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Tabei et al.

[11] **3,911,383**

[45] **Oct. 7, 1975**

[54] **ELECTROMAGNETIC RELAY**

[75] Inventors: **Hitoshi Tabei; Munetada Kazama,** both of Tokyo, Japan

[73] Assignee: **Oki Electric Industry Co., Ltd.,** Tokyo, Japan

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[30] **Foreign Application Priority Data**

May 14, 1973 Japan 48-55553

[52] **U.S. Cl.** **335/106;** 200/283; 335/128; 335/131

[51] **Int. Cl.**[2] **H01H 67/00**

[58] **Field of Search** ..... 335/127, 128, 129, 106, 335/131, 78; 174/52 S; 200/283

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Primary Examiner—G. Harris

Attorney, Agent, or Firm—Peter L. Berger

[57] **ABSTRACT**

This invention relates to a small-sized electromagnetic relay having a contact assembly which is easy to assemble and operates with high stability.

9 Claims, 21 Drawing Figures

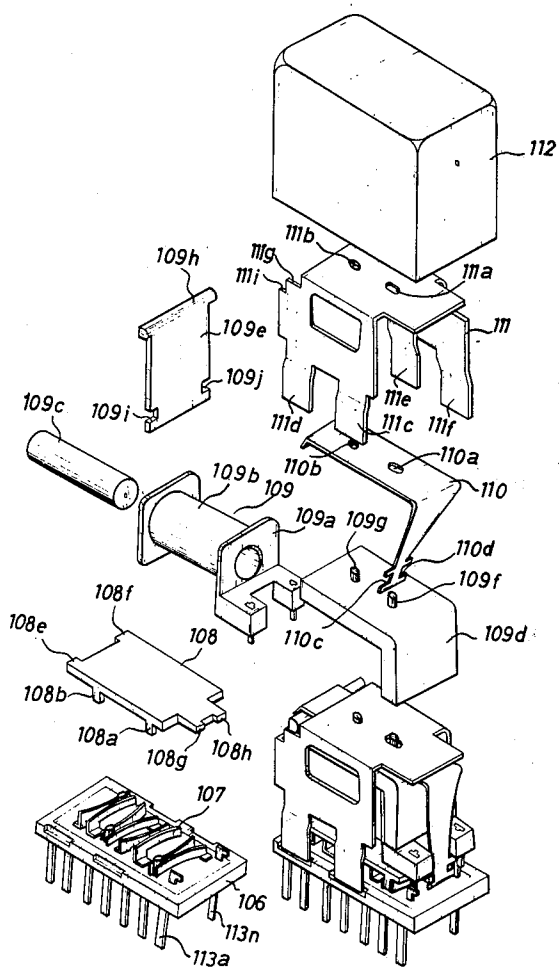


FIG. 1
PRIOR ART

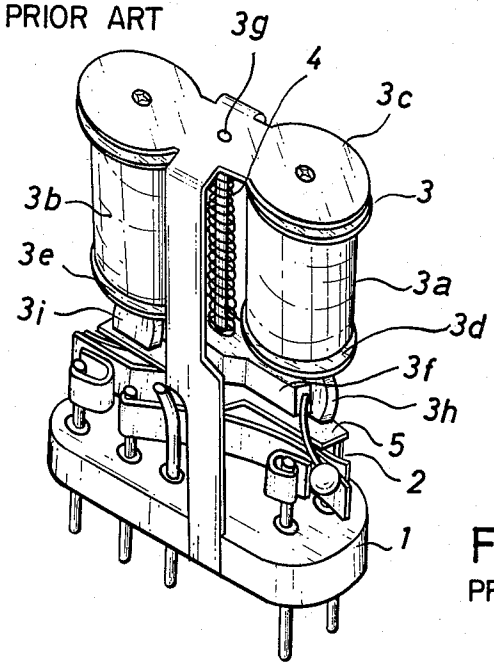


FIG. 2 – B
PRIOR ART

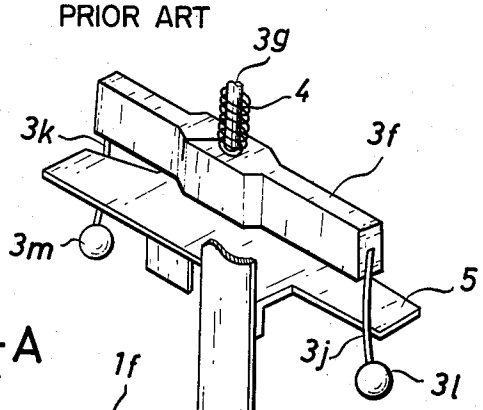


FIG. 2 – A
PRIOR ART

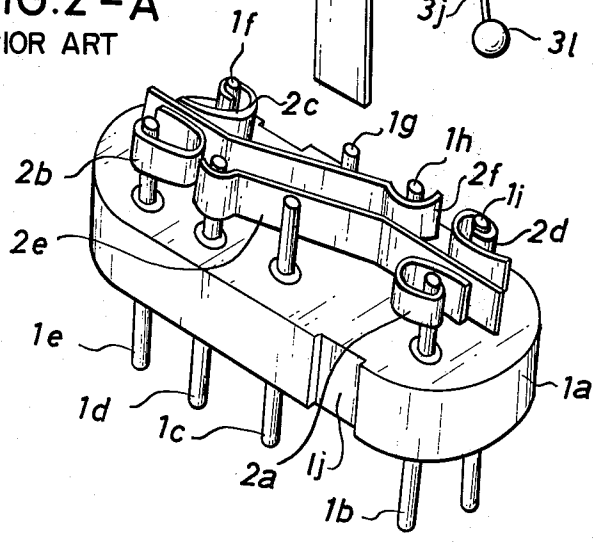


FIG. 3

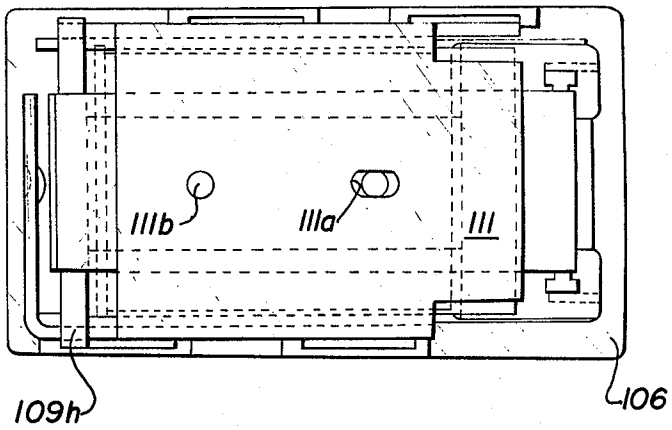


FIG. 4

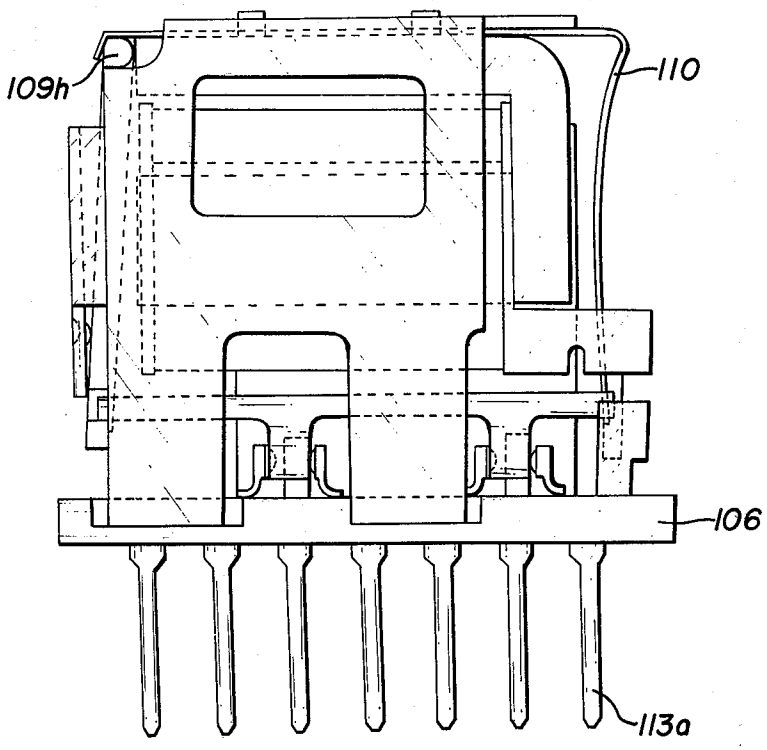
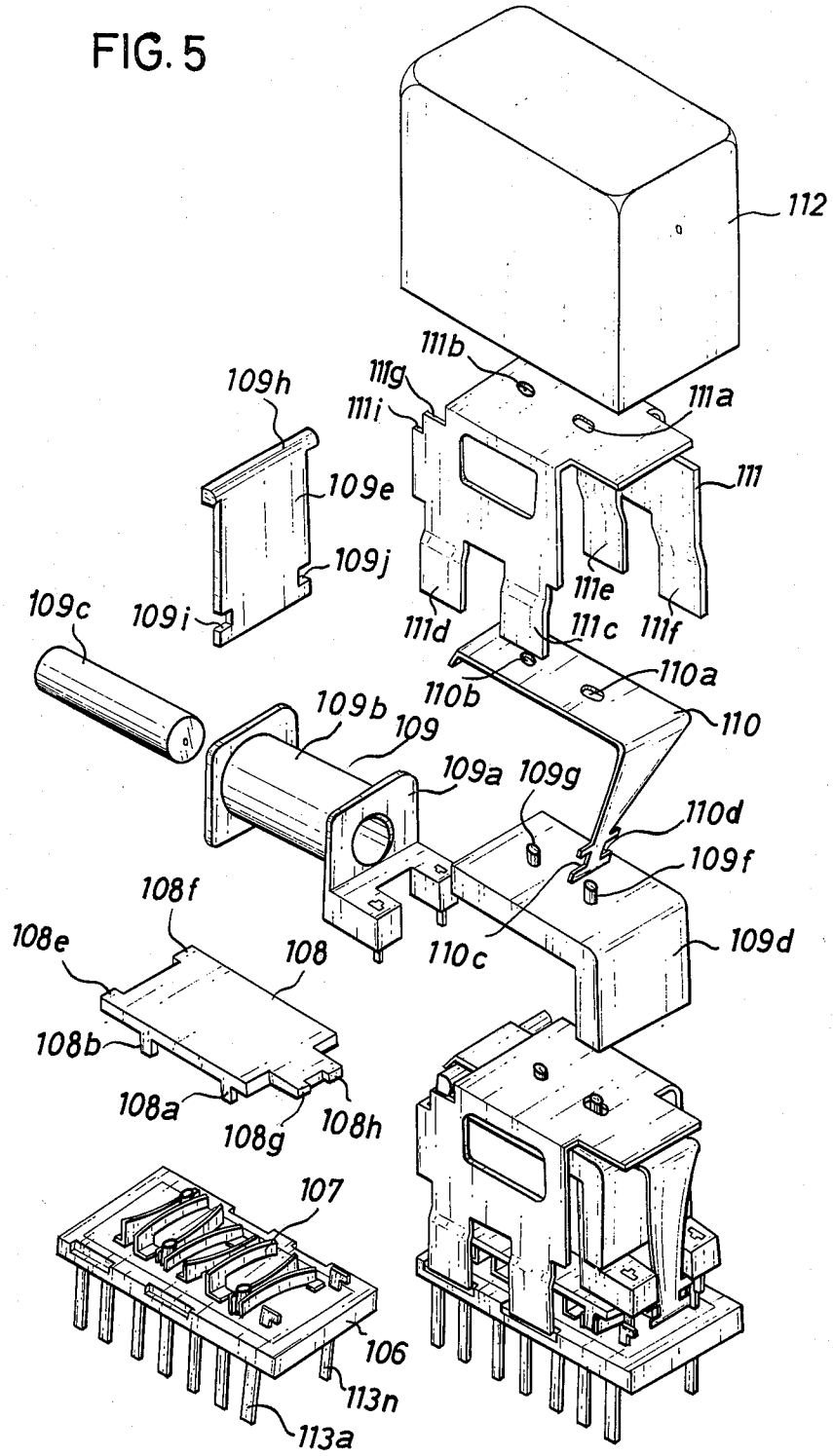


