

March 22, 1966

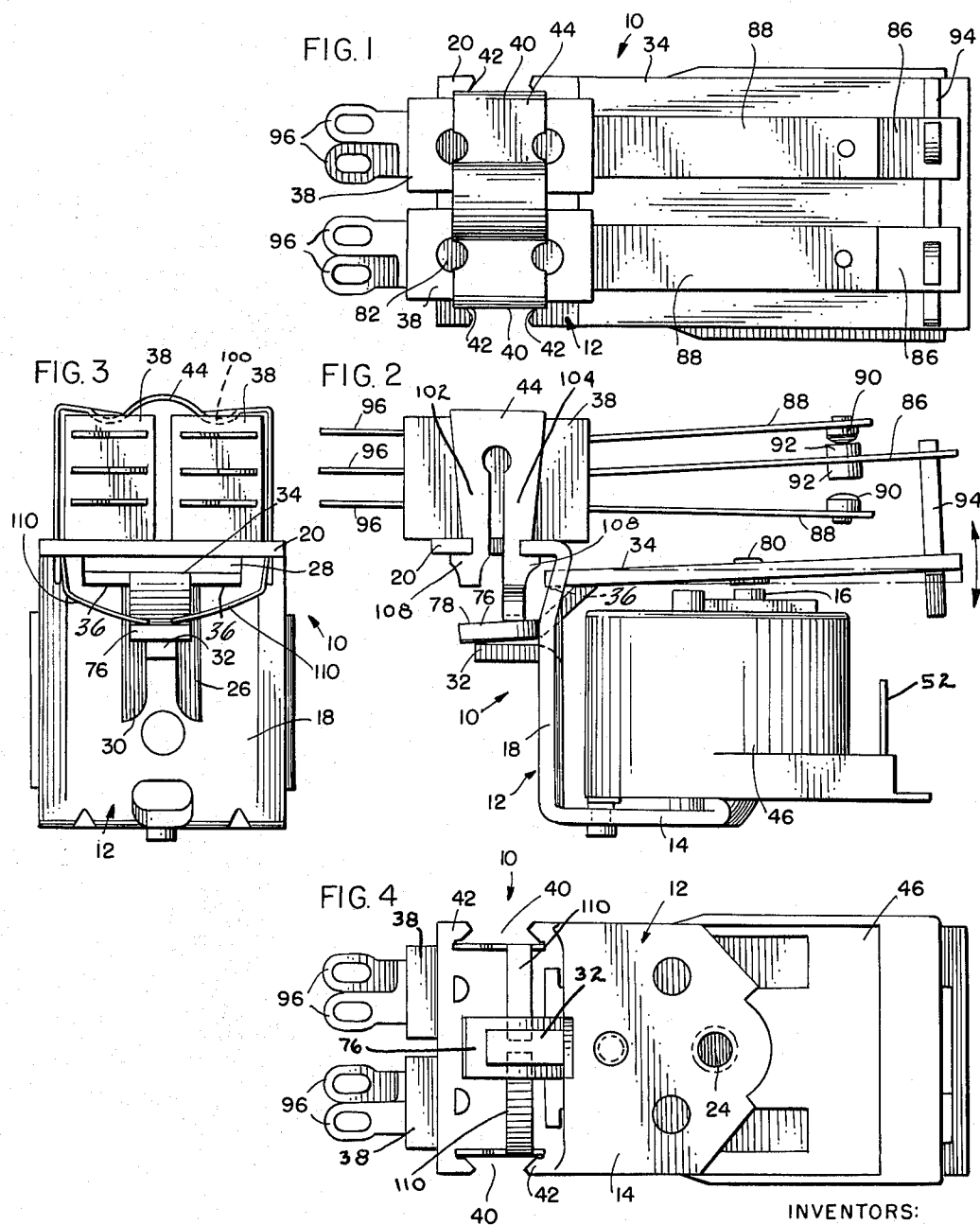
T. J. OBSZARNY ET AL

3,242,285

RELAY WITH UNITARY FIELD PIECE CONSTRUCTION

Filed March 21, 1963

3 Sheets-Sheet 1



INVENTORS:

