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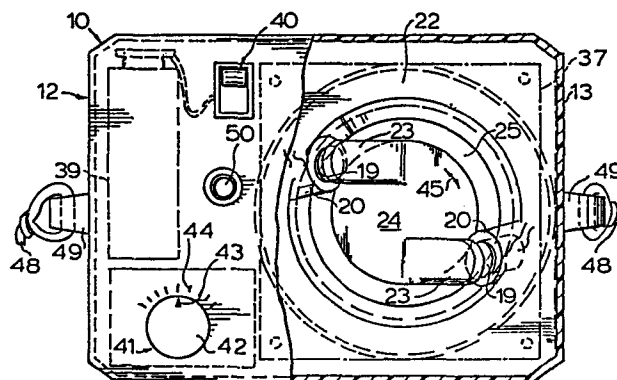
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54 **Metronomic signalling device and method of tempo signalling.**

57 A portable metronomic signalling device (10) comprising a housing (11, 12) having an opening (21) across which a transmitter (25) is fixed for tempo-signal-imparting engagement with a user's skin (S) to which silent motion metronomic impulses are transmitted from the transmitter (25).

In order to avoid acoustical interferences from the device (10) or (53), the clockwork or the pulsing means of the device is electrically generated and the pulsing actions of the transmitter (25) dynamoelectrically translated by means of electromagnets (19) and complementary soft iron actuator assembly (24, 23). The actuator (24) is fixed on to the transmitter (25) of soundproof material such as soft rubber and the latter anchors the former in a narrow gap relation with the electromagnets (19) for actuating engagement without colliding between the members (19 and 23). Multiple signalling is provided by means of a central control (54) including a manual pulsing means (62) which generates flexible tempo signals tacitly to the users contacted by the silent metronomic signalling devices (53).



Metronomic signalling devices and method of tempo signalling

The invention relates to metronomic signalling devices and enabling the practice of a method of tempo signalling comprising: means for generating silent tempo signals; means for controlling the tempo of said signals; means for translating said signals  
5 dynamoelectrically into silent motion impulses of a soundproof transmission means fixed across a housing opening and including a texture accentuated pad face projecting outwardly from said housing for tacit tempo-signal-imparting engagement with a user, and a method whereby said signals may be transmitted tacitly to  
10 a singular user or a plurality of separate users from a central location remote from said users.

Metronomic devices make it possible to train or guide players of musical or similar activities a more accurate timing by a regularly  
15 repeated beat signals emitted from the devices at a rate ranging from 40 to 208 per minute.

Audible (acoustic) and visual (optical) are two types of metronome widely known, while the former produces ticking sound and  
20 the latter produces oscillating light or pendulum. Another is a combination of the audible type with a skin felt addition and is known in accordance with the prior art portion of Claim 8 (U. S. Patent No 2,535,309) in which the device..., a case including a back wall comprising a flexible diaphragm, a timing mechanism  
25 within the case, means responsible to operation of the timing mechanism for creating uniformly periodic impacts in the diaphragm .... And, (colume 1 line 25) ...my timing device may be considered as being in the nature of a silent metronome in that it supplies sensible but substantially inaudible periodic beats. The device  
30 powered by a main spring 94 is regulated by a clockwork mechanism including an escape wheel 112, 8 striking members 116 and pallet fingers 58 and 60.

With these types of metronomic devices they all emit signals that  
35 disturb music making. For example, the audible metronomic signals may interfere with concentration upon tone and pitch. Visual metronomic signals may additionally interfere with note reading. The prior art cited above which the inventor carefully qualifies

the 'silent metronome' obviously is an audible type with added skin felt feature. Unless soundproof material such as soft rubber is used, a diaphragm by definition is a sound amplifying element such as one finds in a telephone receiver or the cone of a loud speaker. In the device the impact actions by the striker members 116 of the escape wheel against the pallet fingers 58 and 60 cause the casing to resonate and the shaft 54 transmits the impact to the diaphragm 28 thereby causing it to amplify the striking sound further to a distinct tick similarly as a regular audible metronome. The ticking sound or noise will render the device useless in an actual performance such as studio recording session where the microphones are sensitive enough to pick up even a slightest sound or noise emitted by the device. The lack of synchronizing or interconnecting means of the device in the reference further hinders the application of a method whereby the tempo signals may be effected to a plurality of users tacitly from a central location remote from the users.

