PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: FERMO SOLARI

909,094

Date of Application and filing Complete Specification June 29, 1959.

No. 22256/59.

Complete Specification Published Oct. 24, 1962.

Index at acceptance:—Class 40(1), H(1A:4B), H6(B:E), H(7B:8E), H9(D:X), H12A, H14(B:C).

International Classification:—**G08c.**

COMPLETE SPECIFICATION

Improvements relating to Visual Indicating Assemblies

We, SOLARI & C./UDINE S.P.A., an Italian Body Corporate, of Via Chiusaforte, 1—Udine, Italy, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to indicating assemblies, and according to this invention such an assembly comprises a number of similar visual indicators which are arranged at spaced locations and which are movable by respective drives, which are connected together for energisation, to move the drives, by a common conductor which passes between the locations and which is energised under the control of means arranged at one location, the drive at each location also being arranged to cause a respective arm to sweep over a respective set of electrical contacts to produce, on application of a potential difference between the arm and contacts, a series of electrical pulses, the means being connected to receive the pulses from the different locations and to respond to these by interrupting the common energising conductor and thereby effect synchronised step-by-step movements of the different visual indicators. Such an assembly enables the same information to be displayed at a number of separate spaced places or locations. Moreover, on application of potential differences between each arm and the respective set of contacts, the different indicators are able to move in steps and in synchronism with one another to change the information displayed. The step-by-step movement is an automatic one and does not require human intervention.

In order to stop the step-by-step movements of the different indicators the common energising conductor for the different drives is interrupted. This can be done in various ways, but preferably the interruption is an automatic one, brought about by a previous manual selection. This is conveniently done by employing a controlling relay with contacts in the common energising conductor, so that the operation of the relay can interrupt this conductor to stop the drives. Such a controlling relay may be located at the said one location and may have its winding connected in turn, and in synchronism with the sweeping of the arm at the said one location over the contacts, for energisation through different manually operable switches, so that the controlling relay operates to stop the drives on connection of its winding to any switch which has been closed. With such an arrangement, the appropriate switch is closed and the apparatus itself then operates to produce the step-by-step movement of the individual indicators, which then come to rest at the selected positions.

An indicating assembly according to the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a front view of the mechanical parts of one of a number of similar visual indicators employed in the assembly;

Figure 2 is a cross-section of Figure 1 taken along the line II—II;

Figure 3 is an electrical circuit diagram showing the way in which a single one of the indicators can be driven so as to have a step-by-step movement;

Figure 4 is a further circuit diagram showing the way in which a single indicator can be brought to rest at a pre-selected position;

Figure 5 is a further circuit diagram incorporating further features for use with a single visual indicator;

Figure 6 is a circuit diagram of the com-

[*Price* 4*s.* 6*d.*]

plete indicating assembly, which includes three separate visual indicators; and

Figure 7 shows a number of graphs representing the operation of Figure 3.

Referring first of all to Figures 1 and 2, an indicator is provided in the form of a pallet roll 1 which is arranged to be driven from one indicating position to another by rotation about the axis of a supporting pin 7. This roll 1 is driven by an electromagnetic drive which is indicated in Figure 1 diagrammatically at 2 and 3, 3 being the armature of an electromagnetic relay which has a winding represented at I in Figures 3, 4 and 5. The roll 1 is connected through its pin 7 and through gearing 8 (see Figure 2) to a rotary arm 9 which, during rotation of the roll 1, rotates and thereby sweeps over a set of electrical contacts 10. The arm 9 and contacts 10 are those of a selector-commutator, which is shown diagrammatically at II in Figures 3 and 5.

The drive for the part of the apparatus shown in Figures 1 and 2 is under the control of the circuit shown in Figure 3. The drive I, i.e. the winding of the relay having the armature 3, is connected for energisation through contacts A1 of a relay A which is connected for energisation through contacts X1 of a relay X which is connected for energisation through the selector II. The two relays A and X and the drive I are all energised by a common source of potential V. Both the relays A and X are slugged at the heel, so that both relays operate their contacts immediately on energisation (contacts A1 then closing, whilst the contact X1 then opens), but so that there is a delay between the de-energisation of the relays and the time at which their contacts are operated. In the case of the relay A, there is a delay of 100 milliseconds between de-energisation and the opening of the contacts A1 whilst in the case of the relay X there is a delay of 200 milliseconds between de-energisation and the closing of the contacts X1.

