(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 188 896 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.03.2002 Bulletin 2002/12

(51) Int Cl.[7]: **E06B 9/32**

(21) Application number: **01203431.0**

(22) Date of filing: **11.09.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **18.09.2000 IT MI002027**

(71) Applicant: **DELTRON LTD.**
Douglas, Isle of Man IM1 1JD (GB)

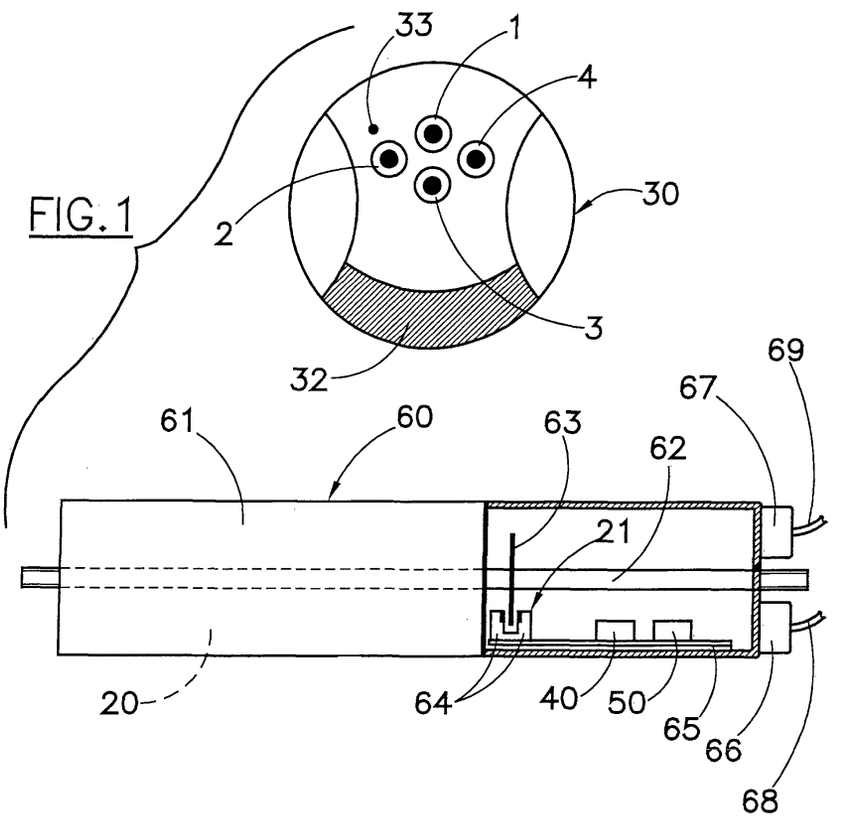
(72) Inventor: **Maffioli, Giampaolo**
30126 Venezia Lido Ve (IT)

(74) Representative: **Mittler, Enrico**
c/o Mittler & C. s.r.l.,
Viale Lombardia, 20
20131 Milano (IT)

(54) Remote control for venetian blinds

(57) An electronic system for the control of ratiomotors for the operation of the slats of Venetian blinds is described. The control system comprises a mobile part (30) made up of a portable radio transmitter and a fixed part (60) associated with the ratiomotor (20) for the operation of a Venetian blind and made up of a radio receiver (40), of an encoder (21) for the detection of the angle of rotation of the ratiomotor (20) and of an electronic power unit (50). The latter is controlled by said radio receiver (40) and by said encoder (21) so as to determine the rotation of the slats of the Venetian blind, in one sense or in the other, up to a desired end of stroke position under the control of the radio transmitter (30).

FIG. 1



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Description

[0001] The present invention refers to an electronic control system with remote control for reversible electric ratiomotors, commonly called "squared", assigned to the operation of Venetian blinds.

[0002] In the last few years the habit of using electric controls for the opening, closing and the movements for the adjustment of the inclination of the slats in Venetian blinds has been increasingly spreading.

[0003] A reversible squared type electric ratiomotor with appropriate power and speed gets thus installed in central position inside the box that contains the driving shaft of the blind. A pair of electric push buttons connected with the ratiomotor is provided in order to allow the user to control from the ground the operation of the same ratiomotor in one sense or in the other for the corresponding opening, closing or movement for the adjustment of the inclination of the slats of the roller shutter.

[0004] The end of the opening or closing movement is controlled by an electromechanical type microswitch, whose state is made to be dependent on the angular position of the driving shaft of the roller shutter by means of an appropriate mechanics that allows also the adjustment of the threshold for the intervention.

[0005] For some types of reversible electric ratiomotors destined to the operation of roll up devices, such as roller shutters, sun shades and the similar, remote control electronic control systems are already known, which provide for a radio receiver inserted in the ratiomotor, or in any case associated with it, and a portable radio transmitter made available to the user on the ground in order to control one or more ratiomotors. This is the case, for instance, of the electronic control system that is described in EP-A-0671676.

