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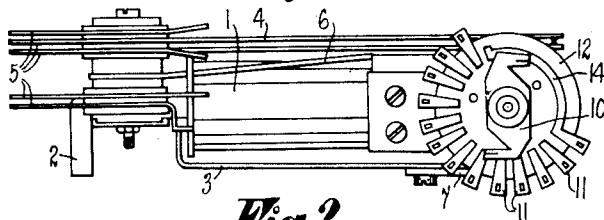
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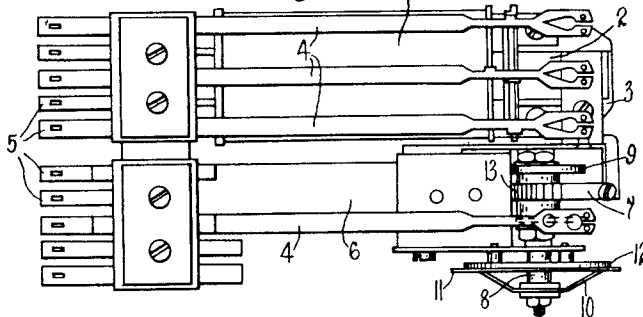
ELECTROMAGNETIC SWITCHING DEVICE

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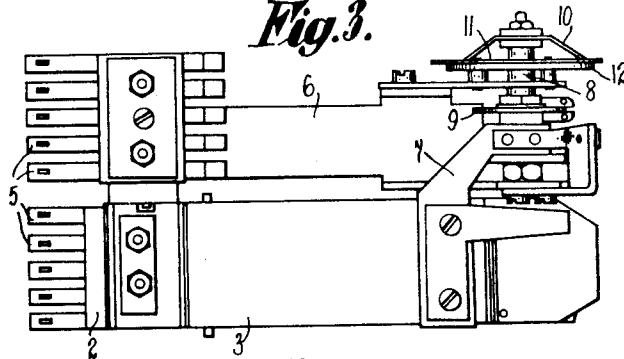
*Fig. 1.*



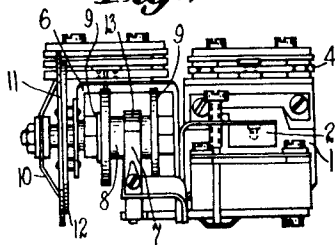
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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## UNITED STATES PATENT OFFICE

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## ELECTROMAGNETIC SWITCHING DEVICE

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7 Claims. (Cl. 179—27.51)

The present invention relates to an electro-  
magnetic switching device suitable for use in tele-  
phone or like systems in which signals are sent  
by means of trains of electrical impulses which  
serve to bring about step-by-step operation of  
the device. Such a device may be employed ad-  
vantageously in telephone systems in connection  
with a switch having movement in one direction  
only which is required to connect with an idle  
line of a particular group, in this case the switch-  
ing devices will respond to a series of impulses  
and in accordance with its setting effect a mark-  
ing to indicate the group concerned.

The invention contemplates the use of an elec-  
tromagnetic structure substantially similar to  
that of a relay of the type ordinarily employed  
in telephone systems but provided in addition with  
ratchet and pawl mechanism for giving rotary  
motion to a shaft which carries a brush or wiper  
arranged to wipe over a set of fixed contacts.  
The shaft may also carry suitable cams arranged  
to operate contact springs in predetermined po-  
sitions and if desired the armature may also ef-  
fect the direct operation of additional contact  
springs in the manner of an ordinary relay. The  
chief object of the invention is to produce a step-  
by-step switch of the character indicated which  
will occupy only a small mounting space, while  
still being reliable in operation and providing for  
the necessary number of circuit changes.

According to the invention an electromagnet  
is adapted to operate pawl and ratchet mecha-  
nism to rotate a vertical shaft which is mounted  
above the magnet while the armature and con-  
tact springs directly operated thereby are mount-  
ed on opposite sides of the magnet.

The invention will be better understood from  
the following description of one method of car-  
rying it into effect which should be taken in con-  
junction with the accompanying drawing com-  
prising Figs. 1-4. With the mounting arrange-  
ment usually adopted in which the plane of the  
contact springs is vertical, Fig. 1 represents a  
plan view of the device, Figs. 2 and 3 are ele-  
vations from the top and bottom of Fig. 1 and  
Fig. 4 is an end view.