The invention as claimed is intended to remedy these drawbacks. It solves the problem of acoustical interferences in metronomic signalling by incorporating a soundproof transmitting means which, coupled with electromagnetic actuating means, dynamoelectrically translates electronically generated or manually tapped electrical signals into silent but physically sensible metronomic motion impulses that can be felt by the user. Thereby the emitting of disturbing sound or noise in metronomic signalling is avoided.

The advantages offered by the invention are that, firstly, the signal impulse generating means in the reference which consists of striker member 116, pallet fingers 58 and 60, diaphragm as well as the mechanical clockwork is replaced by a dynamoelectrical translating means, including an elastic soundproof signal transmitting pad of soft rubber or similar material that allows imparting of silent motion impulses to the skin of the user contacted by the device without acoustic interference and, secondly, the electrical control and pulsing means in the device can also be interconnected in multiple circuit to separate units in a synchronized manner and a central control box or alternately a conductor's baton equipped with a tapping key switch can thereby effect respectively a steady or flexible tempo signals to the units. This method of signalling

(FIGS 3 and 5) allows a conductor or director to direct musicians contacted by the separate devices to be situated unconventionally beyond his field of vision during rehearsal or actual performance. For example, they may be behind him, above him, behind the curtain or moving from place to place to enhance the phonic effect of a performance. In the latter situation, the moving musicians may carry devices that are radio wave controlled--a wireless control which can be easily achieved in accordance with the present state of electronic arts.

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One way of carrying out the invention is described in detail below with reference to drawings which illustrate only one specific embodiment, in which:-

15 FIG. 1 is a plan view of a metronomic signalling device embodying the invention, and partly broken away and in section to reveal details, FIG. 2 is a side elevational view of the device of FIG. 1 with parts broken away and in section for revealing details, FIG. 3 is a schematic view showing how a plurality of metronomic devices according to the present invention may be motivated and controlled through a common control means, FIG. 4 is a schematic electrical diagram relevant to the operation of the device, and FIG, 5 is a schematic electrical diagram especially relevant to the arrangement of FIG. 3.

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FIGS. 1 & 2 show the portable device comprises a body base portion 11 of which is molded from a suitable plastic material. Removably carried by the base 11 is a snap-on detachable cover 12 so that the rim flange 13 with a lower edge inwardly projecting retaining bead 14 is retainingly engageable with a complementary latching shoulder 15 at the inner side of a rabbet groove 17 which provides an upwardly facing shoulder on which the edge of the flange 13 seats.

35 In accordance with the invention, dynamoelectric means are provided inside 18 the device for generating tacit metronomic signal impulses, comprising in a preferred arrangement a balanced, cooperative pair of agitator electromagnets 19 mounted in respective diametrically opposite spaced bosses 20 located at the rim of a cavity 21 defined within an integral thickened area 22 within the

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housing on the base member 11 and defining an opening from the housing. The electromagnets 19, when they are energized, will attract cooperatively related, normally gapped, arms 23 of a metronomic impulse transducer of soft iron material and from which  
5 the arms 23 integrally project divergently and tangentially from diametrically opposite marginal location on the transducer 24 and in complementary positions for actuation by the respective electromagnets 19. The transducer 24 is carried by a soundproof relatively soft, yieldably movable transmission pad 25 having a surface  
10 area facing inwardly. and to which area is secured fixedly the outwardly facing surface of the member 24, while the arm 23 project from the inwardly margin of the facing surface of the member. On its outer face, the pad 25 of rubber or rubber-like elastic material desirably has an array of projections 27 providing a texture accentuated face. About its perimeter, the pad 25 has means  
15 for securing it to the base member 11, comprising a preferably continuous peripheral attachment flange 28 which is adapted to be firmly clamped against an annular frustoconical shoulder 29 provided in annular outwardly opening groove cavity 30 concentric with  
20 the outwardly opening cavity 21 in the thickened base area 22. A clamping ring nut 31 is adapted to be threadedly engaged by means of threads 32 with base 11 within the annular cavity 30 and driven with its complementary frustoconical clamping surface 33 against the pad flange 28 of the pad 25 to clamp it securely against the  
25 clamping shoulder 29.

