May 20, 1941. B. J. BRANDER 2,242,340

AUTOMATIC TELEPHONE SELECTOR

Filed May 3, 1938 2 Sheets-Sheet 1

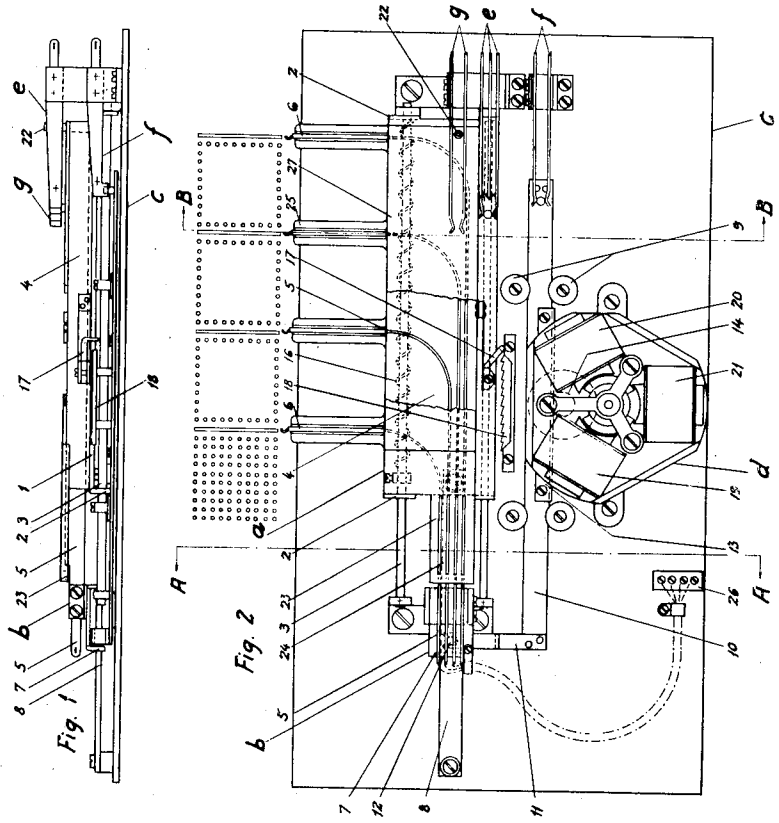


Fig. 1

Fig. 2

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Fig. 5

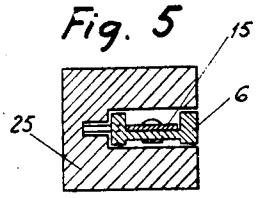
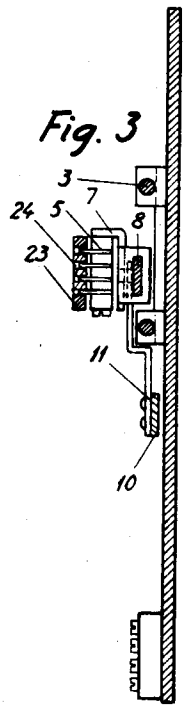


Fig. 3



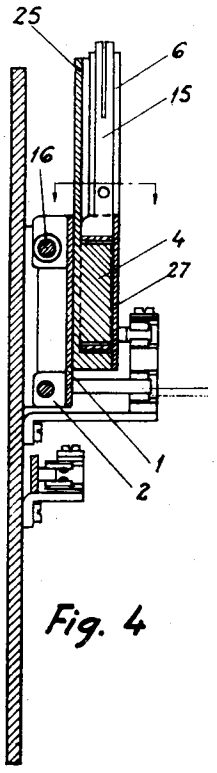
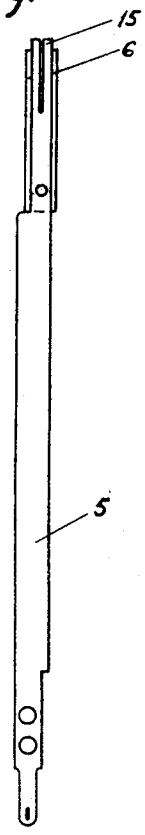


Fig. 4

Fig. 6



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AUTOMATIC TELEPHONE SELECTOR

