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MAY 18, 1943.
BY A. P. C.

A. ZUCKERMANN
SIGNALLING OR ADVERTISING DEVICES
Filed April 24, 1940

Serial No.
331,281
4 Sheets-Sheet 1

Fig. 1.

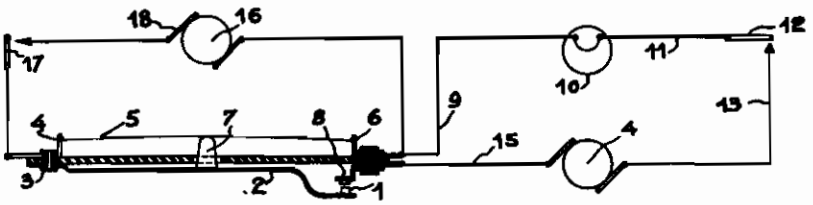


Fig. 2.

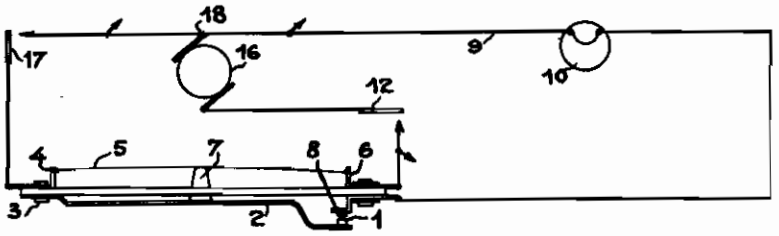


Fig. 3.

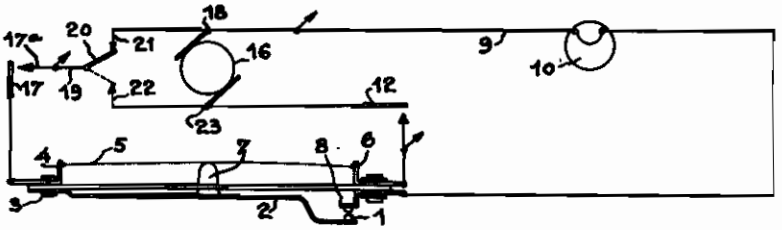


Fig. 5.

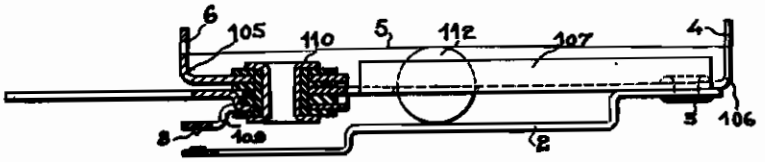
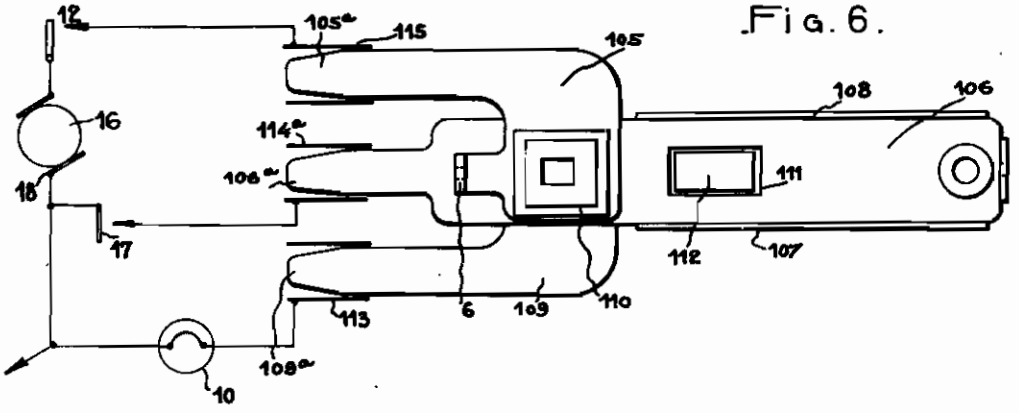


Fig. 6.