The operation of Figure 3 is best described with reference to Figure 7. Prior to the application of the voltage V the contacts X1 are closed and the contacts A1 are open. Application of the potential V causes immediate energisation of the relay A and thus closure of the contacts A1. This closure of the contacts A1 is indicated at 15 in Figure 7. The drive I starts to operate immediately as indicated at 16 and thereby causes the arm 9 to rotate. After 30 milliseconds, (i.e. at the point 17 in Figure 7), this arm reaches the next contact 10 and causes the relay X to be energised, this energisation continuing for 40 milliseconds, i.e. the time during which the arm 9 is in engagement with the contact 10. As soon as the relay X is energised, at the point 17 (Figure 7) the contacts X1 are opened, as shown at 18. The contacts A1, however, remain closed until 100 milliseconds have elapsed from the opening of the contacts X1, the opening of the contacts A1 being indicated at 19. The contacts X1 remain open for 200 milliseconds and then close again as shown at 20, thereby causing energisation of the relay A and the repeat of the whole process.

It will be appreciated, that on application of the potential V, which creates a potential difference between the arm 9 and the contacts 10, the sweeping of this arm over the contacts causes the production of a series of pulses through the arm which serves to control the drive I to bring about a step-by-step movement of the pallet roll 1.

The circuit shown in Figure 4 may be incorporated to ensure that the roll 1 is stopped when it reaches a predetermined position. In this circuit, the drive I is connected in series with the contacts D1 of a controlling relay D, the winding of which is connected, in turn by means of an arm 9*a* of a selector II*a* for energisation through different switches 25, so that the relay D is energised on connection of its winding to any switch which has been closed, serving to open its contacts D1 and thereby stop the drive. The arm 9*a* is mechanically linked to the arm 9 so that the two move in synchronism. Thus, by closing any particular switch 25, the positions at which the arm 9 and the roll 1 stop may be predetermined.

Figure 5 includes all the features shown in Figures 3 and 4, but in addition it includes a further relay P which operates to give an alarm and to stop the drive I if certain fault conditions arise. The winding of this relay P is in series with contacts A2 and X2 controlled by the relays A and X respectively, the contacts A1 and A2 being opened together and closed together, whilst the contacts X1 are closed when the contacts X2 are opened and vice versa. During correct operation, the relay P is energised through the contacts A2 and X2 in accordance with Figure 7 and this serves (since the relay P operates to move its contacts only after a delay of 300 milliseconds following de-energisation) to keep one set of contacts P1 closed to maintain a current path to the drive I, whilst a second set of contacts P2 is kept open and thereby keeps inoperative an alarm in the form of a buzzer Z. If, however, fault conditions arise in which either the arm 9 sticks on one of its contacts 10, or the contacts X1 and X2 of the relays stick and remain operated after this arm 9 has moved off the contacts 10, then the energising circuit for the winding of the relay P is broken and 300 milliseconds later, the contacts P1 are opened

to stop the drive I, whilst the contacts P2 are closed to give the alarm.

Figure 6 represents a complete indicating assembly having three identical drives I, III and V, connected in series for energisation through a common conductor 30. Each drive serves to move in steps the arm of its own selector-commutator shown at II, IV and VI respectively. The drives and their selector-commutators, together with their pallet roll indicators, are arranged at three spaced locations (e.g. at different places in a railway station to give the same information at these places regarding the arrival and departure times, etc. of trains), and the common conductor 30 extends from one to the other. All the contacts 10 are earthed, as is the common conductor 30, through a terminal 31, whilst the potential V is applied to the assembly through a second terminal 32.

