

"ASSEMBLY, E.G. FOR USE IN A TIMEPIECE"

The present invention relates to an assembly comprising a hand, pointer or other indicating member, e.g. for use in a timepiece.

5 The present Applicants have proposed such an assembly in their prior Japanese Patent Application No. 233974/1988 which was not published at the priority date of the present application and which is not therefore prior art in relation thereto. This device is constructed as described below.

10 Two annular conductors are disposed around the axis of rotation of a hand or pointer below the latter. A pair of contact members each of which has a contact capable of sliding on one of the annular conductors is mounted on the underside of the hand. The annular
15 conductors are electrically connected to an external circuit. The contact members are electrically connected to an electrical load on the hand.

In operation, when electric power is supplied to the two annular conductors from the external circuit,
20 the two contact members are electrically connected by the contacts sliding on the annular conductors. Then, electric power is supplied to the electrical load.

In this prior construction, however, when the contacts slide on the annular conductors, they cause
25 mechanical resistance to the rotation of the hand. If the pressure applied to the conductors by the contacts is reduced so as to decrease this mechanical resistance, then the reliability of the electrical conduction may be unsatisfactory. Therefore, it is necessary to effect
30 machining and assembling of the contacts with considerable care. This is difficult to achieve.

Moreover, it is laborious and cumbersome to position the contacts correctly on the hands or pointers.

Accordingly, it is an object of the present invention to provide an assembly, e.g. for use in a timepiece, which is easy to manufacture, does not affect the torque applied to the hand or other indicating member and permits electrical conduction with high reliability.

According to the present invention, there is therefore provided an assembly comprising a rotatable hand or other rotatable indicating member; a first coil carried by said indicating member; a second coil which is disposed close to but spaced from the first coil so that electrical power supplied to the second coil is induced in the first coil; and an electrical load carried by the said indicating member and electrically connected to the first coil.

Preferably, the first coil is mounted on the underside of the said indicating member coaxially of the axis of rotation of the latter, the second coil being mounted below the first coil.

Each of the first and second coils may be wound on a respective bobbin, the first coil bobbin being rigidly secured to the underside of the said indicating member.

Preferably, each of said bobbins is made from a magnetically permeable material.

The said indicating member may be a seconds hand of a timepiece.

The second coil may be mounted on the upper surface of another indicating member which is disposed below the first-mentioned indicating member. The said other indicating member may be a minutes hand of a timepiece.

The electrical load may comprise an electro-

luminescent device, e.g. an LED.

At least one of the first and second coils may be made of a self-fusing wire.

5 The invention also comprises a timepiece provided with at least one assembly as set forth above.

Thus, in operation, the second coil may be electrically connected to an external circuit so that electric current flows through the second coil, producing magnetic flux around it. By arranging that
10 alternating current flows through the second coil, the magnetic flux constantly changes. The variations in the magnetic flux produce a voltage across the first coil which is disposed close to the second coil, thus generating electric current in the first coil. Because
15 of the action of the electromagnetic induction, electric power is thus supplied to the first coil from the second coil connected to the external circuit, the electric power then being supplied to the load connected to the first coil.

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

Figure 1 is a cross-sectional view of part of a timepiece provided with an assembly according to the present invention; and

25 Figure 2 is an electrical circuit diagram of the timepiece.

Referring to the drawings, a timepiece has an hour hand and a minutes hand which are supplied with electrical power by the said prior construction
30 described above. However, the seconds hand of the timepiece is supplied with electrical power by an assembly according to the present invention.