INVENTOR:
ARMAND ZUCKERMANN
BY Hasdline, Lake & Co.
ATTORNEYS

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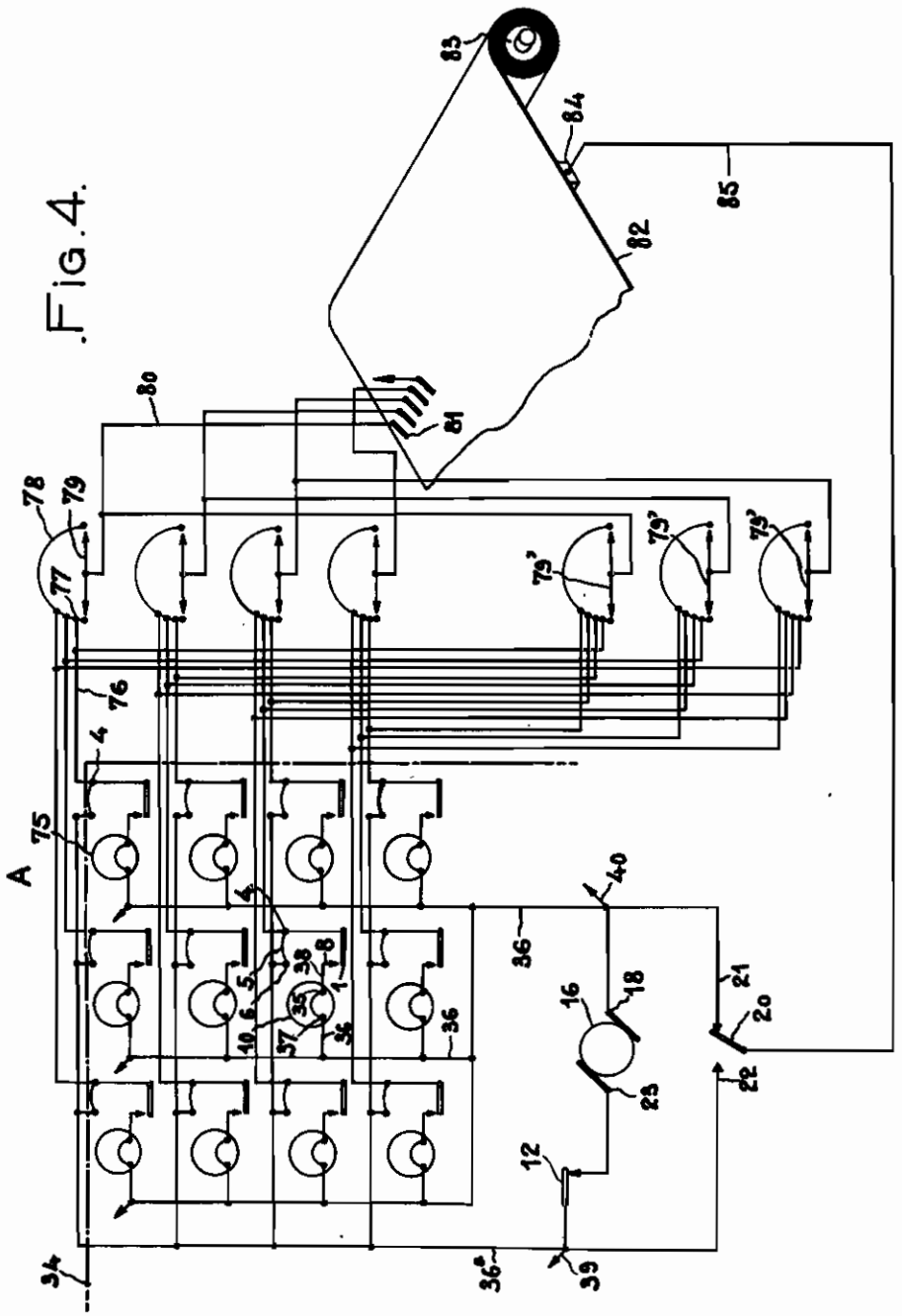
Fig. 4.



INVENTOR
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BY Haseltine, Lake & Co.
ATTORNEYS

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Fig. 8.

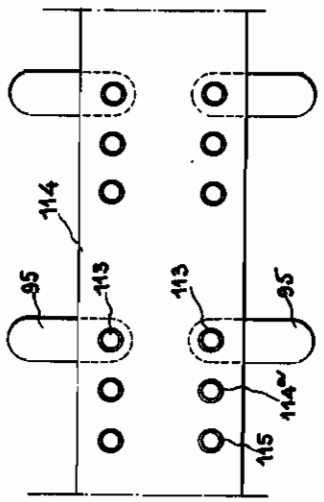


Fig. 9.

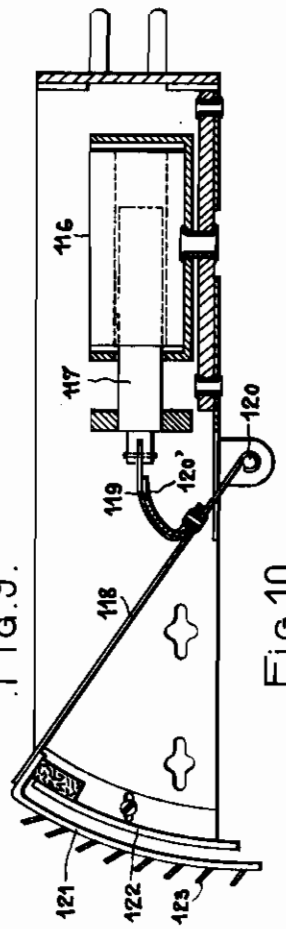


Fig. 10.

