the schematic wiring diagram of a typical image generation controller; and

FIGS. 18 and 19, belonging together and relating to the embodiments of the timepieces of FIGS. 7 to 10, show the schematic wiring diagram of another typical image generation controller.

DETAILED DESCRIPTION OF THE INVENTION

The time indication method that results in the novel timepiece of the present invention provides at least two modes of time indication for the designer's selection, as follows:

1. The number of images present and belonging to the first set of images indicates the hourly segments in designation of the time, and the number of images present and belonging to the second set of images indicates the minute segments in designation of the time; or
2. The number of images present and belonging to the first set of images indicates the hourly segments in designation of the time, the number of images present and belonging to the second set of images indicates the 10-minute segments in designation of the time and the number of images present and belonging to the third set of images indicates the minute segments in designation of the time.

Referring now to the drawings, and in particular to FIG. 1, images 1 of blue sail boats belonging to the first set, images 2 of yellow fish belonging to the second set, and images 3 of red crabs belonging to the third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by color and concept. Assuming that the hatched images are present and the others have faded away (that is, not present), the timepiece indicates the time 4 : 35.

Throughout the present specification, the same reference numerals are used to designate similar elements of the invention for ease of understanding and description.

Referring to FIG. 2, images 1 of blue spades and clubs in a clear background belonging to the first set, images 2 of red hearts in a blue background belonging to the second set and images 3 of red diamonds in a blue background belonging to the third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by color and concept.

Referring to FIG. 3, images 1 of lilies in white square backgrounds belonging to the first set, images 2 of birds in yellow round backgrounds belonging to the second set and images 3 of squirrels in green round backgrounds belonging to the third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by concept and by color and the hourly and minute designating images have explicit identification by the configuration of the background shapes.

FIGS. 4 to 6 show the time vs. pattern of the image array relation for the embodiments of the timepieces of FIGS. 2 and 3. In FIG. 4 (I), (II), (III), . . . , (XII) indicate one o'clock, two o'clock, three o'clock, . . . , twelve o'clock, respectively. In FIG. 5 (I), (II), (III), (IV) and (V) indicate one ten-minute interval, two 10-minute intervals, three 10-minute intervals, four 10-minute intervals and five 10-minute intervals, respec-

tively. In FIG. 6 (I), (II), (III), . . . , (IX) indicate 1 minute, 2 minutes, 3 minutes, . . . , 9 respectively.

These particular patterns of image arrays of FIGS. 4 to 6 are determined based on the following consideration:

1. Easiness in counting images;
2. The pattern of image array clearly indicates the number of images present and eliminates the possibility of misreading; and
3. Easiness in finding lamp failure when it occurs.

For the embodiments of the timepieces as shown in FIGS. 1 to 3, such indicating panel assemblies as shown in FIGS. 13 and 14 may be used.

Referring to FIG. 13, a sheet of image-printed transparent film 8 is placed behind a front cover 6 of clear glass or plastic plate having a translucent back surface 7. A set of lamps 10 and sockets 11 fixed on a base plate 12 are provided, one lamp for each image print of the film. A mask 9 having apertures and skirts is placed behind the film.

Referring to FIG. 14, which shows an alternative arrangement, a sheet of translucent film 14 having a semi-reflective back surface 15 is placed between a front cover 13 of clear glass or plastic plate and a sheet of image-printed transparent film 8. The mask 9 divides the areas and isolates the lit panel sections from each other, as in FIG. 13. The lamp 10 and socket 11 arrangement of FIG. 14 is also similar to that of FIG. 13 described above.

The image-printed transparent films for the embodiments of the timepieces of FIGS. 2 and 3 are interchangeable because the two embodiments have identical patterns of image arrays. Interchangeability of image-printed transparent films is extremely valuable from the commercial view point, because it provides a practically unlimited range of mode selection for users, while at the same time minimizing the range of timepiece models.

Referring to FIG. 7, images 1 of green round spots belonging to the first set, images 2 of orange round spots belonging to the second set and images 3 of red round spots belonging to the third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by color. Assuming that the hatched images are present or visible (i.e., illuminated), the timepiece indicates the time 3 : 26.

Referring to FIG. 8, images 1 of green diamonds belonging to the first set, images 2 of red hexagons belonging to the second set and images 3 of red diamonds belonging to the third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by figure and color. Assuming that the hatched images are present, the timepiece indicates the time 4 : 15.

