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Apparatus for use in a timepiece

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(72) Inventor(s)
Hidetsugu Ikeda
Satoru Yamauchi
Koichi Miyagi
Shoichiro Kumazawa
Isato Watanabe

(73) Proprietor(s)
Seikosha Co Ltd

(Incorporated in Japan)

6-21 Kyobashi 2-chome
Chuo-ku
Tokyo
Japan

(74) Agent and/or
Address for Service
J Miller & Co
Lincoln House
296-302 High Holborn
London
WC1V 7JH
United Kingdom

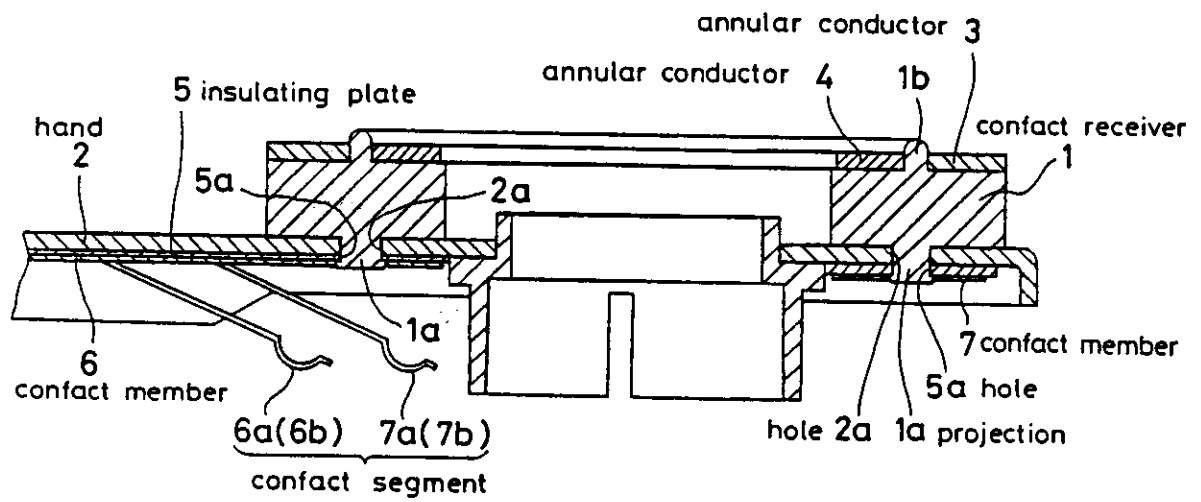
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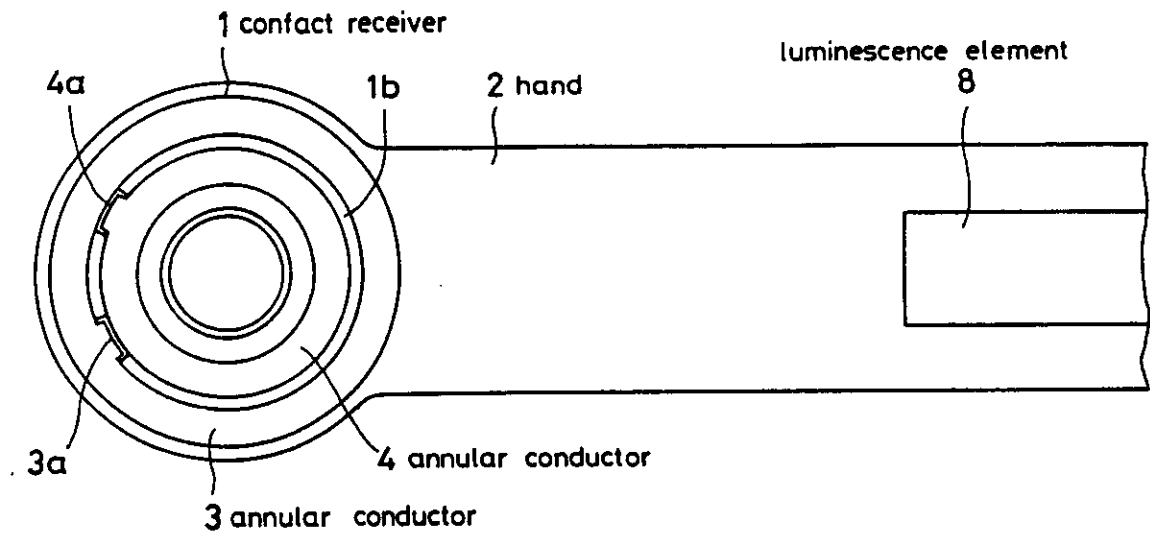
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FIG. 1