In accordance with a preferred embodiment of the invention, pulsing operation of the electromagnets 19 is adapted to be effected by electrical means (FIG. 1, 2 & 4) comprising an electrical circuit 34, components of which may be carried on a circuit board 35  
30 mounted as by means of a thin mounting panel 37 on the inside roof surface provided by the top of the cap 12. Means such as a pulse cycling transistor 38 and capacitor 38a (a digital circuitry may be alternately employed) are connected electrically to the electromagnets 19 and to a power source such as a battery 39. An on/off  
35 electrical switch 40 for the electrical circuit has suitable actuating means mounted conveniently on the cover 12. A pulse frequency or tempo control 41 in the circuit 34 is adapted to be adjusted as by means of a knob 42 located on the cover 12 and desirably  
40 provided with an indicator 43 for visualizing adjustment relative

to a tempo or pulse rate scale 44. Through this arrangement, when the circuit is closed, the electromagnets 19 are energized and deenergized with a frequency determined by the adjustment of the tempo control 41. At each energization of the electromagnets 19 in each cycle, the impulse signalling device arms 23 are drawn toward, but the sufficiently resilient pad 25 prevents contacting, the electromagnets and then released on deenergizing of the electromagnets. This causes the impulse transducer 24 to push outwardly on the pad 25 and at the same time torque slightly in a counterclockwise direction as viewed in FIG. 1 and then returned by virtue of the return spring action of the pad 25. This causes the projection 27 to thrust toward and tacitly impart a silent motion impulse to the skin S (FIG. 2) of a user contacted by the pad face. In FIG. 1, the double-headed arrow 45 indicates the oscillating cycle of the transducer 24 as it is alternately actuated in a pulse and release cycle by the electromagnets 19. A double-headed arrow 47 indicates reciprocatory axial motion cycle of the member 24. As a result, the user receives a definite and dual combined twisting and thrust for each impulse. This is especially effective where an article of clothing intervenes between the device 10 and the skin of the user. The device 10 may be carried in a garment pocket with the impulse transmitting pad 25 contiguous to the user's body. An attachment means (48, 49) is provided alternatively for attaching the device to the user's body.

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For plural tacit metronomic signalling, as enabled by the said preferred embodiment of the invention, the device 10 may provide with multiple circuit jack outlet 50 to which a lead connection 55 to slave unit 53 may be plugged in. The slave unit 53 is a stripped-down version of device 10 that contains electromagnets 19 and transmitter means 23, 24, 25 and it is powered by the signal pulsing component of a device 10 or an equivalent control 54. FIG. 3 depicts a multiple signalling where the equivalent control 54 is of increased capacity to accommodate the power demand from a large number of units 53. Connected to the controller 54 are a D. C. adaptor 57 to supply extra power when needed and an adaptor cord 63 leading to a conductor's baton 60 for effecting manual tempo signalling. Located on the handle 61 of conductor's baton 60 is a digital key switch assembly 62 provided for manually generating flexible tempo signals to the remote signalling units 53 or