The electromagnet comprises a winding 1 which  
is wound around a flat core 2, the left-hand end  
of which is bent over as shown to facilitate the  
mounting of the device. This extended end also  
provides a bearing for the armature 3 and in ad-  
dition serves to support the various contact  
springs 4 which are provided with soldering tags  
5. The projecting end of the core 2 furthermore  
serves as a mounting for the supporting member

6 which provides a bearing for the shaft 8 and  
contact bank 12. The armature 3 comprises a  
flat plate of the shape shown and substantially  
the dimensions of the coil and carries a pawl 7  
arranged to co-operate with a ratchet wheel 13.  
In the arrangement shown the shaft 8 also car-  
ries the cam discs 9 which are given suitable con-  
tour for operating associated contact springs  
in the desired positions. The shaft 8 has attached  
to it at its upper end the wiper 10 which is dou-  
ble-ended, one end bearing on the various con-  
tacts 11 and the other on the semi-circular feed  
segment 14 which are mounted on the insulating  
disc 12.

The operation of the device is that each time  
armature 3 is attracted, pawl 7 advances ratchet  
wheel 13 one step thereby moving wiper 10 from  
one of the contacts 11 to the next. The springs  
directly controlled by the armature will be op-  
erated on each energization of the magnet and  
those controlled by the cam discs in positions de-  
termined by the contour of the cams.

The arrangement according to the invention  
whereby the contact springs are located on one  
side of the coil and the armature on the other  
side while the shaft is mounted vertically with  
the wiper and corresponding contacts on top gives  
an extremely compact arrangement while allow-  
ing the maximum accessibility for inspection or  
adjustment.

What I claim as new and desire to secure by  
Letters Patent is:

1. In a circuit switching mechanism, a sup-  
porting member comprising a flat iron bar hav-  
ing a small portion thereof bent at right angles  
to the major portion thereof and serving as the  
means by which said mechanism may be mounted  
on other equipment, a coil wound about a por-  
tion of said bar to form the operating magnet  
of said mechanism, other apparatus fixed to said  
supporting member adjacent the point at which  
said member is bent; said apparatus including  
an auxiliary member extending alongside said  
supporting member and having on the free end  
thereof a ratchet equipped rotatable shaft  
equipped with wipers and a co-operative set of  
fixed contacts, and also including a pawl equipped  
armature arranged to drive said ratchet wheel  
and wipers upon excitation of said magnet.

2. In a switching device, a bank of fixed con-  
tacts, rotatable wipers co-operative with said  
contacts; a shaft, on which said wipers are se-  
cured, having a ratchet wheel thereon; a sup-  
port for all of said specified elements comprising  
an electromagnet, and a pawl equipped armature

also supported by said electromagnet co-operative with said ratchet wheel to actuate said wipers responsive to energizations of said magnet.

3. In a switching mechanism, an electromagnet comprising a flat core member having on one portion thereof an exciting winding, having another portion thereof serving as a mounting space for circuit switching springs and other apparatus of said mechanism, while a still further portion thereof is bent at an angle with respect to said first portions and serves as the mounting means of the entire mechanism.

4. In a switching mechanism, a double ended wiper, a bank of contacts comprising contacts engaged successively by one end of said wiper and including a contact continuously engaged by the other end of said wiper during successive engagement of contacts by the one end of said wiper until all of them have been encountered, said continuously engaged contact being then continuously engaged by the first-mentioned end of said wiper while the other end thereof successively engages said contacts.

5. In a circuit control and switching device, a core having a winding thereon to form an operating magnet for said device; a member secured to said core, arranged alongside said magnet, and having the configuration of a U at its free end; a disk of insulating material, having a circle of

fixed contacts thereon, fixed to one portion of the U; a rotatable shaft, passing through bearing holes in the U portion of said member, wipers on said shaft arranged in operative relation to said fixed contacts, a ratchet wheel on said shaft for use in rotating it; cams on said shaft in operative relation to contact springs, also mounted upon said core; and a pawl equipped armature also mounted on said core in co-operative relation to said magnet and ratchet wheel and operated upon energization of said magnet to operate said wipers and cams.

6. In an electromagnetic switching assembly, the combination of a magnet having all of the switching mechanism secured on one side thereof and having the driving mechanism for the switching mechanism secured on the opposite side thereof, with both said mechanisms arranged at the front end of said magnet.

7. In an electromagnetic switching mechanism, the combination of a magnet having a flat core on which is mounted in a single pile-up, the armature, the required contact springs and the support for other parts of the mechanism; such other parts including a wiper and a set of bank contacts, as well as other contacts and cams for operating them.

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