Referring to Figure 1, a bush 2 is rigidly fixed to a timepiece movement 1. An hour hand shaft 3, a

minutes hand shaft 4, and a seconds hand shaft 5 extend through the bush 2. A fixed block 6 is pressed into the upper end portion of the bush 2. An annular projection 6a extends from the upper surface of the fixed block 6 coaxially of the axis of rotation of the hands. An annular fixed conductor 7 is disposed radially outwardly of the projection 6a. Another annular fixed conductor 8 is located radially inwardly of the projection 6a. Portions of the conductors 7 and 8 are bent to form L-shaped connecting members 7a and 8a, respectively. These connecting members 7a and 8a protrude below the fixed block 6 and are connected to lead wires 9a and 9b, respectively, so that the connecting members 7a, 8a are electrically connected to a driver circuit (not shown).

An hour hand 10 rigidly fixed to the hour hand shaft 3 is located above the fixed block 6. An insulating plate 11, on which a pair of conductors 12, 13 are mounted, is firmly fixed to the underside of the hour hand 10. The conductors 12 and 13 act to supply electrical power to an electroluminescent device EL₁ (see Figure 2) mounted on the hour hand 10. The conductors 12 and 13 have contacts 12a and 13a respectively, which in operation rotate around the axis of rotation of the hour hand 10 and slide on the annular fixed conductors 7 and 8, respectively.

A block 16 of the same construction as the fixed block 6 is rigidly fixed to the upper surface of the hour hand 10. An annular conductor 17 is disposed radially outwardly of an annular projection 16a of the block 16. Another annular conductor 18 is disposed radially inwardly of the projection 16a.

Connecting members 17a and 18a extend through the block 16 and protrude below the hour hand 10. The connecting members 17a and 18a are soldered at 14 to the

conductors 12 and 13, respectively.

5 A minutes hand 20 that is rigidly fixed to the minutes hand shaft 4 is located above the hour hand 10. A pair of conductors 22 and 23 similar in construction to the conductors 12 and 13 is mounted on an insulating plate 21 which is rigidly fixed to the underside of the minutes hand 20. The conductors 22 and 23 supply electrical power to an electroluminescent device EL_2 (see Figure 2) mounted on the minutes hand 20. The
10 conductors 22 and 23 have contacts 22a and 23a, respectively, which can slide on the annular conductors 17 and 18 on the hour hand 10.

15 A second coil bobbin 24 made from a magnetic material is rigidly fixed to the upper surface of the minutes hand 20 coaxially of the axis of rotation of the minutes hand 20. A conductive wire is wound on the second coil bobbin 24 to form a second coil 25 that is electrically connected to the conductors 22 and 23.

20 A seconds hand 30 that is rigidly fixed to the seconds hand shaft 5 is disposed above the minutes hand 20. A first coil bobbin 34 made from a magnetic material is rigidly fixed to the underside of the seconds hand 30 coaxially of the axis of rotation of the seconds hand 30. The first coil bobbin 34 is disposed
25 opposite and close to the second coil bobbin 24. A conductive wire is wound on the first coil bobbin 34 to form a first coil 35 that is electrically connected to an electroluminescent device EL_3 (see Figure 2) mounted on the seconds hand 30.

30 The hour hand 10, the minutes hand 20, the seconds hand 30 are rigidly fixed to the hour hand shaft 3, the minutes hand shaft 4, and the seconds hand shaft 5 respectively via sleeves 10a, 20a and a cylindrical member 30a, respectively. These hands can rotate above

a dial 32 fixed to a dial mounting member 31.

The hour hand 10, the minutes hand 20, and the seconds hand 30 are rotated by the timepiece movement 1 to indicate the time. Electrical power from the driver circuit is fed to the annular fixed conductors 7, 8 from the lead wires 9a, 9b. Then, it is supplied to the conductors 12, 13 via the contacts 12a and 13a sliding on the annular fixed conductors 7 and 8, respectively. Finally, the power is furnished to the electroluminescent device EL_1 that is a load on the hour hand 10.

Then electrical power is supplied to the electroluminescent device EL_2 , which constitutes a load on the minutes hand 20, via the conductors 12, 13, the annular conductors 17, 18, and the conductors 22, 23 in the same manner.