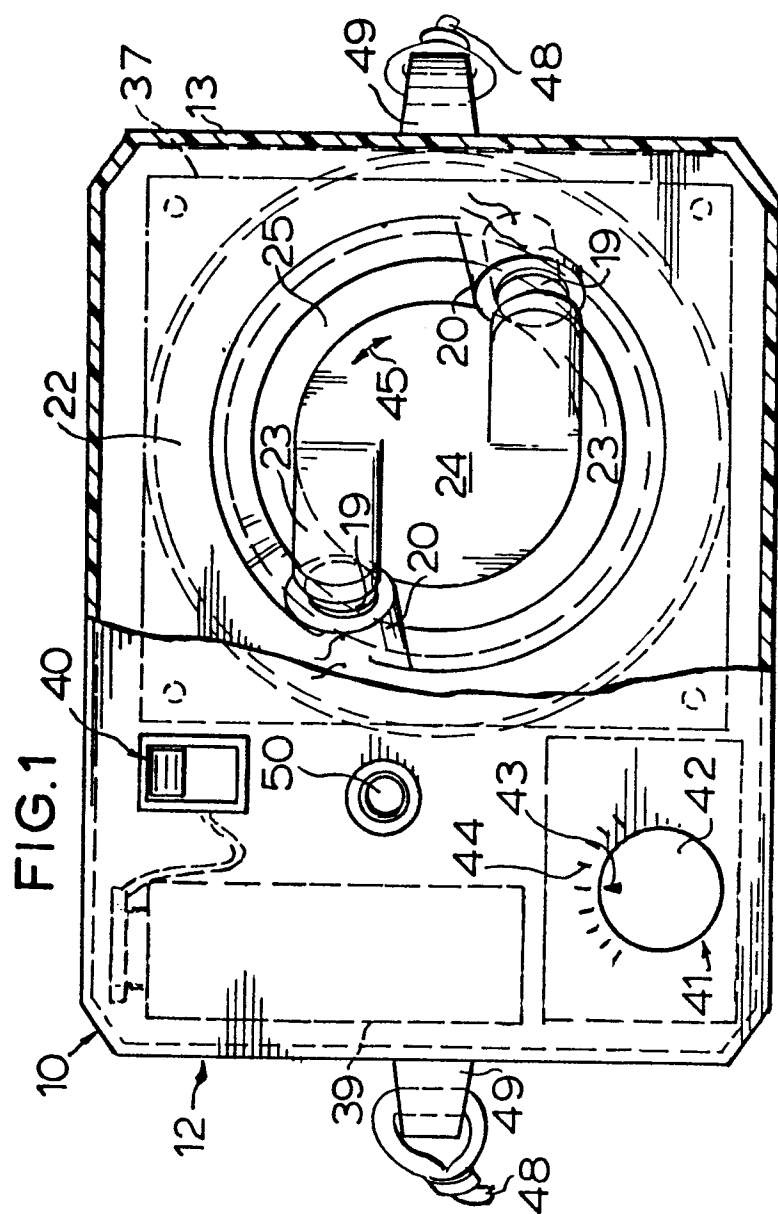
53' as shown in FIG. 5. By tapping the switch key 62 as flexibly in tempo as desired a correnpondingly flexible tempo signals can be generated to the units 53'. On each tap of the normally open-biased key switch 62 it closes briefly the pulsing circuit 65  
5 across the power source 39' (or 57) and the solenoids 19' of the slave units 53' energized synchronously, thereby a multiple signalling of tempo is manually effected. By setting the dial 59 at a desired rate and the control switch 58 closed, the electrical pulsing circuit 34' is energized for steady tempo pulsing action at a  
10 rate indicated on the control 59. Each pulse closes a synchronizing relay switch 64, preferably of a silent kind that having a similar function as switch 62 in closing the pulsing circuit 65, which correspondingly actuate the solenoids 19' of the slave units synchronously, thereby a multiple signalling of a steady tempo is  
15 effected.

Claims:

1. A silent metronomic signal-pulsing device (10) comprising a housing (11, 12) having an opening (21) characterised in that a soundproof transmitter (25) fixed across said opening (21) and having a texture accentuated face (27) projecting from said housing (11, 12) for tempo-signal-imparting engagement with a user, that transducer means comprising a disk-like member (24) fixed to and movable with said transmitter (25), that dynamoelectric means (19, 23) carried in part (23) fixedly on said member (24) and in part (19) fixedly on said housing (11) and operable for pulsing said member (24) and thereby actuating said transmitter (25) for tempo signal guidance of a user without acoustical interferences, and that electrical means which includes means (41, 42, 43, 44, 59, 62, 64) for controlling the pulsing tempo of the pulsing means (19, 23).
2. A device according to claim 1, wherein said dynamoelectric means part (23) carried fixedly on said member (24) comprises at least one rigid arm (23) located along a margin of said member (24) and adjacent to a margin of said transmitter (25), and said part (19) carried on said housing (11) comprises an electromagnet (19) adjacent to said margin.
3. A device according to claim 2, wherein said parts (19, 23) are in a narrow gap relation so that in the operation of said pulsing means (19, 23) said member (24) carried part (23) will be alternately drawn in said gap toward, but not colliding with, said housing carried part (19) and released for thereby effecting pulsing of said member (24) and actuating of said transmitter (25).
4. A device according to claim 1, wherein said dynamoelectric pulsing means (19, 23) is adapted to effect oscillatory, reciprocatory pulsing movement (45, 47) of said transmitter (25).
5. A device according to claim 1, wherein said means (41, 62) for selectively controlling the pulsing tempo of said pulsing means (19, 23) including a conductor's baton (60) electrically connected (63) with said electrical operating means (57, 39', 65) and having

digital control switch (62) mounted on the baton (60).