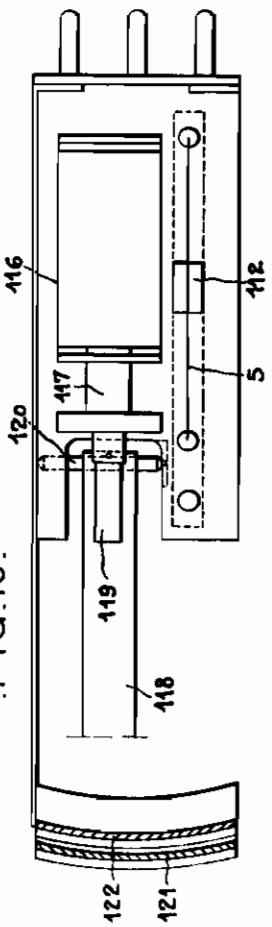
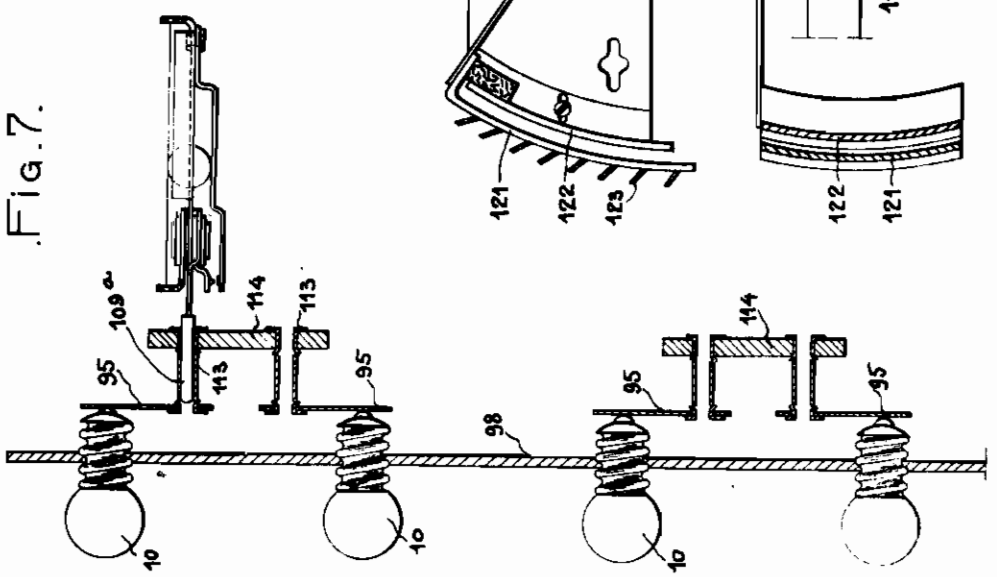


Fig. 7.



