

July 11, 1961

CARL-ERIK GRANQVIST
STAND-BY UNIT ARRANGEMENT

2,992,363

Filed May 28, 1956

3 Sheets-Sheet 1

Fig. 1.

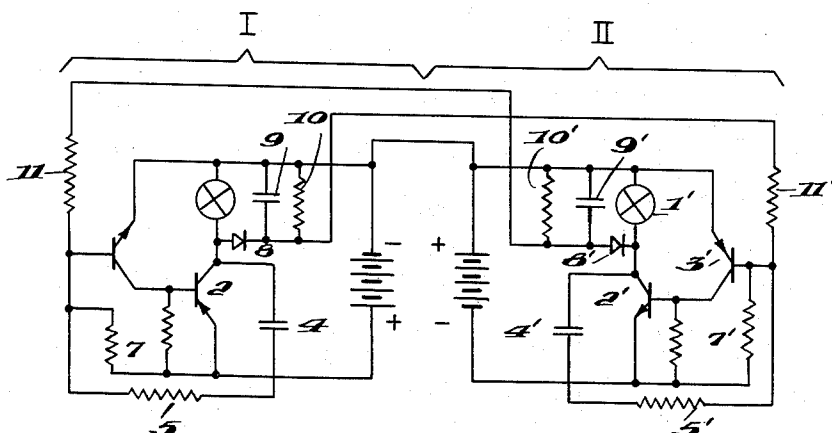


Fig. 2.

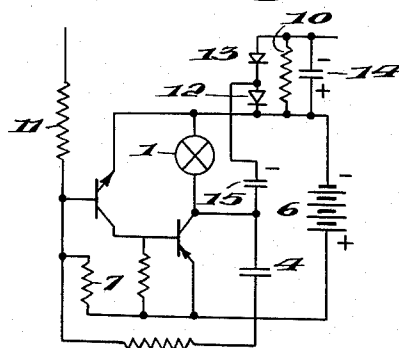


Fig. 3.

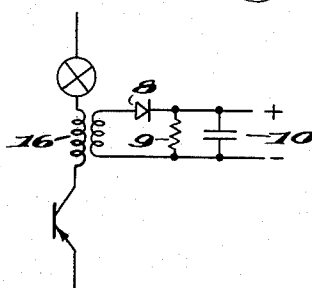
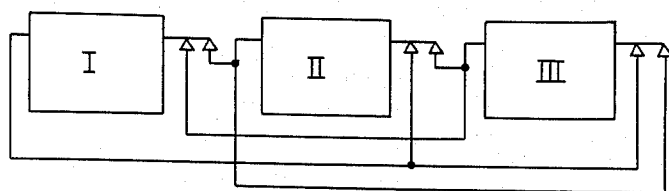


Fig. 4.



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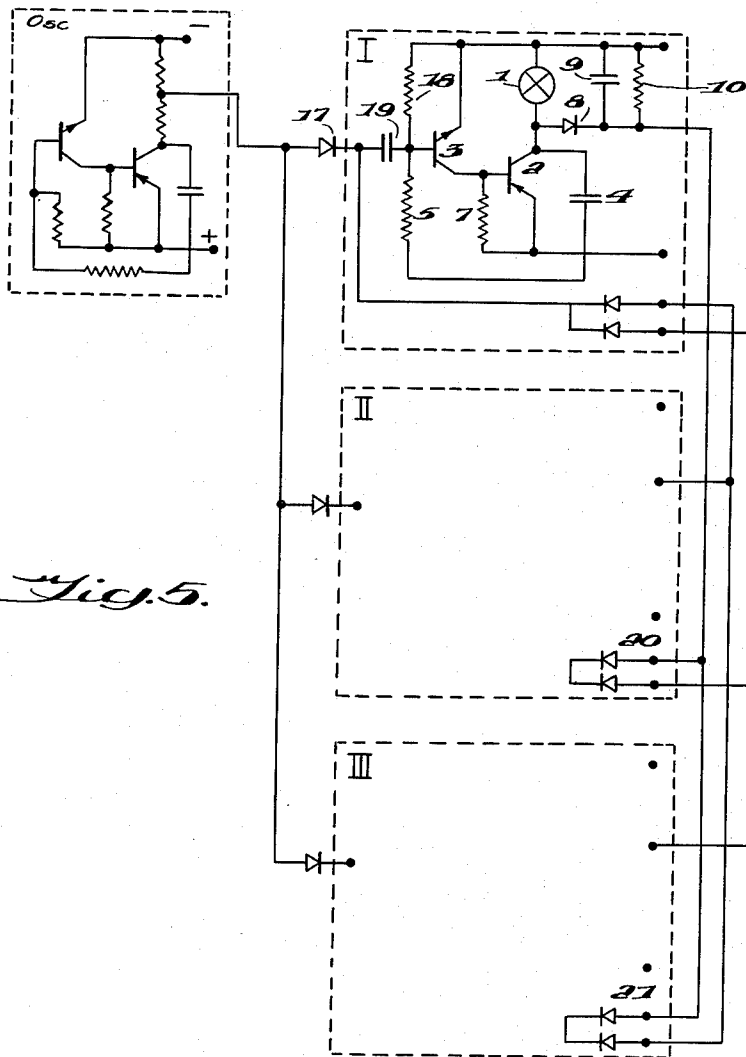