FIG. 5


112
111b
111g
111i
111a
109h
109e
111
109j
111e
109c
109i
111d
111c
111f
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110b
110
109b
109
109a
109g
110d
109f
108f
108e
108
110c
109d
108b
108a
108g
108h
107
106
113n
113a

FIG. 6 - A

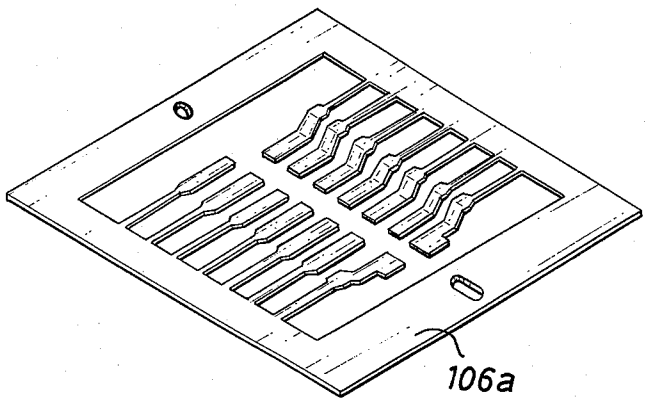


FIG. 6 - B

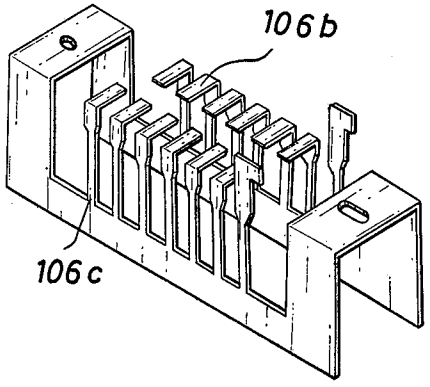


FIG. 6 - C

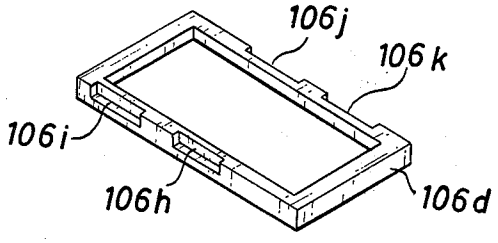


FIG. 6 - D

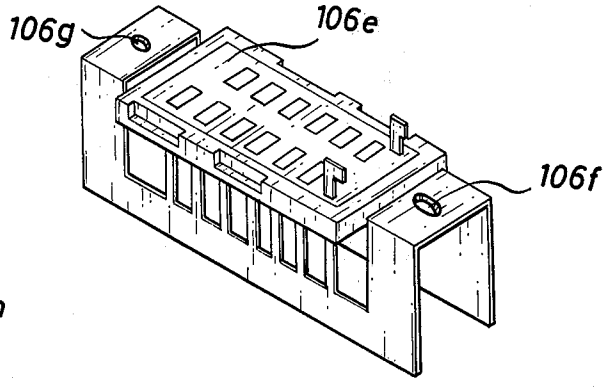


FIG. 6 - E

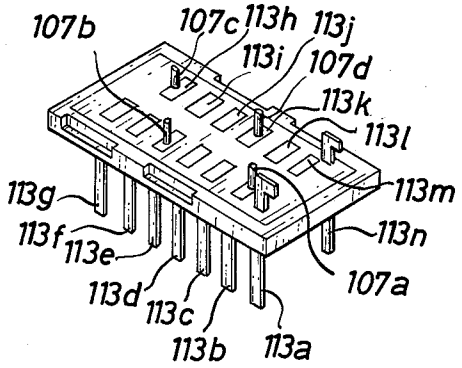


FIG. 6 - F

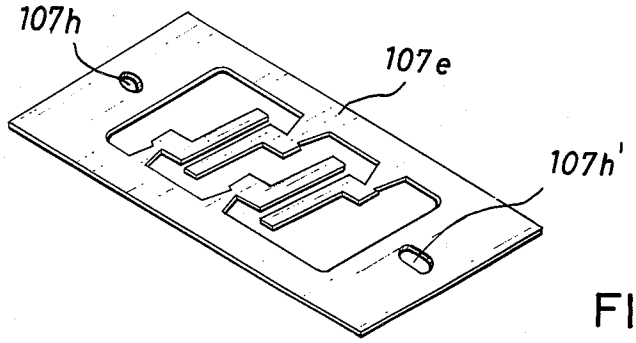


