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SEVERAL-PHASE SIGNALLING INSTALLATION FOR STREET CROSSING

Filed Feb. 18, 1960 2 Sheets-Sheet 1

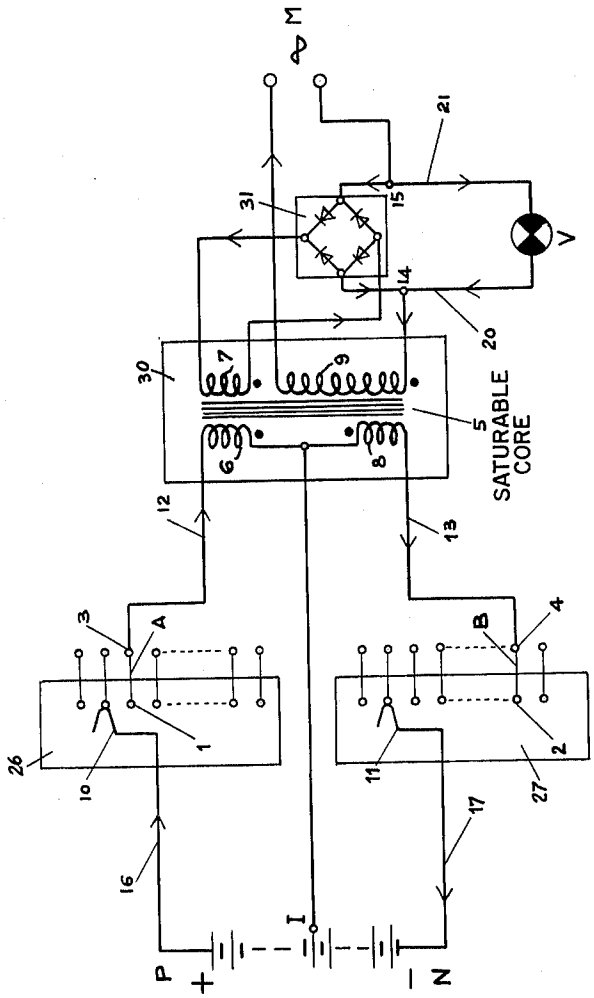

Fig. 1

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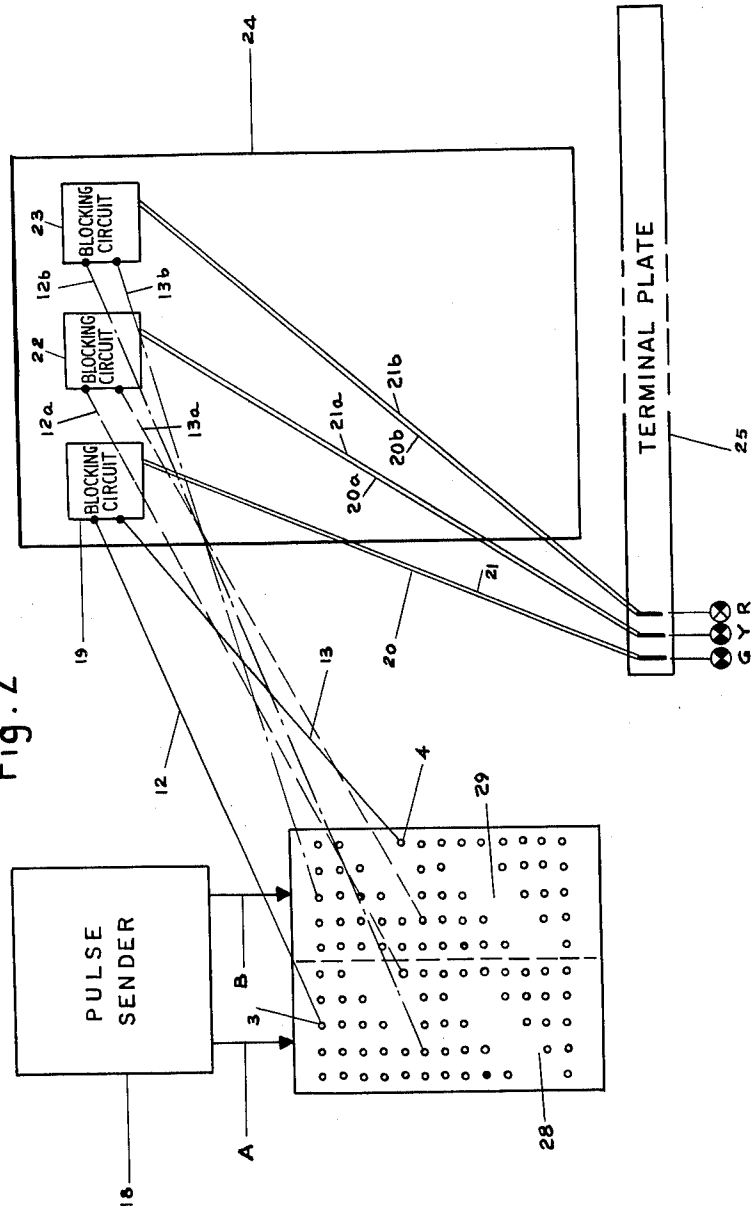

