

**Sept. 8, 1942.**

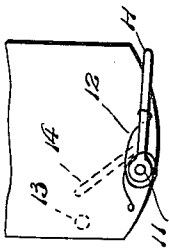
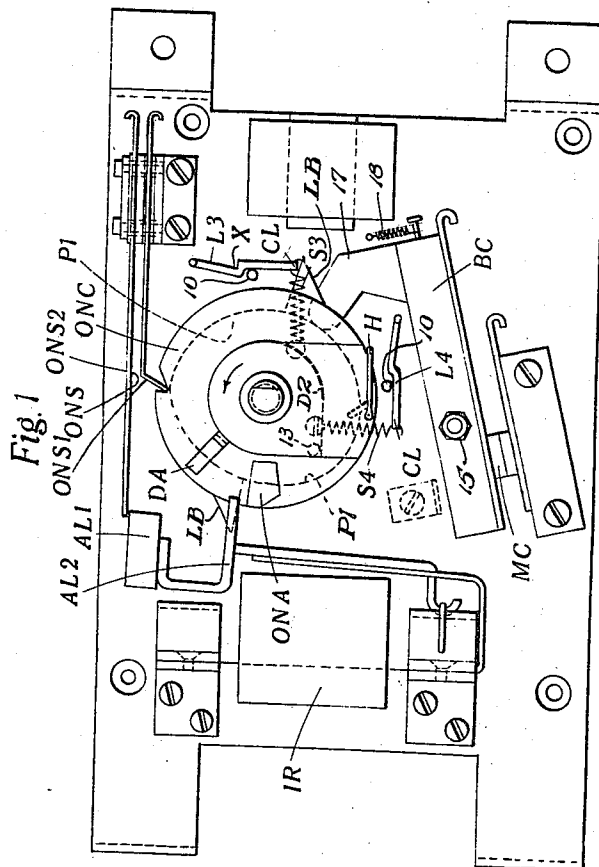
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**2,295,025**

ELECTRICAL SIGNAL-RESPONSIVE DEVICE

Filed March 15, 1940

3 Sheets-Sheet 1



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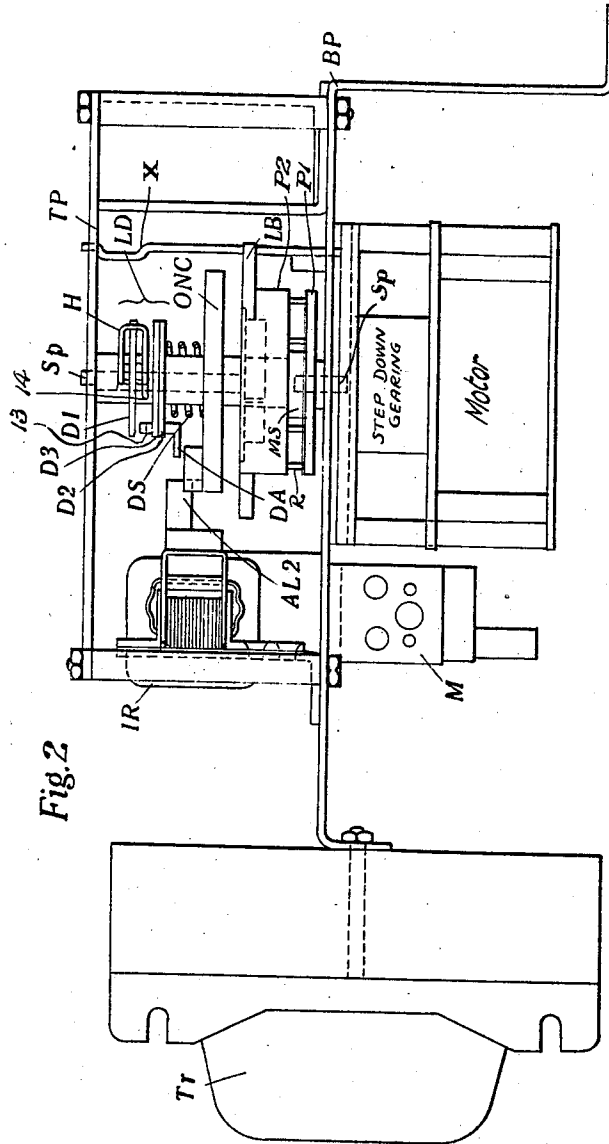
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ELECTRICAL SIGNAL-RESPONSIVE DEVICE

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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 5.