INVENTOR:
ARMAND ZUCKERMANN
BY Haseltine Lake & Co
ATTORNEYS

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A. ZUCKERMANN

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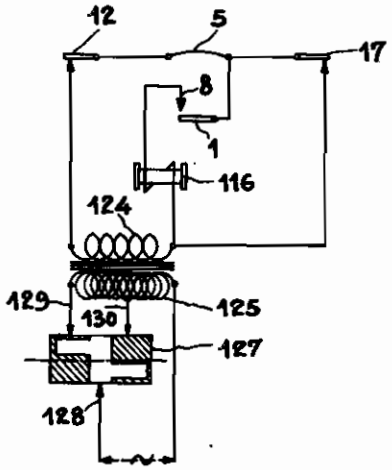
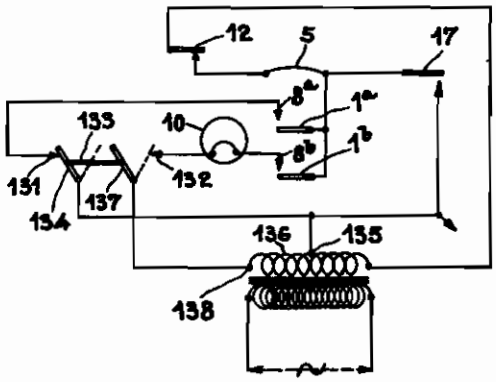
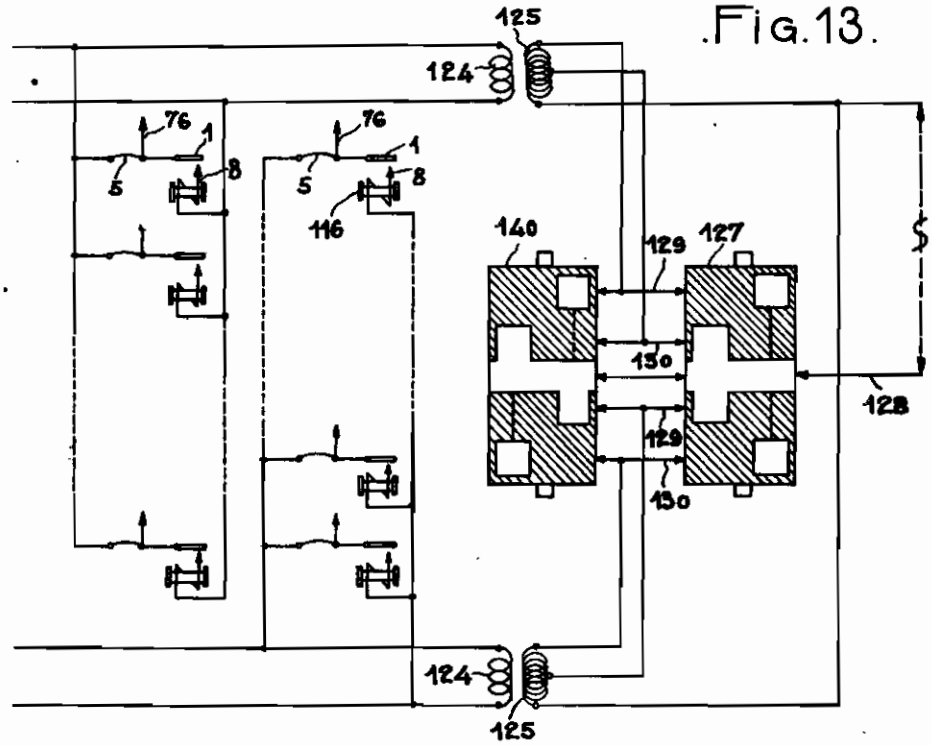
.Fig.11.



.Fig.12.



.Fig.13.



INVENTOR:
ARMAND ZUCKERMANN
BY Haseltine Lake & Co.
ATTORNEYS

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ALIEN PROPERTY CUSTODIAN

SIGNALLING OR ADVERTISING DEVICES

Armand Zuckermann, Paris, France; vested in the Alien Property Custodian

Application filed April 24, 1940

Signalling or advertising devices are already known which are constituted by boards of juxtaposed elements capable of changing their aspect under the action of an external manual or automatic control device. These elements are, for instance, lamps which light or go out, or reflecting surfaces visible in a certain so-called working position and invisible in another so-called rest position, either by the displacement of said surfaces, or by the displacement of a shield which covers them, or on the contrary, uncovers them, according to its position. The device controlling said elements comprises switching means which allow some of said elements to be given, simultaneously or successively, their working aspect, for forming certain figures, and to maintain said aspect until a reverse manipulation is effected which restores to them their rest aspect.

For solving this problem, use has been made, up to now, for each element, of a relay which will be called herein energising relay, because it is its energisation which causes, directly or indirectly, the corresponding element to assume its working aspect. Two cases must then be considered, according as the element is devised to automatically assume its rest aspect as soon as the energisation ceases, or as it maintains its working aspect after the energisation has ceased. In the first case, a holding circuit must obviously be provided for each relay, the return to rest aspect taking place by simply cutting off said holding circuit; in the second case, a special device must be provided, for instance an electric, mechanical or pneumatic device which restores their rest aspect, at the required moment to the elements which have maintained their working aspect.

Owing to the lack of ruggedness of the energising relays used up to now, it had always been considered as impossible to place said relays in the immediate vicinity of the optical elements, and for instance on the rear or dorsal face of the board supporting them. The considerable advantage that would be obtained in placing the energising relays in the immediate vicinity of the elements had indeed been admitted, but objection was raised against the necessity of sheltering said relays for protecting them to the maximum from the external influences which would be prejudicial thereto, and against the necessity, none the less imperative, of then protecting each circuit of the elements by a fuse-wire, since the length of wire between the contact of the relay and the element would be very short and would no longer constitute a protecting resistance. It was set forth that the expense of a fuse-wire for each element would compensate the advantages which might be obtained in arranging the relays in the immediate vicinity of the elements.

The invention is adapted to satisfy the double condition of placing the relays in the immediate vicinity of the elements and of eliminating the necessity of using protecting fuse-wires.