F I G. 2



F I G. 3

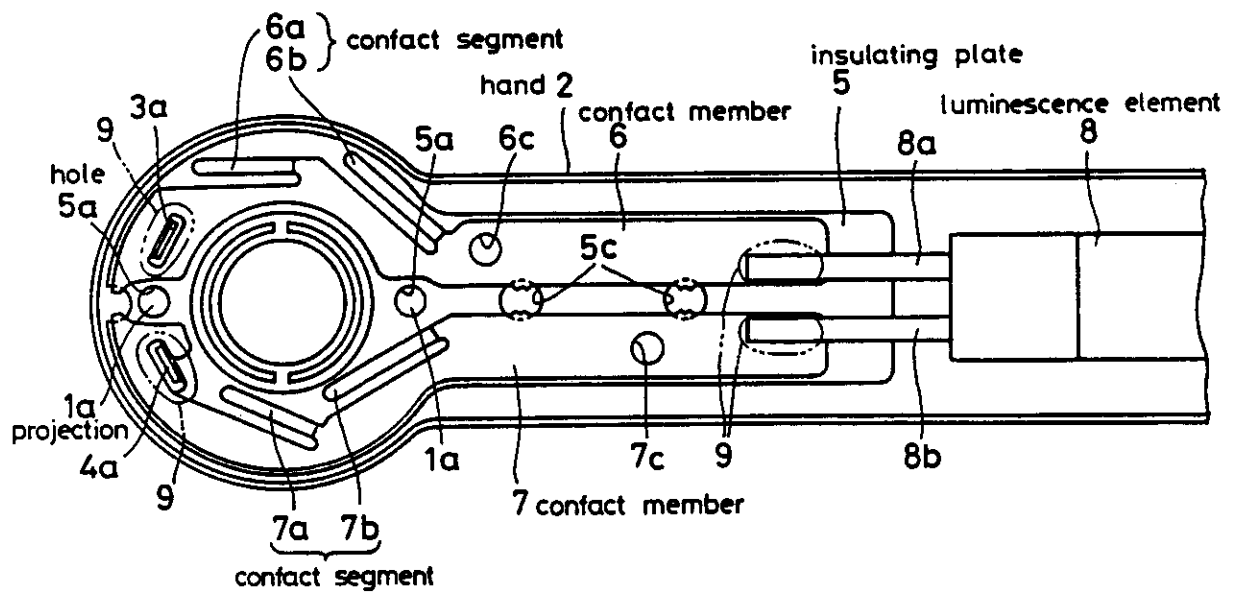
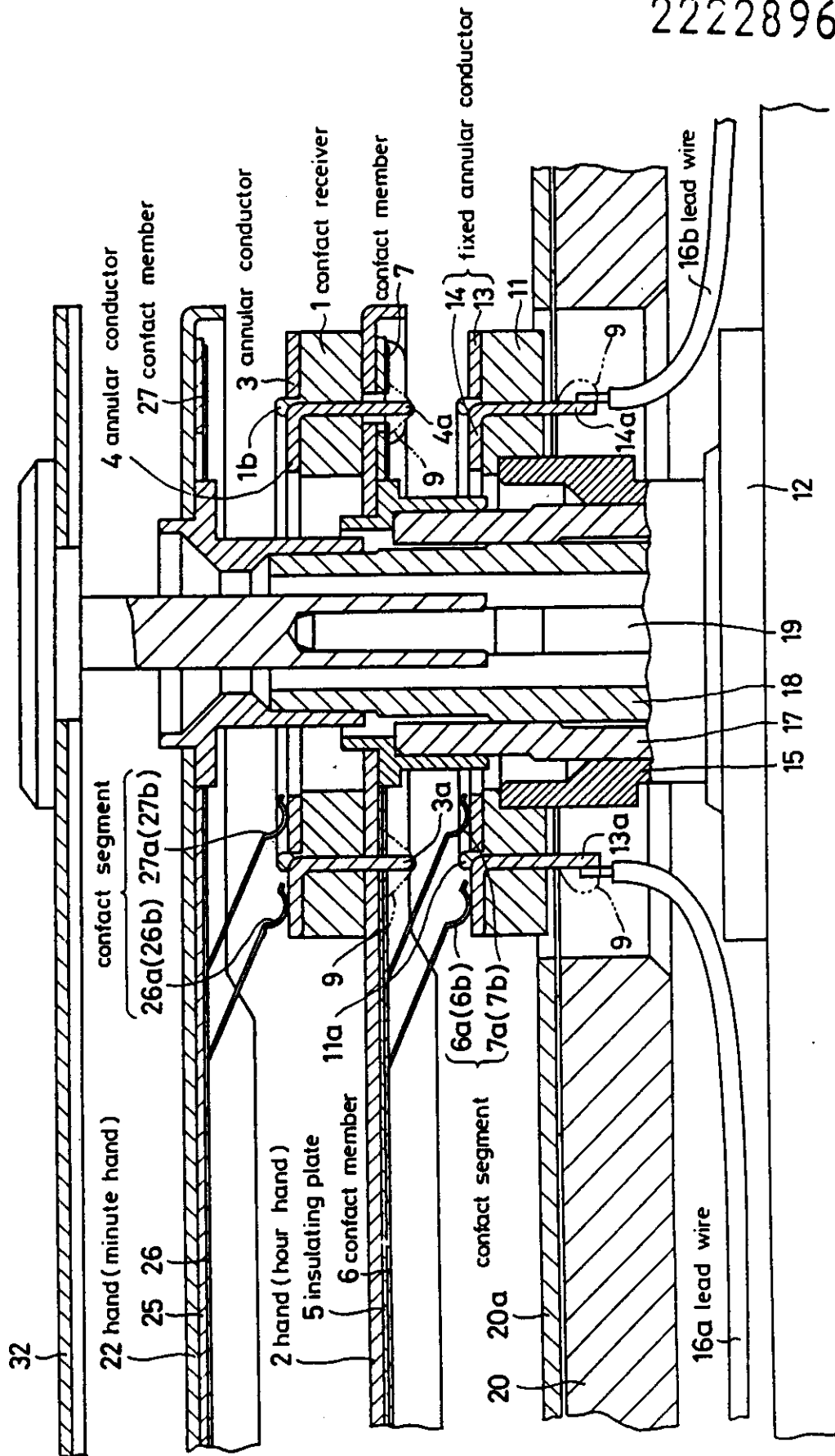