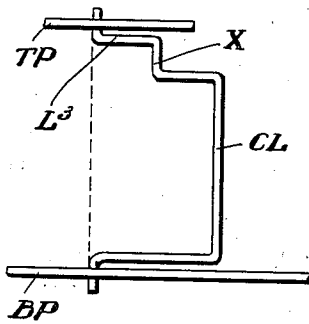


Fig. 6.

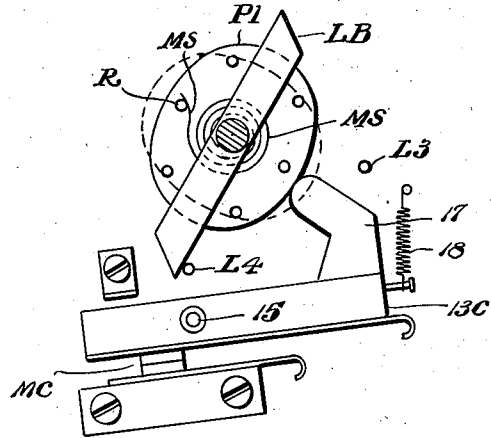
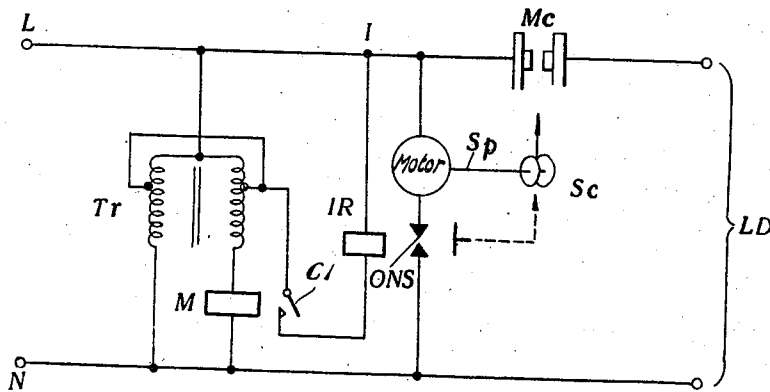


Fig. 4.



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## UNITED STATES PATENT OFFICE

2,295,025

## ELECTRIC SIGNAL-RESPONSIVE DEVICE

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 In Great Britain March 31, 1939

## 1 Claim. (Cl. 177—353)

This invention relates to mechanism responsive to electrical-impulses.

In the prior British Patent No. 495,057, there is described a system for the remote control of various independent pieces of electrical apparatus, a system which could conveniently utilise for the transmission of the controlling impulses the power line actually feeding the apparatus in question. As there described, an initial impulse from the control station starts up a synchronous motor at each of the several receiving stations, to drive a switch through a certain cycle of movement and then come to a stop; a signal impulse, sent out at a determined point in the cycle, affected any individual switch or left it unaffected according to the setting of the switch. Thus signal impulses sent out at various points in the cycle would variously control the several apparatus, these controls being independent or inter-related just as desired.

The present invention provides a mechanical form of signal-responsive switch for use at the receiving stations of such a system and it is in this application that the invention will for convenience be described. However, it must be clearly understood that the invention is not restricted to use in the system described in the prior British Patent No. 495,057 referred to above, since it may be applied to other purposes without the exercise of inventive ingenuity.

In accordance with this invention a mechanism selectively responsive to electrical impulses is characterised by two elements which are adapted to move relatively one at least being deflected upon receipt of an impulse, and which are set with respect to one another so that one will act upon the other if the deflection due to a received impulse occurs whilst the two elements occupy a certain relative position. Thus the mechanism is selective in the sense that an impulse received during the relative movement of the elements is effective or non-effective to cause their interaction according as the mechanism has been previously set so that the two elements occupy the certain relative position referred to at the moment when the impulse causes deflection.

The invention will be clearly understood from the following description of two embodiments shown in the accompanying drawings, in which:

Fig. 1 is a plan view of a mechanical impulse-responsive device in accordance with the invention;

Fig. 2 is a front view;

Figs. 3 and 5 are views of details;

Fig. 4 is a circuit diagram;

Fig. 6 shows details of the switch controller mechanism.