For that purpose, it is characterised by the novel application to signalling or advertising apparatus of the type described, of relays having an expansible conducting wire, this novel application being moreover distinguished by the fact that said expansible conducting wire is common to the circuit of the element and to an energising circuit, so as to be heated by the temporary closing of said energising circuit and to be kept heated by the closing of the main circuit, determined by its lengthening.

It will be understood that such relays, very rugged and unable of getting out of order by the variations of external temperature provided that the support for the wire is made of a material having a coefficient of linear expansion approximating that of the wire, can without objection, be placed at the back of the board or panel supporting the elements; and that, moreover, the expansible wire, which is located in the circuit of the element, constitutes in itself a protection for the circuit in the same manner as a fuse-wire.

The accompanying drawing illustrates, by way of example only, some forms of carrying out the invention.

Fig. 1 is a diagram of a first method of wiring; in this diagram, the relay having an expansible conducting wire is illustrated in a simplified form, but it is to be understood that, in said Fig. 1 as well as Figs. 2 and 3, mentioned hereinafter, it is intended to indicate a relay according to the embodiment illustrated in detail in Figs. 5 and 6 indicated hereinafter.

Fig. 2 is a diagram of a second method of wiring.

Fig. 3 is a diagram of a third method of wiring.

Fig. 4 is a general diagram.

Fig. 5 shows a sectional elevation of the preferred form of relay.

Fig. 6 is a plan view thereof.

Fig. 7 is an elevation of the method of mounting the relay on the board.

Fig. 8 is a detail view in elevation.

Fig. 9 shows a sectional elevation of another embodiment.

Fig. 10 is a plan view thereof.

Fig. 11 is a wiring diagram.

Fig. 12 shows another wiring diagram.

Fig. 13 is a still another diagram.

For effecting the initial energisation, that is to say, to raise the temperature of the wire:

(*a*) As in the example of Fig. 1, use can be made of a special energising circuit having a particular source of electric energy. In this figure, the movable contact 1 is carried at the end of a resilient blade 2 held at 3 and connected at this place to one of the points 4 where the expansible conducting wire 5 is attached. Said expansible wire 5 is stretched between the point 4 and the point 6, substantially parallel to the resilient blade 2 which presses by means of the insulating push-piece 7 near the middle of the wire 5, so that the movable contact 1 cannot, at ordinary temperature, touch the fixed contact 8. The point 6 is connected by the wire 9 to the lamp 10 (or any other optical element as explained), connected by the wire 11 to the switch 12, then by the wire 13 to a first source of current 14, connected, in its turn, by the wire 15, to the fixed contact 8. Finally, another source of current 16, which is to effect the energisation, is connected, on the one hand, through the medium of the switch 17, to the end 4 of the wire 5 and, on the other hand, to the end 6 of said wire.

In the position illustrated, all the circuits are open. For causing the device to operate, the contact 12 is first closed, which at this moment has no effect, since closed contact 12 is in series with contacts 1 and 8 which do not touch each other. But if contact 17 is closed for an instant, the expansible wire 5 is fed by the source of current 16 and rapidly heats up. Wire 5 lengthens, so that the spring 2 can expand upwardly and that the contacts 1 and 8 can touch each other. It will be noted, as an important point, that their contact pressure is determined solely by the strength of the spring, as soon as the wire 5 has lengthened sufficiently.

The utilisation circuit is then closed and the current of said circuit passes through wire 5 which is maintained at a high temperature. Consequently said circuit remains closed until it is intentionally opened, by actuating the switch 12. At this moment, of course, wire 5 is no longer fed with current. It cools, stretches again, compels the spring 2 to inflect downwardly and thereby cuts off the contact 1—8. Further closing of contact 12 will no longer produce any effect, it will be necessary to act on contact 17 in order for the operation just described to take place again.

(*b*) Also, as in the example of Fig. 2, contacts 1–8 normally open can be short-circuited for producing the energisation, and consequently a single source of electric current 16 need be used. In this case, it suffices to connect the wire 9 of Fig. 1, not to point 5, but to the pole 18 of the source of current 16, and to dispense with the source of current 14. The diagram of Fig. 2 is then obtained, in which it will easily be seen that by temporarily closing the switch 17, wire 5 is placed in circuit (provided that switch 12 has been previously closed). Said wire heats up and closes the contacts 1–8, thereby closing the circuit of the lamp 10, said circuit remaining closed until the contact 12 is temporarily opened.

It is to be mentioned that contact 12 is only one means, among others, for cutting off the circuit of utilisation. Other means can be used for that purpose, which all consist in determining in any manner whatever, the cooling of wire 5. For instance, this cooling can be obtained by short-circuiting said wire (Fig. 3). In this example, the fixed contact 17ª is connected by the wire 19 to a switch 20 having a fixed contact 21 connected to the pole 18 of the source of current 16, and another fixed contact 22 connected to the second pole 23.