FIG. 5



"APPARATUS FOR USE IN A TIMEPIECE"

This invention relates to apparatus for use in a timepiece.

Japanese Laid-Open Patent Specification No. 49-68752 discloses a clock which is provided with a luminescence element mounted on a time display hand. A power supply device is provided in a central portion of rotation of the display hand for supplying power to the luminescence element. The power supply device is arranged so that two lead wires connected to a luminescence diode mounted on the display hand extend individually to two conductor discs mounted on a rotary shaft of the display hand, and fixed slide members are arranged to slide individually on the conductor discs.

Japanese Laid-Open Utility Model Specification No. 56-9083 discloses a timepiece in which each of an hour hand tubular drive shaft and a minute hand tubular drive shaft has two contact members mounted on the periphery thereof. Two contact members connected to a luminescence element mounted on each of hour and minute hands are arranged to connect with the corresponding contact members mounted on the periphery of the corresponding drive shaft.

In the construction disclosed in Japanese Laid-Open Patent Specification No. 49-68752, although the disclosed idea can be implemented when power is to be supplied to one single display hand, it needs considerable space in the axial direction where power is to be supplied to a plurality of hands such as those of the clock, thereby making its implementation difficult.

In the construction disclosed in the Japanese Laid-Open Utility Model Specification No. 56-9083, when

an increasing number of hands are to be supplied with power, the contact members mounted on the periphery of each drive shaft become like an increasing number of concentric layers so that the diameter of a central shaft portion becomes considerable and the construction becomes complicated. Further, since said contact members extend from the inside of a timepiece movement, a conventional timepiece movement cannot be used so that the design of the timepiece movement itself also has to be changed.

According, therefore, to the present invention, there is provided apparatus for use in a timepiece comprising a rotatable timepiece hand having a luminescence element mounted thereon; two annular conductors which are carried by the hand and are disposed on one side of the latter, the annular conductors being arranged concentrically of the centre of rotation of the hand; two contact members which are respectively electrically connected to the annular conductors and to the luminescence element for supplying power to the latter, the contact members being carried by the hand and being disposed on the side of the latter opposite to the said one side; and contact segments which extend from the contact members and which in operation trace concentric circles with respect to the centre of rotation of the hand so that the contact segments may be in electrical contact with further, annular conductors which are concentric therewith, the first-mentioned annular conductors being adapted to be contacted by further contact segments.

