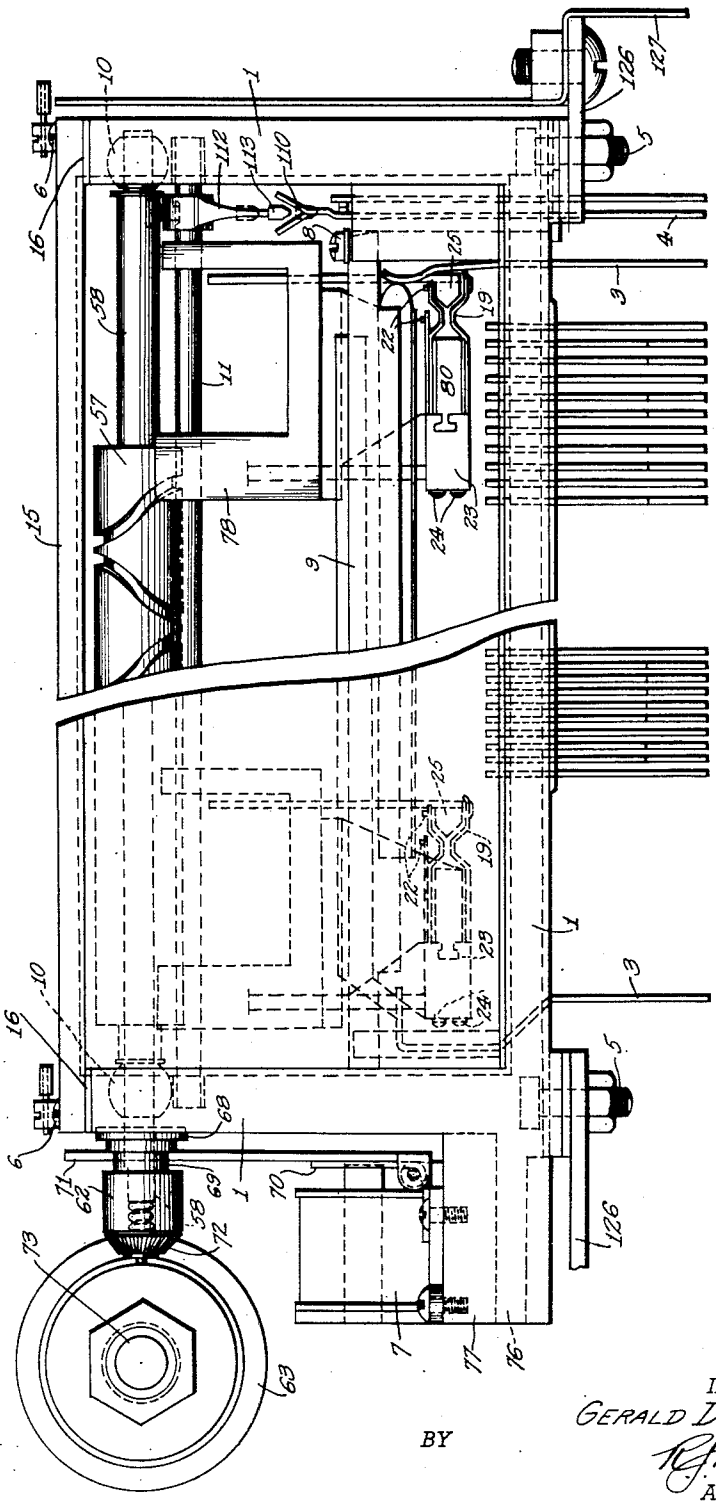
Dec. 14, 1943. G. DEAKIN 2,336,471

SELECTOR SWITCH

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FIG. 1.



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BY

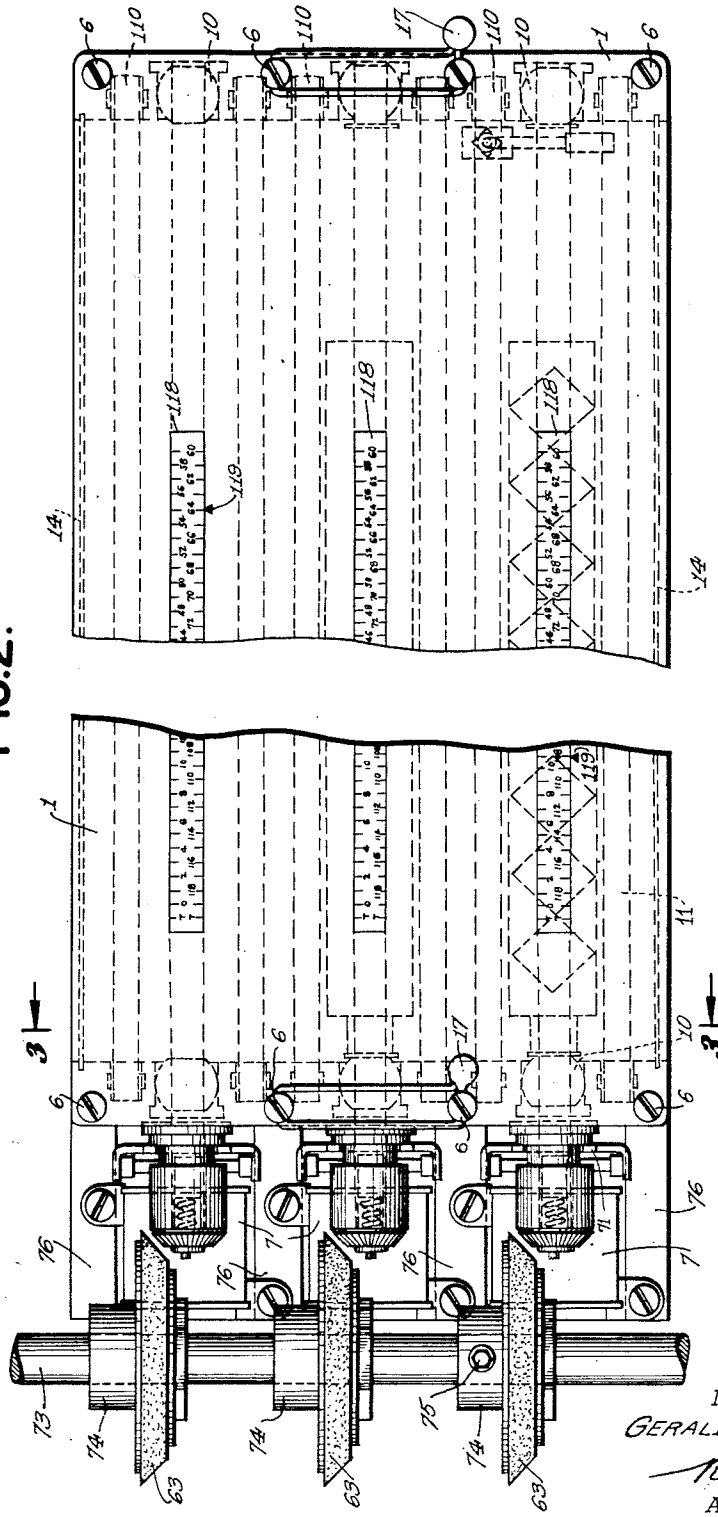
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FIG.2.



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ATTORNEY.

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FIG.5.

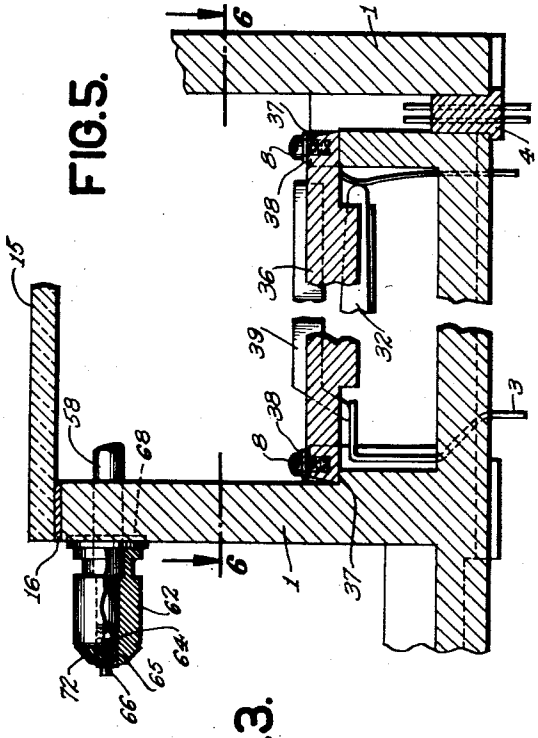


FIG.6.

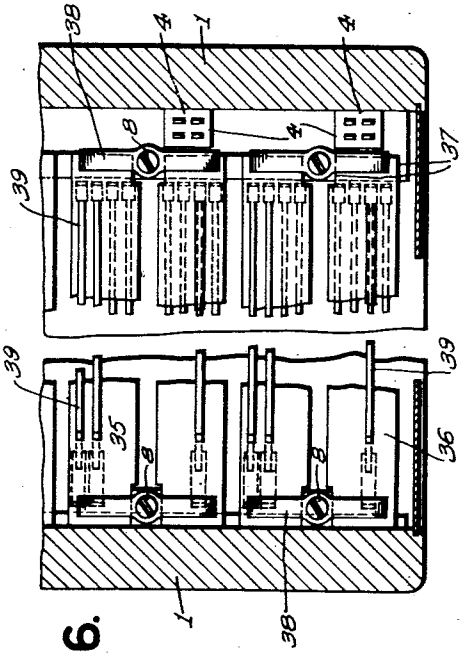


FIG.3.

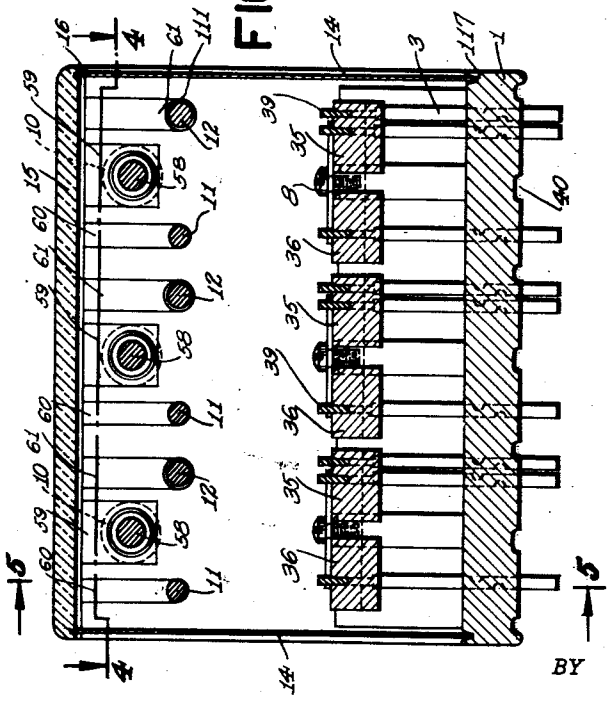
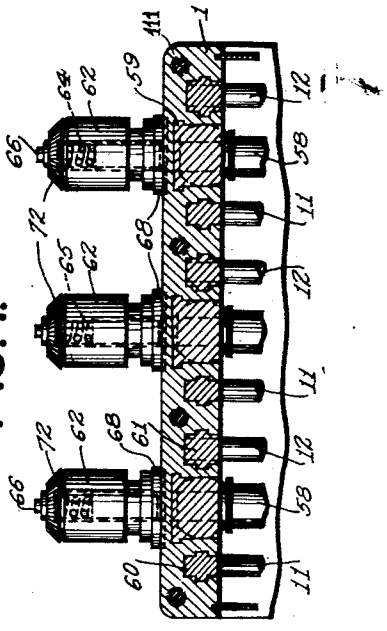


FIG.4.



INVENTOR.
GERALD DEAKIN
BY
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FIG.12.

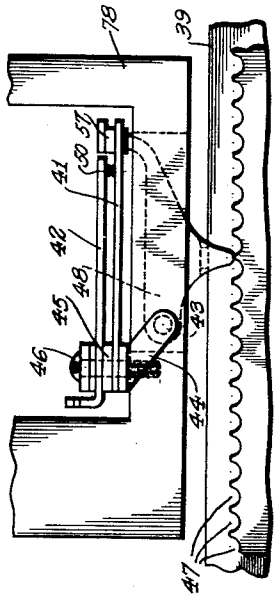


FIG.13.

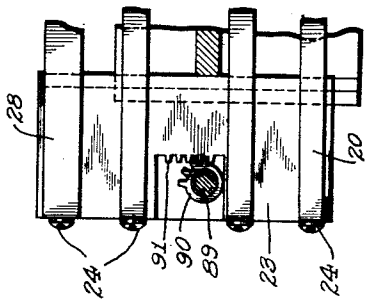


FIG.10.

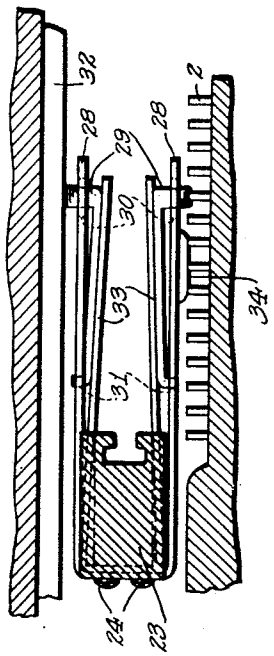


FIG.11.

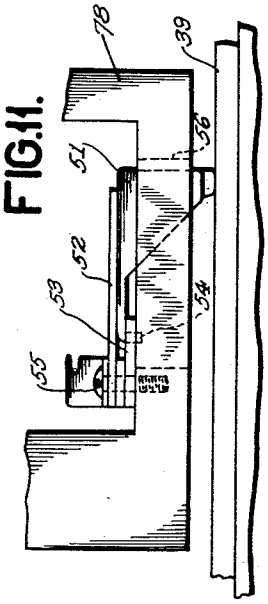
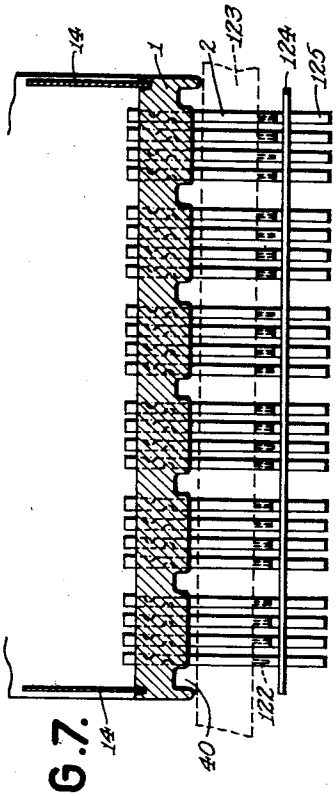


FIG.7.



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GERALD DEAKIN

BY

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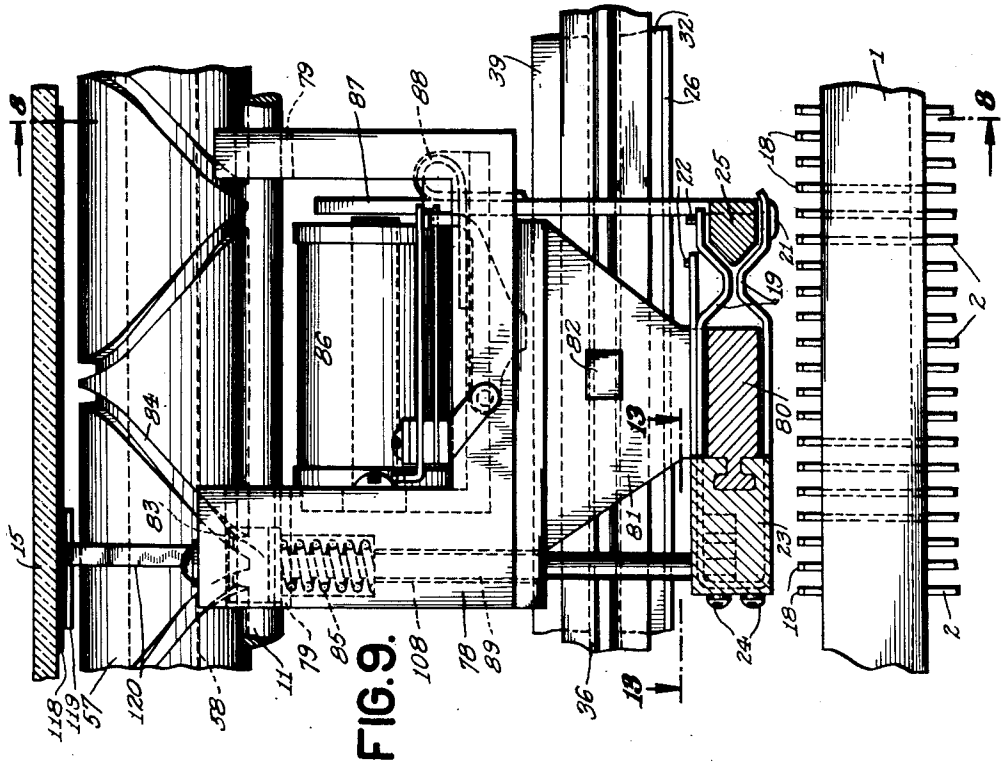


FIG. 9.

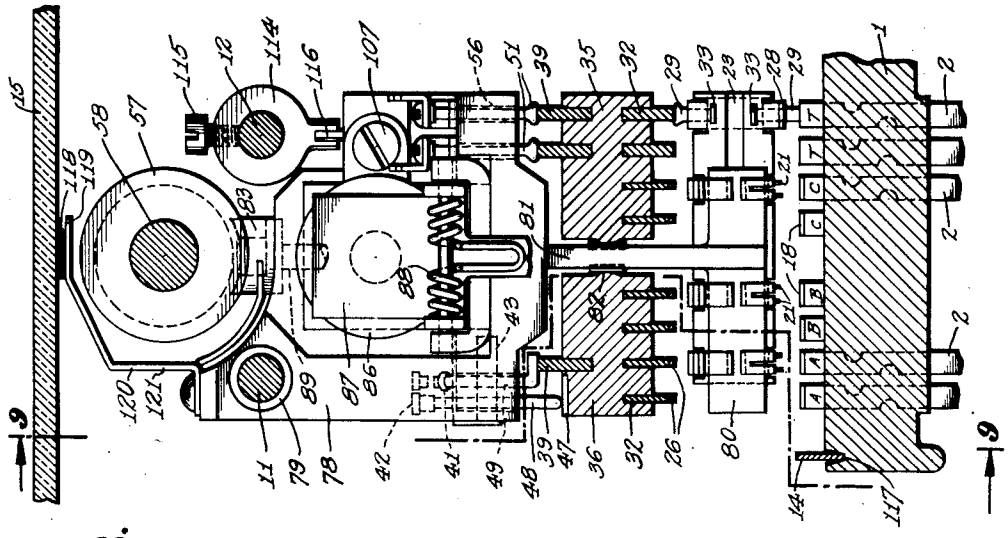


FIG. 8.

INVENTOR.
GERALD DEAKIN

BY

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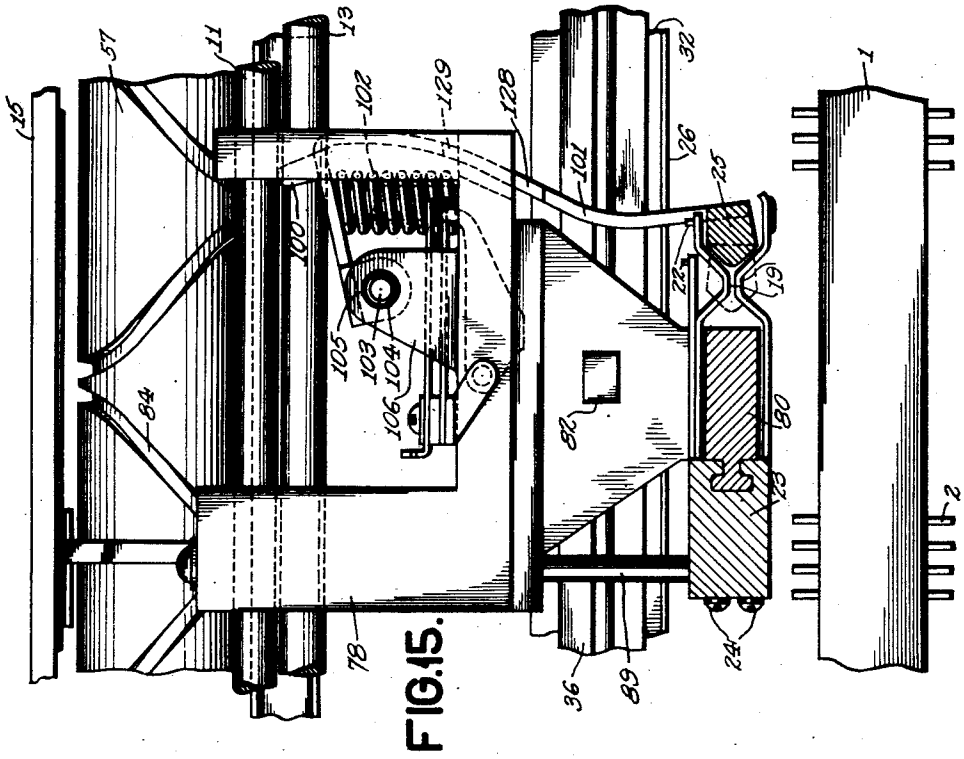


FIG. 15.

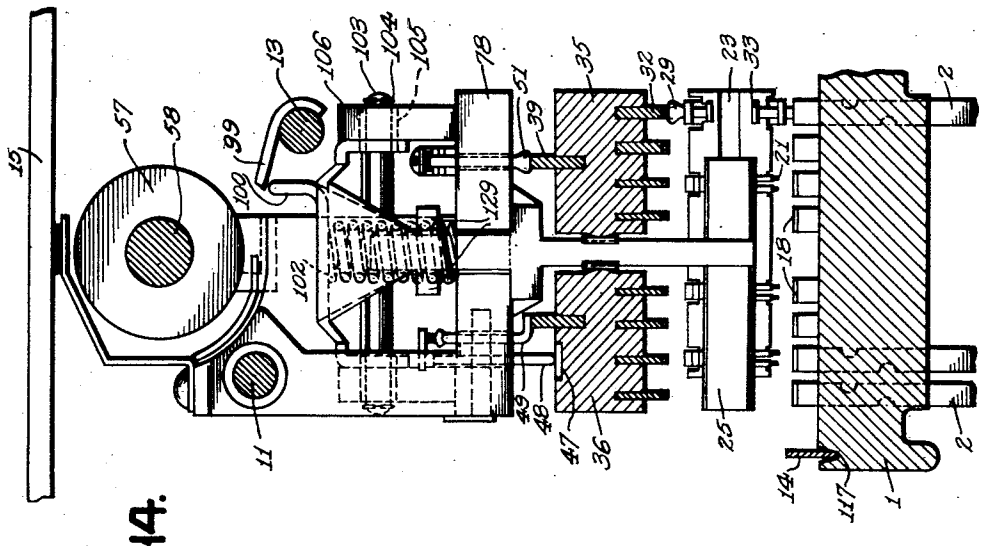


FIG. 14.

INVENTOR.
GERALD DEAKIN
BY
ATTORNEY.

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FIG. 18.

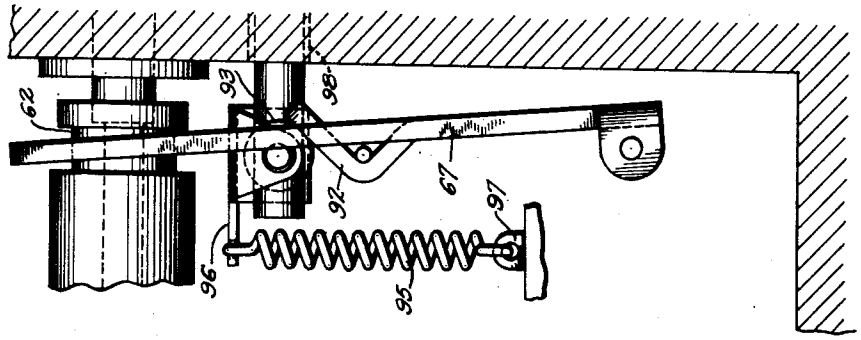


FIG. 17.

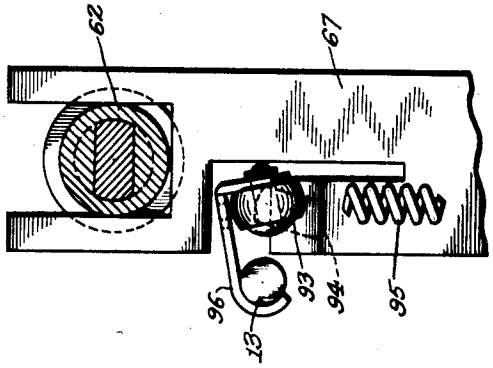
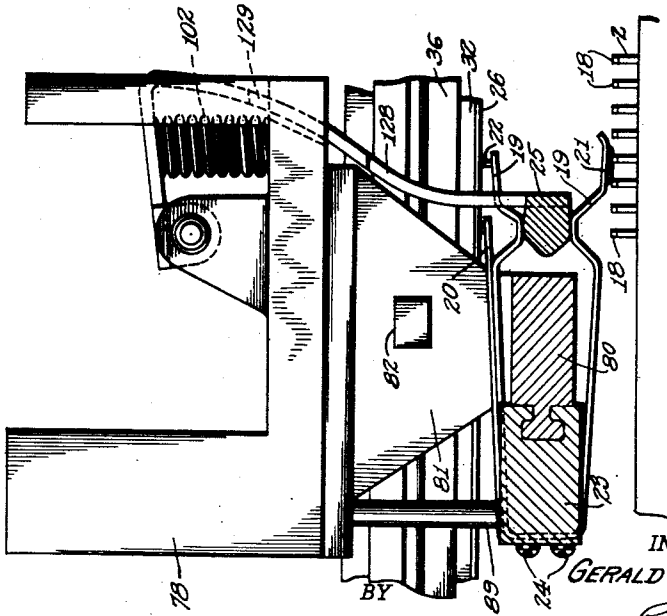


FIG. 16.



INVENTOR.
GERALD DEAKIN
ATTORNEY.

Patented Dec. 14, 1943

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UNITED STATES PATENT OFFICE

2,336,471

SELECTOR SWITCH

Gerald Deakin, New York, N. Y., assignor to International Standard Electric Corporation, New York, N. Y., a corporation of Delaware

Application February 2, 1942, Serial No. 429,272

13 Claims. (Cl. 179—27.51)

This invention relates to selector switches of the kind used for example in automatic telephone systems as finder switches, group selectors, final connectors, marking switches or the like.

An object of the invention is to produce a switch which is easy to assemble and cheap to manufacture, which is robust in construction and which will operate satisfactorily over long periods of service with a minimum of attention. A further object is the reduction of contact noise with at the same time a reduction in contact wear.

It has been appreciated for some time past that the use of precious metal contacts in automatic switches for telephone and like systems results in attendant advantages due to the fact that such contacts are not subject to surface oxidation or alternatively the oxide if formed does not substantially reduce the conductivity at the point of contact. These properties are possessed by the relatively expensive metals, and by the term "precious metal" where used throughout this specification and claims I mean silver, gold and platinum and alloys of these metals. Where such precious metal contacts are provided on the brushes and bank terminals of selector switches for automatic telephone systems it will be readily understood that it is desirable to reduce contact wear as much as possible.

According to one feature of the invention in a selector switch comprising a flat terminal bank consitsing of a plurality of rows of terminals and brushes which are moved longitudinally over said terminals, means is provided for maintaining the talking brushes in non-rubbing relation with respect to their terminals during movement of the brushes over the terminal bank and for causing the talking brushes to make contact with selected terminals when the movement of the brushes is arrested. If, therefore, the talking brushes and bank terminals are provided with a layer of precious metal at the points of contact the advantages which are derived from the use of such precious metal contacts are obtained whilst at the same time contact wear is reduced to a minimum.

The above and other objects and features of the invention will be understood from the following description taken in conjunction with the attached drawings in which:

Fig. 1 is a plan view of a selector mounted on its bay;

Fig. 2 is a front elevation of a unit of three selectors;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a section on the line 5—5 of Fig. 3;

Fig. 6 is a section on the line 6—6 of Fig. 5;

Fig. 7 is a sectional view of the terminal bank;

Fig. 8 is an end elevation and section on the line 8—8 of Fig. 9 with the lower end of armature 87 removed;

Fig. 9 is a side elevation and section on the line 9—9 of Fig. 8;

Fig. 10 is a detailed view of a rubbing brush assembly;

Fig. 11 is a detailed view of a rubbing brush for the brush magnet feeders;

Fig. 12 is a detailed view of the centering contact assembly;

Fig. 13 is a detailed view of the mechanism for laterally shifting the brushes and is a section on the line 13—13 of Fig. 9;

Fig. 14 is an end elevation of a modified selector provided with a tilting bar for forcing the brushes onto the bank terminals;

Fig. 15 is a side elevation;

Fig. 16 is a detailed view of the non-rubbing brush assembly;

Fig. 17 is an end elevation of the mechanism for rocking the tilting bar; and

Fig. 18 is a side elevation of this mechanism.

As will be evident from the drawings, the selectors are manufactured and assembled in units comprising three selectors. Each such unit or "tri-selector" consists of a molded plastic frame 1, Figs. 1 to 7 in which are molded the bank terminals 2, the feeder strip "jack in" springs 3, the home contact assembly 4, insert screws 5 for the bay mounting, inserts for cover retaining screws 6, inserts for the screws securing the clutch magnets 7, inserts for screws 8 securing the feeder blocks 9, grooves into which may be slipped feeder blocks 9, worm shaft bearings 10, main bearing shafts 11, home contact rocker shafts 12, and brush carriage tilting rod 13 (Figs. 14 and 15) when used. In addition to the main molded frame 1, each tri-selector has two sheet metal sides 14 which slip into grooves in the ends of the molded frame and into grooves in the base of the molded frame and a transparent cover 15 secured by four screws 6 to each end of the molded frame 1. Between this transparent cover 15 and the upright ends of frame 1 at each end are two rubber gaskets 16 or their equivalent, the purpose of which is to make the tri-selector dust tight. There are no wires inside the selector. The cover 15 may be sealed in position by two wires piercing two of the holding screws

6 at each end of the selector and sealed at 17 (Fig. 1) in any convenient manner, the intention being that the sealing tool will be under lock and key in the hands of some one responsible party, thus making it impossible for any unauthorized person to open the selector without making the fact noticeable. The inner surfaces of the side plates 14 are enameled white so that through transparent cover 15 a visual inspection of the interior parts is always easily and conveniently possible. Dust due to abnormal wear may be easily detected and the cause removed before any serious damage can take place.

Referring particularly, but not exclusively, to Figs. 8 to 13, Fig. 8 is a cross-section of that part of the base of frame 1 belonging to one selector and showing a side view of the bank terminals 2. Fig. 9 is a side elevation of a section of the base 1 and an edge view of the bank terminls 2. Four sets of terminals are shown in Fig. 8, viz. A, B, C, and T. Two of each are shown since the selector hunts over one row moving in one direction and over the other row when moving in the opposite direction. How this is done will be described later on. Terminals A, B, and C are punched in sets of six (eight for a five-brush selector) from a strip of brass or bronze having one edge 18 of silver. The silver is securely attached to the metal strip before punching and when a set of terminals is punched out, a small piece of metal is left at the non-silver end to facilitate its placing in the mold. After molding, this small piece of metal is clipped off, thus separating the terminals electrically. Terminals A, B, and C are known as the non-rubbing precious metal terminals since the corresponding brushes are not in contact with them when the switch is in motion.

Terminals T over which the corresponding brush rubs while the switch is in motion are punched from a strip of bronze of the proper dimension. The rubbing edge of the terminal is rounded to reduce wear to a minimum.

The imbedded part of all terminals are notched so as to prevent a terminal from being forced out after molding, or displaced.

The brush carriage contacts are shown in Figs. 8, 9, 10, 14, 15 and 16. The non-rubbing brushes consist of two flat strip springs 19 and 20, Figs. 9 and 16. Spring 19 is bent U-shaped and the lower arm is slotted into two prongs with silver tips 21 on the lower side. Springs 19 and 20 have silver tips 22. The two springs are attached to the brush shoe shift block 23 by screws 24. Figs. 8 and 9 show the brushes in the position they assume when the brush carriage is in motion. The silver contacts do not rub. When the selector is at rest, plunger 25 (see Fig. 16) forces the two silver tips 21 against the silver tops 18 of the selected bank terminals and silver tips 22 against the silver edge 26 of the feeder strip 32, thus a substantial, double contact and high pressure connection is made between the fixed feeder strips 32 and the fixed bank terminals 2 without an intervening soldered connection. There is ample pressure to afford a non-microphonic connection.

The rubbing test brush assembly shown in Fig. 10 comprises a supporting member 28 attached to brush shift member 23 by screws 24. Piercing the member 28 are the bronze contact shoes 29 secured against lateral movement by slots 30 in member 28 and against longitudinal movement by toeing into snug fitting holes 31 in the member 28. The contact shoes which are rounded and broadened at the contact end are of hard phosphor bronze. They press against feeder strip 32 at the top and the terminals 2 at the bottom under the tension of band springs 33, also secured to the brush shift member 23. When brush 29 passes from one terminal 2 to the next, it is pressed downward until the shank of the shoe rests in contact with the inner surface 28, thus limiting the downward motion of the shoe. The design is such that under this condition the shoe cannot short-circuit two adjacent terminals while passing from one to the other. To insure accurate alignment between member 28 and the ends of the terminals 2, insulating separator 34 is attached to the lower side of member 28 which is under a slight tension tending to force it towards the terminals.

The metal feeder strips 39 and 32 are molded in feeder blocks 35 and 36, Fig. 8. There are two feeder blocks per selector or six per tri-selector, Fig. 3. The feeder blocks are accurately molded and fit into grooves and shoulders 37, molded in the upright ends of frame 1. They are held in position by screws 8 and clamps 38, Figs. 5 and 6. When the molded feeder blocks 35 and 36 are secured in position, the lower feeder strips 32 make electrical contact with jack springs 3 molded into and projecting through frame 1. The upper feeder strips 39 also make contact with the similar springs 3 but at the other end of the frame, Figs. 3 and 5. To enable all wiring to be brought to one end of the selector, grooves 40 are molded into the base of frame 1, Figs. 3 and 7. No wires pass over or across the ribbon cable or through the inside of the selector.

Feeder strips for the A, B, and C brushes are of brass with a silver edge. The remaining feeder strips are of strip bronze and the brush shoes 29, 49, and 51 making contact with them, are rounded and, where necessary, bumped broader so as to fully cover the edge of the feeder strip when in motion.

The two feeder blocks for a four-brush selector with a brush magnet have six silver edged feeder strips for the non-rubbing A, B, and C brushes, two bronze strips for the rubbing T brushes, two bronze strips for the clutch brushes 51 and one bronze strip for the ground brush 49. When the brush carriage magnet is replaced by a tilting bar, one of the clutch feeder strips may be omitted as shown in Fig. 14.

Details of the rubbing clutch brush assembly is shown in Fig. 11. The assembly comprises the brush shoe 51 with a flattened and rounded point bearing on the feeder strip, band spring 52 forcing shoe 51 against feeder strip, and part 53 into which is toed the brush shoe 51 at 54 and secures it against longitudinal movement. The whole is secured to the brush carriage 78 by a screw 55. Slot 56 in the brush carriage through which the brush shoe 51 projects prevents lateral motion of the brush shoe.

The centering contact assembly is shown in Fig. 12. It consists of a ground spring 41, a magnet spring 42, a pivoted lever 48 insulated from but controlling spring 42 through insulator 57, and a pivoted lever brush shoe 49 making contact between ground feeder strip 39 and spring 41. Both 48 and 49 are secured to the brush carriage 78 by pivot 43, in turn held in position by part 44 of spring nest 45 which is secured to the brush carriage by screw 46. Molded into feeder block 36 is a series of grooves 47 accurately spaced with relation to the corresponding terminals 2 on the base below. As the brush carriage advances, lever 48 moves up and down, causing contact to be

made between contact points 50. Ground shoe 49 does not change its position with respect to the brush carriage in a perfect selector. However, should there be a slight variation in distance between the brush carriage and the surface of the feeder strip, as the brush carriage advances lever 49 follows the change and thus maintains the proper relationships between springs 41 and 42. The adjustment of the centering contact is such that the circuit of the clutch magnet is opened for approximaely 65% of the time and closed when the brushes are between bank terminals for 35% of the time, the center of this period being mid-way between bank terminals.

Motion is imparted to the brush carriage 78 by a continuous thread molded worm 57 secured to steel shaft 58, Figs. 8 and 9. The steel shaft 58 is supoprted at each end by a self-oiling bearing 10, Figs. 2 and 3. These bearings rest in accurately molded slots in the upright ends of the frame 1 and are secured in position by molded plugs 59. Similar plugs 60 and 61 secure the main bearing shaft 11 and home contact rod 12 in position (see Figs. 3 and 4). Motion is imparted to the shaft 58 by a clutch mechanism comprising clutch magnet 7, Fig. 2, which, when energized, allows molded driven cone 62, keyed to but free to slide on shaft 58, to be forced against driving disc 63 under tension of spiral spring 64, one end of which rests on shoulder 65 on shaft 58 and the other end against the bottom of the molded slot in cone 62 (see Fig. 5). To prevent the cone from wobbling, extension 66 of shaft 58 acts as an outboard support. Normally, armature 67 of the clutch forces cone 62 back against a rubber or similar stop 68, Fig. 2, under the tension of a wire spring 70, thus holding the threaded worm and consequently the brush carriage in some fixed position. The clutch armature 67 is forked at the upper end 71 and this fork fits loosely into groove 69 of the cone 62. Armature 67 is not in contact with cone 62 when the latter is rotating. The width of slot 69 and the movement of armature 67 are adjusted accordingly.

Teeth or ribs 72 are molded in the end of cone 62. The driving disc 63 is of leather, rubber, or other semi-hard material. The pressure of spring 64 forces the sharp ribs 72 of the cone into the surface of the driving disc 63, thus developing the necessary torque to rotate the selector shaft. Driving disc 63 is mounted on vertical shaft 73 in any convenient manner. In Fig. 1, it is shown clamped between two metal washers, one of which, at least, is attached to the collar 74 secured by set screw 75 or otherwise to the vertical shaft 73. The vertical shaft 73 is motor driven in the manner well-known in so-called rotary telephone exchange systems.

The clutch magnet 7 is secured to molded projections 76 of frame 1. Space 77 between projections 76 and below the clutch magnet 70 provides space for the condenser forming part of the spark quenching circuit of the coil magnet. The wires from the clutch magnet are brought out along the base of the selector in grooves 40 provided for the purpose.

The brush carriage consists of a molded frame 78, Figs. 8 and 9, of a rather intricate form. It has two main self-oiling bearings 79 arranged to slide on the main supporting shaft 11 which shaft, as previously indicated, is secured at each end in slots molded in the frame 1 of the selector. The brush shift supporting member 80 is attached to the main part of the molding by thin strip 81 which moves in the gap between the two feeder blocks 35 and 36. 78, 81, and 80 are one and the same molding. To guide the brush carriage when in motion, self-oiling parts 82 inserted in molded part 81 rub against slide elevations molded in the sides of feeder blocks 35 and 36 (see Fig. 9).

Motion is imparted to the brush carriage 78 when the continuous thread worm 57 is rotated due to the meshing of hardened steel shoe 83 with continuous thread 84. Shoe 83 is forced into position by the pressure of spring 85 which rests in a hole molded in brush carriage 78. The arrangement assures the absence of back lash.

In Figs. 8 and 9, the brush plunger 25 is controlled by a brush carriage magnet 86 which, when energized, attracts armature 87 causing plunger 25 to move outward, allowing the A, B, and C brushes to disassociate themselves from bank terminals. Plunger 25 does not engage the T brushes. When the magnet is deenergized, plunger 25 assumes the position shown in Fig. 16. Return pressure is applied to armature 87 by wire spring 88. The magnet assembly 86 is attached to the molded part of the brush carriage by screw 107.

As the thread 84 of the worm shaft 87 is continuous shoe 83 is caused to make a 90° turn in opposite directions each time the brush carriage reverses its direction of motion. To shoe 83 is attached shaft 89, Fig. 9. To the bottom of this shaft, which passes through a hole 108 molded in frame 78, is attached segment 90, Fig. 13, of a spur gear which engages rack 91 molded in the brush shift member 23. In the relative position shown, it is assumed that the brushes are over the row of terminals as shown in Fig. 8. Thus, on the return journay, shaft 89 would rotate 90° and shift the brushes over to the adjacent row of terminals. When the other end of the selector is reached, the brushes are shifted back, and so on. In this way, a 120 point selector is obtained from a selector having duplicate rows of 60 terminals each. Brush shift member 23 slides on T runway 109, Fig. 9, forming part of 80.

In non-shift selectors where eight to ten brushes are available, brush shift member 23 is fixed in position. With the particular feeder block arrangement shown in Fig. 8, eight brushes can be served. In a five-brush selector, ten brushes would be used.

In Figs. 14 to 18 is shown an alternative arrangement in which a tilting rod 13 is used in place of the magnet 86. The rod is tilted in Figs. 14, 15, 17, 18 and normal in Fig. 16. It is caused to tilt strip 99, Fig. 14, upward when armature 67 of the main clutch magnet 7 is attracted. Inclined surface part 92 pressed out of armature 67 engages roller 93 and forces it up to the position shown from its normal position indicated by dotted lines 94 (Fig. 17) against the tension of a strong retractile spring 95 secured at one end to flange 96 welded or otherwise attached to rod 13 and at the other end to lug 97 forming part of the clutch frame or its equivalent. Roller 93 is suitably attached to part 96. As the tilted shaft is under considerable tension, it is suitably held in position in the selector frame 1 by self-oiling bearings 98, one at each end. These bearings are placed in a continuation of the slot under home contact rods 12.

Inside the selector and running the full length of the travel of the brush carriage is part 99 welded or otherwise attached to shaft 13. When shaft 13 is tilted upwards, this part 99 moves upwards and removes pressure from lug 100, thus

allowing plunger arm 101, of which lug 100 forms part and to which is attached brush plunger 25, to move upward under tension of spring 102. The upward motion of plunger arm 101 is stopped by projections 128 striking against the underside of the adjacent part of brush carriage 78. The downward motion of the plunger arm is stopped by similar projections 129 which strike the upper surface of the brush carriage when the plunger arm is forced into the operating position, Fig. 16. The free position of plunger arm 101 is shown in Figs. 4 and 5. Pivot pin 103 secures arm 101 to the brush carriage. Split wishers 104 slipped into grooves hold pin 103 in self-oiling bearings 105 secured in projections 106 of brush carriage molding 78. To prevent undue displacement of brush plunger 25 due to the necessary offset from center of lug 100, the two lever bearings 105 are placed as far apart as possible.

When armature 67 is released, it falls back, principally under the tension of spring 95, but also partially under the tension of spring 70, Fig. 2, thus allowing the rod 13 to assume its normal position under the tension of spring 95. Part 99 now forces plunger arm 101 and brush plunger 25 against the tension of spring 102 into their operated and normal position as shown in Fig. 16.

Number or position strips 118, Figs. 1 and 8, are placed under the transparent cover 15 and over each selector. The pointers 119 are exposed on one side of the number strip or on the other side as the brushes are correspondingly shifted. The lower part of the pointer arm 120 is forked and engages shoe 83. As this shoe moves 90° from one side to the other, pointer arm 120 turns about screw pivot 121 and buries one of its two indicating points 119 and exposes the other. By burying the pointer, is meant slipping it under the opaque number strip.

The home contact spring assembly 110, Figs. 1 and 2, is molded into a small separate unit 4 which is forced into holes molded in frame 1 as shown in Figs. 5 and 6. If a selector always makes its home position at the home spring contact end for example, the right hand end, Fig. 2, a simple insulated part attached to a home contact spring or to the brush carriage will suffice to open and close the home contacts as conditions require when the selector is in its home position. However, since the system in which the selector is to be used may require the home position to be in different locations on the selector, a rocker rod 12 is provided for. This rod is secured in position as are the other rods but is free to rotate in bearings 111 (see Figs. 3 and 4). To the home contact end of rod 12 is attached rocker arm 112 with insulated plunger 113, Fig. 2. Normally rocker arm 112 is held away from the springs 110 under the tension of the springs themselves or under the tension of a separate spring, according to which plan is found to be the best. To turn rod 12, adjustable part 114, Fig. 8, is shifted along the rod to the proper position and there secured by set screw 115 or its equivalent. The lower lip of 114 is placed 45° one way or the other off the axis of shaft 12; thus when pin 116 attached to the traveling brush carriage contacts part 114, it will force it and consequently rock rod 12 one way or the other depending upon which side of the slanting lip of 114 its hits, the idea being that the home contact rocker arm plunger 113 moves into contact with home contact springs 110 only when the brush carriage is traveling in the proper direction.

The brush carriage makes a complete cycle go and return in two sections. The hunting speed is approximately 62 to 64 terminals per second. With 6 threads per length, the molded worm makes six revolutions per second or 360 R. P. M. With a driving disc to driven disc ratio of 17 to 5, the speed of the continuously rotating vertical shaft is 103 R. P. M.

The tri-selector is made dust tight. The two sheet iron sides 14 fit into deep grooves 117, Fig. 8, in the base and ends of frame 1. Transparent cover 15 is also grooved to receive the upper end of the sheet iron sides and at each end the joint with the frame ends is sealed by gasket 16, Fig. 2, which gasket also tends to hold down tightly and uniformly the various molded plugs 59, 60, and 61 which hold the shafting in position. The transparent cover 15 is held in position by eight screws 6 and is sealed at 17. As sides 14 will not be removed after the selector is in position on a bay, sealing compound may be used to seal the joint between the sides and the grooves should this additional precaution be found advisable or necessary.

The design of the tri-selector foresees ease of assembly, dismounting and re-assembly. All parts have been designed so that they may be preadjusted and gauged so as to make further adjustment unnecessary when the parts are assembled. There will be some final adjustment when partial assemblies are made, for example, when the brush springs are attached to the brush carriage or when the home contact springs are removed from the mold. These partial assemblies are given their final adjustment before the final assembly in the frame is made. To assemble a tri-selector, no internal wiring or soldering of connections is involved. The order of assembly is about as follows: First, the home contact assemblies 4 are forced into position in the frame 1. Next, the main bearing shaft 11 is slipped through the two bearings 79 of the brush carriage frame 78 and with the two feeder blocks 35, 36, the four parts are slipped into position, the molded grooves in the frame 1 accurately positioning the bearing shaft 11 and the feeder blocks 35, 36. The feeder blocks are secured in position by the screws 8 and clamps 38 provided for the purpose. These screws 8 assure ample pressure between the feeder strips 32, 39 and the jack springs 3 in the frame 1. The home contact rod 12, the molded shaft 58, and the tilting rod 13, if one is used, are now slipped into position after which the molded plugs 59, 60, 61 are forced into their respective grooves in the upright ends of the frame 1. Prior to final assembly, the rocker arm 112 and rocking device 114 on the rocket shaft 12 are properly adjusted with respect to each other. The two sheet iron sheets 14 are slipped into position, after which the transparent cover 15 with gasket 16 is screwed into position and sealed. The clutches are now mounted in position and the selector is ready for check testing.

It will be noted that the molded driving cone slips into position. It is held on the shaft in its normal position by pressure of armature 67 of the clutch and its operating position by the driving surface of disc 63. The driving disc is made considerably wider than the driving surface of the driven cone. This is done to provide means for a reasonable adjustment of the air gap by moving the driving disc up or down on the vertical shaft.

It is not expected that a tri-selector properly built will have to be opened for any purpose whatsoever except at in frequent periods of five or

ten years. To open a tri-selector, the two seals 17 are cut, after which the transparent cover 15 may be removed. Each selector may now be lifted out separately, first withdrawing the plugs 59, 60, 61 holding down the shafts and then the screws 8 holding the feeder blocks 35, 36. All parts may now be removed without the unsoldering of any connection. The individual parts may be gauged, checked, readjusted, reconditioned, or replaced as required and the whole then re-assembled as previously required. The bearings are of phosphor bronze impregnated in oil and thus self-lubricating. They should require little treatment over a long period of years.

With the aid of a bright and shaded lamp it is possible to make a careful examination of the movement of selectors from the outside looking through the transparent cover 15. Any undue wear or cutting will be indicated by accumulations of particles of metal or plastic dust. When this is noticed, the selector should be dismantled without delay and the fault corrected. As dust cannot enter the selector, the liability of undue wear and cutting is greatly reduced.

Ribbon cable will be welded to the bank terminals. The flat tabs 122, Fig. 7 of the ribbon cable 123 are welded to the flat surfaces of the bank terminals 2 at the rear of the selector. The ribbon cable is made in unit patterns, thus three patterns are required for each vertical row of terminals. These patterns may be welded in position while the tri-selector is on the bench. The free end of one pattern will project over for welding to the corresponding terminals of the adjacent tri-selector when the tri-selectors are mounted on the supporting strip which forms part of the bay framework.

Each of the three selectors in a tri-selector has, of course, a complete set of bank terminals for hunting over. However, only one-third of the terminals of each selector are brought out beyond the ribbon cable at the rear of the fiber strip protection 124. Two-thirds of the terminals terminate at the end of the ribbon cable weld 122; the other one-third project beyond fiber protection strip 124. These projections 125 are available for soldering to the outside cables. One of the selectors in a tri-selector would have terminal rows 1, 4, 7, etc., brought out, another would have terminal rows 2, 5, 8, etc., brought out, and the third selector terminal rows 3, 6, 9, etc. The rear of each tri-selector thus affords ample space without crowding for outside cable soldering and as each tri-selector is its own terminal strip, separate terminal strips are thus made largely unnecessary.

In order to facilitate welding, it is proposed to mount selectors when ready for cabling on accurately drilled flat metal strips 126, Fig. 2. These flat strips allow easy access to the terminals when welding. After welding, the rest of the bay framework, for example, the sheet metal sides 127, is fastened in position.

Although certain embodiments of the invention have been shown and described for the purpose of illustration, modifications occurring to those skilled in the art may be made without departing from the scope of the invention as defined in the appended claims.

What I claim is:

1. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush for establishing contact with said terminals, means for longitudinally moving said brushes over said terminal bank, means for maintaining said talking brushes in non-rubbing relation with respect to said talking terminals during movement of said brushes over the said terminal bank, a tilting bar extending in the direction of movement of said brush carriage, means for rocking said tilting bar when the movement of said brushes is arrested, and means operable by said tilting bar for bringing said talking brushes into contact with a pair of talking terminals.

2. A selector switch according to claim 1 comprising a test brush assembly consisting of a U-shaped member supported by a brush carriage, the arms of said member being provided with apertures for accommodating contact shoes adapted to engage respectively the test terminals and a feeder bar under pressure of a U-shaped band spring.

3. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least one talking wire terminal the end surface of which is provided with a contact surface composed of precious metal, a brush carriage, at least one talking brush mounted on said brush carriage and provided with a contacting surface composed of precious metal, means for longitudinally moving said brush carriage over said terminal bank, means for maintaining said talking brush in non-rubbing relation with respect to said talking wire terminals during movement of said brush carriage, and means for moving said talking brush to make contact with the end surface of a talking wire terminal when the movement of said brush carriage is arrested.

4. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising two talking wire terminals and a test terminal, talking brushes and a test brush for establishing contact with said terminals, means for longitudinally moving said brushes over said terminal bank, feeder bars extending in the direction of movement of said brushes, contacts in electrical connection with said brushes and adapted to make contact with said feeder bars, means for maintaining said talking brushes in non-rubbing relation with respect to said talking terminals and for maintaining said contacts in non-rubbing relation with respect to said feeder bars during movement of said brushes over said terminal bank, and means for moving said talking brushes to make contact with a pair of talking terminals and for moving said contacts to make contact with said feeder bars when the movement of said brushes is arrested.

5. A selector switch according to claim 4 wherein each talking brush and feeder contact assembly comprises a flat spring provided at one end with a feeder bar contact and a U-shaped spring the end of one arm of which is provided with a contact adapted to engage the terminals of a row of talking wire terminals and the end of the other arm of which is provided with a contact adapted to engage a feeder bar, and wherein a plunger is provided for opening the arms of said U-shaped spring to an extent such that the contact on said flat spring and the con-

tact on said second-mentioned arm is forced into contact with said feeder bar and the contact on said first-mentioned arm is forced into contact with a talking wire terminal.

6. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least one talking wire terminal provided with a contact surface composed of precious metal, a brush carriage, at least one talking brush mounted on said brush carriage and provided with a contacting surface composed of precious metal, means for longitudinally moving said brush carriage over said terminal bank, a feeder bar extending in the direction of movement of said brush carriage, at least one contact in electrical connection with said talking brush and adapted to make contact with said feeder bar, contacting surfaces for said feeder bar and said contact composed of a layer of precious metal, means for maintaining said talking brush in non-rubbing relation with respect to said talking terminals and for maintaining said contact in non-rubbing relation with respect to said feeder bar during movement of said brush carriage, and means for moving said talking brush to make contact with a talking terminal and for moving said contact to make contact with said feeder bar when the movement of said brush carriage is arrested.

7. A selector switch of the kind used in automatic telephone systems or the like comprising a flat bank of contact terminals, a brush for establishing contact with said terminals, a rotatable shaft for longitudinally moving said brush over said terminals, a power shaft adapted to be driven continuously by a source of power, an electromagnet for clutching said rotatable shaft to said power shaft, and means controlled by said electromagnet for maintaining said brush in non-rubbing relation with respect to said terminals during the movement of said brush.

8. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush for establishing contact with said terminals each of said talking brushes including a flat strip spring mounted upon a brush carriage and provided at one end with a contact surface which is out of engagement with the ends of said bank terminals during movement of said brush carriage, a lever mounted on said brush carriage, a tilting bar extending in the direction of movement of said brush carriage for actuating said lever to cause it to force said contact surface onto the end of a selected terminal, a rotatable shaft for longitudinally moving said brush carriage over said terminals, a power shaft adapted to be driven by a source of power, an electromagnet for clutching said rotatable shaft to said power shaft, and means under the control of said electromagnet for rocking said tilting bar.

9. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush for establishing contact with said terminals, means for longitudinally moving said brushes over said terminal bank, means for maintaining said talking brushes in non-rubbing relation with respect to said talking terminals during movement of said brushes over the said terminal bank, feeder bars extending in the direction of movement of said brushes, a pair of U-shaped springs mounted on a brush carriage the end of one arm of each spring being provided with a contact adapted to engage the terminals of a row of talking wire terminals and the end of the other arm of each spring being provided with a contact adapted to engage a feeder bar, a lever mounted on said brush carriage and provided with a plunger extending between the arms of said U-shaped springs, and means for actuating said lever to cause said plunger to open the arms of said springs to an extent such that the said contacts on said arms are respectively forced into contact with selected talking wire terminals and with feeder bars.

10. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush mounted upon a supporting member which is in turn mounted upon a brush carriage, means for longitudinally moving said brush carriage over said terminal bank, means for maintaining said talking brushes in non-rubbing relation with respect to said talking terminals during movement of said brushes over said terminal bank, means for causing said talking brushes to make contact with a pair of talking terminals when the movement of said brushes is arrested and means for moving said supporting member laterally with respect to said brush carriage.

11. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals, each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush mounted upon a longitudinally slidable brush carriage, a continuous thread worm, means for rotating said worm, a shoe engaging in said worm and mounted on said brush carriage, a supporting member for said brushes slidingly mounted on said brush carriage, means for maintaining said talking brushes in non-rubbing relation with respect to said talking terminals during movement of said brushes over said terminal bank, means for causing said talking brushes to make contact with a pair of talking terminals when the movement of said brushes is arrested, and means controlled by the turning movement of said shoe for moving said brush supporting member laterally with respect to said brush carriage at the end of each longitudinal traverse of said brush carriage.

12. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush for establishing contact with said terminals each of said talking brushes including a spring mounted upon a brush carriage and provided at one end with a contact surface which is out of engagement with the ends of said bank terminals during movement of said brush carriage, a lever mounted on said brush carriage, a tilting bar extending in the direction of movement of said brush carriage for actuating said

lever to cause it to force said contact surface onto the end of a selected terminal, a rotatable shaft for longitudinally moving said brush carriage over said terminals, a power shaft adapted to be driven by a source of power, an electromagnet for clutching said rotatable shaft to said power shaft, and means under the control of said electromagnet for rocking said tilting bar.

13. A selector switch of the kind used in automatic telephone systems or the like comprising a flat terminal bank consisting of a plurality of rows of terminals, each row comprising at least two talking wire terminals and at least one test terminal, a pair of talking brushes and a test brush mounted upon a longitudinally slidable brush carriage, a continuous thread worm, means for rotating said worm, a shoe engaging in said worm and mounted on said brush carriage, a supporting member for said brushes slidingly mounted on said brush carriage, means for maintaining said talking brushes in non-rubbing relation with respect to said talking terminals during movement of said brushes over said terminal bank, means for causing said talking brushes to make contact with a pair of talking terminals when the movement of said brushes is arrested, means controlled by the turning movement of said shoe for moving said brush supporting member laterally with respect to said brush carriage at the end of each longitudinal traverse of said brush carriage, indicating means and two scales for indicating the position of said brushes, and means actuated by the turning movement of said shoe for alternately associating said indicating means with each of said two scales.

GERALD DEAKIN.