[0006] In such case the radio transmitter has its own identification code that is recognisable only by the enabled receiver or receivers. An example of system for the transmission and reception of codified signals for remote control that allows the desired univocality of dialogue between transmitter and receiver, without the problem of having to physically have access to the receiver, is described in the application for Italian Patent n. VE97A000021, deposited on 06/06/1997 in the name of TELECO AUTOMATION S.r.l.

[0007] In addition there is also provided the possibility to provide to the adjustment of the end of stroke for the opening and the closing of the roller shutter device from a distance, by using an electronic remote control system as taught in licence EP-A-0940736.

[0008] No remote control is currently provided for the control of Venetian blinds.

[0009] Scope of the present invention is therefore to provide an electronic control system with remote control for reversible electric ratiomotors assigned to the operation of Venetian blinds.

[0010] Another scope of the present invention is to provide a control system destined to the aforesaid use, which allows the adjustment of the end of stroke from a distance.

[0011] In view of the aforesaid scopes the control system according to the present invention is characterised in that it comprises a mobile part made up of a portable radio transmitter and a fixed part associated with a ratiomotor for the operation of a Venetian blind, said fixed part being made up of a radio receiver, of an encoder for the detection of the angle of rotation of the ratiomotor and of an electronic power unit controlled by said radio receiver and by said encoder so as to determine the rotation of the slats of the Venetian blinds, in one sense or in the other, up to a desired end of stroke position under the control of the radio transmitter.

[0012] There is also provided that the radio transmitter is utilisable for the control of the position of the end of stroke from a distance too.

[0013] Finally the possibility is provided that a single transmitter is capable of controlling more than one radio receiver and therefore the operation of several Venetian blinds. '

[0014] The characteristics and the advantages of the present invention will become evident from the following detailed description of an embodiment thereof, that is illustrated as a non limiting example in the enclosed drawings, in which:

Figure 1 shows the fundamental elements of a remote control electronic system for Venetian blinds according to the present invention;
Figure 2 shows an additional representation of a radio transmitter making up the mobile part of the electronic control system in Figure 1;
Figure 3 shows a cross-sectional view of the fixed part of the electronic control system in Figure 1;
Figure 4 shows the functional block diagram of the mobile part of the electronic control system in Figure 1;
Figure 5 shows the functional block diagram of the fixed part of the electronic control system in Figure 1;
Figure 6 shows the functional block diagram of a control unit comprised within the diagram in Figure 5.

[0015] As shown in Figure 1, an electronic remote control system according to the present invention fundamentally comprises a mobile part 30 and a fixed part 60 which are connected by means of radio waves.

[0016] The mobile part 30 is provided with a portable radio transmitter with four push buttons 1, 2, 3 and 4, corresponding to as many channels, the first two of which devoted to the individual lifting and lowering control and the other two destined to centralised controls. There is also provided a red led 33 that signals the emission of radio waves. A removable cover 32 closes a space, shown in Figure 2, in which a supply battery 32

and a push button 5 for the enabling of a radio receiver comprised within the fixed part 60 are housed, as it will be better explained hereinafter.

[0017] As illustrated in the form of a block diagram in Figure 4, the push buttons 1, 2, 3 and 4 are connected with a microcontroller 6, connected in biunivocal way with a memory 7 containing identification codes memorised by the supplier and connected in addition with a transmitter section 8 comprising an antenna 9. The push button 5 is connected with the microprocessor 6 too.

[0018] Getting back to Figure 1, it is possible to see that the fixed part 60 is in turn associated with an electric reversible ratiomotor 20, that is housed inside a casing 61 and determines, when commanded to do so, the rotation of a square section motor shaft 62 for the consequent rotation of the slats of a Venetian blind.

[0019] The aforesaid fixed part 60 comprises a radio receiver 40, an encoder 21 that is suitable to detect the angle of rotation of the motor shaft 62, and to this purpose made up of a pierced disc 63 which is fastened onto the motor shaft 62 (see also Figure 3) and of a pair of fixed sensors 64 opposite and staggered as regards one another (as for example of the type described in EP-A-0671676), and an electronic power unit 50. The radio receiver 40, the pair of sensors 64 and power unit 50 are mounted onto a printed circuit card 65 provided with the appropriate electric connections. Cable guide elements 66 and 67 for the passage of a power supply wire 68 and of an antenna cable 69 are provided.

[0020] As shown in the form of block diagram in Figure 5, the radio receiver 40 comprises a receiving section 11 with relative antenna 10 (connected with the antenna cable 69 in Figure 1) and a microcontroller 12 which receives signals from the receiving section 11 and it is connected in biunivocal way with a RAM memory 14, a sound alarm 13 which is piloted by the microcontroller 12, an amplifier 16 positioned in output of the radio receiver 40 and finally a push button 15, suitable to the clearing of the RAM memory 14.