6. Silent metronomic signalling devices (10, 53), comprising means (34, 34', 62) for generating tempo signals, means (42, 43, 44, 5 62) for controlling the tempo of said signals, and translating said signals into impulses and transmitting (25) the impulses to a user and comprising an electromagnetic actuator (24) and a soundproof transmitter (25) actuated by the actuator (24) for transforming the signals into silent but sensible impulses.
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7. A method of tacit metronomic tempo signalling comprising, generating silent tempo signals, controlling said tempo signals, and translating said signals dynamoelectrically into silent motion impulses of a soundproof transmission means and thereby translating 15 ing the impulses to a user so that the user receives tempo guidance by feeling said impulses silently.
8. A method according to claim 7, comprising transmitting said silent motion impulses through a plurality of separate units (53, 20 53') for transmitting such impulses to separate users, and generating said signals and controlling said signals at a location remote from said units.
9. A method according to claim 7, which comprises effecting tempo 25 guidance through manually operated means.



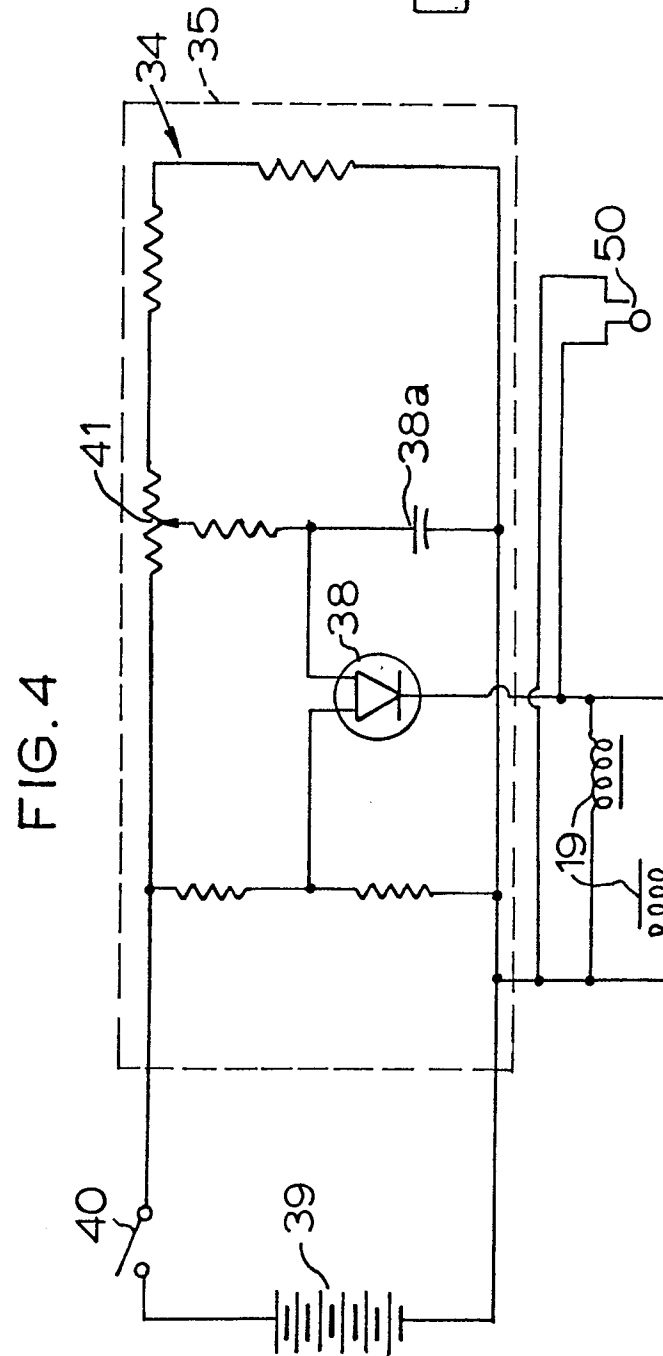
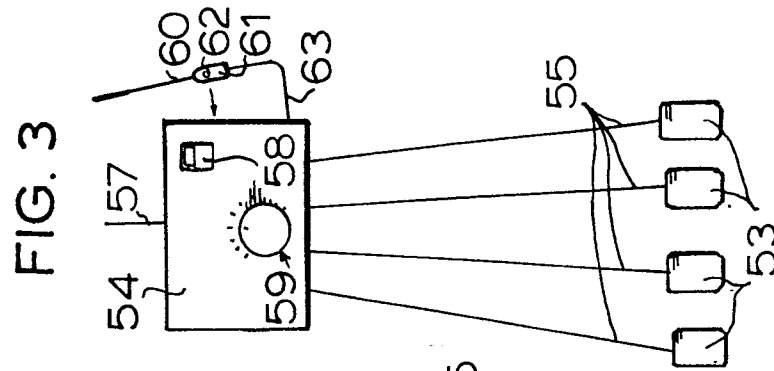
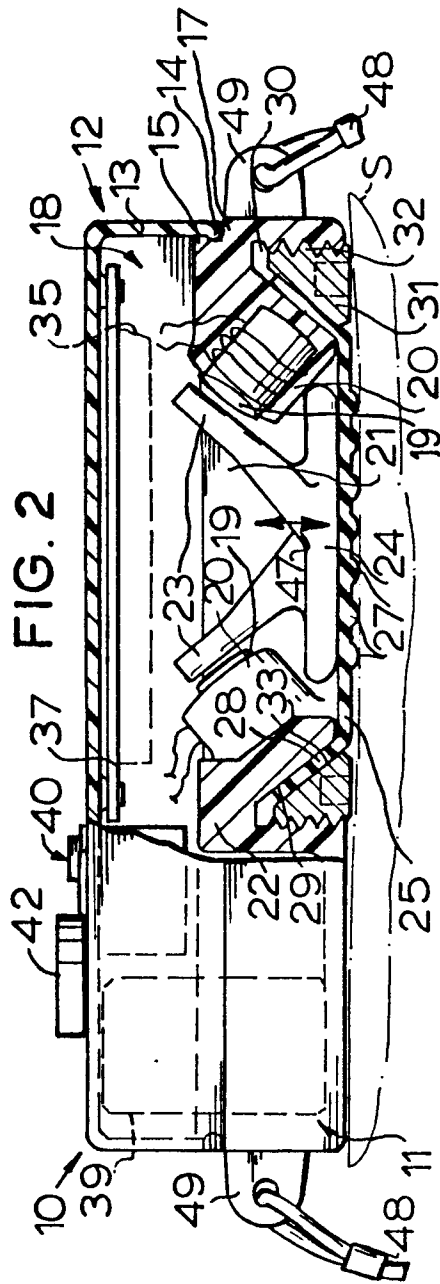
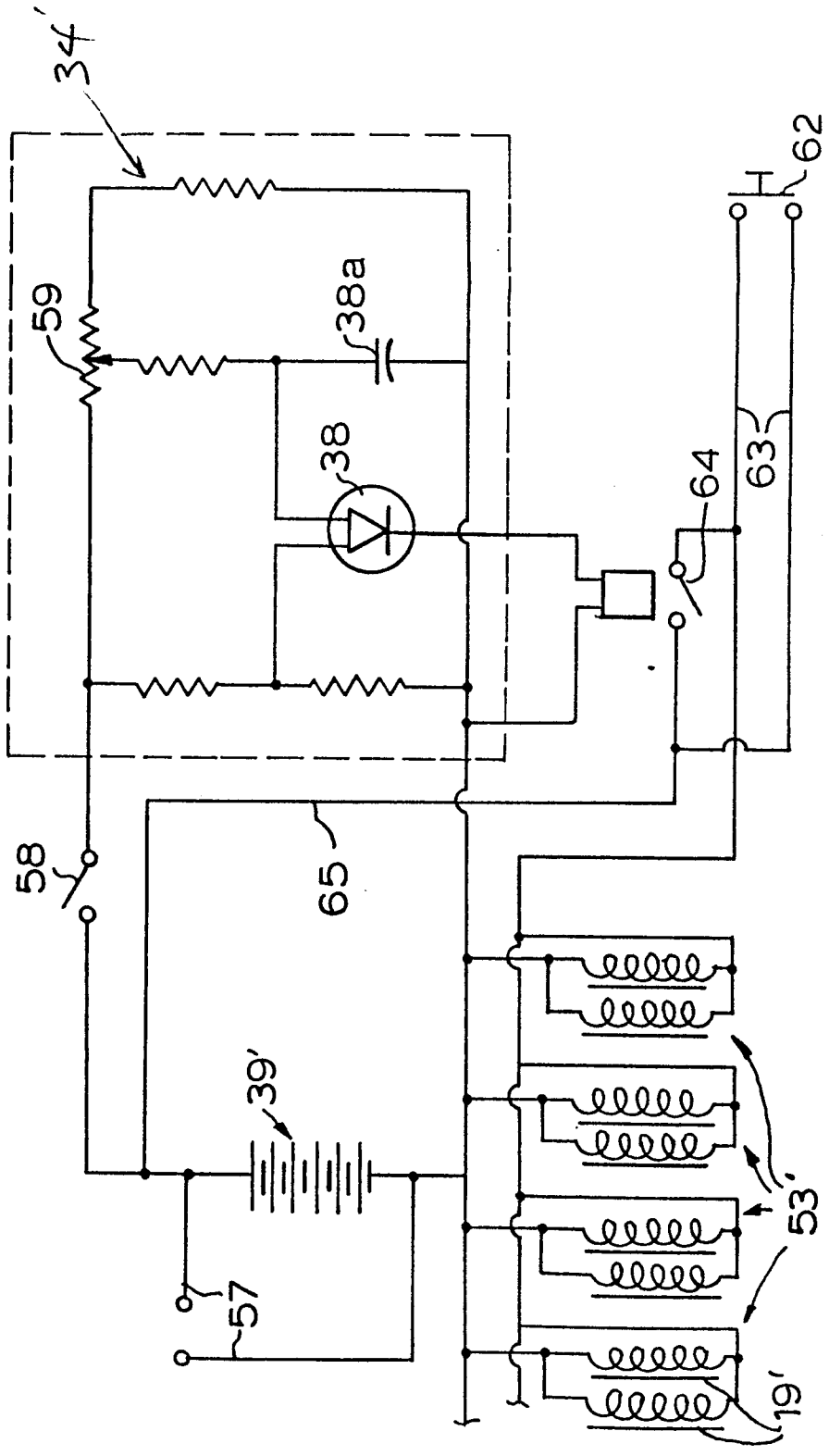