On application of this potential V, and the depression of a push button MV, relays W and M are energised. The relay W operates immediately to close its contacts W1, so that the relays W and M continue to be energised even after the push button MV is released. The relay M operates its contacts M1 and M2 only after a delay, these being closed only after contacts P2 have been opened by a relay P, as explained later.

The potential V is thus applied to relays A and B and also to relays X, Y and Z which are all arranged at the locations of the drive I and its associated parts but which are connected to the respective selector-commutators II, IV and VI. When no electrical pulses are being received from these selector-commutators, the relay contacts X1 X2 X3, Y1 Y2 Y3, Z1 Z2 Z3, are in the positions shown and as a consequence the application of the potential V causes immediate energisation of the relays A, B and P. As a result of this, the contacts A1 close, the arm A2 moves from the illustrated position to the position shown in dotted lines, the contacts B1 open, the contacts P1 close, and the contacts P2 open. After the opening of the contacts P2, the relay M closes the contacts M1 and M2, so that thence forth whether or not the drives I, III and V are operated depends on whether or not all the contacts A1, B1, P1 and D1 are closed. Initially, of course, the contact B1 is open, because of the energisation of the relay B, but after a delay of 150 milliseconds it closes and, as a consequence, if the contacts D1 are closed all the drives I, III and V are operated together. As this happens, the three pallet rolls are turned and the arms 9 of the three selector-commutators are also caused to sweep over their respective contacts 10. As each arm reaches the next contact 10, an electrical pulse is produced which causes immediate energisation of the respective relay, X, Y or Z. This causes the immediate operation of the relay's contacts. The operation of the contacts X2, Y2 Z2 establishes a holding circuit which serves to hold the contacts in their new positions even after the arm 9 has left the particular contact 10 concerned. When pulses have been received from each of these selectors, all the contacts X1, Y1 and Z1 will have been opened and after a delay of 150 milliseconds, the relay A opens its contacts A1 and thereby simultaneously stops all three drives I, III and V. At the same time the arm A2 is moved from the position shown in dotted lines to that shown in full lines, so that the three relays Z, Y and X are all de-energised and immediately return all their contacts to their original positions. At the same time, the relay B is energised and causes its contacts B1 to open so that the drives I, III and V cannot start again immediately on closure of the contacts A1 and P1. When all the contacts of the relays X, Y and Z return to their original positions, the whole process starts again, starting with the energisation of the relays A and P and the closing of their contacts A1 and P1.

In this way, each of the arms 9 and the respective pallet rolls are driven forward in steps, so that each pallet roll moves from one indicating position to the next without the need for any manual control. When any of the rolls 1 is stationary, its arm 9 is out of engagement with the contacts 10.

The relay P operates its contacts only 300 milliseconds after its de-energisation, that is to say 300 milliseconds from the time when the first of the contacts X3, Y3 and Z3 are opened. Since, however, the whole cycle of operation takes less than 300 milliseconds, during normal operation, the contacts P1 remain closed and the contacts P2 remain opened. If, however, any of the arms 9 stick on one of the contacts 10, or if any of the contacts X3, Y3, Z3 sticks and remains operated after the arms 9 have moved off their contacts 10, then the energising circuit to the relay P remains interrupted for longer than 300 milliseconds. In this case, the contacts P1 open to stop all the drives, whilst the contacts P2 close and cause the buzzer Z to operate.

The same effect arises if any of the arms 9 does not move at all or if simply its relay X, Y or Z does not operate, because in either case the relay A remains energised, keeps the arm A2 in its dotted line position, and as a consequence keeps two of the relays X, Y and Z operated so that their cntacts X3, Y3 or Z3 remain open.

The arm 9 of the selector-commutator II is mechanically linked to the arm 9a whose

function has been described with reference to Figure 4. If the potential V is applied at a time when this arm 9*a* is connected to a switch 25 which has been closed, the relay D is energised and immediately opens the contacts D1, so that no drive starts at all. At the same time, the contacts D2 are opened so that when the push button MV has been released the relay W becomes de-energised and the contacts W1 open so that the whole assembly becomes de-energised immediately. If, on the other hand, the potential V is applied when the arm 9*a* is not connected to a switch 25 which is closed, the drive proceeds as explained above, until that arm 9*a* does reach such a switch. In this way, the operation of the switches predetermines the positions at which the pallet rolls 1 are to stop. These switches 25 together with all the parts of the indicator assembly to the left of the dotted line 40 are of course arranged at the location of the drive I, so that the only links between adjacent apparatus that are necessary are the common conductor 30, and the conductors 35, the earthing being easy to effect at the separate locations.