[0021] In cascade with the radio receiver 40 and in particular with the amplifier 16, a power unit 50 is connected, that comprises a receiver decoder 17 connected with a control unit 18, than in turn pilots a power device 19 connected with the ratiomotor 20. The encoder 21, physically associated with the ratiomotor 20, is functionally interposed between the ratiomotor 20 and the control unit 18.

[0022] A rectifier 22 and a stabiliser 23, in cascade with it, provide an appropriate power supply to the microcontroller 12, to the RAM memory 14, to the receiving section 11, to the control unit 18, to the power device 19 and to the receiver decoder 17, by taking it from a power of mains terminal 68.

[0023] In Figure 6 a possible functional block diagram of the control unit 18 is shown, in which the proper connections with the external blocks are also rendered: the unit 18 is internally subdivided into a counter block 24, that receives signals from the encoder 21 and is connected with a non volatile EEPROM memory 25, and a comparison block 26, that receives signals from the memory 25 and sends them to a microcontroller 27, the latter connected with the remaining external blocks and with the same memory 25.

[0024] To sum up, the control system according to the invention is therefore made of a radio receiver 40 with power unit 50 and encoder 21, all mounted onto the fixed structure of the Venetian blind, and of a portable radio transmitter 30 by which it is possible to control the radio receiver 40 and therefore ratiomotor 20 from a distance. Each transmitter has four channels for the normal use that are set in action by the four relative push buttons: such push buttons are usable in order to control the two running directions (lifting and lowering) of the single ratiomotor (push buttons 1 and 2) and in order to control the two running directions of other ratiomotors (push buttons 3 and 4) in a centralised way.

[0025] By means of the radio transmitter 30 it is also possible to carry out the adjustment of the end of stroke points of the roller shutter being controlled, to memorise or to cancel more transmitters relatively to a single radio receiver.

[0026] According to the aforementioned application for Italian Patent n. VE97A000021, the transmitter sends commands to a receiver by using a signal characterised by an emission code having a determined protocol (for instance made of 66 bits), which gets changed at each transmission in a random way (Rolling-code system). In addition each transmitter has its own identification code recognisable only by the enabled receiver or receivers, which characterises it as regards others by making it unique and not reproducible.

[0027] Each control system according to the invention, as already said consisting of a radio transmitter and a radio receiver, is destined to being supplied to the user with the transmitter provided with enabling only for the push buttons 1 and 2, which control the lifting and the lowering of the Venetian blinds, in addition to the orientation of the slats. Above all it is necessary to carry out the adjustment of the positions of end of stroke and to such purpose the following operating stages must be carried out:

a) the push buttons 1 and 2 of the radio transmitter are simultaneously pressed for a certain period of time (for instance 15 seconds) and immediately the microcontroller 6 sends signals to the memory 7 which contains the relative codes and in turn sends instructions to the microcontroller 6; the latter by means of the transmitter section 8 sends a radio frequency codified signal to the radio receiver 40, which is tuned with its own receiving section 11 to the same frequency of transmission, so as to be sent to the microcontroller 12 which sets in action the sound alarm 13 in such a way that this sounds uninterruptedly for the entire aforesaid period of time. In addition the microcontroller 12, through the

amplifier stage 16 and the receiver decoder 17, sends a control signal to the control unit 18, that informs it that at the end of the aforesaid seconds 15 it must clear to the entire EEPROM memory 25. In this way the system is ready for the end of stroke information to be set in the EEPROM memory 25.

b) Once the two push buttons 1 and 2 have been released, a single one of the two previous push buttons (for instance the push button 1 corresponding to the lifting movement) must be pressed up until the reaching of the desired end of stroke position (top) and therefore it must be released. When the push button 1 is pressed, the microcontroller activates itself by sending signals to the memory 7, containing codes relative to the channel being activated and it receives instructions from it, therefore by means of the section 8 it sends a codified signal to the receiver; the microcontroller 12 informs the control unit 18 of the signal being received and the latter pilots the power device 19 that in turn sets in action the motor 20 and the roller shutter lifts up. The encoder 21 reads the degrees of rotation of the motor shaft 62, and therefore the pace of the motor 20, and it sends impulses to the unit 18 that through the function 24 starts counting them until the push button 1 is released and the movement of the ratiomotor stops.

c) At this point the push buttons 1 and 2 must be pressed again simultaneously for a determined interval of time (for instance more than 1 second), then, once they are released, the lifting push button 1 is immediately pressed (within 0.25 second) for a certain time (for instance more than 1 second). In this way the information of the number of impulses generated in the encoder 21 is memorised in the EEPROM memory 25 and in addition such information is associated with the lifting push button in such a way that each time the push button 1 will be pressed again in the future, the system will be ready to execute the opening movement (lifting) of the Venetian blinds up to the programmed end of stroke position in a repetitive and automatic way.