FIG. 6 - G

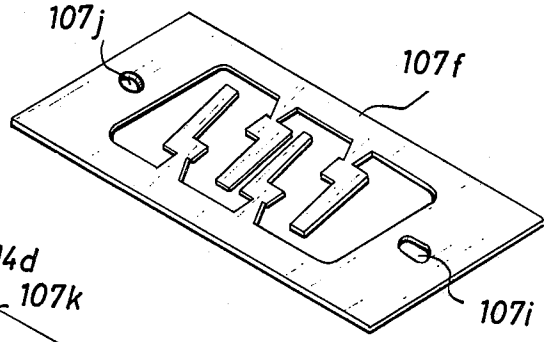


FIG. 6 - H

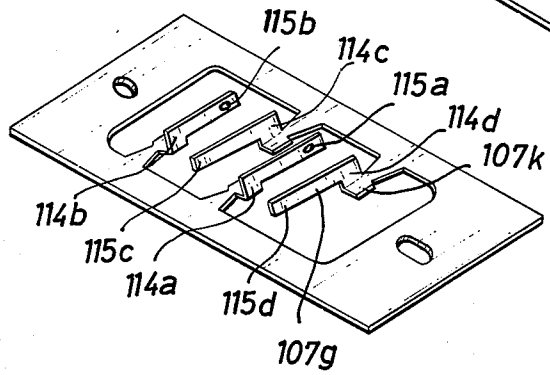


FIG. 6 - I

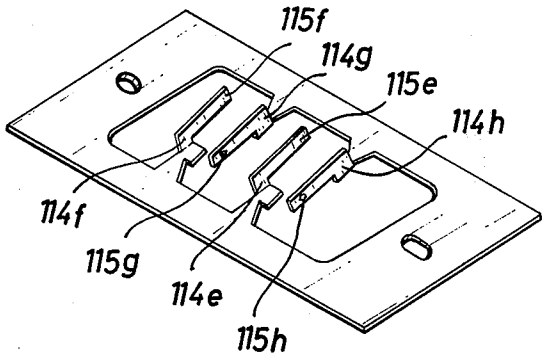


FIG. 6 - J

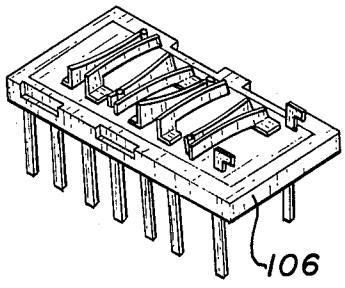


FIG. 7 -A

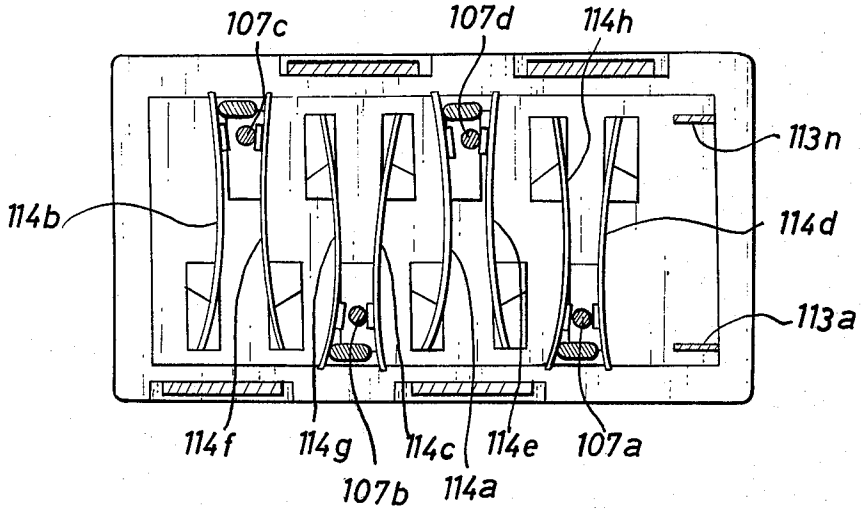

107c
107d
114h
113n
114b
114d
113a
114f
114g
114c
114e
107a
107b
114a

FIG. 7 -B

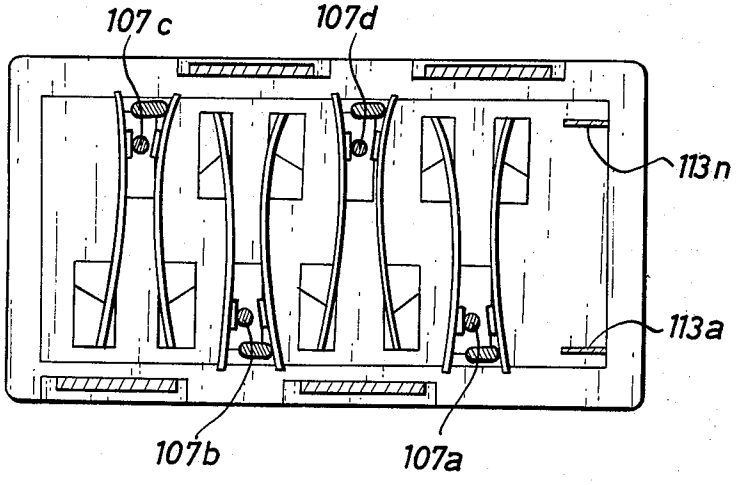

107 c
107d
113n
113a
107b
107a

FIG. 8

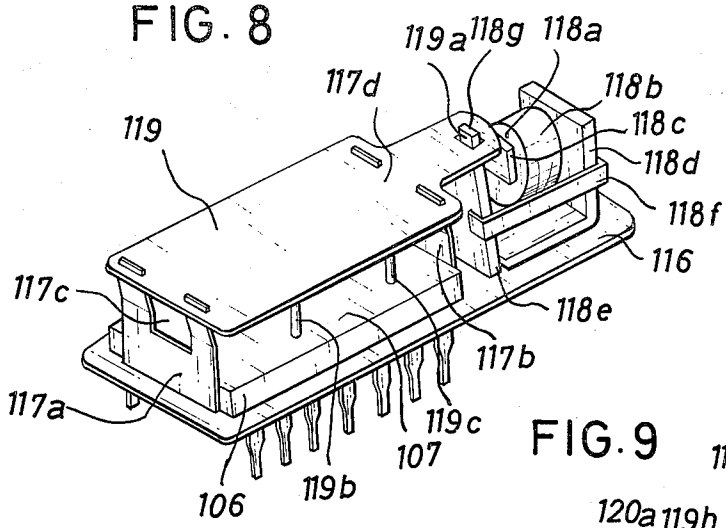


FIG. 9

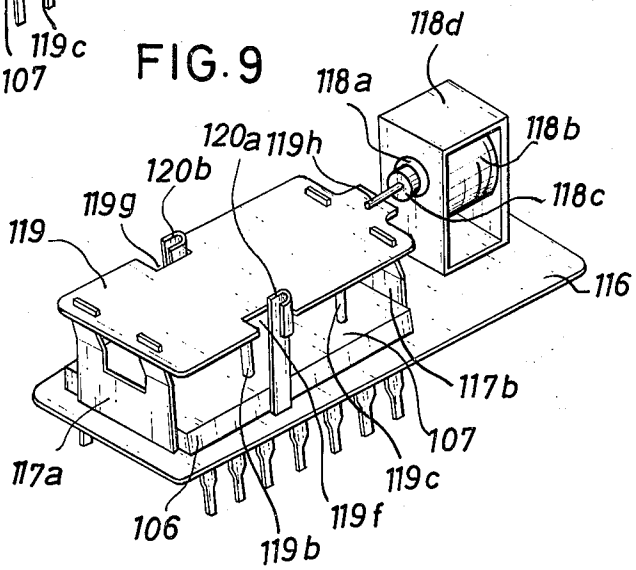
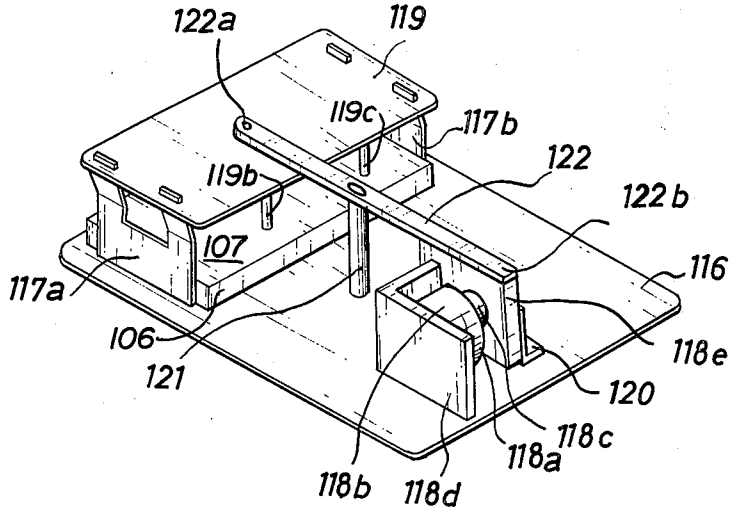