WHAT WE CLAIM IS:—

1. An indicating assembly comprising a number of similar visual indicators which are arranged at spaced locations and which are movable by respective drives, which are connected together for energisation, to move the drives, by a common conductor which passes between the locations and which is energised under the control of means arranged at one location, the drive at each location also being arranged to cause a respective arm to sweep over a respective set of electrical contacts to produce, on application of a potential difference between the arm and contacts, a series of electrical pulses, the means being connected to receive the pulses from the different locations and to respond to these by interrupting the common energising conductor and thereby effect synchronised step-by-step movements of the different visual indicators.

2. An assembly according to Claim 1, in which the common energising conductor can be interrupted, to stop the drives, by contacts of a controlling relay which is located at the said one location and which has its winding connected in turn, and in synchronism with the sweeping of the arm at the said one location over the contacts, for energisation through different manually operable switches, so that the controlling relay operates to stop the drives on connection of the winding to any switch which has been closed.

3. An assembly according to Claim 1 or Claim 2, in which each indicator is connected to the respective arm through gearing, the respective drive being connected directly to only the indicator.

4. An assembly according to any of the previous claims, in which each arm rotates in moving over the respective set of contacts.

5. An assembly according to any of the previous claims, in which each indicator is in the form of a pallet roll which rotates to give different indications.

6. An indicating assembly comprising a number of similar visual indicators arranged as spaced locations, an arm at each location arranged to sweep over a respective set of electrical contacts, a drive at each location for moving the indicator in steps from one indicating position to another and for simultaneously moving the arm relatively to the contacts to sweep over them, a common conductor extending between locations to energise the drives in series, terminals for applying across each arm and its contacts a potential difference to cause the production of a series of pulses at each location as the arm there sweeps over its contacts, and, at one location only, means connected to each of the arms and their contacts to receive the pulses from them, the means including a first relay for each location, which first relays respond to the receipt of a pulse by opening respective contacts arranged in parallel in an energising circuit for a further relay, so that after receipt of pulses from all locations this relay is de-energised, this de-energisation serving to open contacts provided in the common conductor at the one location, and to stop, thereby, all the drives simultaneously, the relays operating with a delay sufficient to ensure that the drives stop after the arm has left the particular contact concerned, the drives being initiated again to produce the next step by the contacts of the relays taking up their original positions.

7. An assembly according to Claim 6, in which the first relays are unslugged, but are each connected so that on receipt of a pulse its contacts are operated and remain so after the end of the pulse.

8. An assembly according to Claim 7, in which the contacts of the first relays are held operated, after operation by pulses, by virtue of current flowing through the winding of each of these first relays and through contacts which are subsequently opened by the de-energisation of the further relay.

9. An assembly according to Claim 8, in which the said subsequent opening is accompanied by the closing of a circuit which energises another relay which opens further contacts in the common conductor.

10. An assembly according to any of Claims 6 to 9, in which a further relay is arranged, at the one location, to be energised through a circuit containing in series

contacts controlled respectively by the various first relays, this further relay serving to give an alarm and to stop the drives if fault conditions arise in which any of the arms stick on their contacts or if the contacts of any of the first relays stick and remain operated after the arm has moved off a contact.

11. An assembly according to any of Claims 6 to 10, in which, at the one location, the arm is linked to a further arm which also sweeps over a set of electrical contacts, these contacts being connected for energisation through different switches so that, when the further arm engages a contact connected to a switch which has been closed, a pulse of current is provided for energising a further relay arranged to stop the drives.

12. An assembly according to Claim 1, substantially as described with reference to Figure 6 of the accompanying drawings.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
51/52, Chancery Lane, London, W.C.2.

Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1962.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

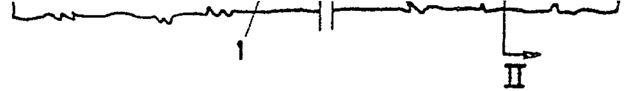


Fig.2

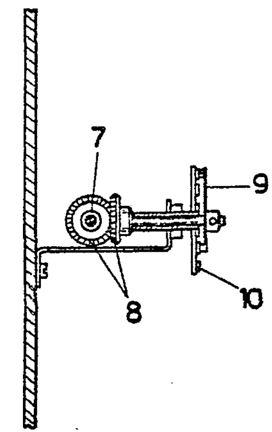
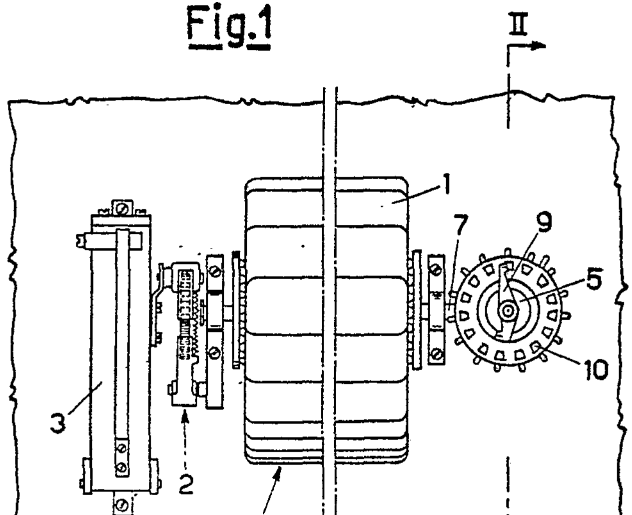


Fig.1



909094 COMPLETE SPECIFICATION
4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

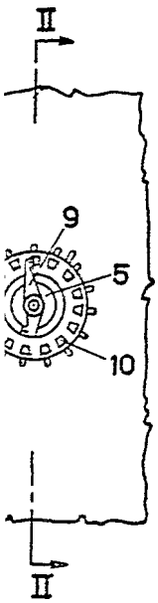


Fig.3

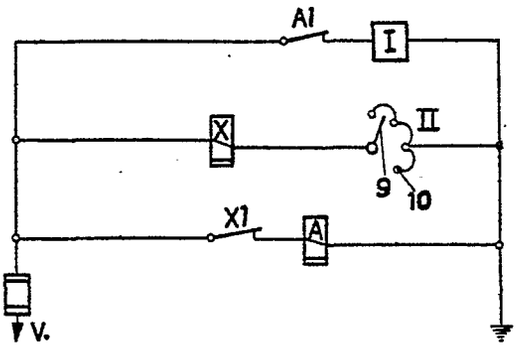
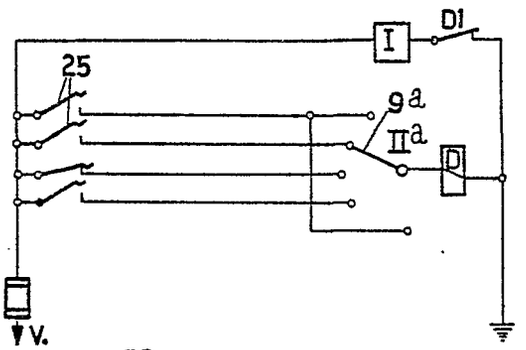


Fig.4



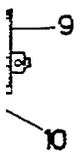
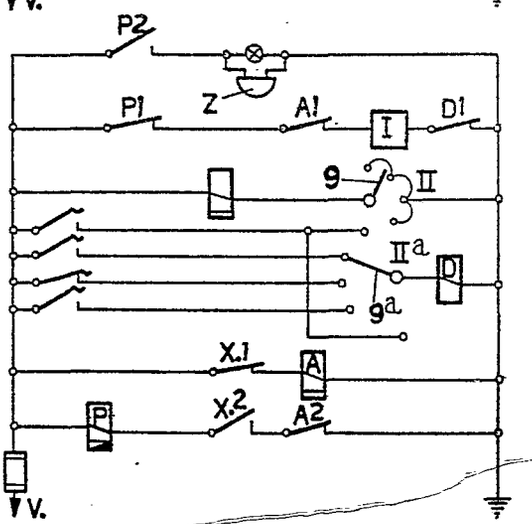