[0028] By these operations the top end of stroke position is memorised and in order to memorise the bottom one too it is necessary to press the push button 2 (lowering) until the reaching of the desired point of end of stroke, to release it, to press simultaneously the push buttons 1 and 2 for a time above one second, then to release them and finally to immediately (within 0.25 second) press the lowering push button 2 for a time above one second: in a similar way as before, the information relative to the bottom end of stroke position is memorised in the memory 25 , so that at each subsequent operation on the push button 2 the mobile element will automatically reach the aforesaid bottom end of stroke point.

[0029] At this point the transmitter is capable to control the lifting and the lowering of Venetian blinds up to the automatic stop in correspondence of the relative end of stroke: for instance, by pressing the push button 1, relative to the lifting, the microprocessor 6 sends, by means of the transmitter section 8, a codified signal to the receiver 40 and therefore the microcontroller 12 is programmed so as to transmit a control signal to the power unit 50, whose control unit 18 is predisposed so as to set in action the power device 19 and to obtain the relative movement of the ratiomotor 20; the number of impulses generated by the encoder 21 and associated with the movement of the ratiomotor 20 is counted by the block 24 and compared by means of the block 26 with the information stored in the memory 25, indicating the end of stroke position, and in the instance the two data turn out to be equal, the microcontroller 27 automatically stops the ratiomotor 20 and the slats of the Venetian blinds have reached the desired end of stroke position.

[0030] If one wants to enable the two channels 3 and 4 too devoted to the centralised control of more receivers associated with respective ratiomotors in order to set in action as many Venetian blinds, it is necessary to proceed in the following way:

a) in the first stage the push button 5 for the enabling of a determined receiver must be pressed, for a time interval within which the microcontroller 6 transmits a codified signal to the receiver by means of the sections 8 and 11, therefore the microcontroller 12 sets in action the sound alarm 13 so as to emit a continuous sound; in this way the receiver is enabled so as to memorise an additional channel in its RAM memory 14;

b) within a determined period of time (for instance 5 seconds) from the beginning of the sound signal it is necessary to press the channel to be memorised in the memory 14, for instance the push button 3; the confirm of the memorisation being made is signalled by a change in the sound produced by the sound alarm 13;

c) it is necessary to repeat what reported in the two aforesaid points by pressing in this case the push button 4 in order to memorise the last channel that is left to be memorised.

[0031] In order to memorise the channels 3 and 4 of the aforesaid transmitter in other control systems according to the present invention, that is to enable the aforesaid transmitter to the centralised control of other receivers, it is necessary to repeat for each single system the point a) with the transmitter of that system, since it is the only one capable to enable the relative receiver for the memorisation by means of the push button 5 and therefore to repeat the points b) and c) with the transmitter of the other system that one wants to be enabled for the centralisation control.

[0032] For the memorisation of the channels 1 and 2

of an additional transmitter, for instance coming integral from the supplier, for a system according to the present invention, provided only with its own transmitter, it is necessary to carry out the same operations just described for the memorisation of the centralised control channels 3 and 4, for each single channel of each transmitter that one wants to be added.

[0033] Each receiver, for instance, can memorise 64 channels and therefore it is possible to associate at most 32 transmitters with it with the centralised control channels 3 and 4, or 16 four-channel transmitters 1, 2, 3 and 4.

[0034] In order to operate a cancellation of the channels of an additional transmitter or of the channels 3 and 4 of the main transmitter it is necessary to carry out the following operations for each single channel: the push button 5 must be pressed for a certain number of times at regular intervals, within a determined period of time (for instance for three times within 5 seconds), and in such a way a codified signal is sent by the transmitter 30 to the receiver which reaches the microcontroller 12, which sets in action the sound alarm 13 in such a way that the latter sounds slowly at intermittence and in addition it predisposes the RAM memory 14 so that its locations, relative to certain channels, get cancelled.

[0035] The subsequent pressure on the push button of the channel that it is wanted to be cancelled, within a prefixed interval of time (for instance 5 seconds) from the beginning of the sound signal, causes the deletion of the locations in the RAM memory 14, relative exactly to that determined channel, so that at each subsequent command given with the push button of the channel being cancelled, the microcontroller 12, to which the relative codified signal from the transmitter 30 gets, does not receive any instruction from the RAM memory 14 and the power block unit 50 is not piloted and therefore the ratiomotor 20 is not set in operation.

Claims

1. Electronic control system for ratiomotors for the operation of the slats of Venetian blinds, **characterised in that** it comprises a mobile part (30) made up of a portable radio transmitter and a fixed part (60) associated with the ratiomotor (20) for the operation of a Venetian blind and made up of a radio receiver (40), of an encoder (21) for the detection of the angle of rotation of the ratiomotor (20) and of an electronic power unit (50) controlled by said radio receiver (40) and by said encoder (21) so as to determine the rotation of the slats of the Venetian blind, in one sense or in the other, up to a desired end of stroke position under the control of the radio transmitter (30).