FIG. 10



ELECTROMAGNETIC RELAY

BACKGROUND OF THE INVENTION

In FIG. 1 there is shown, in perspective, a typical example of the prior art miniature electromagnetic relays. In the figure, numeral **1** denotes a header, **2** a contact assembly, **3** an electromagnetic assembly, **4** a return spring, and **5** a back stopper. FIG. 2A is a perspective view of the header **1** and contact assembly **2.** The header **1** consists of a sole plate **1***a* and a series of contact pieces **1***b* – **1***i* which are hermetically sealed to said sole plate **1***a*. The contact assembly comprises stationary contact springs **2***a*, 2*b*, 2*c*, 2*d*, and movable contact springs **2***e*, 2*f*. All of these contact springs **2***a* – **2***f* are welded to the respective contact pieces **1***b*, 1*d* – **1***f*, **1***h*, 1*i* which project beyond the surface of said sole plate **1***a*. The sole plate **1***a* is also formed with a recess **1***j*. The stationary contact springs **2***a*, 2*d* and movable contact spring **2***e* constitute, in combination, a switch contact assembly, and the stationary contact springs **2***b*, 2*c* and movable contact spring **2***f* constitute another switch contact assembly. FIG. 2B show, in perspective, a part of the electromagnetic assembly **3** including a return spring **4** and a back stopper **5.** The electromagnetic assembly **3** comprises a pair of coils **3***a*, 3*b*, a yoke **3***c*, a pair of bobbins **3***d*, 3*e*, an armature **3***f*, a shaft **3***g*, and a pair of cores **3***h*, 3*i*. The armature **3***f* is secured to the shaft **3***g* which, in turn, is rotatably supported by the yoke **3***c*. Secured to both ends of said armature **3***f* are driving bars **3***j*, 3*k* which carry at their ends insulating balls **31, 3***m*, respectively. These insulating balls **31, 3**m are so arranged as to actuate the movable contact springs **2***e*, 2*f*, respectively. The ends of the coils **3***a*, **3***b* are connected to the terminals **1***c*, 1*g*, respectively. The return spring **4** is coiled around the shaft **3***g*. The stopper **5** is secured to the yoke **3***c* and disposed between the contact assembly **2** and the electromagnetic assembly **3** so as to define the scope of actuation of said driving bars **3***j*, 3*k* secured to the armature **3***f*. The yoke **3***c* is securely fixed in the recess **1***j* of the sole plate **1***a*.

Having the above-described arrangement, this prior art miniature electromagnetic relay operates as follows.

When the electromagnetic assembly **3** is nonexcited, the armature **3***f* is set at its initial position under the pressing force of return spring **4.** In the contact assembly **2,** the movable contact spring **2***e* is in contact with the stationary contact spring **2***a* under a predetermined pressing force produced by the bending of the spring, while the movable contact spring **2***f* is also similarly in contact with the stationary contact spring **2***e*. When the coils **3***a*, 3*b*, are energized, the armature **3***f* is attracted to the cores **3***h*, 3*i*, so that the insulating balls **31, 3***m* depending from both ends of said armature **3***f* move the movable contact springs **2***e*, 2*f* to cause them to be pressed against the respective stationary contact springs **2***d*, **2***b*, thereby effecting contact switchover.

However, in assembling such a miniature electromagnetic relay, the terminals **1***b* – **1***i* must be inserted and hermetically sealed one by one, and also the stationary contact springs **2***a* – **2***d* and movable contact springs **2***e*, 2*f* must be secured one by one to the corresponding terminal pieces **1***b*, 1*e*, 1*f*, 1*i*, 1*d*, 1*g*. Therefore, the assembly work is very inefficient and a number of parts as well as many steps are required for adjustment. Also, when it is desired to form a multiple switchover contact system by using such contact assemblies, the size of the relay unit becomes large and can hardly be formed as a miniature size. Further, for effecting loaded actuation of the movable contact springs in such a contact assembly, there is employed a so-called flexure type where any actuating force is supplied from the outside, so that the contact opening and closing operations of the unit are low in reliability.

OBJECTS OF THE INVENTION

An object of the present invention is to realize a reduction of the number of parts, the number of assembling steps and the number of adjusting steps required in assembling the unit, by directly combining a movable contact spring assembly to which the movable contact pieces are welded and a terminal assembly to which said movable contact spring assembly and stationary contact pieces are welded.

Another object of the present invention is to allow easy construction of a contact assembly having a plurality of switchover contacts by using the above-said arrangement and also to allow employment of a highly reliable liftoff type mechanism for loaded actuation of the movable contact springs.

Still another object of the present invention is to obtain a relay unit with a flat construction.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view showing an example of the prior art miniature electromagnetic relays;

FIGS. 2A and 2B are perspective views of the principal parts of the electromagnetic relay shown in FIG. 1;

FIG. 3 is a top plan view of an electromagnetic relay according to an embodiment of the present invention;

FIG. 4 is a side elevation of the electromagnetic relay of this invention thereof;

FIG. 5 is an exploded view of the invention illustrating the method of assemblage;

FIGS. 6A to 6J are assembly drawings of the header and contact assembly in the electromagnetic relay shown in FIGS. 3 to 5;

FIGS. 7A and 7B are top plan views showing operation of the contact assembly; and

FIGS. 8 to 10 are perspective views of an electromagnetic relay according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, FIG. 3 is a top plan view of a miniature electromagnetic relay embodying the present invention, and FIGS. 4 and 5 are a side elevation and an assembly drawing thereof respectively. In these figures, numeral **106** designates a header, **107** a contact assembly, **108** a card member, **109** an electromagnetic assembly, **110** a return spring, **111** a support member, and **112** a cover. These elements are assembled into a unit by first fixing the contact assembly **107** in position on the header **106** and then joining the card member **108,** electromagnetic assembly **109,** return spring **110,** support member **111** and cover **112** in that order.