Fig. 2

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SEVERAL-PHASE SIGNALLING INSTALLATION FOR STREET CROSSING

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8 Claims. (Cl. 340—41)

This invention relates to a multiple-phase signalling installation for street crossing.

A signal-light installation provided for regulating the vehicle traffic in a two-way crossing or a multiple-way square comprises a number of groups of three lamps which provide a green, an amber and a red light, respectively. Each of these groups constitutes a so-called "phase."

It has already been proposed to control several phases by means of a single installation utilizing a cam-shaft controlled switch means. The number of phases may, however, be so large in certain cases that all phases cannot be controlled by a cam-shaft controlled switch means of the conventional design. Moreover, the cam-shaft controlled switch means does not always permit adjustment or varying of the control pattern as is necessary under varying conditions of traffic.

It is also known to control the phases by means of an installation containing devices utilizing relays only. The operation of these relays, however, causes a sudden opening of electric contacts, thus bringing about troubles in the installation.

An object of this invention is to provide a signalling installation which does not present any of the above mentioned draw backs.

An embodiment of the installation according to the invention is shown by way of example in the accompanying figures, which show:

FIG. 1, the parts of the installation which belong to a lamp and the parts which are common to the different lamps.

FIG. 2, a number of similar parts which belong to an installation.

In FIG. 1, P and N are a positive and a negative terminal of a source of direct current, respectively, I an intermediate point of the source, **1** a contact of a first plurality of input contacts, which are shown aligned along a vertical line, and **2** a contact of a second plurality of input contacts, which are also shown aligned along a vertical line. **10** is a wiper of a rotary switch **26**, which is connected with the positive terminal P by a conductor **16** and can pass over each contact **1** successively. **11** is similarly a wiper of another rotary switch **27**, which is connected with the negative terminal N by a conductor **17** and can pass over each contact **2** successively. All these elements are common to the whole installation, whereas those which will now be mentioned are individual to each signalling lamp.

The numeral **3** represents one of a first plurality of output contacts shown aligned along a vertical line, and **4** is one of a second plurality of output contacts, also shown aligned along a vertical line. A is one of the conductors connecting a contact **1** with a corresponding contact **3**, and B is one of the conductors connecting a contact **2** with a corresponding contact **4**. V is a signalling lamp, for instance a green one.

The other elements **30** and **31** of FIG. 1 constitute a bistable saturable core switching unit individual to lamp V. The element **30** includes a magnetic core **5** having oriented crystals and windings **6**, **7**, **8**, and **9** which are wound around the core **5**. M is an alternating-current

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source and **31** is a rectifying bridge which connects source M to the bias winding **7**. The winding **6** is connected by a conductor **12** with one of the output contacts **3**, and the winding **8** is similarly connected by a conductor **13** with one of the output contacts **4**. The sense of winding **8** considered in the direction from I to **13** is the opposite of the sense of winding of **6** considered in the direction from **12** to I. The magnetic core **5** is made of a known magnetic material having oriented crystals presenting a substantially rectangular hysteresis curve; as follows from the description hereinabove the magnetic core **5** is bistable, i.e., in absence of excitation it will maintain either a saturated condition in which the impedance of winding **9** is negligible or an unsaturated condition in which this impedance is sufficient to maintain the lamp V in series therewith effectively deenergized. Saturation of the core **5** is effected by energization of the winding **6** with a predetermined polarity as indicated in the drawings over wiper contact **10** and the appropriate connecting conductor A. The saturated condition of the core **5** remains, even though winding **6** is deenergized, until winding **8** is subsequently energized with an appropriate polarity as indicated via wiper contact **11** and the appropriate connecting conductor B to render the core **5** unsaturated and the impedance of winding **9** sufficient to effectively block the current through lamp V. The unsaturated condition of the core **5** will remain until the winding **6** is again energized.