2. Control system according to claim 1, **characterised in that** said radio transmitter (30) comprises at least two push buttons (1, 2) for the control of the closing and opening movement of the Venetian blind.

3. Control system according to claim 2, **characterised in that** said radio transmitter (30) comprises in addition a transmitter section (8) (9) comprehensive of an antenna and a first microcontroller (6) with a first memory (7) of prefixed codes that at each operation on at least one of said control push buttons (1, 2) sends a codified signal, having a respective identification code of the push button being operated, to said transmitter section (8).

4. Control system according to claim 3, **characterised in that** said radio receiver (40) comprises a receiving section (11), comprehensive of antenna (10), suitable to receive the codified signal transmitted by said radio transmitter (30) by means of said transmitter section (8), and a second microcontroller (12) with a second memory (14) of prefixed codes, that at each signal being received, having one of the codes of said second memory (14), emits a control signal for said power unit (50), and said power unit (50) comprises a control unit (18) provided with a third memory (25) that, upon reception of said control signal, starts the rotation of said ratiomotor in one sense of rotation or in opposite sense according on the identity of the push button being operated of said radio transmitter (30) and receives identification data of the angle of rotation of the motor from an encoder (21) coupled to the motor, in order to allow the rotation of the same motor up to the reaching of a prefixed end of stroke.

5. Control system according to claim 3, **characterised in that**, in order to allow the electronic adjustment of the end of stroke position for the lifting and lowering of the roller shutter, said first microcontroller (6) is programmed so as to emit a first or a second codified signals depending on whether respectively either a first (1) or a second (2) one of said push buttons get pressed, and said second microcontroller (12) is predisposed so that the reception of one of said first or second codified signals causes the emission of a first control signal for the pilot of the motor up to the reaching of a first end of stroke position and an information of the position of said end of stroke generated by said encoder (21) is memorised in said third memory (25) associated with the pressed push button that has generated said codified signal, so that subsequently, each time that said push button gets pressed , said system is ready to have the Venetian blinds automatically execute the desired movement up to the end of stroke position being programmed, the aforesaid sequence being repeated for the adjustment of a second end of stroke position corresponding to the operation of the other one of said first or second push button (1,

2).

6. Control system according to claim 5, **characterised in that** said first microcontroller (6) is programmed so that the reception of a third codified signal generated by pressing simultaneously said first and second push button and maintained for a first interval of prefixed time causes the generation of a zeroing signal for said third memory (25) and the repetition of said third codified signal for a second interval of prefixed time causes the generation of a second control signal for said second microcontroller (12) in order to memorise said information on the end of stroke position generated by the encoder (21) in said third memory (25).

7. Electronic control system according to claim 5, **characterised in that** said radio transmitter (30) comprises at least two centralised control push buttons (3, 4) and one enabling push button (5), which are connected with said first microcontroller (6) in such a way that, by pressing said enabling push button (5) and by pressing subsequently one of the two centralised control push buttons (3, 4) of said radio transmitter within a fourth prefixed time interval or one of the two push buttons (1, 2) for the lifting and lowering control or one of the two centralised control push buttons (3, 4) of another radio transmitter, a fourth codified signal is generated for said microcontroller (12) in order to memorise in said second memory (14) an identification code of the push button being pressed.

8. Electronic control system according to claim 7, **characterised in that**, by pressing said enabling push button (5) for a prefixed number of times and by subsequently pressing one of the two centralised control push buttons (3, 4) of the same radio transmitter or one of the two push buttons (1, 2) for the lifting and lowering control or of the two centralised control push buttons (3, 4) of another radio transmitter within said fourth interval of prefixed time, an additional codified signal for said second microcontroller (12) is generated in order to cancel in said second memory (14) the identification code of the push button being pressed .

9. Electronic control system according to claim 5, **characterised in that** said receiver (40) comprises a clearing push button (15) for the manual clearing of said second memory (14).

10. Electronic control system according to claim 5, **characterised in that** said radio receiver (40) comprises an amplification stage (16) in output of said second microcontroller (12).

11. Electronic control system according to claim 5, **characterised in that** said power unit (50) comprises a receiver decoder (17), suitable to receive the control signals from said receiver (40) and to send them, once being appropriately decoded, to said control unit (18).

12. Electronic control system according to claim 5, **characterised in that** said power unit (50) comprises a rectifier (22) and a stabiliser (23), in cascade with it, which supply an appropriate power supply to the elements of the radio receiver (40) and of the power unit (50) that need it, by taking it from a power of mains terminal (68).