The apparatus may also comprise two fixed annular conductors which constitute the said further annular conductors and each of which is connected to a drive circuit.

Moreover, the apparatus may further comprise another hand which carries further contact members having the said further contact segments which contact the first-mentioned annular conductors.

5 The luminescence element is preferably an electroluminescence element.

 The first-mentioned contact members are preferably mounted on the respective hand with an insulating plate interposed therebetween.

10 The first-mentioned annular conductors are preferably mounted on an insulating contact receiver which is itself mounted on the hand.

 The contact receiver preferably has positioning projections which extend through aligned holes in the hand and insulating plate respectively.

15 The invention also comprises a timepiece provided with apparatus as set forth above.

 The invention enables a timepiece to be provided with a simplified construction in which electric power can be successively supplied from one hand thereof to another hand in superposed relationship therewith. In such a timepiece, power can be readily supplied to the hands without the need to increase the diameter of a central shaft portion of the timepiece and without the need to change the construction of a movement thereof.

20 In its preferred form, moreover, the present invention makes it possible to attach the contact receiver and contact members accurately and readily to each other.

30 The said fixed annular conductors may be concentrically provided below the hand on which the first-mentioned contact segments are provided, each of the fixed annular conductors having a lead wire for connection to the said drive circuit.

The invention is illustrated, merely by way of example, in the accompanying drawings in which:-

Figure 1 is an enlarged sectional side view of a portion of an apparatus for use in a timepiece according to the present invention;

Figure 2 is a plan view of the structure shown in Figure 1;

Figure 3 is a bottom view thereof;

Figure 4 is a plan view of a portion of the structure shown in Figure 3 so as to illustrate the method of assembly; and

Figure 5 is a broken away sectional view of a timepiece provided with the apparatus of Figures 1-4.

In Figures 1-3 there is shown apparatus for use in a timepiece comprising an annular contact receiver 1 which is made of an insulating material and which has downwardly-extending projections 1a provided on the under side thereof. Holes 2a are bored in a timepiece hand 2 in alignment with the projections 1a of the contact receiver 1. The contact receiver 1 is secured on the hand 2 with the projections 1a passing through the holes 2a and projecting from the under side of the hand 2. An annular protrusion 1b is provided on the upper side of the contact receiver 1 concentrically with the centre of rotation of the hand 2, and two annular conductors 3 and 4 are disposed on the radially outer and inner sides of the protrusion 1b. The annular conductors 3 and 4 respectively have L-shaped connecting members 3a, 4a formed in a portion thereof, each of the connecting members 3a, 4a passing through the contact receiver 1 and projecting from the under side of the hand 2.

Contact members 6 and 7 are secured on an insulating plate 5. The insulating plate 5 has holes 5a

bored therein in alignment with the projections 1a of the contact receiver 1 which project from the under side of the hand 2. The insulating plate 5 is secured on the under side of the hand 2 with the projections 1a passing through the holes 5a. The distal ends of the projections 1a project from the under side of the insulating plate 5 and are deformed over and/or fused to the insulating plate 5 to prevent their detachment therefrom. In this way, the contact members 6 and 7 are attached to the under side of the hand 2.

The contact members 6 and 7 are arranged to supply drive power to a luminescence element 8, such as an electroluminescence element, mounted on the hand 2, and respectively have contact segments 6a and 6b, and 7a and 7b.

The contact segments 6a and 6b, and 7a and 7b are formed so that in operation their travel traces, i.e. the loci of their movements, define concentric circles with respect to the centre of rotation of the hand 2.

The two annular conductors 3 and 4 are respectively connected electrically to the pair of contact members 6 and 7. Thus the connecting member 3a of the annular conductor 3 is secured and electrically connected to the contact member 6 by solder 9, and the connecting member 4a of the annular conductor 4 is secured and electrically connected to the contact member 7 by solder 9. Further, one lead electrode 8a of the electroluminescence element 8 is secured and electrically connected to the contact member 6 by solder 9, and another lead electrode 8b of the electroluminescence element 8 is secured and electrically connected to the contact member 7 by solder 9.

A method of assembling the hand 2 with the

luminescence element 8 to the remaining parts described above will now be described.