Fig. 5.

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Lic. B.

Fig. 6.

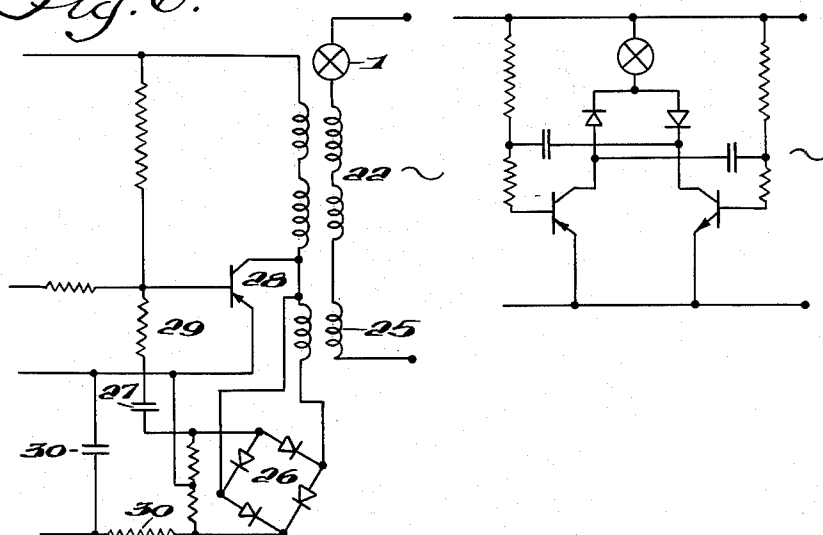
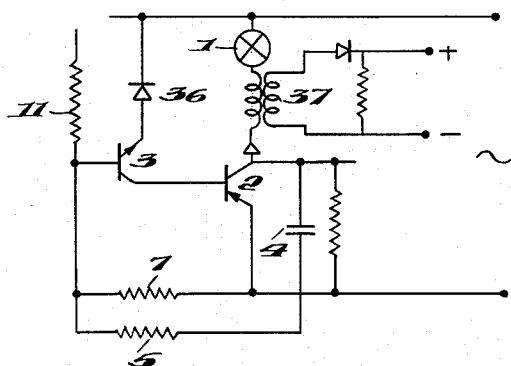


Fig. 7.



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STAND-BY UNIT ARRANGEMENT

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4 Claims. (Cl. 315—87)

In automatically driven arrangements it is often desirable to have a stand-by unit switched into operation automatically when a disturbance in the operation of the normally operative unit occurs. This applies, for instance, to electric beacons without mechanically movable parts, in which it is necessary in order to increase the active life of the arrangement to replace automatically the light source, the battery, or possibly the control signal oscillator itself. In order to obtain a high light output in arrangements of this type, the lamps are often driven at a high temperature, which causes them to be shortlived. It is therefore customary to arrange automatic lamp changers with four or more lamps in order to achieve the desired active life span. To this end, a relay with double windings has usually been employed, which responds when no current passes through the normally operative lamp and causes by its response a fresh lamp to be fed into position, for instance by means of a step-by-step mechanism.

The present invention refers to stand-by unit switching arrangements generally and particularly of the type just referred to, which is used in electric beacons, in which the current supplied to the arrangement is controlled without mechanically movable parts. According to the invention, each unit is adapted in operation to produce a blocking voltage, which is applied to the other units and blocks them off.