FIG. 5





| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                     |                                                                                                                              |                                                                                                                                                                                                                                                                              |                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Category                                                                                                                                                                                                                | Citation of document with indication, where appropriate, of relevant passages                                                | Relevant to claim                                                                                                                                                                                                                                                            | CLASSIFICATION OF THE APPLICATION (Int. Cl. <sup>3</sup> ) |
| A                                                                                                                                                                                                                       | PATENTS ABSTRACTS OF JAPAN, vol. 7, no. 198 (P-220)[1343], 2nd September 1983; & JP - A - 58 97 687 (KOUICHI OKI) 10-06-1983 | 1,3-7                                                                                                                                                                                                                                                                        | G 04 F 5/02                                                |
| D,A                                                                                                                                                                                                                     | ---<br>US-A-2 535 809 (O.H. NIENDORFF)<br>* Figures *                                                                        | 1                                                                                                                                                                                                                                                                            |                                                            |
| A                                                                                                                                                                                                                       | ---<br>CH-A- 220 800 (O. STALDER)<br>* Figures *                                                                             | 1                                                                                                                                                                                                                                                                            |                                                            |
| A                                                                                                                                                                                                                       | ---<br>FR-A-2 493 014 (E. STABLER)<br>* Page 2, line 1 - page 4, line 40 *                                                   | 5,8,9                                                                                                                                                                                                                                                                        |                                                            |
| A                                                                                                                                                                                                                       | ---<br>DE-A-2 454 621 (P. PÖTSCHKE)                                                                                          | 1                                                                                                                                                                                                                                                                            | TECHNICAL FIELDS<br>SEARCHED (Int. Cl. <sup>3</sup> )      |
| E                                                                                                                                                                                                                       | ---<br>GB-A-2 121 567 (SHIN HSING CHEN)<br>-----                                                                             | 1-9                                                                                                                                                                                                                                                                          | G 04 F<br>G 04 B<br>G 04 C<br>G 04 G                       |
| The present search report has been drawn up for all claims                                                                                                                                                              |                                                                                                                              |                                                                                                                                                                                                                                                                              |                                                            |
| Place of search<br>THE HAGUE                                                                                                                                                                                            |                                                                                                                              | Date of completion of the search<br>20-07-1984                                                                                                                                                                                                                               | Examiner<br>EXELMANS U.G.J.R.                              |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                             |                                                                                                                              | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                            |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                              |                                                                                                                                                                                                                                                                              |                                                            |