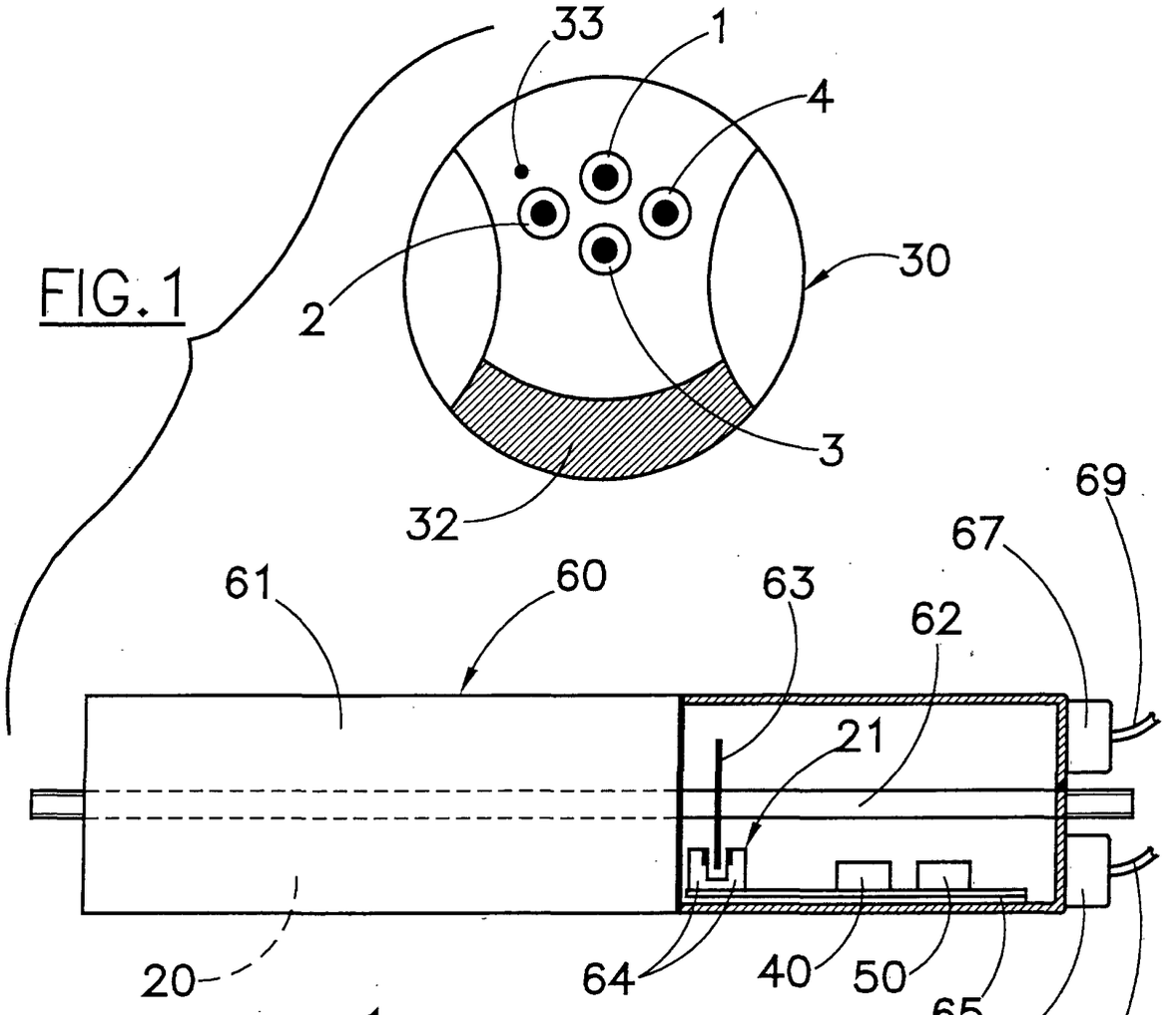


FIG.1

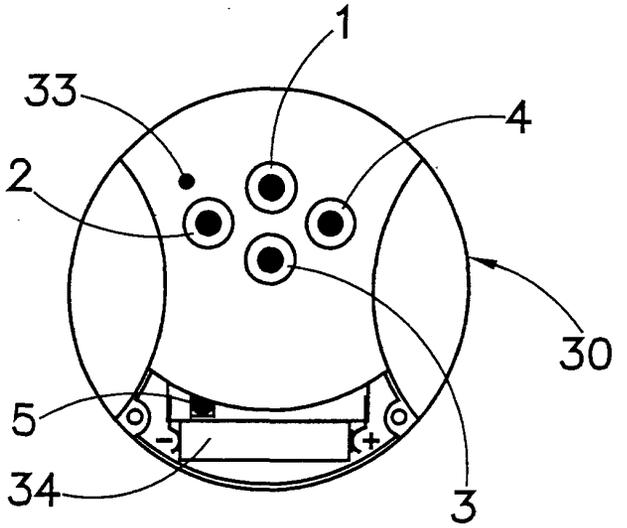


FIG.2