Embodiments of the invention are described below with reference to FIGS. 1—8 of the annexed drawings.

FIG. 1 shows an arrangement comprising two units. The units are designated I and II and comprise similar parts, which have been given the same designations, the parts of the unit II having a prime following the reference numeral. In the following, only the unit I will therefore be described. It comprises an apparatus 1, for example a beacon lamp, which is driven by means of current pulses from a relaxation oscillator comprising a pair of transistors 2 and 3 connected with opposite polarities. To simplify the arrangement, transistors of different types have been employed in corresponding positions in the two units, as is apparent from the figure. The batteries are therefore connected with opposite polarities. Each unit can, owing to this arrangement, produce in a simple manner a blocking voltage for blocking off the other unit, as will be apparent from the following.

The unit I operates in the following way. An electrical disturbance at the base of the transistor 3 is amplified and impressed on the base of the transistor 2, whereby a current impulse is obtained and is applied to the apparatus or lamp 1. This causes a positive impulse to be impressed on the condenser 4, whereby a further potential increase is obtained at the base of the transistor 3. The current flowing through the feedback path is limited by a resistor 5 inserted therein, which resistor together with the condenser 4 substantially determines the length of the light intervals. When the condenser 4 has been almost completely discharged, a voltage at the base of the transistor 3 decreases and, owing to the amplification occurring in the transistors, the light interval is cut off abruptly. After some time the condenser 4 is recharged over the resistor 7, whereupon a fresh light period is obtained. The distance between the light periods is therefore substantially determined by the condenser 4 and the resistor 7.

In order to obtain a blocking voltage there is used a

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rectifier 8 with an integrating load circuit comprising a condenser 9 and a resistor 10. The rectifier is connected in series with its load circuit across the lamp 1. When the unit I is in operation, a positive voltage is obtained across the resistor 10, which blocks off the unit II through the resistor 11'. If, for some reason or other, the unit I should become inoperative, for instance owing to a break in the lamp, no voltage is obtained across the resistor 10 and the unit II automatically starts operating. If the battery voltage of the unit I is too small or some other type of error occurs, this may have the result that the voltage across the resistor 10 gets too small to block the unit II effectively. In order to avoid simultaneous operation of both units and the irregularities in operation caused thereby, the unit II is provided with a similar blocking circuit for blocking off the unit I when the unit II has started. Owing to the use of transistors of different polarities in the two units, the blocking voltage of the unit II must have the opposite polarity of that of the unit I.

When the batteries are connected to the units according to FIG. 1, either the unit I or II may start first. If the battery 6 is first switched on, the unit I will obviously start first and will then block the unit II. If it is desired to have a preference for one of the units in operation, the resistors 11 and 11' or 7 and 7' may be chosen of different magnitudes. This results in somewhat different circuit arrangements, which require different battery voltages.

This drawback can be obviated and a standardization of the units be obtained through the use of the modified circuit arrangement shown in FIG. 2. It is substantially the same as that of the unit I according to FIG. 1, corresponding elements having been designated with the same reference numerals. The difference is that two rectifiers 12, 13 have been inserted in a voltage-doubling arrangement, whereby a blocking voltage is obtained across the resistor 10. To this end, two condensers 14 and 15 are used, one of which is in parallel with the resistor 10 and the other of which is connected between the junction of the rectifiers 12, 13 and the lamp circuit.

FIG. 3 shows a modified arrangement for obtaining a blocking voltage by means of a transformer 16 having its primary in series with the lamp and its secondary connected to the rectifier 8 with its load circuit 9, 10.

The invention is also applicable in case there has to be more than one stand-by unit to be switched into operation automatically when a failure occurs. An arrangement of this type is indicated by the block diagram shown in FIG. 4 comprising three units I, II, III. The interconnections of the units are shown only to the extent that they are of interest for the application of the blocking voltages. These are fed in at the right of each block, as indicated by means of arrows, a blocking voltage being obtained at the left for each block for application to the other two. If it be assumed, for instance, that the unit I is in operation, the output thereof is negative and the units II and III are therefore blocked off. In the same manner, the units I and III, for instance, will be blocked off if the unit II is in operation. It is obvious that it is possible in this manner to switch an arbitrary number of units into operation. In the case of beacons, when the various beacon lamps must be at the focal point of a lens system, the units may be constructed either to have a common beacon lamp with a plurality of filaments, or the various beacon lamps may be placed each in a corresponding lens system, the lens systems being, for instance, placed above each other.