THEODORE J. OBSZARNY

JOHN J. ROWELL

JOHN SCHMIDT

WILLIAM WARREN WRIGHT

BY

Dair, Freeman & Molmare

ATT'YS

March 22, 1966

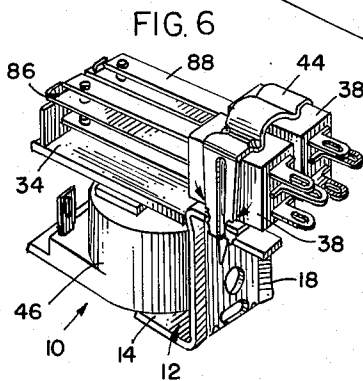
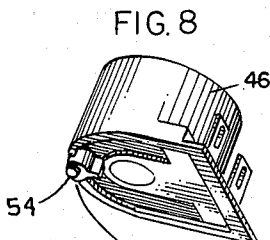
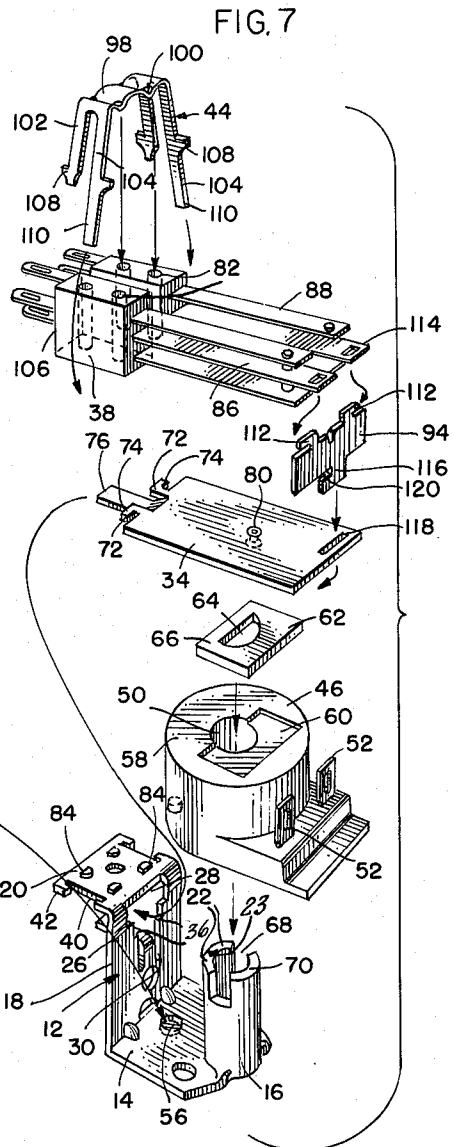
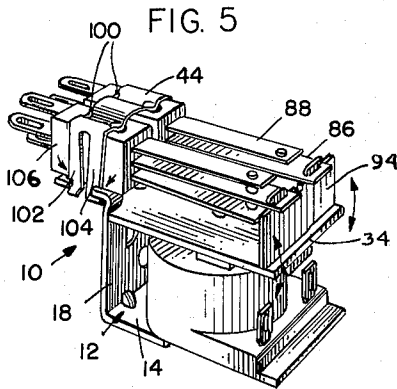
T. J. OBSZARNY ET AL

3,242,285

RELAY WITH UNITARY FIELD PIECE CONSTRUCTION

Filed March 21, 1963

3 Sheets-Sheet 2



INVENTORS:

THEODORE J. OBSZARNY

JOHN J. ROWELL

JOHN SCHMIDT

WILLIAM WARREN WRIGHT

BY

Bair, Freeman & Molinare

ATT'YS

March 22, 1966

T. J. OBSZARNY ET AL

3,242,285

RELAY WITH UNITARY FIELD PIECE CONSTRUCTION

Filed March 21, 1963

3 Sheets-Sheet 3

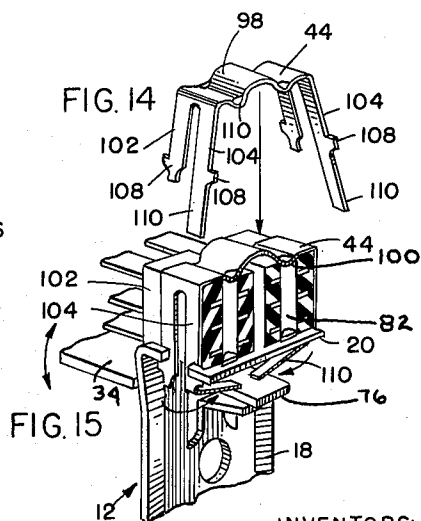
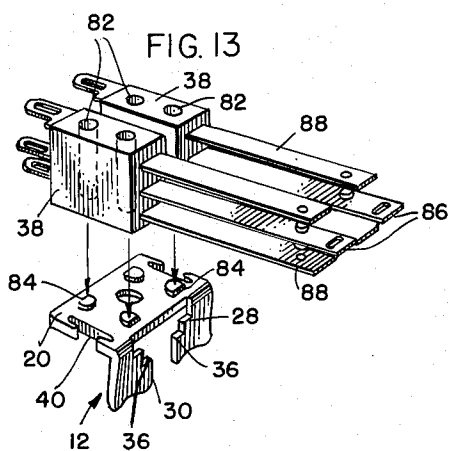
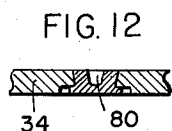
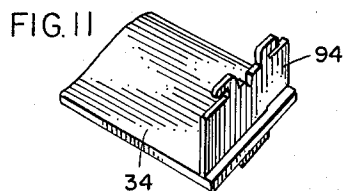
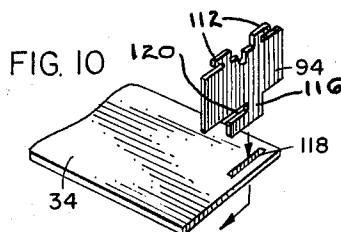
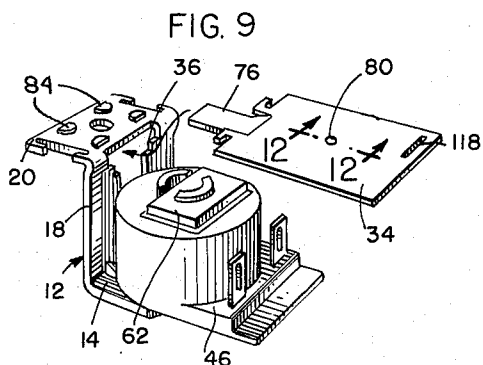


FIG. 15

INVENTORS:
THEDORE J. OBSZARNY
JOHN J. ROWELL
JOHN SCHMIDT
WILLIAM WARREN WRIGHT
BY

Bair, Freeman & Molinare
ATT'YS

1

2

3,242,285

RELAY WITH UNITARY FIELD PIECE CONSTRUCTION

Theodore J. Obszarny, Chicago, John J. Rowell, Glenview, John Schmidt, Mount Prospect, and William Warren Wright, Wheaton, Ill., assignors to Guardian Electric Manufacturing Co., a corporation of Illinois
Filed Mar. 21, 1963, Ser. No. 266,954
12 Claims. (Cl. 200-104)

This invention relates to electrical relays and it particularly relates to novel electrical relays which are simply and economically constructed.

Generally, the electrical industry is considered to be highly competitive, competition being particularly keen in the area of electrical relays. Specifically, any time that the manufacturer is able to reduce manufacturing costs of relays in any way, important savings are realized. Ordinarily such savings can be attained by reducing the cost of the component parts of the relay or by reducing labor costs involved in assembling the relay or by reducing both labor costs and piece part costs.

Therefore, it is a primary object of this invention to provide a novel electrical relay which is simply and economically constructed.

It is a further object of this invention to provide a novel relay which effects important savings both by reducing the cost of the component parts of the relay and also by substantially lowering labor costs involved in assembling the relay.

Since it is always desirable to improve the operating characteristics of any relay, it is an additional important object of this invention to provide a novel relay which is not only simply and economically constructed but which also exhibits markedly improved operating characteristics.

Further purposes and objects of the present invention will appear as the specification proceeds.

Generally, our improved relay comprises a field piece having an integral core, a coil mounted on the core for creating an electromagnetic field, an armature pivotally carried by said field piece and being aligned with the core, switch blocks mounted on the field piece, blade contact members carried by the switch blocks and being distally spaced from said armature, a spring clip secured to said field piece for maintaining the switch blocks on the field piece and also for biasing the armature away from the coil, and means for moving the blade contact members in response to movement of the armature caused by energizing the coil, thereby making or breaking an electrical circuit.