Fig.5



909094 COMPLETE SPECIFICATION
4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

Fig.1

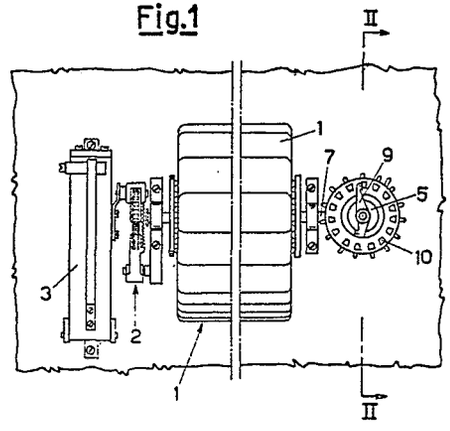


Fig.2

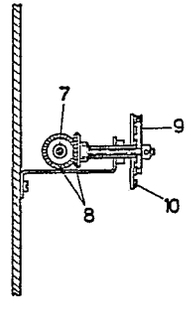


Fig.3

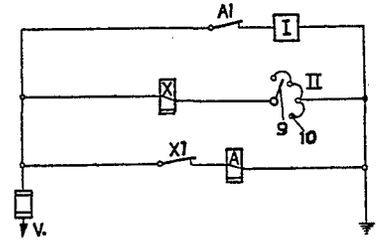


Fig.4

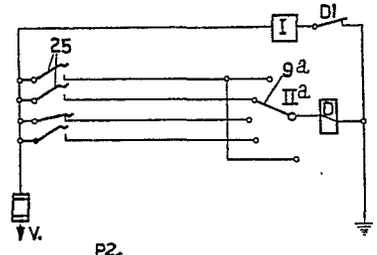