As shown in Figure 4, the insulating plate 5 has both the holes 5a, 5b and disconnection-purpose holes 5c bored therein. The contact members 6 and 7 are formed integrally together or are interconnected by a coupling member 10 and respectively have holes 6c and 7c bored therein. The parts are arranged so that the holes 5b and the holes 6c and 7c overlap each other and so that projecting portions (not shown) of an assembly jig or the like are fitted therein. The contact members 6 and 7 are then bonded to the insulating plate 5. Then, the coupling member 10 is disconnected or removed by the use of a punch or the like (not shown) which is adapted to pass through the hole 5c. In this way, the contact members 6 and 7 can be readily secured to appropriate positions on the insulating plate 5 without deformation.

Then, with the projections 1a of the contact receiver 1 passing through the holes 2a of the hand 2 and through the holes 5a of the insulating plate 5, the contact receiver 1 and the insulating plate 5 are secured to the hand 2. The distal ends of the projections 1a are then deformed over and/or fused to the under side of the insulating plate 5. In this way, the contact members 6 and 7 and the contact receiver 1 are attached to appropriate positions on the hand 2.

Figure 5 is a broken away sectional view of a timepiece provided with the apparatus described above, the hand 2 being an hour hand.

As shown in Figure 5, a fixed contact receiver 11 is press-fitted onto the upper end portion of a bush 15 secured on a timepiece movement 12. The upper side of the fixed contact receiver 11 has fixed

annular conductors 13 and 14 disposed on the radially outer and inner sides of an annular protrusion 11a, and connecting members 13a and 14a projecting from the under side of the fixed contact receiver 11 are connected to lead wires 16a and 16b for connection to a drive circuit (not shown).

An hour hand shaft 17, a minute hand shaft 18, and a seconds hand shaft 19 pass through the bush 15 so as to extend above the fixed contact receiver 11, the shafts 17, 18, 19 respectively having an hour hand 2, a minute hand 22, and a seconds hand 32 secured thereto. The hour hand 2, minute hand 22 and seconds hand 32 are rotatable over a dial 20a fixed to a dial receiver 20.

Contact members 26 and 27, which are identical in construction to the contact members 6 and 7 provided on the under side of the hour hand 2, are secured on the under side of the minute hand 22 with an insulating plate 25 interposed therebetween. The contact members 26 and 27 are arranged to supply drive power to a luminescence element such as an electroluminescence element (not shown) mounted on the minute hand 22, and their contact segments 26a and 26b, and 27a and 27b are slidable on the annular conductors 3 and 4 of the hour hand 2.

With the construction described above, if power is supplied from the drive circuit while the hour hand 2, minute hand 22 and second hand 32 are rotating at their respective rotational speeds under the drive from the timepiece movement 12, thereby indicating "time", the power is transmitted from the lead wire 16a to the fixed annular conductor 13, and thence to the contact member 6 via the contact segments 6a and 6b sliding on this fixed conductor. The power is also transmitted to the lead electrode 8a of the luminescence element 8, and at

the same time, from the lead wire 16b to the fixed annular conductor 14, and thence to the contact member 7 via the contact segments 7a and 7b sliding on this fixed conductor, and so to the other lead electrode 8b of the luminescence element 8, whereby power is supplied to the luminescence element 8 of the hour hand 2.

Similarly, power is transmitted from the contact member 7 to one lead electrode of the luminescence element of the minute hand 22 via the annular conductor 4 and the contact member 27, and from the contact member 6 to the other lead electrode of the luminescence element of the minute hand 22 via the annular conductor 3 and the contact member 26, whereby power is supplied to the luminescence element of the minute hand 22.

Since the two contact segments 6a and 6b, and 7a and 7b, and the contact segments 26a and 26b, and 27a and 27b are adapted to slide on the fixed conductors 13 and 14 and on the conductors 3 and 4, respectively, it is possible to enhance the reliability of conduction by changing the spring pressure, spring height, spring length, sliding radius, etc. of each component. Further, the annular protrusions 1b and 11a which are respectively provided on the contact receivers 1 and 11 prevent the contact segments from contacting the opposite conductor or fixed conductor even when they deviate a little from their proper sliding routes.

As described above, the power supplied from a lower portion of the timepiece is used to drive the luminescence element 8 mounted on the hand 2 and, at the same time, it is further transmitted to the hand 22 disposed above it. Thus, power is successively supplied to a number of hands disposed in superposed relation at the same axial position so as to drive loads mounted on the individual hands. A simplified construction is thus

provided such that it is possible to drive a luminescence element of one hand by power supplied thereto and concurrently, to successively supply the same power to other hands superposed above the said one hand.

5

A luminous hand is readily provided by driving an electroluminescence element which acts as an electrical load. Thus there can be provided a number of luminous hands of differing colour.