Describing a preferred embodiment, and referring to the circuit shown in Fig. 4 in order to gain a general concept of the functioning of the device, one sees that the power line LN, is connected through to a particular apparatus constituting a load LD, when the main contacts MC are closed. A magnet M is arranged in series with one winding of a transformer TR, and as both windings of the transformer bridge the power line LN the magnet M is rendered insensitive to alternating currents but remains responsive to direct currents put out over the power line. Energisation of the magnet M by a direct current impulse closes the normally open contacts C1 to operate intermediate relay IR from a tapping on transformer TR; and relay IR closes switch ONS for the motor so that the latter will start on its cycle, and once started the off-normal switch ONS is closed to maintain energisation of the motor despite release of the switch C1, until a spindle Sp, driving a mechanical switch controller SC for the main switch MC, has executed a definite cycle of movement, say one complete revolution during a time of one minute. If during this cycle, a second impulse of direct current is received by the magnet M, the switch controller SC will be influenced or not, according to its previous setting and the timing of the impulse.

Referring now to the more detailed Figs. 1 and 2, there is shown a base plate BP, with the transformer Tr at one side, the motor and its step down gearing below, and the spindle Sp passing up through the base plate to a bearing in the top plate TP. The magnet M is disposed beneath the base plate, and the intermediate relay IR above it.

Above base plate BP and rotatably mounted on spindle Sp is a spring drum assembly consisting of the oval cam plate P1, the circular plate P2 and the latch bar LB. LB is fixed to P2 and P2 is separated from P1 by a series of pins R. A main spring MS has its inner end fastened to the spindle, Fig. 6, but its outer end is free to slip past the pins R when the spring is over wound. When the spring is unwound, it is confined by pins R. Thus, every revolution of the spindle winds or over winds the spring, because the spring drum assembly is prevented from rotating by latch bar LB engaging with levers L3 or L4 which are held against their stops 10 by springs S3 and S4 respectively.

Referring to Fig. 6, it will be seen that the position of the spring drum assembly just de-

scribed controls the position of a lever BC, pivoted at 15 having a projecting arm 17 which engages with the oval cam plate P1. On lever BC is mounted one of the main contacts MC. Spring 18 attached to BC tends to rotate lever BC to close contacts MC.

When the spring drum assembly is in the position shown by the full lines of Fig. 6, contacts MC are closed and latch bar LB is in engagement with crank CL of lever L4, but if this crank is rotated outwards, it allows the latch bar to pass, the spring drum assembly rotating through 90 degrees under tension of main spring MS. The latch bar then engages with crank CL of lever L3, the oval cam plate P1 deflects arm 17 of bell crank BC against the tension of spring 18 and contacts MC open. This arrangement is similar to an escapement. Subsequent deflection of lever L3 outward on its pivot, in a subsequent selecting operation, causes the assembly to rotate through a further 90 degrees and the contacts close again.

The levers L3 and L4 are in the form of wires pivoted at the top and bottom in the plates TP and BP. A crank CL is formed in the intermediate part of the levers, and a kink X is formed in the upper arm of the crank as shown in Figs. 1 and 5. Springs S3 and S4 urge the levers in a clockwise direction and hold them normally against stops 10, Fig. 1, so that cranks CL normally lie in the path of latch bar LB.

Above the spring drum assembly on the spindle Sp is an off-normal cam ONC, which is notched at one point in its periphery so as to allow one of the contacts ONS1 of the motor switch to drop away from the other. The other contact ONS2 is normally held out of engagement with the first by a latch AL1 carried on the armature of the relay IR; so that upon operation of relay IR contact ONS2 springs into engagement with ONS1 to start the motor, and thereafter the pair of them ride up on the periphery of the cam ONC.

The cam ONC carries an abutment ONA which is adapted to engage with a second latch AL2 on the armature of relay IR so as to move the armature in its direction of operation.

Finally, the spindle carries a lever displacing assembly LD. This includes an arm which is fixed on the spindle and which carries a U-shaped finger H, the arms of which are pivoted on a pivot 11 on opposite surfaces of arm D1, and which is urged by spring 12 in anti-clockwise direction so as normally to lie in the position shown against the edge of the arm. Beneath arm D1 is a releasing disc D2, which is rotatable on the spindle but connected with it through a spring DS wound up if the disc is held while the spindle rotates. This releasing disc D2 carries an abutment DA which engages with the second latch AL2 on the armature of the relay IR.