One embodiment of the present invention is illustrated in the accompanying drawing wherein:

FIGURE 1 is a top plan view of our novel relay;

FIGURE 2 is a side elevational view of the embodiment of FIGURE 1;

FIGURE 3 is an elevational view of the rear end of the relay embodied in FIGURE 1;

FIGURE 4 is a bottom plan view of the embodiment of FIGURE 1;

FIGURE 5 is a perspective view of our novel relay;

FIGURE 6 is also a perspective view of our novel relay, except that the perspective is opposite to the perspective of FIGURE 5;

FIGURE 7 is an exploded view illustrating the interrelationship of the component parts of the relay;

FIGURE 8 is a perspective view of the underside of the coil cover for the present relay;

FIGURE 9 is a perspective view showing the relationship between the field piece, the coil and cover assembly, the retaining member, and the armature of the relay;

FIGURE 10 is a perspective view of the means used for actuating the blade contact members in response to the movement of the armature before attachment to the armature;

FIGURE 11 is a view similar to FIGURE 10, except that the parts are illustrated in assembled relationship;

FIGURE 12 is a sectional view of the armature taken along line 12-12 of FIGURE 9;

FIGURE 13 is an exploded view illustrating the relationship between the switch blocks and the shelf on the field piece for supporting the switch blocks;

FIGURE 14 is a perspective view of the spring clip before attachment to the field piece; and

FIGURE 15 is a perspective view showing the relationship between the spring clip, the switch blocks, the field piece and the armature of the relay.

The relay 10 is provided with a field piece, generally 12, as illustrated most clearly in FIGS. 2, 5, 6 and 7. The field piece 12 includes a base 14 having a core 16, a leg 18 directed upwardly from the base 14, and a rearwardly directed shelf 20 at the upper end of the leg 18, all integrally connected together.

The unitary field piece and core assembly 12 as shown is constructed by stamping and forming one piece of magnetic material such as ferrous metal stock. If desired it may be produced of powdered ferrous metal. This unitary construction of the field piece 12 not only provides great economy in manufacturing, but it also provides an improved magnetic circuit. For example, the magnetic efficiency of an orthodox field piece requires the use of at least $\frac{3}{32}$ " stock, whereas in making our unitary field piece, $\frac{1}{16}$ " thick stock may be used, with essentially the same relative magnetic performance.

The core 16 extends in a normal direction from the base 14 and is hollow at its central portion. The hollow core 16 is formed by first rolling edges 22 of the metal blank which forms the unitary assembly 12 into abutting relationship at 23 with each other and then turning the formed hollow core 16 into position at substantially right angles to the base 14 and spaced from the leg 18. The hollow core 16 has the advantages of permitting air circulation which cools the coil and also reduces undesired eddy currents and also of eliminating the necessity of laminating to obtain these results. A tapped hole 24 for mounting the relay 10 is provided in the base 14 in alignment with the hollow core 16. This eliminates the usual chip problems found with orthodox cores, as the hole 24 may be tapped allowing the chips to fall through the open core 16. A further advantage results in the fact that the length of associated mounting screws is not critical since clearance extends throughout core body.

The leg 18 of the field piece 12 is provided with an aperture 26 which has a relatively wide upper end 28 and a relatively narrow lower end 30. A stop member 32 projects rearwardly from the leg 18. The stop member or tongue 32 limits the upward rotational movement of the armature 34. The narrow end of the aperture 26 is provided with pivot edges 36 which are adapted to pivotally carry the armature 34.

The shelf 20 of the field piece 12 is adapted to support the switch blocks 38. The shelf 20 is provided with recesses 40 on each side for cooperating with the opposed retaining fingers 42, which project into recess 40, so as to lock the spring clip member 44 and thereby the switch blocks 38 on the shelf 20.

The coil and cover assembly 46 is provided with a central aperture 50 which is adapted to be received by the core 16. Electrical connectors 52 are provided at the front of the coil and cover assembly 46, each being connected to one end of the electrical coil which is contained within the assembly 46. Referring particularly to FIGS.

7 and 8, an indexing projection 54 is provided on the underside of the coil and cover assembly and is adapted to engage the indexing depression 56 in the base 14 of the field piece 12, whereby proper alignment is maintained between the field piece 12 and the coil and cover assembly 46. The upper side 58 of the coil and cover assembly 46 has a depressed area 60 which is adapted to receive a shading ring or retaining member 62.