At this time, electrical power is supplied to the second coil 25 from the conductors 22, 23. As a result, electrical power is induced across the first coil 35. Then electrical power is supplied to the electroluminescent device EL_3 , which constitutes a load on the seconds hand 30, by a connecting means (not shown).

The electrical operation of the assembly described above is next explained by reference to Figure 2.

In the present embodiment the electroluminescent devices $EL_1 - EL_3$ are mounted on the hands as loads. When an AC voltage is applied to each electroluminescent device, it emits light and so it is a kind of capacitor.

The driver circuit for the electroluminescent devices $EL_1 - EL_3$ comprises capacitors C_1, C_2 , a resistor R , a transformer T_1 , a transistor T , and the electroluminescent devices EL_1 and EL_2 to form a

blocking oscillator which transforms the voltage from a DC voltage source E into an AC voltage to drive the electroluminescent devices EL_1 and EL_2 . A capacitor C_3 stabilizes the oscillation.

5 In the present embodiment, the second coil 25 connected to the electroluminescent devices EL_1 and EL_2 , and the first coil 35 which is opposite to and close to the second coil 25 form a second transformer T_2 . When alternating current flows through the second coil 25, 10 electrical power is induced across the first coil 35 by electromagnetic induction. Therefore, electrical power is supplied to the electroluminescent devices EL_3 on the second hand 30.

15 In the present embodiment electrical power is supplied to the hour hand 10 and the minutes hand 20 by the said prior means described above. Only the seconds hand 30 is supplied with electrical power by the assembly of the present invention. However, it is also possible to use a said assembly for transmitting 20 electrical power to the hour hand 10 and the minutes hand 20.

The first coil 35 and/or the second coil 25 can be made of a self-fusing wire. Further, it can be an air-core coil having neither the first coil bobbin 34 nor the 25 second coil bobbin 24. Additionally, the first coil bobbin 34 and the second coil bobbin 24 can be made from a non-magnetic material.

Loads can take various forms such as LEDs, as well as the electroluminescent devices $EL_1 - EL_3$.

30 In the construction shown in the drawings, electrical power can be supplied to a timepiece hand or hands in a non-contact manner. Therefore, the torques acting on the hands are not affected. Accordingly, the invention can be applied to hands driven with low

torque, such as a timepiece seconds hand. Further, in the said construction, electrical conduction is reliable. Additionally, machining and assembly operations are easy to perform, and great accuracy is not required.

CLAIMS

1. An assembly comprising a rotatable hand or other rotatable indicating member; a first coil carried by said indicating member; a second coil which is disposed close to but spaced from the first coil so that
5 electrical power supplied to the second coil is induced in the first coil; and an electrical load carried by the said indicating member and electrically connected to the first coil.
2. An assembly as claimed in claim 1 in which
10 the first coil is mounted on the underside of the said indicating member coaxially of the axis of rotation of the latter, the second coil being mounted below the first coil.
3. An assembly as claimed in claim 2 in which
15 each of the first and second coils is wound on a respective bobbin, the first coil bobbin being rigidly secured to the underside of the said indicating member.
4. An assembly as claimed in claim 3 in which
20 each of said bobbins is made from a magnetically permeable material.
5. An assembly as claimed in any preceding claim in which the said indicating member is a seconds hand of a timepiece.
6. An assembly as claimed in any preceding claim
25 in which the second coil is mounted on the upper surface of another indicating member which is disposed below the first-mentioned indicating member.
7. An assembly as claimed in claim 5 and in
30 claim 6 in which the said other indicating member is a minutes hand of a timepiece.



8. An assembly as claimed in any preceding claim in which the electrical load comprises an electro-luminescent device.

9. An assembly as claimed in any preceding claim in which the electrical load comprises an LED.

10. An assembly as claimed in any preceding claim in which at least one of the first and second coils is made of a self-fusing wire.

11. An assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

12. A timepiece provided with at least one assembly as claimed in any preceding claim.