Immediately above the release disc D2 is a striker disc D3 which is fixed with respect to the disc D2 and is therefore connected with the spindle for driving purposes, only through the spring DS. The striker disc D3 has a projection 13 adapted to engage with the tail 14 of the finger H and displace it clockwise.

The following is the operation of this device: A first or starting impulse of direct current energises magnet M and hence causes relay IR to be fed with alternating current from the mains LN. Attraction of the armature of relay IR will cause the latch AL1 to release the contact spring ONS2, thus closing the switch ONS and starting up the motor. Once the spring ONS2 has been released by the latch AL1, the motor continues to run

despite subsequent release of relay IR, the latch AL1 simply striking against the extremity of the spring ONS2. Moreover the spindle Sp in its rotation carries round the cam ONC so that the springs ONS, although remaining in contact, are moved out by the edge of the cam, and remain so until at the end of one complete revolution the inner spring ONS1 drops into the cam notch, leaving spring ONS2 again caught by latch AL1.

At an early stage in the movement, but after the relay IR has been allowed to release, the abutment DA on the release disc D2 reaches the latch AL2 on the armature of relay IR. Release disc D2 and striker disc D3 stop, and the continued movement of the spindle Sp winds up the spring DS. The arm D1 on the other hand, carrying finger H, continues in rotation, being fixed on the spindle.

If now a second or signalling impulse is received, the relay IR again operates, with the consequence that latch AL2 frees abutment DA, and the discs D2 and D3 fly round under the force of spring DS to catch up with the arm D1. The tail 14 of the finger H is then struck by the projection 13 on disc D3, and the finger is turned round clockwise until, if its path is clear, it will have its extremity lying radially outward beyond the cranked part CL of the lever L3 or L4. In this case, on engagement of finger H with lever L3 or L4, the finger will not move the lever but will rotate on its pivot 11 in a clockwise direction against the tension of spring 12 with the continued rotation of arm D1 until the end of the finger disengages from the lever when spring 12 partly restores the finger toward its normal position depending on the position of projection 13, as shown in Fig. 3. It will be understood that the striker projection 13 after having once tripped finger H is ineffective to cause another operation thereof until the spring DS is tensioned prior to another selecting cycle.

If the signal impulse should come in during that portion of the cycle when the finger H is adjacent one of the levers L, the finger will be unable to turn out beyond the cranked part CL, but will strike against the horizontal part of the lever and there stay. Continued movement of the spindle will carry the end of the finger into the kink X in the lever L and will then force the lever to move outwardly until the latch bar is released. The latch bar assembly being under tension of spring MS turns until either arm of latch bar LB comes into engagement with a lever L3 or L4 changing the position of the assembly and oval cam P1 thereof 90 degrees thus reversing the position of contacts MC.

On the other hand, should no signal impulse occur during the cycle the spring DS might be overwound, and in order to prevent this the abutment ONA is provided, which will displace the armature latch AL2 and thus release the discs D2 and D3 shortly before the end of the cycle.

Setting of the device to respond to a signal impulse at a certain point in the cycle, is accomplished by angular adjustment of the arm D1 with respect to the spindle, or more correctly with respect to the cam ONC, and by a corresponding angular adjustment between the striker disc D3 and the release disc D2.

It will be seen that with this embodiment of the invention, the operation by which the finger H is displaced i. e. the release of latch AL2, is independent of the duration of the signal impulse.

What is claimed is:

In a device of the character described, the

combination of an oval cam, a yielding drive for said cam, a contact arm engaged by said cam to be moved to open or closed position thereby, an escapement comprising a stop arm secured to said cam and lever means cooperating therewith, a 5 motor for turning said yielding drive, a power line, a magnet connected to said line arranged to respond to impulses transmitted thereover, means controlled by said magnet in response to an ini-

tial impulse to start said motor, means to cause said motor once started to rotate independently of said magnet, means responsive to an operation of said magnet by an impulse transmitted in a predetermined interval after said initial impulse to operate said escapement lever means and thereby permit said cam to change the position of said contact arm.

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