The retaining member 62 is preferably constructed of flat copper or other high conductivity material and is provided with an aperture 64, which is generally semi-circular in configuration. An outer strip 66 is positioned adjacent to the opening 64 and is adapted to be press fit into the slots 68 provided in the upper portion of the hollow core 16. Simultaneously, the semi-circular opening 64 is being press fit to the arced segment 70 of the core 16. The retaining member 62 is received in the depressed area 60 of the assembly 46 whereby the assembly 46 is held in place on the field piece 12. The shading ring or retaining member 62 not only retains the coil and cover assembly 46 in place on the armature 12, but it also reduces relay chattering, caused by A.C. circuits.

The armature 34 is formed from pieces of magnetic ferrous material and has its underside pivotally mounted on the pivot edges 36 of the aperture 26 in the leg 18. The armature 34 is aligned with and pivotally carried over the assembly 46 and the core 16. The armature 34 includes a pair of projections 72 at its pivoted end. The underside of the projections are adapted to pivot on the edges 36. The projections 72 have retaining fingers 74 which are adapted to lock the armature 34 into place on the field piece 12 by engaging the rear side of the upstanding leg 18. Also, the armature is provided with a central extension 76, distorted out of alignment with the major portion of the armature 34, and extends into the passage 26 and is aligned with the stop 32 projecting from the leg 18. The central extension 76 also serves a second purpose since its upper side 78 provides a bearing surface against which the spring member 44 is positioned for normally biasing the armature 34 about the pivot edges 36 in a direction away from the coil and cover assembly 46 and core 16.

The armature 34 includes a piece of semi-magnetic material, such as stainless steel. Conveniently the piece of material may be a strip or a rivet 80. The rivet 80 is aligned to strike a segment 70 of the hollow core 16, whereby at no time does the segment 70 contact any other portion of the armature 34.

The use of the semi-magnetic rivet 80, in an A.C. type electrical relay, permits controlled reluctance of the magnetic circuit, which does not affect the attract values of the armature and the coil. The semi-magnetic rivet 80 also provides an economic production control for obtaining desired release values of the armature from the coil. By providing the semi-magnetic rivet 80, it is unnecessary to interrupt the magnetic circuit at a point which would reduce the attract value or the insert relay efficiency. Because of the alignment of the rivet 80 with the core 16, although the magnetic field is affected, the attract value remains the same. Also, the semi-magnetic rivet 80 provides much quieter relay operation since there is a lower magnetic resistance available for the magnetic flux field.

As previously indicated, the switch blocks 38 are mounted on the shelf 20 and are maintained in place by the spring clip member 44. The switch blocks 38 include indexing apertures 82 which are adapted to engage the indexing bosses 84 which are positioned on the upper side of the shelf member 20. The switch block 38 is molded of an insulating material and carries a moving blade contact 86 mounted between two blade contact members 88, which are relatively stationary but do move slightly as a result of engagement by the moving contact blade 86. The blade contacts 86 and 88 are spaced from

each other in the block 38 to avoid any electrical contact between the members 86 or 88. By the use of molded switch blocks 38 containing the switch contact members 86 and 88, it is possible to have maximum electrical creepage distances with minimum heights and widths. Also, by the use of molded switch blocks 38, the problem of electrical clearance distances between the fastening devices of normal switch blocks to the contact members is eliminated.

The blade contact members 86 and 88 are constructed of flat spring material. The stationary blade contacts 88 are provided with contact rivets 90 at the free end, the contacts 90 being adapted to contact the double-sided electrical contact 92 which is secured to the movable end of the moving blade contact member 86. In the construction of the present relay 10, the moving blade contact member 86 is biased upward and is adapted to contact the stationary contact member 88 furthest from the coil, permitting current to flow through the two upper contacts. When the coil is energized and draws the armature 34 downward, the moving contact blade 86 is also drawn downward by the lift member 94 and contacts the contact member 88 positioned closest to the coil, thereby permitting current flow in the lower two contact members. Each of the contact members 86 or 88 is provided with connectors 96 projecting from the blocks 38 and is adapted to receive wires directed to the electrical components which are controlled by the relay 10.

The spring clip member 44 is preferably formed from flat spring material. The spring clip 44 is provided with a cross strip 98 having a rounded central portion and having inward indexing depressions 100 which are adapted to engage the apertures 82 in the switch blocks 38, whereby the switch blocks 38 are properly aligned with the spring clip 44. The spring clip 44 is adapted to contact the top of the switch blocks 38 and to be locked to the shelf 20.