When the switch 20 is in the position illustrated, in which it touches the contact 21, the diagram of Fig. 2 is obtained and, consequently, the temporary closing of contact 17 determines the energization of wire 5 and the closing of the circuit of the optical element, as explained. But, when, on the contrary, the switch 20 touches the contact 22, the temporary closing of contact 17 has the effect of short-circuiting wire 5; therefore, when said contact 17 is closed, wire 5 is no longer fed with current, as the difference of potential between points 23 and 4 becomes practically null; wire 5 therefore cools and contacts 1 and 8 separate.

In this arrangement it will be noted that the element 10 is slightly boosted when the switch 20 being in contact with 22, contact 17 is temporarily closed. This particularity can, in certain applications, be considered as an advantage; for instance, if the element 10 is a lamp, said lamp shines with a brighter light before it goes out, and it may be that, for advertising or signalling purposes, advantage may be taken of this property. Moreover, it will be noted that if the period during which contact 17 is closed is very short, it will not produce the opening of contacts 1–8, as wire 5 will not have time to cool; thus, by means of contact 17 can be obtained, either the energization of 10 when contacts 20—21 are closed, or, when contacts 20—22 are closed, the temporary boosting of 10 followed or not by its de-energization This property can in certain cases be of very great interest.

In all the embodiments described, it can clearly be seen:

That the use of heat, during energization is excellent; the energy consumed is in fact entirely used in the wire;

That the temperature reaches such a high degree (for instance 300 to 350°) that the operation is entirely independent of the variations of the external temperature;

That the cooling is rapid, for the very reason of the relatively high temperatures of operation, and owing to the fact that the wire is in the best conditions for cooling;

That wire 5 offers the great advantage of also constituting fuse-wire protecting the element such as 10.

Having described the relay according to the invention, some methods of application thereof will now be set forth. In the example of Fig. 4, a board 34 is provided with lamps juxtaposed in vertical and horizontal rows; some of said lamps only are diagrammatically illustrated for instance at 10 and 75. The connections of lamp 10 will simply be described, for instance, as they are the same for the other lamps. The terminal 35 of lamp 10 is connected by a wire 38 to point 8 of a relay according to preceding Figure 3, and point 6 is connected by the switch 12 to the pole 23 of the source 16 of electric energy, the second pole 18 of which is connected by a wire 36 to the second terminal 37 of the lamp 35. The wires 36ª and 36 are respectively multiplied, as diagrammatically

illustrated by the arrows 38 and 40, on all the other lamps of the board.

The point 4 of the relays 36 respectively associated with the lamps such as 75 of one and the same first vertical row A are connected by wires such as 78 to the first active contact-pieces 77 of a series of contact banks 78 each comprising as many contacts as there are lamps in one and the same horizontal row. There are as many contact banks 78 as there are lamps in one and the same vertical row.

Thus, a lamp of the vertical row in line *p* and of the horizontal row in line *q* has its auxiliary electrode connected to the contact in line *q* in the contact bank for line *p*.

The wipers 78 corresponding to each contact bank are independently connected by wires such as 80 to brushes 81 placed above a perforated band 82 mounted for instance on rollers 83. The brushes 81 are arranged transversely to said band above a conducting table 84, connected by the wire 85 to the suitable terminal of the source of energy 16. Finally, the wipers 78 are all driven simultaneously and in synchronism with the perforated band 82, in such a manner that a hole of the band can present itself under a brush 81 only when the wipers such as 79 touch the contacts of a definite line, in each of the contact banks. The movement of the wipers 79 and of the band 82 can be continuous or discontinuous and of uniform or variable speed.

Each wiper 81 and 79 thus controls the lamps of one and the same vertical row; if it is assumed that there are *x* lamps in a vertical row, there will therefore be *x* wipers 81—79; and if there are *y* lamps in a horizontal row, each contact bank 78 scanned by a wiper such as 79 comprises *y* contacts.

The operation is as follows: when the wipers 78 are on the contacts No. 1, the lamps of the vertical row No. 1 are subjected to the control of the perforated band 82. Some of the wipers 81, passing through the perforations, are, at this moment, in contact with the table 84. Consequently, the lamps of the first vertical row corresponding to said holes of the perforated band, light. Then, the wipers 79 as well as the perforated band 82 move one step forward.

The wipers 79 then touch the contacts corresponding to the second vertical row of lamps, which are then controlled by the perforated band 82. The operation is repeated up to the last vertical row of lamps. At this moment, the movement of the wipers 79 and of the band 82 is stopped for a time; then the contact 12 is opened for detemining, automatically or not, the extinguishing of the lamps. Finally, the device starts again in the same manner as previously. Or else the switch 20 can be moved on to the contact-piece 22 and ensure the extinguishing, lamp after lamp, according to all possible combinations.