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Application May 3, 1938, Serial No. 205,837
In Sweden May 5, 1937

6 Claims. (Cl. 179—27.52)

The present invention relates to telephone selectors of the kind in which the selecting mechanism is adapted to cooperate with a multiple field consisting of bare wires. More particularly the invention relates to such telephone selectors in which the selecting mechanism comprises a member, preferably in the form of a chariot or carriage, which is movable in a straight path in front of the multiple field and is provided with a number of contact arms or wipers adapted to be inserted between the bare wires of the multiple field. In selectors of said kind the wipers thus perform two distinct movements in directions extending at right angles to each other, namely a first movement during the displacement of the carriage to select a certain group of wires in the multiple, and a second movement when the wipers are inserted between the multiple wires to select a certain line within the group.

According to the invention selectors of the kind set forth are provided with wipers in the form of flexible electric conductors, for instance thin elastic metal bands or metal wires, which are movable in perpendicularly bent paths in the carriage in such a manner that when the carriage is stationary a force which acts in the direction of movement of the carriage can be used for pushing the flexible conductors along said paths and further into the multiple field in a direction at right angles to the direction of movement of the carriage. By arranging the wipers in this manner complicated movement transmitting mechanism for effecting the two different setting movements of the wipers may be dispensed with.

The invention will now be described more in detail having reference to the drawings attached to this specification and forming part thereof, in which

Figure 1 is a front view of an embodiment of a selector according to the invention,

Figure 2 is a top view thereof,

Figures 3 and 4 show two sections through the selector on the lines A—A and B—B respectively, and

Figures 5 and 6 show details of a wiper.

The selector is intended for use in connection with a multiple field consisting of bare metal wires that extend vertically and are arranged in groups of square cross-section, as shown in Figure 2.

The movable switching members of the selector comprise two main parts which are movable back and forth rectilinearly, namely a chariot or carriage *a* and a slide *b*. The carriage *a* consists mainly of a metal plate **1** which by means of four depending lugs **2** is displaceable along two guide rods **3** secured to the bottom plate *c* of the selector, and of a plate **4** of pressure-cast insulating material, for example of the material sold under the trade name Bakelite, said plate **4** being secured onto the plate **1**. The Bakelite plate **4** is provided with four narrow slots or channels in which four elastic metal bands **5** (for example consisting of steel or of a stainless steel alloy) are readily slidable. Said metal bands **5** form the wipers or contact arms of the selector, each metal band being provided at its outer end with a kind of plug **6** of insulating material intended to be inserted between the wires of the multiple field. The inner ends of the metal bands **5** are secured on the slide *b* so as to be insulated therefrom and form together with the slide a system which is movable back and forth in a straight path. The slide *b* is movably supported by means of a metal loop **7** on a bar **8** secured in the bottom plate *c* and it is coupled with a bar **10** which is movable between four rollers **9** mounted in such positions on the bottom plate *c* as to permit an arm **11** secured on the bar **10** to engage with a pin **12** inserted in the loop **7**. The bar **10** thus also forms a part of the system which is movable together with the slide *b*.

Secured on the bar **10** is a rack **13** which is in engagement with a pinion **14** mounted on the shaft of a small motor *d* serving to drive the selector. The construction of the motor *d* is arbitrary as long as it permits of driving the rack **13** together with the slide *b* back and forth by means of current impulses.

Each of the plugs **6** is provided with a contact spring **15** electrically connected with the corresponding metal band, said contact spring being adapted upon insertion of the plug into the bank of contacts to make contact successively with said wires. The contact spring can also be formed by the metal band **5** proper, provided that the end of said band is given a shape suitable for making contacts.

The carriage *a* is actuated by a comparatively weak helical spring **16** which is threaded onto one of the guide rods **3** and which engages at one of its ends with an adjustable stop on the guide rod **3** and presses at its other end against the bent-over edge of the plate **1**. The helical spring **16** thus strives to move the carriage towards its position of rest. Mounted on the carriage *a* is also a detent **17** which by means

of a pin or projection extending towards the bottom plate *c* engages with a toothed bar **18** which is secured on the bottom plate *c*. For closing the channels in the carriage *a* a cover plate **27** is mounted on the plate **4**.