The clip 44 includes legs 102 and 104 which project outwardly from the central strip 98 and which abut the outer sides 106 of the switch blocks 38. The legs 102 and 104 include barbs 108 which are sprung into the recesses on the shelf 20, with the barbs positioned to engage the underside of the shelf 20, as clearly seen in FIGURE 2. The fingers 42 in the recess 40 are adapted to prevent the legs 102 and 104 from moving away from the sides 106 of the switch block 38. The long depending legs 104 include extensions 110 which are turned inwardly towards each other, as shown in FIGURE 3, and are in biasing contact with the upper side 78 of the central extension 76 of the armature 34, thereby normally biasing the armature 34 away from the coil assembly 46 and core 16. Thus, not only does the spring clip 44 provide means for retaining the switch blocks 38 upon the shelf 20, but the clip 44 also biases the armature 34 on the field piece 12. The clip 44 has the additional advantage of being easily mounted in locked relation to shelf 20 without the use of tools.

The actuating or lift member 94 is constructed from a flat strip of electrical insulating material and is connected to the outer free end of the armature 34 and is connected to moving blade contact members 86 to move the armature and blades in unison toward and away from the core 16 upon energization and de-energization of the coil in the assembly 46. When the armature 34 moves away from the core 16, upon de-energization of the coil in response to the normal upward biasing action of the spring extensions 110 of the clip 44, the lift 94 moving with the armature causes movement of the contact members to their upper position.

The lift member 94 is provided with hooks 112 which are adapted to be inserted into the apertures 114 provided in the extremities of each moving blade contact member 86. A lower locking portion 116 on the member 94 is adapted to be inserted into an opening 118 at the free end of the armature 34. A slot 120 in the locking portion 116 permits said lift member to be moved trans-

versely of the armature 34 into locking relation therewith. The lift member 94 is so constructed that it is centrally located on the armature 34, whereby the hooks 112 cause substantially equal downward pressure on both moving blade contacts 86 so as to accommodate for any slight misalignment between the moving blade contacts 86. The lift 94 allows the use of a preadjusted switch block assembly 38 so that there is no deformation required to adjust the contact members 86 with respect to the armature 34.

From the above description it is seen that an extremely simple and economically constructed relay is provided by the utilization of a number of novel component parts and novel combinations of parts. The relay may be readily assembled without the use of any special tools and likewise may be readily disassembled and because of the simplicity of design, it lends itself for automatic assembly and testing. By providing a novel integral, one piece form of field and core, we eliminate one nonworking magnetic gap as exists in conventional relay devices. More important however, is the fact that elimination of said one magnetic gap results in a relay having materially increased magnetic efficiency as compared to conventional relays. In addition to eliminating various separate parts of conventional relays, our novel design and construction is such as to totally dispense with all forms of fasteners, such as screws for connecting the various elements and components. Clearly various of the described parts and combinations may be separately used in other designs of relays. In summary, all of the objects of the present invention are realized by the above described relay.

While the foregoing is a detailed description of a specific embodiment of the invention, it is to be understood that all equivalents obvious to those skilled in the art are to be included within the scope of the invention, as claimed.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent is:

1. A relay comprising a field piece having a core, a coil mounted on said core for creating an electromagnetic field, an armature pivotally carried by said field piece and being aligned with said core, a switch block mounted on said field piece and having blade contact members distally spaced from said armature, a spring clip firmly connecting said switch block to said field piece, said clip engaging and biasing said armature in a direction away from said coil, and means for moving said contact members in unison with said armature upon energizing and de-energizing said coil.

2. An electrical relay comprising a field piece having a shelf, an upstanding leg, a base and a hollow core projecting upwardly from said base, said field piece including said shelf, said leg, said base and said hollow core being constructed of a single piece of magnetic material, an electrical coil mounted on said core, an armature pivotally mounted on said leg and aligned for striking said core in response to energization and de-energization of said coil, a switch block carrying blade contact members which act in response to pivoting movement of said armature, said switch block being mounted on said shelf, cooperating indexing means on said shelf and said switch block to maintain proper orientation therebetween, and cooperating indexing means on said coil and said field piece for maintaining proper alignment therebetween.

3. The device of claim 2 wherein a piece of semi-magnetic material is carried in the armature and is positioned for striking said core so that only said semi-magnetic piece strikes said core.