Referring to FIG. 9, images 1 of green squares belonging to the first set, images 2 of twin diamonds, the top one being red and the bottom one being green, belonging to the second set and images 3 of red diamonds belonging to the third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by figure and color. Assuming that the hatched images are present, the timepiece indicates the time 2 : 32.

Referring to FIG. 10, images 1 of oblique green rectangles belonging to the first set, images 2 of horizontal yellow rectangles belonging to the second set and images 3 of vertical green rectangles belonging to the

third set are to be generated on the indicating panel 4. Each image has explicit identification to its set by color and orientation. Assuming that the hatched images are present, the timepiece indicates the time 1 : 44.

Such images as shown in FIGS. 7 to 10 may preferably be generated by means of solid state illuminants, e.g. light emissive diodes, resulting in a compact jewelry-like indicating panel that is particularly suitable for a wrist watch.

Referring to FIG. 11, images 1 of blue squares belonging to the first set and images 5 of rose-colored round spots belonging to the second set are to be generated on the indicating panel 4. Each image has explicit identification to its set by figure and color. The images 1 may preferably be generated by means of electroluminescent devices, such as electroluminescent panels, and the images 5 by means of miniature lamps. Assuming that the hatched images are present, the timepiece indicates the time 3 : 37.

FIG. 12 shows the time in hours vs. pattern of image array relation for the embodiment of the timepiece of FIG. 11. (I), (II), (III), . . . , (XII) indicate one o'clock, two o'clock, three o'clock, . . . , 12 o'clock, respectively.

FIG. 15 shows a typical indicating panel assembly making use of liquid crystal cells. The liquid crystal cell assembly is comprised of a pair of clear glass plates 18 and 20, each plate having transparent and electrically conductive coatings on the counter-facing surfaces thereof, and nematic liquid crystal 19 held between the plates. A liquid crystal cell is placed behind each aperture of a mask 17. The cells are further protected with clear plates 16 and 22. A sheet of image-printed transparent film 8 is placed between the liquid crystal cells and a mirror 23. The timepiece is viewed from the side of clear plate 16. The liquid crystal cell is translucent when an electric field is applied across it and is transparent when the electric field is gone. Image prints of the film 8 are visible by external light when the corresponding liquid crystal cells are transparent. Thus, the image generation is controlled by the electric field applied to the conductive coating on the plates 18 and 20. Spaces 21 for wiring are provided between the liquid crystal cells.

FIGS. 16 and 17 belonging together show the schematic wiring diagram of a typical image generation controller particularly suitable for the embodiments of the timepieces shown in FIGS. 2 and 3. The lamps 34 for generating images 1 of the first set are controlled by means of rotary cam switches 31 driven by a pulse motor M1. Likewise the lamps 35 for generating images 2 of the second set and the lamps 36 for generating images 3 of the third set are controlled by means of rotary cam switches 32 and 33, respectively. Cam switches 32 and 33 are driven by respective pulse motors M2 and M3. The timing pulses to drive the pulse motor are generated by means of switch S_{w-1} and cam 28 driven by a synchronous motor 29, as shown in FIG. 16.

The following nomenclature is employed in connection with the diagram shown in FIGS. 16-19 of the drawing: R-relay coil; and r-relay contact. Subscripts: "1" — Pulse Generator Lock Relay; "2" — Holding Relay; "3" — Unlock Relay.

When adjusting the time for the embodiment of FIGS. 16 and 17, the user shifts the contact of selector switch SS_1 from normal position 1 to position 2 and

waits until pilot lamp 30 lights. The pilot lamp lights when the synchronous motor 29 is disconnected immediately after the first timing pulse in the time-adjusting operation is sent out. Then the user repeatedly pushes push button PB₁ as many times as necessary until the right number of images of the third set appear. The user then shifts the contact of the selector switch SS₁ to position 3 and pushes push button PB₁ as many times as necessary until the right number of images of the second set appear. Likewise the contact of the selector switch SS₁ is then shifted to position 4 and the number of images of the first set is adjusted by depressing push button PB₁. Then the contact of selector switch SS₁ is returned to normal position 1.

A pair of lamps 35a and 35b are provided at the third position of the second image set so that lamp failure would not cause misreading of the time. Lamp failure at other positions will be easily found because of unusual patterns of the image array.