The header **106** and contact assembly **107** are built up in the process shown in FIG. **6.** That is, firstly, a metal sheet **106***a* is punched as shown in FIG. **6**A and then bent in an L shape so as to form first arms **106***b* and second arms **206***c* as shown in FIG. **6**B. Then a metal frame **106***d* such as shown in FIG. **6***c* is mounted on and fixed by a glass sheet **106***e* to said L-shaped

metal sheet **106***a* as shown in FIG. **6**D. The first arms **106***b* of the L-shaped metal sheet **106***a* are exposed on one side of the glass sheet **106***e* while the second arms **106***c* protrude beyond the other side of said glass sheet. Then, the unnecessary portion of the metal sheet **106***a* is cut off, thereby obtaining a header **106** provided with two rows of L-shaped terminals **113***a* – **113***n*. In the actual manufacturing process, cutting-off of the unnecessary portion is practiced after fixing the contact assembly **107** in position. The metal sheet **106***a* is also formed with guide holes **106***f*, 106*g*, and the metal frame **106***d* is provided with recesses or cut-out portions **106***h* – **106***k*.

The contact assembly **107** is built up in the following way. The stationary contact pieces **107***a* – **107***d* are connected vertically to the first arms **106***b* of the respective terminals **113***b*, 113*e*, 113*h*, 113*k*.

Next, two metal sheets **107***e* and **106***f*, which have been punched as shown in FIGS. **6**F and **6**G, are subjected to L-shape bending work to form raised-up strip protions **107***g* and their base portions **107***h* as shown in FIGS. **6**H and **6**I. (Each strip portion with its base portion describes an L shape). The strip portions **107***g* serve as movable contact springs **114***a* – **114***d*, 114*e* – **114***h*. Secured to one side of each of said movable contact springs **114***a* – **114***h* is a corresponding one of the movable contact pieces **115***a* – **115***h*. Mounting of the metal sheet **107***e* to the header **106** is accomplished by first positioning them relative to each other by registering the guide holes **106***f*, 106*g*, at both ends of the metal sheet **106***a* with the corresponding guide holes **107***h'*, 107*h* formed at both ends of the metal sheet **107***e*, then welding the first arm portions **106***b* of the corresponding terminals **113***d*, 113*g*, 113*j*, 113*m* exposed on the surface of the header **106** to the base portions **107***h* of the associated movable contact springs **114***a* – **114***d*, and then cutting off the unnecessary portion of the metal sheet **107***e*. Fixing of the metal sheet **107***f* to the header **106** can also be accomplished similarly by first positioning them relative to each other by registering the guide holes **106***f*, 106*g* with corresponding holes **107***i*, 107*j*, then welding the base portions **107***h* of the associated movable contact springs **114***e* – **114***h* to the first arm portions **106***b* of the corresponding terminals **113***c*, 113*f*, 113*e*, **1131**, and then cutting off the unnecessary portion of the metal sheet **107***f*. After uniting the header **106** and contact assembly **107** in the above-said manner, the unnecessary portion of the metal sheet **106***a* is cut off, thereby obtaining a combined structure of header **106** and contact assembly **107** as shown in FIG. **6***J*. The movable contact springs **114***a* – **114***h* contact the corresponding stationary contact pieces **107***a* – **107***d* by the action of their elastic pressure.

The electromagnetic assembly **109** consists of a bobbin **109***a*, a coil **109***b*, a core **109***c*, a yoke **109***d* and an armature **109***e*. The coil **109***b* is wound around the bobbin **109***a*, and the core **109***c* is inserted in said bobbin **109***a*, with one end of said core being secured to the L-shaped yoke **109***d*. Both ends of the coil **109***b* are connected to the terminals **113***a* and **113***n*, respectively. On the top surface of said yoke **109***d* are provided a pair of protuberances **109***f*, 109*g* adapted to define the positions of the return spring **110** and support member **111** when they are assembled together.

An end **109***h* of the armature **109***e* is worked circularly so that it is rotatably supported by the support member **111**. The other end of said armature is formed with recesses **109***i*, 109*j* and disposed in opposition to the core **109***c*. The return spring **110** is L-shaped and formed with guide holes **110***a*, 110*b* which fit with the protuberances **109***F*, 109*g*, respectively, provided on the yoke **109***d*. In one end of said return spring **110** are formed recesses **110***c*, 110*d* for supporting the card plate **108**. Said card plate **108** is provided with protuberances **108***a* – **108***d* (**108***c* and **108***d* being not shown) disposed corresponding to the stationary contact pieces **107***a* – **107***d* and greater in width than said contact pieces **107***a* – **107***d*. Also provided at one end of said card plate are protuberances **108***e*, 108*f* that fit in the recesses **109***i*, 109*j*, respectively, formed in the armature **109***e*, and at the other end of said card plate are provided protuberances **108***g*, 108*h* that fit in the recesses **110***c*, 110*d*, respectively, formed in the return spring **110**. The card plate **108** is supported by said armature **109***e* and return spring **110** so as to lie parallel to the contact assembly **107**.

The support member **111** is made from a metal sheet which has been punched and bent into a desired shape. In the top face of said support member are formed guide holes **111***a*, 111*b* which fit with the protuberances **109***f*, **109***g*, respectively, on the yoke **109***d*. In assemblage, said support member is secured by said protuberances **109***f*, 109*g* together with the return spring **110** as for instance by calking. At both ends of said support member **111** are provided legs **111***c*, 111*d* and **111***e*, 111*f* which fit securely in the respective recesses **106***h* – **106***k* formed in the metal frame **106***d* of the header **106**. At an upper end of said support member **111** are also provided recessed portions **111***g*, 111*h* (**111***h* being not shown) adapted for rotatably retaining an end **109***h* of the armature **109***e*, and below said recessed portions **111***g*, 111*h* are provided back stoppers **111***i*, 111*j* (**111***j* being not shown) for the armature **109***e*.