The coordination of the synchronous movements of the perforated band 82 and wipers 79 can be obtained by any known means, and in particular by a simple kinematic connection between the shafts of 82 and of 79.

Figs. 5 and 6 illustrate a practical form of construction of the relay. In this example, the point 6 of attachment of the expansible wire 5 is provided on a cut-out member 105, the shape of which will be more fully described later on; and the point 4 is provided on the member 106 which is substantially flat, except as regards the bent down lug which constitutes the point of attachment 4 and two flanges 107 and 108 also bent down which ensure the rigidity of the whole. The member 108 terminates in a plug 108^a. Finally the point 8 is provided on a third cut-out member 109.

The members 105, 108 and 109 are superposed with the interposition of insulating washers, and mechanically connected by an eye 118; but they are electrically insulated. The members 105 and 109 are slightly bent back so that their ends 105^a and 108^a, in the form of plugs, are in the same plane as the plug 106^a.

Finally, the resilient blade 2 is secured at 3 on the member 106, which is perforated at 111 for the passage of the disc 112, made of insulating material which is interposed between the wire 5 and the resilient blade 2.

Fig. 6 is completed by a wiring diagram quite identical to that of Fig. 2, which renders unnecessary any complementary description of this embodiment.

Figs. 7 and 8 then show the manner in which the board of lamps is fitted up. This board comprises a conducting plate 98 in which the lamps 10 are screwed, the base of the lamps pressing against spring blades 95. Said blades 95 are secured on thimbles 113, mounted in their turn on insulating cross members 114, also receiving other thimbles 114^a and 115. The thimbles 115 correspond to the plugs 105^a, thimbles 114^a to plugs 106^a and thimbles 113 to plugs 109^a, as clearly shown in Fig. 6. It is therefore a very simple matter to replace or exchange a relay such as that illustrated in Figs. 5 and 6, since it suffices to remove a member having three plugs and replace it by another, without having to effect any connection, just as if it was a wall-plug or a fuse.

In all the foregoing embodiments, the relay according to the invention was used in combination with lamps; but it can also be utilised in combination with electromagnets for actuating and changing from rest aspect to working aspect, and vice versa, an optical element which is not a lamp, but a surface, which, in a certain so-called working aspect, reflects, refracts or diffuses luminous rays arising from any source whatever illuminating the board, whereas in another so-called rest aspect, it is, for instance, invisible. It is to be understood that this definition includes not only surfaces which pass from one aspect to the other by changing their position, but also those which pass from one aspect to the other, by the displacement of an auxiliary member such as a movable shield with, for instance, illumination behind the board.

In the example of Figs. 9 and 10 the relay is combined with an electromagnet 116 the movable armature 117 of which is kinematically connected to a lever 118 through the medium of a flexible strap 119, for instance of leather or rubber. The lever 118 is pivoted at 120 and it carries a circular guide 120′ for the strap 119; the latter, in fact, winds on the guide 120′ the axis of which coincides with that of the pivot 120. The lever 118 might also be supported by a flexible blade made of spring steel, which would allow it to move angularly without having recourse to a pivot.

The lever 118 carries a spherical shield 121 which, in rest position, screens a mirror 122 adjustable in position which contitutes the optical element, reflecting, when it is uncovered, the light towards the observer's eye. The shield 121 is provided with inclined fins 123 constituting a

dark background avoiding any interfering reflections, in such a manner that the board, when all the shutters 121 are in their position of rest, appears entirely black. It will be understood that when the electromagnet 116 is suitably energised, the armature 117 is attracted and the shutter 118 moves angularly and upwardly uncovering the mirror 122. The latter, illuminated by daylight or artificial light, then appears brilliant against the black background.

In an arrangement of this kind, and in the case in which the current supplied is alternating current, it is possible to effect, for controlling the shutter 121, two operations with a single contact. One of these operations consists in energising the relay having an expansible wire without however actuating the shutter; this operation will be called recording. During the second operation the actuation of the shutter is produced.

This possibility offers great advantage; it allows, for instance, of preparing a drawing, or a part of the drawing, for causing it to appear or to disappear at a single stroke and as many times as desired, allowing to obtain a twinkling or flickering which attracts more the attention of the public. For that purpose, the relay is devised in such a manner that it can be energised by a relatively low voltage, for instance 8 volts, and the electromagnet 116 is so constructed that it cannot be sufficiently energised by said voltage. Consequently, when the 8 volt tension is applied, the expansible wire 5 lengthens, determines the closing of contacts 1 and 8, thereby causing low voltage current to pass into the electromagnet 116 which is not energised, and maintains the relay energised. When the 12 volt tension is then applied, the electromagnet 116 is fully energised, attracts the armature 117 and, by means of the strap 119 causes the lever 118 to pivot. The shutter or shield 121 then uncovers the mirror 122 which appears.