The present invention may be applied to a centralized timekeeper system having a plurality of secondary clocks. For this application, the timing pulse generator is eliminated in the image generation controller of each secondary clock.

FIGS. 18 and 19 belonging together show the schematic wiring diagram of a typical image generation controller particularly suitable for an embodiment of the timepiece shown in FIG. 7. Solid illuminants 37 such as light emissive diodes for generating images 1 of the first set are controlled by means of cyclically operable stepping switch 40 (FIG. 18), or an equivalently functioning solid state switch circuit, and diode matrix 44, the row conductors of which are connected to the outputs of switch 40. Likewise illuminants 38 for generating images 2 of the second set and the illuminants 39 for generating images 3 of the third set are controlled by means of cyclically operable stepping switches 41 and 42 and diode matrices 45 and 46 respectively.

Adjustment of the time in minutes, in ten-minutes and in hours is performed using push button PB₁ at contact positions 2, 3 and 4 of selector switch SS₁, in a similar manner as in the embodiment of FIGS. 16 and 17. Illuminant failure can be examined using PB₂ and PB₃. The power source V can be disconnected by S_{w-2} and pilot lamp 43 indicates connection of the timing pulse generator 47 to the power source.

In this embodiment, images are generated only at the desired time by depressing push button PB₃ so that power consumption is minimized.

In the typical image generation controller shown in FIGS. 16 and 17, the pulse motors M₁, M₂ and M₃ are of the type wherein the shafts thereof are advanced a predetermined vocational distance in response to each timing pulse. The shaft of the motors are attached to rotary cam switches which are selectively activated, in accordance with the arrangement of the cams, for each advancement of the motor responsive to each pulse. It should be clear that other types of motors and switch arrangements could be used. For example, a well known type of stepping switch which changes its switching configuration upon receipt of input pulses, could be used.

In FIG. 16, the terminals K and K' are coupled to a source of power.

I claim:

1. A timepiece comprising:
an image generation controller; and

at least two sets of images, predetermined images of which are selectively generated under control of said image generation controller, the number of images generated and belonging to the first set indicating the hourly segments in the designation of the time, and the number of images generated and belonging to the second set indicating the minute segments in the designation of the time, the images of each set having explicit identification to their set; predetermined arrays of generated images in each of said sets being so arranged that each pattern of said image arrays differs distinctly from others, thus facilitating reading of the time by said patterns of generated image arrays.

2. The timepiece of claim 1 wherein said predetermined arrays of generated images in the first set are further arranged such that disappearance of any single image in any image array does not reproduce the preceding image array configuration.

3. The timepiece of claim 1 wherein said sets of images are carried by an indicating panel.

4. The timepiece of claim 1 wherein said image generation controller selectively illuminates predetermined ones of said images to indicate the time.

5. The timepiece of claim 1 wherein each set of images has explicit identification to its set by at least one of figure, color, concept, background and orientation thereof.

6. The timepiece of claim 1 comprising at least three sets of images, the number of images generated and belonging to the first set indicating the hourly segments in the designation of the time, the number of images generated and belonging to the second set indicating the 10-minute segments in the designation of the time, and the number of images generated and belonging to the third set indicating the minute segments in the designation of the time, the images of each set having explicit identification to its set.

7. The timepiece of claim 2 wherein said indicating panel carries a plurality of lighting devices, each of said lighting devices being in registration with a respective one of said images, said lighting devices being connected to said image generation controller for selective lighting thereof for selective illumination of predetermined images of said sets of images to indicate the time.

8. The timepiece of claim 2 wherein said indicating panel carries a plurality of controllable elements coupled to said image generation controller and arranged in registration with said images, all of said elements being maintained non-transparent by said image generation controller except for those prescribed elements in registration with said predetermined images which are to be selectively generated, which prescribed elements being controlled to be transparent, the images in registration with said transparent elements being visible to designate the time.

9. The timepiece of claim 1 wherein said image generation controller comprises a source of timing signals; at least first and second motors corresponding respectively to said at least two sets of images, and coupled to said source of timing signals, said timing signals selectively advancing said motor; lighting means for selectively illuminating predetermined images of said sets of images to indicate the time; and switching means coupling said motors to said lighting means for selectively energizing said lighting means.

10. The timepiece of claim 9 wherein said image generation controller further comprises second switching means coupling said source of timing signals to said motors, said second switching means having a first operable position for normal timepiece operation, and at least two additional positions for disconnecting said source of timing signals and for selectively connecting a time-setting switch to said motors, whereby said motors are selectively advanced in response to operation of said time-setting switch to set the time indication of said timepiece.