Arranged on the bottom plate *c* are three contact spring groups *e, f, g,* of which *e* and *f* serve to interrupt a circuit in the position of rest of the selector, and *g* serves to close a relay circuit provided for reversing the direction of movement of the motor when during its restoring movement the carriage *a* has arrived in its outermost position (to the left).

The co-operation of the various parts will appear from the following description of the manner of action of the selector.

The selector illustrated on the drawings is assumed to be a final selector for a system comprising 100 subscribers' lines and its manner of action is as follows:

When the subscriber has been connected in known manner by means of a line selector to the final selector, impulses arrive from the dial in known manner in the form of current interruptions in the line, a repeating relay set then transferring the impulses in such a manner that the stator electro-magnets **19, 20, 21** of the motor obtain in rotation one impulse each for each impulse from the dial. The rotor of the motor then rotates one half revolution (clock-wise) bringing about the displacement of the rack **13** a distance to the left which is equal to the pitch of the conductor groups in the multiple field. The rack brings along the slide *b* and together therewith the bar **10**, the bar in turn bringing along the carriage *a* by means of the metal bands **5**, so that the plugs **6** become displaced one step to the left in front of the multiple field. The same operation is repeated for each impulse from the dial, the plugs **6** being thus set in position right opposite to the wanted conductor group in the multiple.

During the displacement of the carriage *a* to the left the detent **17** freely slides over the teeth of the toothed bar **18**, stopping in a tooth opening corresponding to the position of the plugs **6**, the pitch of the teeth being equal to the pitch of the conductor groups in the multiple field. Upon cessation of the first train of impulses a relay, which is adapted to prepare in advance the rotation of the motor armature in the reverse direction, is energized in known manner by means of a slow-upon-release relay which remains attracted during the entire train of impulses but thereafter drops its armature. The following train of impulses will therefore bring about a displacement of the rack **13** in the opposite direction (to the right) a number of steps equal to the number of impulses in the train of impulses now received by the impulse relay. The slide *b* is also displaced to the right and since the carriage *a* is prevented by the detent mechanism **17, 18** from being displaced as well, the metal bands **5** will slide in their slots in the carriage *a* causing the plugs **6** to be moved in between the multiple wires a number of steps, equal to the number of impulses in the last train of impulses. The setting of the selector on the wanted line is now completed.

The restoring of the selector to its position of rest is effected by means of two trains of impulses which are automatically supplied to the motor. The first train effects a rotation of the motor armature clockwise with a consequent displacement of the slide *b* to the left. During this movement the metal bands **5** with their plugs **6** are first pulled out from the multiple field, and when this has been done and the plugs **6** have reached their bottom positions in the Bakelite plate **4** the carriage *a* will follow the movement of the slide *b* until the detent **17** has passed over the last or eleventh tooth of the toothed bar **18**. At this moment the contacts between the contact springs of the spring group *g* are closed by means of an insulated metal pin **22** on the carriage *a*, causing a so called reversing relay to operate and to bring about a rotation of the motor *d* in the opposite direction. This will cause the slide *b* to be driven to the right together with the carriage *a*, the detent **17** of the carriage then sliding along the opposite edge of the bar **18** until the members *a* and *b* have reached their positions of rest, when the operating current of the motor is interrupted through opening of the contacts in the spring groups *e* and *f*.

The helical spring **16** which strives to move the carriage *a* towards its position of rest has for its purpose to insure the restoring of the selector in that, first, it prevents the carriage from starting to move to the left on the pulling out of the plugs from the multiple field until the plugs have reached their positions of rest and, second, it prevents the metal bands from being pushed out anew on reversal of movement of the motor, as could otherwise happen if for some reason the frictional resistance between the carriage *a* and the guide rods **3** should be greater than the resistance offered by the metal bands **5** when pushed out towards the multiple field. If, however, said two factors are correctly balanced with respect to each other the helical spring **16** can be dispensed with, entailing the advantage of reducing the load of the motor during the first setting movement of the selector. Alternatively, the slide *b* can be provided, instead of with the helical spring **16**, with a detent which engages with a fixed toothed rod similar to the toothed rod **18** but having its teeth turned in the opposite direction, said detent being held out of function during the simultaneous movements of the slide *b* and the carriage *a* by means of an arm or a projection provided on the carriage to be released on the reversed movement of the slide *b* then locking the carriage *a* until the slide *b* has returned to its position of rest with respect to the carriage.

The plugs **6** are preferably made of a cast insulating composition (Bakelite) and are I-shaped in cross-section, as will be clear from Figure 5.

The flanges which project on opposite sides of each contact spring **15** serve as guides during the movement of the plug between the multiple wires; it should be noted that during the movement of the plug said flanges do not slide on the points of the multiple wires with which the spring **15** is to make contact. Hereby contamination of the contact points through particles which may be worn away from the insulating material of the plug is avoided.

With regard to the guiding of the metal bands **5** during their insertion into the multiple field, the carriage A can be provided with an extension in the form of a thin plate **23** of insulating material having slots **24** therein which embrace one edge of the metal bands only, as shown in Figure 3, thereby avoiding swerving or bending of the portion of the metal bands extending between the slide *b* and the Bakelite plate **4**. In order that the slide *b* shall be able to pass without obstruction under the plate **23**, the metal bands **5** are narrower at the point where they

are secured in the slide *b*, and the latter is so dimensioned that it can pass freely under the plate **23**. A similar guiding arrangement is provided at the outer ends of the metal bands **5** where said bands are secured in their plugs **6**. The metal bands have a reduced width even at this point, so that the portion of the band **5** which moves rectilinearly towards the multiple field is guided at one edge (the lower one) by a narrow slot in the bottom of an extension **25** from the Bakelite plate **4**.

For connecting the flexible wipers with the corresponding stationary fixed conductors on the selector plate *c* an ordinary cord connected to a terminal distributor **26** can be used, as indicated with dot-and-dash lines in Figure 2. Said cord can be avoided, however, if the metal bands **5** are extended instead towards the left of the slide *b* (Figure 2) and are brought in separate loops directly to the terminal distributor **26**.

As regards the guiding of the metal bands **5** by means of the plate **23** projecting from the carriage, the need for said guiding device depends of course on the thickness of the metal bands **5**. If the bands are made of steel plate, having a thickness of .15 millimeter, for example, said guiding device is not needed, but even when using bands being as thin as .1 millimeter the guiding device may be dispensed with under certain contingencies, particularly if the freely extending portions are given a curved cross-section.

As far as the motor *d* is concerned, said motor can be substituted, of course, by another driving means, for instance by two so called stepping mechanisms which act in opposite directions.

I claim:

1. In a selector, a bare metal wire contact field, a slidable switching member movable to and fro in front of the contact field, a reversible motor for driving the said switching member, a carriage arranged at said switching member and movable parallel with the path thereof and in relation thereto, a number of wipers adapted to be inserted between the wires of the multiple field, curved and electrically insulated slots in said carriage, a number of flexible electric conductors carrying said wipers and being slidably supported by said curved electrically insulated slots, means securing the conductors for movement in both directions with the slidable switching member, said carriage being drawn along with the switching member in one direction of movement thereof by the conductors, and means to temporarily lock the carriage against movement in the opposite direction whereby during movement of the switching member in the second mentioned direction, the wipers at the free ends of the flexible conductors are projected from the carriage at right angles to the paths of movement thereof and are moved in between the wires of the multiple fields.

2. An automatic selector in accordance with claim 1 in which the flexible conductors have wiper-shaped free ends.

3. An automatic selector in accordance with claim 1, in which the slots for the flexible conductors are formed in a pressure-cast plate of insulating material.

4. An automatic selector in accordance with claim 1 in which those parts of the flexible conductors made in form of elastic metal bands which extend freely outside the channels in the carriage are guided on their edges in slots provided in an extension from the carriage.

5. An automatic selector as claimed in claim 1 in which the wipers are provided at their outer ends with plugs having an I-shaped cross section, the contact springs of the wipers electrically connected with the flexible conductors being disposed between the projecting flanges of said plugs whereby the flanges of said plugs while constituting a guide with respect to the multiple wires slide across other surfaces of said wires than those with which the contact springs make contact.

6. An automatic selector in accordance with claim 1 in which the flexible conductors made in form of elastic metal bands have those portions which extend outside the carriage with an arcuate cross section.

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