Fig.5

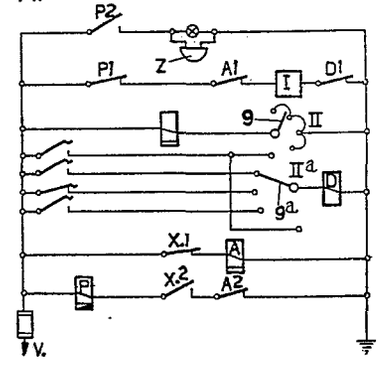
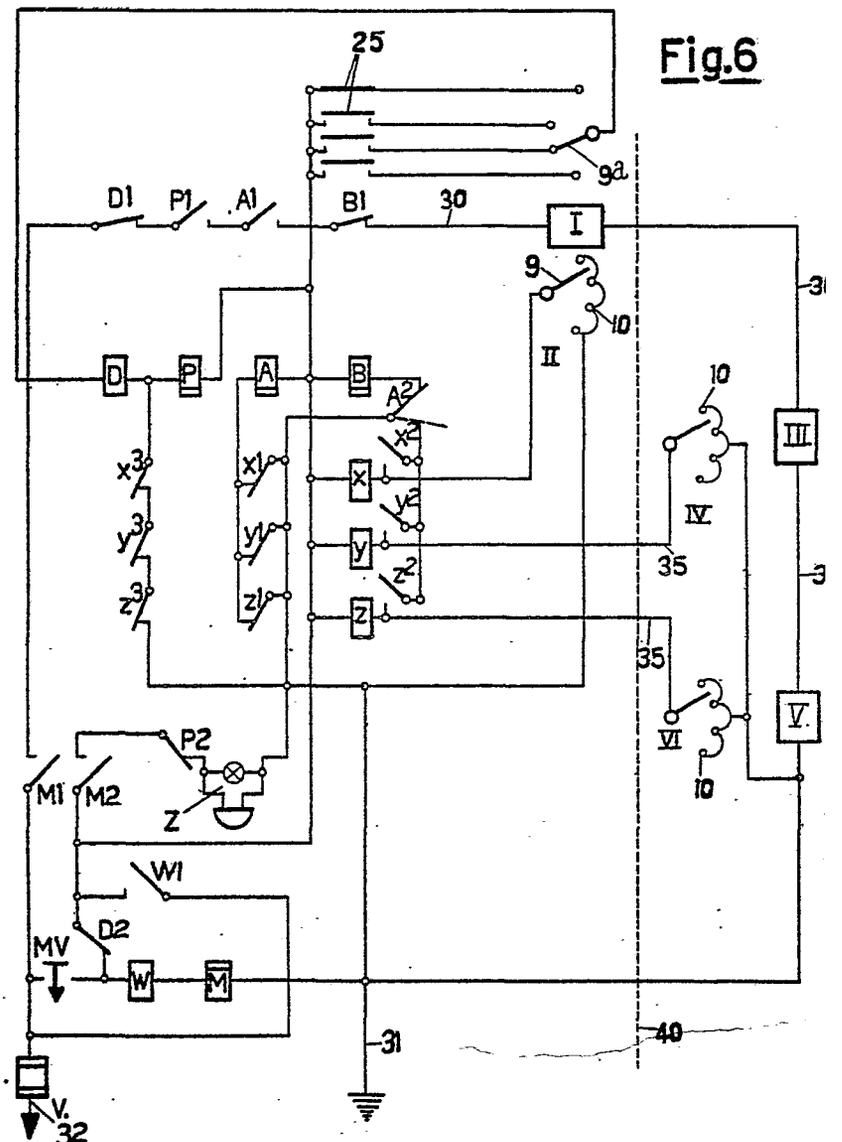
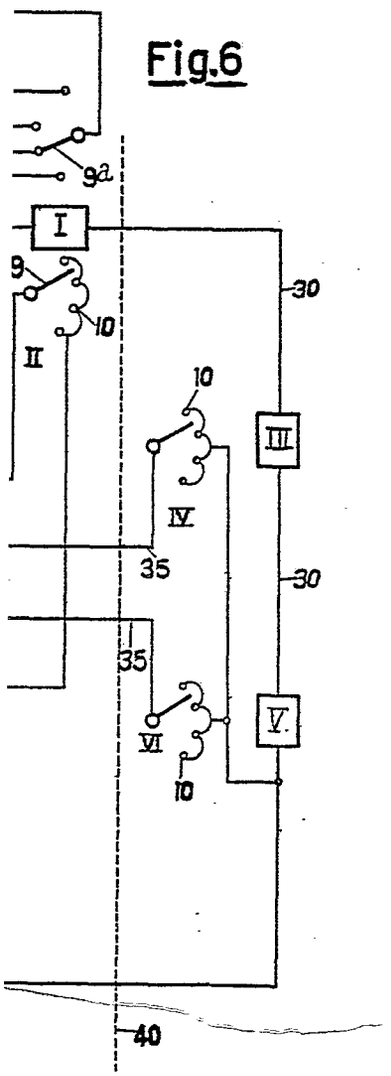


Fig.6


25
9a
D1
P1
A1
B1
30
I
9
10
II
D
P
A
B
A2
x2
x3
x1
x
y2
y3
y1
y
z2
z3
z1
z
10
III
IV
35
35
V
VI
10
P2
M1
M2
Z
W1
D2
MV
W
M
31
40
V.
32