FIG. 5 shows an arrangement, in which a control oscillator designated OSC is adapted for the common control of three units I, II and III. The units are thus normally inoperative and start only upon the application of a pulse, in response to which a light interval is produced. The three units are similar, so that the circuit

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arrangement has been shown only for the first one. This arrangement is otherwise the same as that of the unit I according to FIG. 1, which has been indicated by the use of corresponding reference marks. A difference consists in that the resistor 18 is connected between the base and the emitter of the first transistor 3, thereby to prevent self-oscillation of the unit I. The control arrangement OSC operates in the same manner as was described in connection with FIG. 1 and produces positive pulses, which are applied to the rectifiers 17 of the various units. A positive pulse passes through the rectifier and is impressed on the transistor 3 through the condenser 19, unless the cathode of the rectifier 17 is positive with regard to its anode. The arrangement for producing a blocking voltage is similar to what has been shown above. The blocking voltage from the unit I is applied to the other units over rectifiers 20 and 21 therein. If the unit I is in operation, the units II and III will be blocked owing to the fact that no positive control pulses can be applied, since they are blocked off by the blocking voltages impressed through these rectifiers.

The arrangement of FIG. 5 is superior to those described above, since the blocking voltages can not influence the character of the signal. It is obvious, that an arbitrary number of arrangements can be interconnected, it being only necessary to increase the number of rectifiers for the distribution of the blocking voltage. The rectifiers 20, 21 etc. referred to are necessary as soon as more than two units are used in order to obviate inter-coupling of the units.

In A.C. operation it may be advantageous to replace the power control transistor by a saturable-core reactor, especially if very strong light sources are used. Such an arrangement is illustrated in FIG. 6, in which a saturable-core reactor 22 is in series with the lamp 1. In series with the lamp and the reactor there is a special transformer 25 for producing the relaxation voltage. The transformer 25 supplies voltage to a rectifier bridge circuit 26, from which an A.C. voltage is applied to the condenser 27 and through the condenser and a resistor 29 to the base of a transistor 28. In the operation of the arrangement, a disturbing voltage causes a growing voltage to flow through the reactor, which results in the application of a feed-back relaxation voltage over the transformer 25 and the bridge circuit 26, which aids the increase of the current. The length of the light pulse is therefore substantially determined by the magnitudes of the resistor 29 and the condenser 27. A blocking voltage is obtained through the charging of a condenser 30, which occurs over resistor 31. The operation of the arrangement is otherwise fundamentally the same as has already been described, so that further explanation thereof will not be required.

The circuit arrangements shown can also be used in principle for A.C. operation, it being however then necessary to see to it that they are protected against the alternating voltage during the half-periods when the collector

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is not operating in the blocked interval. This can be achieved in a simple manner through the insertion of rectifiers. An arrangement of this kind is shown in FIG. 7, where the rectifiers inserted to this end are designated 35 and 36. The arrangement is otherwise the same as has been shown above, as has been indicated through the use of similar reference characteristics. An explanation of the operation of the arrangement will therefore not be required.

FIG. 8 shows a circuit arrangement for alternating current having a pair of transistors of different polarities connected each across a corresponding rectifier. In this case a blocking voltage of arbitrary polarity can easily be obtained since positive as well as negative D.C. pulses are obtained in the transistors.

What is claimed is:

1. A stand by unit arrangement comprising at least two units, each of said units comprising a light source, and means to apply a voltage across the terminals of said light source, said means including means to apply zero voltage across the terminals upon failure of the light source, one of said units being normally operative applying a voltage to the terminals of the light source in said unit, means connecting said units whereby the voltage across the terminals of the light source of said operative unit blocks the voltage applied to the light source of the other unit, whereby on failure of said light source in said operative unit, operating voltage is applied to the terminals of said light source in said other unit, thus resulting in operation of said other unit.

2. Arrangement according to claim 1 wherein each unit comprises a pulse generator for feeding current pulses to said light source.

3. Arrangement according to claim 2, wherein an integrating circuit is connected across the light source through a rectifier, thereby to obtain the blocking voltage across the integrating circuit.

4. Arrangement according to claim 1 wherein said units comprise means whereby a preference is obtained for one of said units when they are switched on simultaneously.

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