4. The device of claim 2 wherein a spring clip is provided for holding said switch block to said shelf, and cooperating indexing means are provided on said switch block and on said spring clip for maintaining proper orientation therebetween.

5. The device of claim 4 wherein said spring clip includes a portion which biases said armature in one direction about its pivot on said field piece.

6. A unitary field piece for an electrical relay for pivotally mounting an armature responsive to energization and de-energization of electrical coil means, the pivoting movement of said armature operating switch means, said field piece comprising an upstanding leg having an aperture, said aperture having a wide upper end and a narrow lower end, said narrow end defining upper pivot edges for pivotally mounting said armature, a rearwardly projecting stop member extending from said narrow end of the aperture for limiting the pivotal movement of said armature, a shelf projecting rearwardly from said leg for supporting said switch means, said shelf having means for indexing said switch means on said shelf, a base projecting frontwardly from said leg and having an upstanding hollow core member for receiving said electrical coil means, said field piece including said upstanding leg, said stop member, said shelf, said base, and said hollow core all being formed of a single piece of material, said base having means for indexing said coil means on said field piece, and said core having slots at the upper end for receiving retaining means for securing said coil means in position on said field piece.

7. A unitary field piece for an electrical relay, for pivotally mounting an armature responsive to energization and de-energization of electrical coil means, the pivoting movement of said armature operating switch means, said field piece comprising an upstanding leg having an aperture defining upper pivot edges for pivotally mounting said armature, a rearwardly projecting stop portion extending rearwardly from said leg for limiting the pivotal movement of said armature, a shelf projecting rearwardly from said leg for supporting said switch means, and a base projecting frontwardly from said leg and having an upstanding hollow core for receiving said electrical coil means, said field piece including said upstanding leg, said stop portion, said shelf, and said hollow core being constructed of a single piece of material.

8. The device of claim 1 wherein said moving means comprises said armature having a free end with an aperture therein, stationary and moving blade contact members having free ends and being mounted in said switch block and extending over said armature, the free ends of said moving blade contacts being provided with openings, a lift member having an open-ended slot defining a hooked portion, said slot permitting said lift member to be moved transversely of said armature and in said aperture whereby said hooked portion is moved into locking relationship with said armature, said lift member also having upper hooks which interlock with each of the openings in said moving blades whereby said moving blades and said armature are movable in unison.

9. The device of claim 1 wherein said field piece including said core is constructed of a single piece of material.

10. The device of claim 1 wherein said switch block is a molded mass of insulating material, and a plurality of elongated blade contact members are carried in said mass in spaced apart and insulated relationship.

11. A combination useful in connection with an electrical relay, said combination comprising a field piece having a shelf, a switch block mounted on said shelf, an armature pivotally carried on said field piece, and a spring retaining clip for locking said switch block to said shelf and having a portion positioned to engage and bias said armature in one direction on said field piece.

12. A combination useful in connection with an electrical relay, said combination comprising a field piece having an upstanding leg and a shelf, said leg having an opening and a stop member projecting from said opening, a switch block mounted on said shelf, an armature pivotally carried in the opening in the leg of said field piece, said armature having a portion passing through said opening and aligned with said stop member, and a spring clip member for securing said switch block in place on said shelf, said clip having extended legs which abut said

portion of the armature for biasing said armature upwardly, said stop member serving to limit the upward pivotal movement of said armature.

References Cited by the Examiner

UNITED STATES PATENTS

2,284,621	6/1942	Kuhn et al.	200—87
2,398,657	4/1946	McMaster et al.	
2,421,642	6/1947	Obszarny	200—87
2,524,874	10/1950	Bean	200—104
2,608,630	8/1952	Harrison	200—104
2,735,968	2/1956	Bogue et al.	200—87 X
2,775,671	12/1956	Dreyfus	200—87 X
2,818,481	12/1957	Nicolaus	200—104 X

2,866,030	12/1958	Wirth	200—104
2,896,045	7/1959	Brunicardi	200—87
2,916,585	12/1959	Moyer	200—104
2,932,705	4/1960	Nicolaus	200—87
2,975,252	3/1961	Juptner	200—87 X
3,017,475	1/1962	Smith	200—87 X
3,025,370	3/1962	Greshel	200—104 X
3,126,466	3/1964	Schwartz	200—166

FOREIGN PATENTS

770,030	3/1957	Great Britain.
---------	--------	----------------

BERNARD A. GILHEANY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*