In this way, the contact assembly **107** is unitarily combined with the header **106** and then the card plate **108**, electromagnetic assembly **109** and return spring **110** are assembled together so as to be supported by the support member **111**, and thereafter the cover **112** is airtightly mounted over the metal frame **106**d which constitutes the header **106**.

The miniature electromagnetic relay according to the present invention which has the above-described arrangement operates as follows.

Referring to FIGS. **7**A and **7**B, there are shown top plan views of the contact assembly **107** for illustrating the operation of the present device. FIG. **7**A shows the condition of the contact assembly **107** where the electromagnetic assembly **108** is inoperative, and FIG. **7**B shows the situation where the electromagnetic assembly **108** is operative.

In FIGS. **7**A and **7**B, the protuberances **108***a* – **108***d* provided on the card plate **108** are disposed adjacent the stationary contact pieces **107***a* – **107***d* to actuate the movable contact springs **114***a* – **114***h* to perform touching and separating operations relative to the stationary contact pieces **107***a* – **107***d*.

Now, let it be supposed that the electromagnetic assembly **109** is in an initial inoperative condition; then the card member **108** will be moved to the position of the back stoppers **111***i*, 111*j* by the return spring **110**, and the protuberances **108***a* – **108***d* will actuate the movable contact springs **114***a*, 114*b*, 114*g*, 114*h* to let

them separate from the respective stationary contact pieces **107***d*, 107*c*, **107***b*, 107*a*, while making contact between stationary contact piece **107***a* and movable contact spring **114***d*, between stationary contact piece **107***b* and movable contact spring **114***c*, between stationary contact piece **107***c* and movable contact spring **114***f*, and between stationary contact piece **107***d* and movable contact spring **114***e*, under elastic pressure of movable contact spring **114***d*, 114*c*, 114*f*, 114*e*, respectively, as shown in FIG. 7A.

Let it now be assumed that power is connected to the coil **109***b* of the electromagnetic assembly **109** to energize the latter. Then the armature **109***e* supported rotatably by the support member **111** will be attracted by the core **109***c* and the card member **108** fitted in the recesses **109***i*, **109***j* in the armature **109***e* and recesses **110***c*, 110*d* in the return spring **110** will be actuated by attraction of the electromagnetic assembly **109** to move parallel to the contact assembly **107** against the restorative force of the return spring **110,** thus separating the movable contact springs **114***d*, 114*c*, 114*f*, 114*e* away from the respective stationary contact pieces **107***a*, 107*b*, 107*c*, 107*d*, while making contact between stationary contact piece **107***a* and movable contact spring **114***h*, between stationary contact piece **107***b* and movable contact spring **114***g*, between stationary contact piece **107***c* and movable contact spring **114***b*, and between stationary contact piece **107***d* and movable contact spring **114***a*, under elastic pressure of the movable contact springs **114***h*, 114*g*, 114*b*, 114*a*, respectively, as shown in FIG. 7B. When power is disconnected from the coil **109***b*, the card member **108** is again forced back to its original position by the action of return spring **110,** bringing the contact assembly **107** back into the condition of FIG. 7A. Thus, as apparent from FIGS. 7A and 7B, four switchover contact assemblies centered by the stationary contact pieces **107***a* – **107***d*, respectively, are formed in the miniature electromagnetic relay of the present invention.

FIGS. **8** shows, in perspective, a miniature electromagnetic relay with a more flat construction according to another embodiment of the present invention. In FIG. **8,** reference numeral **106** indicates a header and **107** a contact assembly built up on said header **106.** This header **106** and contact assembly **107** are the same as that shown in FIG. **6.** Another contact assembly **107** is not shown to avoid redundancy. Numeral **116** denotes a supporting base plate on which said header **106,** return springs **117,** an electromagnetic assembly **118** and card member **119** are mounted. The return springs **117***a*, 117*b*, have their one end secured to both ends of the header **106,** and recesses **117***c*, 117*d* are formed toward the other ends of said springs. The electromagnetic assembly **118** comprises a bobbin **118***a*, a coil **118***b*, a core **118***c*, a yoke **118***d*, an armature **118***e*, and a stopper **118***f*. The core **118***c* is secured at its one end to the yoke **118***d*. The yoke **118***d* is L-shaped, with one side thereof being secured to the core **118***c* and the other side to the base plate **116.** The armature **118***e* is opposed to the other end of the core **118***c*, with one end of said armature being rotatably supported on said base plate **116** and a protuberance **118***g* is provided at the other end of said armature. The back stopper **118***f* is secured to the yoke **118***d* to define the movable range of the armature **118***e*. The card member **119** is disposed on the contact assembly **107** so as to extend parallel to the header **106** and fits securely in the recesses **117***c*, 117*d* in the return springs **117***a*, 117*b*. Toward one end of the card member **119** is formed an opening **119***a* through which a protuberance **118***g* of the armature **118***e* is inserted. Said card member **119** is also provided with protuberances **119***b* – **119***e* (**119***d* and **119***e* being not shown) corresponding to the stationary contact pieces **107***a* – **107***d* of the contact assembly **107.**

According to this arrangement, when the electromagnetic assembly **118** is inoperative, the card member **119** is moved to the position where the armature **118***e* is held back by the back stopper **118***f*, and when the electromagnetic assembly **118** is energized, the armature **118***e* now is attracted by the core **118c** to move against the restorative force of the return springs **117***a*, 117*d*. Making and breaking of contact assembly **107** is effected in accordance with said movement of the card member **119.** Thus, in this embodiment, as the electromagnetic assembly **118** is disposed substantially flush with the header **106,** the height of the unit is appreciably reduced to provide a flat miniature electromagnetic relay.