909094 COMPLETE SPECIFICATION
4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 3 & 4

Fig.6



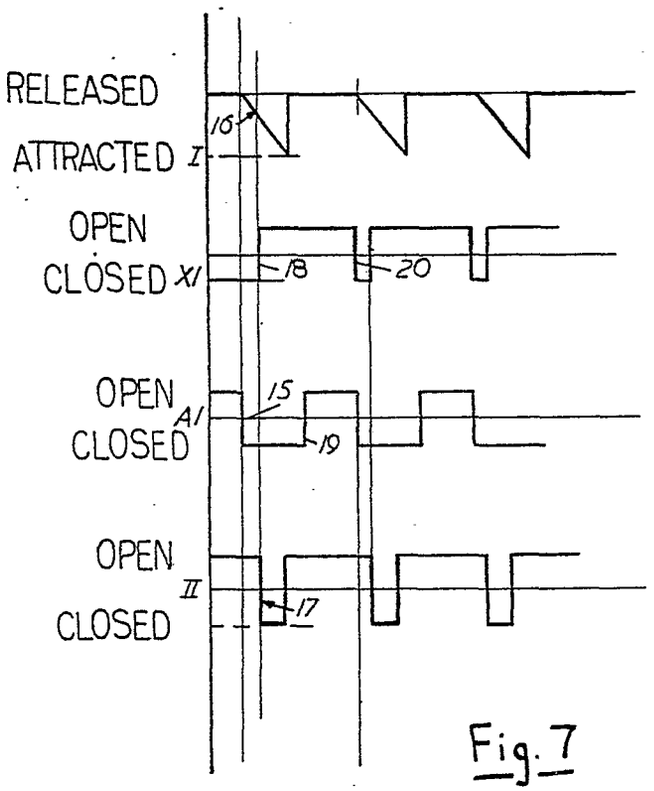
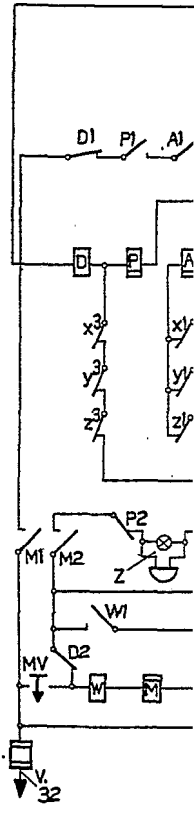


Fig. 7


D1
P1
A1
D
P
x3
y3
z3
P2
M1
M2
Z
W1
D2
MV
V.
32

909094 COMPLETE SPECIFICATION
4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 3 & 4

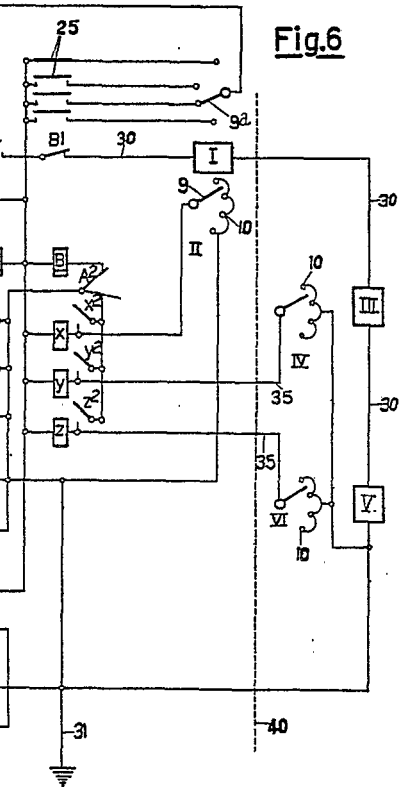


Fig.6

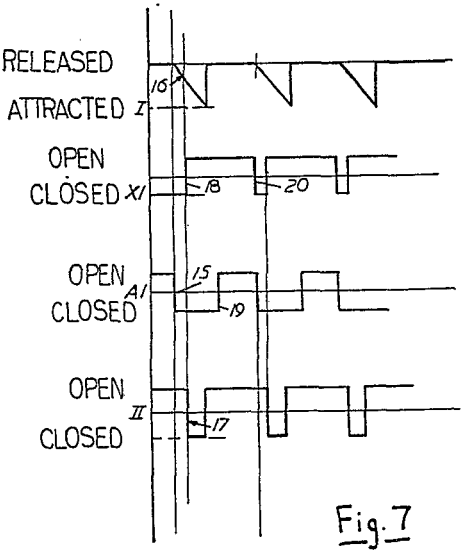


Fig.7