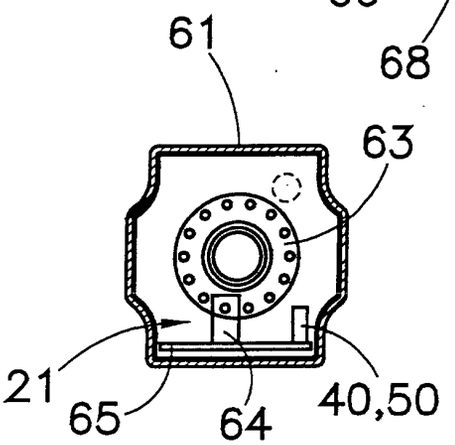


FIG.3

FIG.4

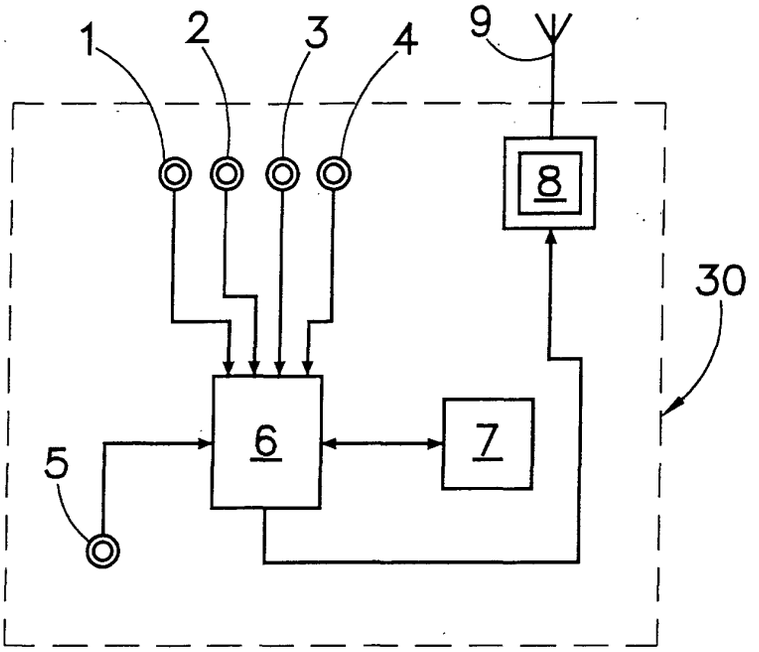
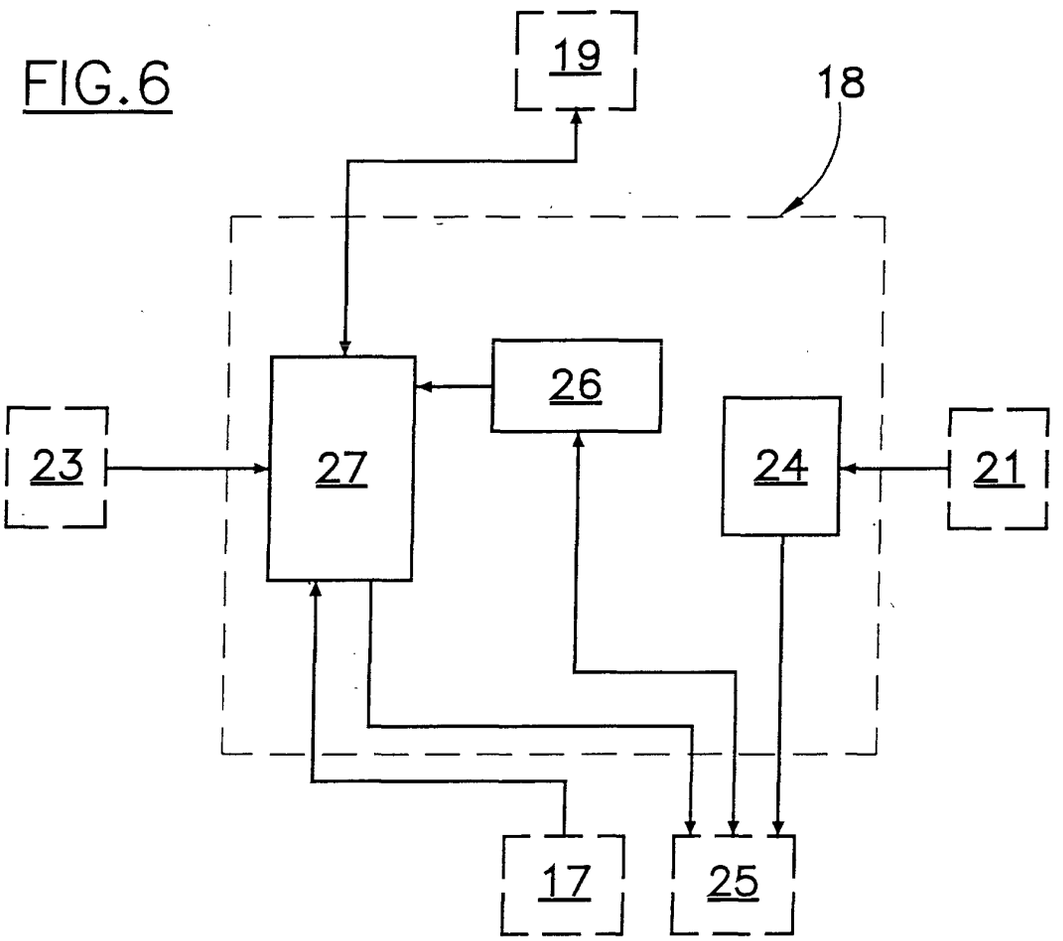