When, during the rotation of the wipers **10** and **11**, terminal P is connected with winding **6** over conductor **16**, wiper **10**, contact **1**, conductor A, contact **3** and conductor **12**, the core **5**, which previously was not magnetically saturated, becomes saturated. The impedance of winding **9**, which till then prevented the flow of the alternating current generated in M, then becomes negligible, and this from source M flows through winding **9**, rectifying bridge **31** and winding **7**, and also through lamp V, which is connected in shunt across points **14** and **15**. Lamp V is lit and remains lit until wiper **11** is moved to the contact **2** which is connected with winding **8** through conductor B, contact **4** and conductor **13**. From this moment, the magnetic core **5** is no longer saturated, winding **9** again has a high impedance, the current no longer flows through lamp V with a noteworthy intensity and the lamp therefore goes out.

It is therefore clear that lamp V is alternately lit and goes out when wipers **10** and **11** pass over the corresponding contacts **1** and **2** which control the windings **6** and **8**, respectively, of the element **30** associated with the particular lamp V.

In FIGURE 2, reference numeral **18** designates a so-called pulse sender which comprises voltage sources P and N, the conductors **16** and **17**, the rotary switches **26** and **27** with the wipers **10** and **11** thereof, and the contacts **1** and **2** connected as has been indicated in FIGURE 1. The reference numerals **28** and **29** designate two parts of a distribution board comprising, respectively, the two series of terminals **3** and **4**. These series of terminals **3** and **4** are selectively connected to series of contacts **1** and **2** of the rotary switches by corresponding conductors which are shown schematically in the figures, respectively, by the conductors A and B.

Reference numeral **24** designates a board on which there are disposed units **19**, **22**, and **23**. These units are constituted by elements **30** and **31** of FIGURE 1 which have been defined as blocking circuits hereinabove.

Each of these units such as **19**, **22**, and **23** is connected, respectively, to a pair of terminals **3** and **4** by the series of conductors **12–13**, **12*a*–13*a***, and **12*b*–13*b***. The board **24** comprises any desired number of blocking circuits, such as **19**, **22**, and **23**, three of these circuits only having

been represented in order not to confuse the illustration of the invention. Each blocking circuit such as **19**, **22**, and **23** is connected, respectively, to a pair of terminals disposed on a plate **25** by pairs of conductors shown at **20–21**, **20***a*–**21***a*, and **20***b*–**21***b*. The pairs of terminals of the plate **25** are connected to lamps G, Y, and R which corresponds to the green, yellow, and red lights of a phase.

Contacts **3** and contacts **4** form together a distribution board. In order to modify as desired the succession of the phases, it is only necessary to suitably modify the connections A between the contacts **1** enclosed within the sender **18** and the contacts **3** of the distribution board and similarly the connections B between the contacts **2** and the contacts **4**.

I claim:

1. A plural phase signalling installation for street intersections, comprising a first set of input contacts, a second set of input contacts, switch means for successively and repeatedly energizing said first contacts individually from a power source, switch means for successively and repeatedly energizing said second input contacts individually from a power source, a first set of output terminals for said switch means, means for selectively interconnecting said first input contacts with said first output terminals, a second set of output terminals for said switch means, means for selectively interconnecting said second input contacts with said second output terminals, a plurality of signalling devices, and means for individually energizing each of said signalling devices from an alternating current source including for each signalling device a bistable impedance means having stable states of high and low impedance connected in series with said signalling device and said alternating current source for selectively presenting said high and low impedance to said signalling device in the respective stable states, each said bistable impedance means including control means connected to one of said first output terminals and responsive to energization of said one terminal for setting said bistable impedance means to its stable state of low impedance, each said bistable impedance means including further control means connected to one of said second output terminals and responsive to energization of said one of said second output terminals for setting said device to its stable condition of high impedance.