10

By arranging that the contact members 6, 7 are mounted on the hand 2 with the interposing therebetween of the insulating plate 5, the risk of deformation of the contact members 6, 7 at the time of assembly is reduced, thereby improving the positional accuracy of the parts and enhancing the insulation effect.

15

Further, power can be readily supplied to the hands by a simplified construction without increasing the diameter of a central shaft portion and without changing the construction of the timepiece movement itself.

20

The provision of the positioning projections 1a on the under side of the contact receiver 1, and the provision of the holes which are bored in the hand 2 and the insulating plate 5 in alignment with the projections 1a, enables the contact receiver 1 and the contact members 6, 7 to be readily attached to appropriate positions on the hand 2, whereby the contact segments 6a, 6b, 7a, 7b can slide on the annular conductors 13, 14 accurately.

25

CLAIMS

1. Apparatus for use in a timepiece comprising a rotatable timepiece hand having a luminescence element mounted thereon; two annular conductors which are carried by the hand and are disposed on one side of the latter, the annular conductors being arranged
5 concentrically of the centre of rotation of the hand; two contact members which are respectively electrically connected to the annular conductors and to the luminescence element for supplying power to the latter, the contact members being carried by the hand and being
10 disposed on the side of the latter opposite to the said one side; and contact segments which extend from the contact members and which in operation trace concentric circles with respect to the centre of rotation of the hand so that the contact segments may be in electrical
15 contact with further annular conductors which are concentric therewith, the first-mentioned annular conductors being adapted to be contacted by further contact segments.
- 20 2. Apparatus as claimed in claim 1 in which the apparatus also comprises two fixed annular conductors which constitute the said further annular conductors and each of which is connected to a drive circuit.
- 25 3. Apparatus as claimed in claim 1 or 2 in which the apparatus also comprises another hand which carries further contact members having the said further contact segments which contact the first-mentioned annular conductors.
- 30 4. Apparatus as claimed in any preceding claim in which the luminescence element is an electroluminescence element.

5. Apparatus as claimed in any preceding claim in which the first-mentioned contact members are mounted on the respective hand with an insulating plate interposed therebetween.

5 6. Apparatus as claimed in any preceding claim in which the first-mentioned annular conductors are mounted on an insulating contact receiver which is itself mounted on the hand.

10 7. Apparatus as claimed in claim 6 when dependent on claim 5 in which the contact receiver has positioning projections which extend through aligned holes in the hand and insulating plate respectively.

15 8. Apparatus for use in a timepiece substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

9. A timepiece provided with apparatus as claimed in any preceding claim.

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Title APPARATUS FOR USE IN A TIMEPIECE

Applicant/Proprietor

SEIKOSHA CO LTD, Incorporated in Japan, 6-21 Kyobashi 2-chome, Chuo-ku,
Tokyo, Japan [ADP No. 00712521001]

Inventors

HIDETSUGU IKEDA, SEIKOSHA CO LTD, 1-1 Taihei 4-chome, Sumida-ku, Tokyo,
Japan [ADP No. 02898054002]

SATORU YAMAUCHI, SEIKOSHA CO LTD, 1-1 Taihei 4-chome, Sumida-ku, Tokyo,
Japan [ADP No. 03952066002]

KOICHI MIYAGI, SEIKOSHA CO LTD, 1-1 Taihei 4-chome, Sumida-ku, Tokyo,
Japan [ADP No. 04368759001]

SHOICHIRO KUMAZAWA, SEIKOSHA CO LTD, 1-1 Taihei 4-chome, Sumida-ku, Tokyo,
Japan [ADP No. 03952074002]

ISATO WATANABE, SEIKOSHA CO LTD, 1-1 Taihei 4-chome, Sumida-ku, Tokyo,
Japan [ADP No. 03931391002]

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Address for Service

J MILLER & CO, Lincoln House, 296-302 High Holborn, LONDON, WC1V 7JH,
United Kingdom [ADP No. 00001149001]

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J MILLER & CO, Lincoln House, 296-302 High Holborn, LONDON, WC1V
7JH, United Kingdom [ADP No. 00001149001]
to
J MILLER & CO, 34 Bedford Row, Holborn, LONDON, WC1R 4JH, United
Kingdom [ADP No. 00001149002]
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PROPRIETOR(S)

Seikosha Co Ltd, Incorporated in Japan, 6-21 Kyobashi 2-chome,
Chuo-ku, Tokyo, Japan

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