FIG.6



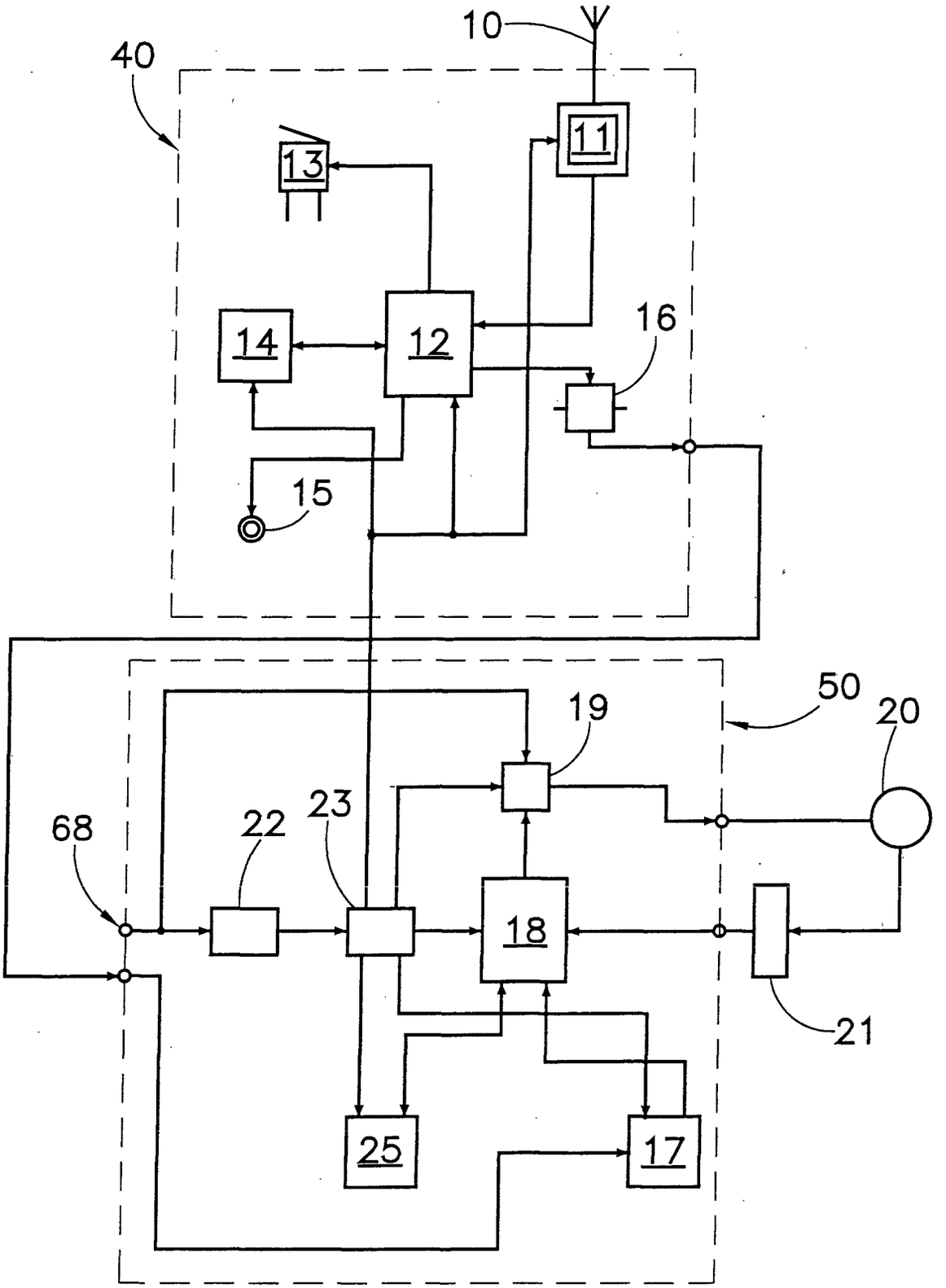


FIG.5