It is to be noted that the 12 volt tension determines at the beginning in the expansible wire an intensity sufficiently high for it to become dangerous if it lasted, but in proportion as the core 117 penetrates into the winding 116, the self of the coil increases, which has the effect of reducing the intensity to a value just sufficient for maintaining the relay energised and of reducing the consumption by the diminution of the intensity and the increase of the phase displacement.

If the 4 volt over-voltage is eliminated, the electromagnet 116 ceases to be sufficiently energised and the shutter 121 falls back; by re-establishing said over-voltage, the operation described starts again. It is therefore possible to obtain the twinkling of the apparatus in this manner.

Fig. 11 diagrammatically illustrates an arrangement of this kind. In this diagram, the expansible wire is shown at 5, and the contacts 1 and 8 are separated therefrom, but it is to be understood that the wiring is the same as previously. The circuit of utilisation is fed by the secondary 124 of a voltage reducing transformer, the primary 125 of which is fed by the source of energy 126 through a switch 127 so devised as to connect the terminal 123 to one of the two terminals 129 or 130. It is then obvious that according to the position of 127 the circuit of utilisation is fed under high voltage (when 128 is connected to 130) or under low voltage (when 128 is connected to 129). In this latter case, the closing of contact 17 suffices to energise the wire 5, but not the electromagnet 116 after the closing of contacts 1 and 8; consequently, the recording is obtained in this position. If the switch 127 is then caused to rotate, 128 and 130 are connected which determines the energisation of the electromagnet 116. By returning to the first position, the feeding of the utilisation circuit is stopped during a short moment, so that 116 deenergises, but not the wire 5, the deenergization of which would require an interruption of longer duration. Then the circuit of utilisation is again fed with low voltage current, which maintains the recording and so on. The twinkling of the apparatus is thus obtained.

The example of Fig. 12 relates to the case in which the signalling elements are lamps 10; in this case the preceding diagram cannot be applied, as even with a voltage much lower than normal voltage, the lamps would still be visible. Contacts 1—8 are then replaced by two series of contacts 1^a—8^a and 1^b—8^b. Contact 8^a is connected to the contact 131 of a switch 133 and contact 8^b is connected through lamp 10 to the contact 132 of said switch 133.

The arm 134 is connected to the point 135 of the feeding secondary 136, whereas the arm 137 is connected to the point 138 of said secondary. In the position illustrated, the circuit is therefore fed with low voltage current for recording, when contact 17 closes, but the circuit of lamp 10 is open. In the reverse position, the circuit of wire 5 is fed with high voltage current, said wire 5 being then in series with lamp 10. Once the recording is effected in the position illustrated, the twinkling is produced by the periodic actuation of the switch 133.

In the example of Fig. 4, the use of a rotary distributor 79 has been described which allows of obtaining a drawing by the successive scanning of the vertical or horizontal lines; but, on the same apparatus, a second distributor 79' can be provided which, whereas the first distributor 79 scans the drawing through vertical lines, allows the drawing to be scanned through horizontal lines. One or the other of said distributors is set in action, each of which having a position of rest in which the wipers 79 or 79' are in contact with dead contact-pieces. While one of them operates the other is at rest. The wires such as 76 are then suitably multiplied, as shown in Fig. 4.

Such an arrangement has the double advantage of avoiding monotony and of facilitating the tracing of the lines of any directions.

It would also be interesting to be able to cause to successively appear on the board, drawings corresponding, for instance to the successive phases of a movement, in order to obtain a rudimentary motion picture.

Fig. 13 shows a diagrammatic example of this kind of assemblage in which the elements are distributed in two series, one of said series comprising for instance the rows of elements of an even number line (which are not necessarily rectilinear rows, but which can have any desired shape) the other series comprising the rows of odd number lines.

The switch 127 is the same as that of Fig. 11 and serves, for the entire board, for supplying current of high or low voltage, as already described. If it is stopped in the position in which all the circuits are cut off, use can then be made in lieu thereof, of the switch 140 (which also comprises a position in which all the circuits are cut off). This switch allows of alternately feed-

ing with high voltage and low voltage current one and the other of the series of elements and of thereby obtaining two phases of a motion picture. A larger number thereof might obviously be obtained. The switch 140 being held stationary in its position of rest, the operation can be resumed by means of the switch 127.

It is to be noted that as many switches 140 as desired can be provided, each of said switches corresponding to a definite part of the board. It must also be noted that the rows controlled by the various switches 140 can have different colours.

ARMAND ZUCKERMANN.