2. A signalling installation according to claim **1** wherein each bistable impedance means includes a saturable magnetic core having magnetically oriented crystals with a first winding thereon in series with said signalling device to provide said high and low impedance and wherein each of said control means includes a further winding on said core.

3. Signalling apparatus according to claim **2** wherein the means for energizing said first input contacts is a direct current source of one polarity and said means for energizing said second input contacts includes a direct current source of opposite polarity.

4. A signalling installation according to claim **2** wherein the magnetic core of each of said bistable impedance means will maintain either of its stable conditions when neither of said control windings is energized.

5. A signalling installation according to claim **3** wherein each of said first input contacts and said second input contacts are the fixed contacts of a first and second rotary switch and the means for energizing said contacts include rotary wiper contacts of said respective rotary switches repeatedly movable over said input contacts.

6. A multi-phase signalling installation with a cyclic commutation, and more particularly, multi-phase signalling equipment for control of street intersections, comprising first and second direct current sources of opposite polarity, potential and a reference potential, a pair of rotary switches, each having plural fixed contacts with output terminals and a movable wiper, said wipers being connected, respectively, to said first and second direct current sources of opposite polarity, a plurality of saturable magnetic cores having magnetically oriented crystals, each of these cores having at least four windings, two of these windings being coiled in the opposite direction with respect to each other and connected in series, the free terminals of these two windings being connected, respectively, to one of the output terminals of each of said rotary switches, a center point between these two first windings being connected to said common reference potential, a plurality of signalling devices, the third winding of each of said cores being connected in series with a signalling device to a source of alternating current, a rectifying bridge connected in parallel with said signalling device and having its output terminals connected to said fourth winding, a first of said rotary switches being positionable to energize a first of said four windings of a magnetic core to provide saturation of said core and low impedance of said third winding for activating one said signal device, a second of said rotary switches being positionable to energize a second of said windings to unsaturated said magnetic core whereby said third winding presents high impedance to deactivate said signal device, said fourth winding being effective to said saturation of said core in accordance with the impedance of said third winding, so that the voltage applied to said signalling device depends upon the impedance of said third winding which is, in turn, controlled by the degree of saturation of said magnetic core, as determined by control of the two series connected windings.

7. A signalling installation in accordance with claim **6** characterized in that it is constituted by three panel units interconnected by electrical connections, the first panel unit comprising said sources of direct current, and said rotary switches, the second panel unit being constituted by a distribution board carrying terminals connected to the output terminals of the rotary switches, the third panel unit comprising said saturable magnetic cores with their windings and the rectifying bridge, the two first windings of each of said cores being connected, respectively, to the terminals of the second panel unit, the rectifying bridges corresponding to each of these elements being connected each to the terminals of a signalling device constituted by a colored electric lamp.

8. A multi-phase signalling installation with a cyclic commutation comprising a plurality of saturable magnetic cores having magnetically oriented crystals, first and second windings on each core being coiled in the opposite direction with respect to each other, control means for selectively pulsing said first and second windings on each of said cores in a sequential manner with direct current including a current source and a pair of rotary switches each having plural fixed contacts with output terminals and a movable wiper connected to said current course, said first and second windings on each core being connected, respectively, to one of the output terminals on each of said rotary switches, a plurality of signalling devices, a source of alternating current and a third winding of each of said cores being connected in series with a respective signalling device to said source of alternating current, a rectifying bridge connected in parallel with said signalling device and having its output terminals connected to said fourth winding, a first of said rotary switches being positionable to energize a first of said four windings of a magnetic core to provide saturation of said core and low impedance of said third winding for activating one said signal device, a second of said rotary switches being positionable to energize a second of said windings to unsaturate said magnetic core whereby said third winding presents high impedance to deactivate said signal device, said fourth winding being effective to aid saturation of said core in accordance with the impedance of said third winding, so that the voltage applied to said signalling device depends upon the impedance of said third winding which is, in turn, controlled by the degree

of saturation of said magnetic core, as determined by control of the two series connected windings.

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