FIG. **9** is a perspective view of a miniature electromagnetic relay with a flat construction according to still another embodiment of the present invention. In FIG. **9,** numeral **106** designates header, **107** contact assembly (not shown), **116** support base, **117** return springs, **118** electromagnetic assembly, **119** card member, and **120** back stopper. The electromagnetic assembly **118** consists of a bobbin **118***a*, a coil **118***b*, a core **118***c* and a yoke **118***d*. The bobbin **118***a* is secured to the yoke **118***d* and the core **118***c* is arranged movable in said bobbin **118***a*. Said yoke **118***d* is secured to the support plate **116.** The card member **119** is disposed on the contact assembly **107** while supported by the return springs **117***a*, 117*b*. Said card member **119** is provided on both sides thereof with protuberances **119***b* – **119***e* and recesses **119***f*, 119*g* designed to define the movable range of the card member **119.** Said card member also has at its one end a protruding portion **119***h* adapted to join with the core **118***c* of said electromagnetic assembly **118.** The back stoppers **120***a*, 120*b* are secured to both sides of the header **106** and fit in the recesses **119***f*, 119*g*, respectively, formed in the card member **119.**

When the electromagnetic assembly **118** is inoperative, the card member **119** is forced by the return springs **117***a*, **117***b* to one of the positions defined by the back stopper **120,** and when the electromagnetic assembly **118** is energized, said member **119** is now attracted by the core **118***c* to move to the other position defined by said back stopper **120.** Contact opening and closing of the contact assembly **107** is effected with said movement of the card member **119.**

FIG. **10** shows, in perspective, still another embodiment of the present invention. As will be seen, header **106,** return springs **117,** electromagnetic assembly **118,** back stopper **120** and driving lever support **121** are mounted on a base plate **116.** The electromagnetic assembly **118** consists of a bobbin **118***a*, a coil **118***b*, a core **118***c*, a yoke **118***d* and an armature **118***e*. The core **118***c* is secured to the yoke **118***d* which is in turn secured to the base plate **116.** The card member **119** is supported parallel to the header **106** on the contact assembly **107** by return springs **117***a*, 117*b*. Supported swingably by the support **121** is a working lever **122** of which one end **122a** is pivotally secured to a central

part of the card member **119** and the other end **122***b* has secured thereto the armature **118**e of the electromagnetic assembly **118.** The back stopper **120** is fixed at a location opposed to the core **118***c* for defining the movable range of the armature **118***e* secured to the working lever **122.** In a situation where the electromagnetic assembly **118** is inoperative, the card member **119** is moved to the position defined by the back stopper **122** under elastic pressure of the return springs **117***a*, 117*b*, and when said electromagnetic assembly **118** is energized, the armature **118***e* secured to the working lever **122** is attracted by the core **118***c* to let the card member **119** move with swing of the working lever **122,** thus effecting touching and separation of contacts of the contact assembly **107** through protuberances **119***b* – **119***e* on the card member **119.**

Thus, according to the present invention, the header assemblage can be accomplished by merely mounting groups of integrated terminals on the base plate, while the contact assembly can be formed by merely fixing the integrated movable contact springs to the header. Also, highly stable operation is ensured as the contact assembly employs a lift-off system in which closing or touching of contacts is accomplished by the force of elastic pressure of the movable contact springs while separation of contacts is effected by utilizing a driving force opposing said elastic pressure of said movable contact springs.

In a certain embodiment of the present invention, there was shown a miniature electromagnetic relay in which the terminals are secured by a glass sheet in a metal frame, with the support member being fixed to said metal frame, but a similar relay can be also obtained without using said metal frame, by instead fixing the terminals to the opposing sides of the glass sheet and securing the support member to said glass sheet.

In still another embodiment of the present invention, there is an arrangement in which the movable contact springs are provided in pairs so as to be contactible with the opposed sides of the stationary contact pieces, with the protuberances provided on the card member being disposed between said movable contact springs. It is also possible to obtain a desired miniature electromagnetic relay by employing an arrangement in which a single movable contact spring is provided contactible with the side of each stationary contact piece, so that said movable contact spring will be actuated by a corresponding protuberance on the card member.

What is claimed is:

1. A miniature electromagnetic relay including a header comprising an insulating base plate and a plurality of L-shaped terminals, said terminals being arranged in two rows with the first arms of said respective terminals being positioned on one side of said insulating base plate and the second arms of said respective terminals being projected out from the other side of said insulating base plate; a contact assembly comprising stationary contact pieces secured vertically to the first arms of one group of terminals and movable contact springs secured at one end to the first arms of the other group of said terminals, each of said movable contact springs being arranged in contactable relationship at its other end with a corresponding one of said stationary contact pieces; a card structure movable in a direction parallel to the surface of said header and having protuberances provided adjacent corresponding stationary contact pieces; an electromagnetic assembly adapted to attract said card structure to thereby effect a touching and separation operation between said stationary contact pieces and said movable contact springs; and a return spring adapted to restore the original position of the card structure after it has been moved by the said electromagnetic assembly.

2. A miniature electromagnetic relay as set forth in claim **1** and further including a support member to which said electromagnetic assembly and said return spring are secured and which is fixed on said header, wherein said card structure is supported at its one end by an end of said return spring and also supported at its other end by an end of an armature in said electromagnetic assembly, so as to retain said card structure movable parallel to the header surface.

3. A miniature electromagnetic relay as set forth in claim **1,** wherein said plurality of terminals are secured to the opposing sides of said insulating base plate and said support member is also fixed to said insulating base plate.

4. A miniature electromagnetic relay as set forth in claim **1,** wherein said card structure is supported movable parallel to the header surface by a plurality of return springs.

5. A miniature electromagnetic relay as set forth in claim **1,** further including another base plate for mounting the header thereon, said another base plate also having amounted thereon said electromagnetic assembly.

6. A miniature electromagnetic relay as set forth in claim **1** and further including another base plate adapted for mounting thereon said header and said electromagnetic assembly, wherein said armature of said electromagnetic assembly and said card structure are connected by a lever supported to be swingable about a fixed pin and parallel to the surface of said second base plate.

7. A miniature electromagnetic relay as set forth in claim **1,** wherein said movable contact springs are provided in pairs for each of the stationary contact pieces so as to be contactable with the opposing side faces of said stationary contact pieces, with said protuberances being disposed between each said pair of movable contact springs.

8. A miniature electromagnetic relay as set forth in claim **1** and further including a metal frame and a cover, said header being secured airtightly surrounding said insulating base plate, wherein said cover is airtightly fixed to said metal frame so as to seal at least said electromagnetic assembly, said card structure, and said contact assembly.

9. A miniature electromagnetic relay as set forth in claim **1,** wherein the movable contact springs are provided one for each of the stationary contact pieces.

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