11. The timepiece of claim 9 wherein said timing signals are timing pulses and wherein said motors are pulse-type stepping motors.

12. The timepiece of claim 1 wherein said image generation controller comprises a source of timing signals; at least first and second switching devices corresponding respectively to said at least two sets of images, and coupled to said source of timing signals; lighting means for selectively illuminating predetermined images of said sets of images to indicate the time; and coupling means coupling said switching devices to said lighting means for selectively energizing said lighting means.

13. The timepiece of claim 12 wherein said coupling means includes respective logic means coupling each of said switching devices to the lighting means corresponding to respective sets of images for selectively energizing said lighting means to indicate the time.

14. The timepiece of claim 13 wherein said logic devices are diode matrix circuits coupling the outputs of said switching devices to said lighting means.

15. The timepiece of claim 12 wherein said first and second switching devices include a plurality of sequentially operated switching elements which are sequentially operated in response to said timing signals.

16. The timepiece of claim 2 wherein said sets of images are formed on an image-printed transparent film and wherein said indicating panel carries a plurality of lighting devices, each of said lighting devices being in registration with a respective one of said images on said transparent film, said lighting devices being coupled to said image generation controller for selective lighting thereof for selective illumination of predetermined images which are lit by said image generation controller for indicating the time.

17. The timepiece of claim 16 wherein said image printed transparent film is interchangeable in said indicating panel and comprises a plurality of sets of light-transmissive images printed thereon, said images being disposed on said film sheet in registration with respective ones of said lighting devices.

18. The timepiece of claim 17 including at least two sets of images printed on said film sheet, the images belonging to the first set indicating the hourly segments in the designation of the time, and the images belonging to the second set indicating the minute segments in the designation of the time, the images of each set having

explicit identification to its set.

19. The timepiece of claim 17 wherein said light transmissive images are transparent or translucent.

20. A timepiece comprising:

an image generation controller; and

at least two sets of images, predetermined images of which are selectively generated under control of said image generation controller, the number of images generated and belonging to the first set indicating the hourly segments in the designation of the time, and the number of images generated and belonging to the second set indicating the minute segments in the designation of the time, the images of each set having explicit identification to their set; said image generation controller comprising a source of timing signals; at least first and second motors corresponding respectively to at least two sets of images, and coupled to said source of timing signals, said timing signals selectively advancing said motors; lighting means for selectively illuminating predetermined images of said sets of images to indicate the time; first switching means coupling said motors to said lighting means for selectively energizing said lighting means; and

second switching means coupling said source of timing signals to said motors, said second switching means having a first operable position for normal timepiece operation, and at least two additional positions for disconnecting said source of timing signals and for selectively connecting a time-setting switch to said motors, said motors being selectively advanced in response to operation of said time-setting switch to set the time indication of said timepiece.

21. A timepiece comprising:

an image generation controller; and

at least two sets of images, predetermined images of which are selectively generated under control of said image generation controller, the number of images generated and belonging to the first set indicating the hourly segments in the designation of the time, and the number of images generated and belonging to the second set indicating the minute segments in the designation of the time, the images of each set having explicit identification to their set; said image generation controller comprising a source of timing pulses; at least first and second pulse-type stepping motors corresponding respectively to at least two sets of images, and coupled to said source of timing pulses, said timing pulses selectively advancing said pulse-type stepping motors; lighting means for selectively illuminating predetermined images of said sets of images to indicate the time; and switching means coupling said pulse-type stepping motors to said lighting means for selectively energizing said lighting means.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,744,235

Dated July 10, 1973

Inventor(s) Shunsei KRATOMI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent, change priority data to read as follows:

--December 9, 1970 Japan.....45/108586
January 13, 1971 Japan.....46/669;

In the Claims:

Claims 7, 8 and 16, line 1, change "claim 2" to
--claim 3--.

Signed and sealed this 6th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,744,235

Dated July 10, 1973

Inventor(s) Shunsei KRATOMI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent, change priority data to read as follows:

--December 9, 1970 Japan.....45/108586
January 13, 1971 Japan.....46/669;

In the Claims:

Claims 7, 8 and 16, line 1, change "claim 2" to
--claim 3--.

Signed and sealed this 6th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents