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MULTIPLE RELAY ASSEMBLY

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Fig. 3

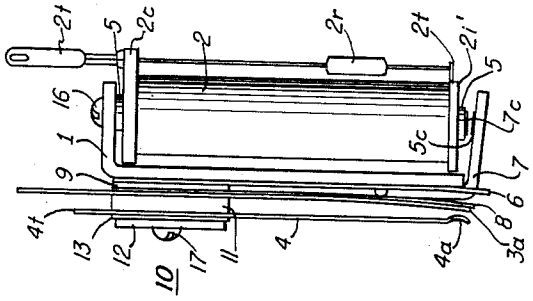


Fig. 2

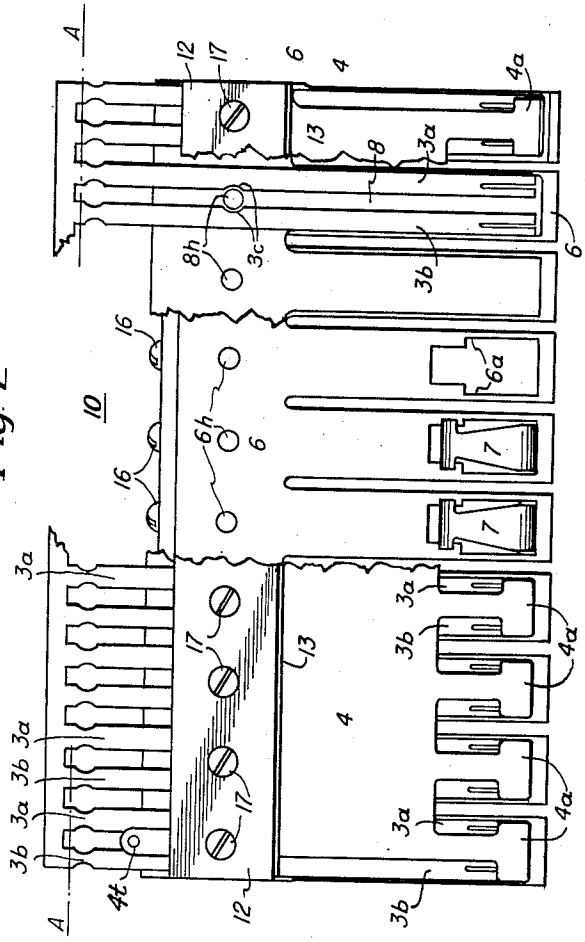
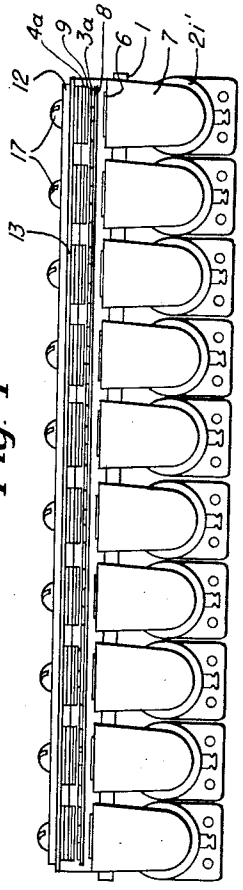


Fig. 1



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MULTIPLE RELAY ASSEMBLY

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The present invention relates to electromagnetic relays of the multiple type used in telephone electrical signalling systems and is more particularly concerned with so-called detector relay assemblies, that is to say, relays in which a number of operating coils controlling separate sets of contact springs are assembled to form an integral unit having a common support member. There are various circumstances in which the use of such a multiple relay offers appreciable advantages, for instance in toll ticketing where signals are transmitted in code, which requires the use of a plurality of relays for detecting or marking purposes, and in such cases it is very convenient to have the multiple relay available as a single unit.

According to one feature of the invention, in a multiple electromagnetic relay comprising a plurality of pivotal armatures adapted to be operated independently by separate energizing coils mounted on a common support and thereupon to actuate associated contact springs, the individual contact springs including an armature mounting plate where the armatures are pivotally mounted thereon, are located in a plane parallel to the axes of the coils.

According to another feature of the invention, in a multiple electromagnetic relay comprising a plurality of pivotally mounted armatures adapted to be operated independently by separate energizing coils mounted on a common heelpiece, the armatures are resiliently held pivotally mounted by associated spring contacts and insulator projections of a common insulating plate, whereby the insulator projections also act as insulators between the armatures and their corresponding spring contacts.

It is another feature of the invention of the character described above, that responsive to the energization of any electromagnetic relay the magnetic attraction of the armature causes the armature to pivot to tension the corresponding spring contacts against a contact plate independently of the other spring contacts, with the also tensioned insulator projection acting as an electrical circuit preventive means between the armature and the associated spring contacts.

The invention will be better understood from the following description of a preferred method of carrying it into effect which should be taken in conjunction with the accompanying drawings, comprising Figs. 1 to 3 whereby:

Fig. 1 is a front view of the complete assembly in the position in which it would be mounted.

Fig. 2 is a top view of the assembly having certain sectional parts removed to show all the component parts of a contact spring assembly.

Fig. 3 is a side view of the complete assembly.

Referring to Fig. 1, there is shown a plurality of relays commonly secured as a unit. That is, ten small coils **2** are mounted on one common metallic heelpiece or heel-iron **1** and each controlling one of the ten associated metallic armatures **7** to cause two individual metallic springs **3***a* and **3***b* to make contact with a common metallic contact plate **4**.

The heelpiece **1** as shown in the side view in Fig. 3 is in the shape of an inverted L, and extends longitudinally (Fig. 1) the length of ten lined up relays. The relays are of the miniature type. On the rear side of the heelpiece **1**, ten holes are evenly spaced where ten screws, such as **16**, are inserted into threaded holes in each core **5** of the coils **2**, to thereby fasten the coils to the heelpiece **1**. On the top surface of the heelpiece **1**, ten threaded holes are evenly spaced for securing a spring assembly **10** to the top surface of the heelpiece **1** by means of ten screws **17** fastened therein. The spring assembly **10** consists of one common retaining member **6** pivotally supporting ten angular armatures **7**, twenty contact springs **3***a* and **3***b*, one common spring insulator **8**, one common contact plate **4**, two insulator spacing plates **11** and **13**, and two metallic spacing plates **9** and **12**. Each of the spring assembly's individual parts, excluding the armatures, are cut or stamped out of thin sheets of either metallic or insulating material.

Referring to Fig. 2, and more particularly to the spring assembly **10**, the individual parts will now be described.

The retaining member **6** is cut or stamped out of a thin sheet of metallic material, having ten evenly spaced projections where ten apertures **6***a* are provided for pivotally supporting ten armatures **7**. Also provided on the retaining member **6** are ten evenly spaced holes **6***h* which align with the ten threaded holes on the top surface of the heelpiece **1**. As viewed from the side in Fig. 3, the bottom end of member **6** is bent slightly for a purpose to be described.

The spring insulator **8** is cut or stamped out of a thin sheet of insulating material, such as linen Bakelite, having ten evenly spaced extending members, and also includes ten evenly spaced holes **8***h* for aligning with the ten threaded holes on the heelpiece surface.

The twenty contact springs, such as **3***a* and **3***b*, are all cut out or stamped out of one thin sheet of metallic material (as shown in Fig. 2). At the terminal end of the contact springs, the springs are all fastened together. As shown in Fig. 2, two spring contacts, such as **3***a* and **3***b*, are associated in pairs with each relay. Each spring contact at the open end is fork shaped. Each spring contact has an arc shaped opening **3***c*, whereby the arc shaped opening on spring contact **3***a* faces the arc shaped opening **3***c* on spring contact **3***b*, to form an opening which align with each threaded hole on the heelpiece surface.

The contact plate **4** is also cut or stamped out of a thin sheet of metallic material, having ten "T-shaped" projections **4***a* arcing slightly as shown in Fig. 3. The furthermost portion of each projection **4***a* is of a width proportional to two evenly spaced spring contacts, such as **3***a* and **3***b*. Although not shown, the contact plate **4** also has ten evenly spaced holes corresponding to the ten threaded holes on the heelpiece surface. Also included as part of the contact plate is a soldering terminal **4***t*, where wires are soldered thereto.

The insulator spacer plates **11** and **13**, although of different thicknesses are made of an insulating material, such as phenol fibre. The length of each insulator plate is proportional to the length of the heelpiece **1**, however their width is much smaller, as shown. The insulator plates **11** and **13** also have ten evenly spaced holes (not shown) for being aligned with the threaded holes on the heelpiece surface.

The spacer plates **9** and **12**, although of different thicknesses are made of a metallic material, such as a tempered bright zinc plate. The spacers **9** and **12**, other

than the material used are similar to the insulator spacer plates 11 and 13.

Referring to Fig. 3, each coil 2 consists of an insulated terminal mounting 2*i* and 2*i'* at each end thereof. The terminal mountings 2*i* and 2*i'* each have circular holes where the core 5 protrudes therethrough. Mounted on the insulated terminal mounting 2*i* are two soldering terminals 2*t* (only one being visible in Fig. 3). A radio type resistor 2*r* is connected at one end to one of the soldering terminals 2*t* by means of a bare wire conductor, and at the other end to another soldering terminal 2*t'* on the insulated terminal mounting 2*i'*. The windings of the coil, which may be of terminal 2*t'*, and the other end is connected to the soldering terminal that is not shown on insulator 2*i*. (In viewing Fig. 3 the other soldering terminal is directly behind soldering terminal 2*t*.)

Assembling the multiple relay assembly

The ten cores 2 are first fastened to the inner rear surface of the heelpiece 1, by means of the ten screws, such as 16, inserted through the holes on the heelpiece 1 and into the threaded holes in the cores, such as 5, where they are tightened. The heelpiece 1 with the coils attached thereto may then be placed in a position with the heelpiece surface facing upward. The retaining member 6 is then placed on the heelpiece surface, with the bent portion of the member 6 facing upwards, and the holes 6*h* being aligned with the threaded holes on the heelpiece surface. The metallic spacing plate 9 is then placed on the retaining member 6, with the ten holes therein aligning with the ten holes 6*h* in the retaining member 6. The spring insulator 8 is then placed on the metallic spacer 9, with the ten holes 8*h* aligning with the ten holes on the metallic spacer 9. The contact spring assembly with its twenty contact springs, such as 3*a* and 3*b*, is placed upon the spring insulator 8, with the twenty arced portions 3*c* of each spring contact forming a circular hole around the ten holes 8*h*. The spacer insulator 11 is then placed on the contact spring assembly, with each hole therein aligning with the holes formed by the arced openings 3*c*. The contact plate 4 is then placed on the spacer insulation 11, with the arced projection 4*a* facing downward, and the ten holes in contact plate 4 aligning with the ten holes in the spacer 11. The spacer insulation 13 is then placed on contact plate 4, with the holes therein in alignment. Likewise, metallic spacer 12 is then placed on spacer insulation 12, with the ten corresponding holes in each spacer in alignment. The screws 17 are then inserted into the aligned holes and fastened into the threaded holes in the heelpiece surface.

The armatures 7 could have been inserted into the apertures 6*a* of retaining member 6 before placing the retaining member 6 on the heelpiece 1. When the retaining member is then aligned with the heelpiece 1, the angular inner surfaces of the armatures 7 engage the extending outer end of the heelpiece (as shown in Fig. 3), to prevent the armatures 7 from falling out of the apertures 6*a*. It is to be noted that the armatures 7 have an inner surface angle greater than ninety degrees, so that when the insulator plate 8 tensions against the armature 7, the armature surfaces 7*c* do not engage the surfaces 6*c* of the cores 5 when the spring assembly 10 is assembled. The end of the retaining member projection as mentioned is bent slightly, so that one angular side of the armature 7 is perpendicular to the bent projection, to insure the retainment within the aperture 6*a*. The armatures 7 however, can be inserted after the remaining spring assembly 10 has been fastened to the heelpiece 1, by manually tensioning the spring insulator 8 and spring contacts away from the heelpiece 1 while simultaneously tensioning the retaining member 6 away from the heelpiece 1 and then inserting the armatures 7 into the apertures 6*a*, and then releasing the tension on the mentioned members. The tensioning of the individual contact springs and spring insulator 8 against the armatures 7 also help prevent the armatures 7 from falling out of the apertures 6*a*.

After the spring assembly 10 has been fastened to the heelpiece 1, the contact springs, such as 3*a* and 3*b*, can be separated by shearing along line A—A of Fig. 2. At the sheared off point of each spring contact, the after-effect provides soldering terminals where wires are soldered thereon.

Operation

Assuming that the relay on the extreme right of Fig. 1 is energized in a well-known manner, the armature 7 will be magnetically attracted to the core 5. The magnetic attraction thereof will cause the angular armature 7 to pivot between the bottom surface of the associated aperture 6*a* and the edge of the heelpiece 1, whereby the surfaces 5*c* and 7*c* will make and only the associated extending member of spring insulator 8 and the associated spring contacts 3*a* and 3*b* will be tensioned against the associated arced projection 4*a* of the contact plate 4. It is to be understood that due to the flexibility of any spring insulator extending members, the tensioning thereof has no effect on the remaining extending members and their corresponding pair of contacts. In this position an electrical circuit is completed between wires soldered to the mentioned spring contacts 3*a* and 3*b*, and a wire or wires connected to the soldering terminal 4*t* of the contact plate 4. Likewise, the energization of any of the ten relays will complete an electrical circuit only between the spring contacts of the particular relay energized and the common contact plate 4.

Deenergization of the relay

Responsive to the deenergization of the above mentioned relay, the magnetic attraction of the armature 7 to the core 5 is dissipated, whereby the tensioned extending member of the spring insulator and the associated spring contacts forces the armature 7 to pivot, thus opening surfaces 5*c* and 7*c*. The electrical circuit between the spring contacts 3*a* and 3*b*, and the contact plate 4 is thus opened.

Having fully described the invention, what we believe to be new and desire to protect by Letters Patent is set forth in the appended claims.

What is claimed is:

1. In a multiple relay assembly, an L-shaped heelpiece, a plurality of electromagnets mounted side by side on one branch of said L-shaped heelpiece so that their longitudinal axes lie in a common plane parallel to the other branch of said heelpiece, a plurality of L-shaped armatures corresponding respectively to said electromagnets, a contact spring assembly mounted on said other branch of said L-shaped heelpiece and parallel to the longitudinal axes of said electromagnets, said contact spring assembly containing in part a retaining member having a plurality of apertures for pivotally supporting each armature, said contact spring assembly comprising a plurality of contact springs and a single contact plate with a pair of contact springs corresponding to each electromagnet, said contact spring assembly containing an insulating plate having a plurality of projections thereon corresponding to each pair of contact springs, each insulating plate projection acting independently in combination with one pair of contact springs to resiliently hold one side of one of said armatures against said retaining member, means responsive to the energization of one of said electromagnets for attracting the corresponding armature to thereby pivot the armature within said retaining member aperture, the pivoting of said armature tensioning said insulating plate projection and the corresponding pair of spring contacts against said contact plate to complete an electrical circuit between said pair of contact springs and said contact plate.

2. In a multiple relay assembly as claimed in claim 1,

whereby the said tensioning acts independently of the other corresponding insulating plate projections and contact spring pairs to prevent an electrical circuit between the contact springs of unenergized electromagnets and the common contact plate.

3. In a multiple relay assembly, an L-shaped heelpiece, a plurality of electromagnets mounted side by side on one branch of said L-shaped heelpiece so that their longitudinal axes lie in a common plane parallel to the other branch of said heelpiece, a plurality of L-shaped armatures corresponding respectively to said electromagnets, a contact spring assembly mounted on said other branch of said L-shaped heelpiece and parallel to the longitudinal axes of said electromagnets, said contact spring assembly comprising a retaining member, an insulating plate, a plurality of spring contacts and a contact plate, said retaining plate having a plurality of apertures for pivotally mounting each armature at their point of angle, said insulating plate having projections each corresponding to a pair of spring contacts each of which in turn correspond to one electromagnet, said contact plate parallel and common to each longitudinal spring contact, each insulating plate projection resiliently holding one branch of one of said L-shaped armatures against said retaining member and also separating the associate armature and its corresponding pair of spring contacts, means responsive to the energization of one of said electromagnets for attracting the corresponding armature which causes said armature to pivot on its point of angle, the pivoting of said armature causing said armature to tension the corresponding insulator plate projection and pair of springs against said common contact plate, the tensioning thereof providing an electrical circuit between said contact plate and said pair of contact springs, each insulating plate projection acting to prevent an electrical circuit between the operated armature and said corresponding pair of contact springs.

4. In a multiple relay assembly, an L-shaped heelpiece, a plurality of electromagnets mounted side by side on one branch of said L-shaped heelpiece so that their longitudinal axes lie in a common plane parallel to the other branch of said heelpiece, a plurality of angular armatures corresponding respectively to said electromagnets, a retaining plate mounted parallel to said other branch of said heelpiece and having a plurality of apertures for pivotally supporting each armature in alignment with its respective electromagnet, an insulating plate mounted parallel to said retaining plate which is common to all the electromagnets and having projections individual to each armature, a plurality of contact springs mounted parallel to said electromagnets with a pair of contact springs associated with each electromagnet, a contact plate mounted parallel to said retaining plate and common to said contact springs, each insulator plate projection in combination with each respective pair of spring contacts acting jointly to resiliently hold each respective armature against said common retaining plate, means responsive to the energization of each electromagnet to tension the corresponding insulating plate projection and pair of spring contacts against said contact plate to complete electrical circuits therebetween without effecting the insulating plate projections and spring contacts of unenergized electromagnets.

5. In a multiple relay assembly, an L-shaped heelpiece, a plurality of electromagnets mounted side by side on one branch of said L-shaped heelpiece so that their longitudinal axes lies in a common plane parallel to the other branch of said heelpiece, a plurality of angular armatures corresponding respectively to each of said electromagnets, a retaining plate mounted parallel to said other branch of said heelpiece and having a plurality of apertures for pivotally supporting each armature in alignment with its respective electromagnet, a plurality of contact springs mounted parallel to said electromagnets with a pair of contact springs associated with each electromagnet, a contact plate mounted parallel to said retaining plate and common to said contact springs, an insulating plate mounted parallel to said retaining plate and having projections associated with each pair of contact springs, each projection tensioning its corresponding pair of spring contacts against said contact plate responsive to the energization of its corresponding electromagnet and independently of electromagnets not energized, and means responsive to the said projections and associated pair of spring contacts operative upon deenergization of each electromagnet to pivot said associated armature to resiliently hold said armature in an unoperated position independent of other unoperated electromagnets.

6. In a multiple relay assembly, an L-shaped heelpiece, a plurality of electromagnets mounted side by side on one branch of said L-shaped heelpiece so that their longitudinal axes lie in a common plane parallel to the other branch of said heelpiece, a plurality of angular armatures corresponding respectively to each of said electromagnets, a retaining plate mounted parallel to said other branch of said heelpiece and having a plurality of apertures for pivotally supporting each armature in alignment with its respective electromagnet, a plurality of contact springs mounted parallel to said electromagnets with a pair of contact springs associated with each electromagnet, a contact plate mounted parallel to said retaining plate and common to each contact spring, an insulating plate mounted parallel to said retaining plate and having projections associated with each pair of contact springs, means responsive to the energization of one of said electromagnets for pivoting its corresponding armature in one direction to tension the corresponding projection and provide an electrical circuit between the corresponding pair of springs and said contact plate while simultaneously providing an electrical insulation between said pair of contact springs and said armature without effecting the projections and pair of spring contacts of electromagnets not energized, said tensioning thereof acting to pivot said armature in a second direction opposite to said first direction responsive to the deenergization of said electromagnet to open said electrical circuit, the opening thereof being independent of other tensioned armatures.

No references cited.