

PATENT SPECIFICATION

(11)

1 493 377

(21) Application No. 45000/74 (22) Filed 17 Oct. 1974

(44) Complete Specification published 30 Nov. 1977

(51) INT. CL.² H01H 11/00 1/58

(52) Index at acceptance

H1N 638 646 649 652 662 700 704 805

B3A 26 49T 78C

(72) Inventors JAMES WILLIAM CASSARLY
NORWOOD CLAUDE GRAEFF
DEAN ROOSEVELT HOOPER JR.
WILLIAM VITO PAUZA
WILMER LEE SHEESLEY
FRANK CHRISTIAN YOUNGFLEISH



(54) ELECTRICAL LEAD FRAME

(71) We, AMP INCORPORATED, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of Eisenhower Boulevard, Harrisburg, Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to an electrical lead frame, and to a method of making a lead frame, and to an electrical switch device, such as an electromechanical relay, including a contact member arrangement formed from a lead frame according to the invention.

British Patent Specification No. 1,266,817 discloses a lead frame, for use in forming a contact member arrangement for a reed relay assembly, which is stamped out of sheet metal stock and comprises two spaced end strips and two spaced side strips arranged in a generally rectangular configuration and holding a plurality of contact members in spaced relationship. First ends of the contact members are formed as contact pins, and the other ends of the contact members are formed as contact portions for connection to components to be carried in the assembly, which components include a reed relay.

With this known lead frame none of the contact portions thereof are capable of serving as a movable contact providing a switching function, and hence the need for a separate reed relay to provide the necessary switching function. This is because due to the form of the lead frame none of the contact portions of the contact members are capable of being overlapped and thus made capable of contact to provide a switching function.

According to this invention there is pro-

vided a method of making a lead frame, comprising stamping a lead frame blank from sheet metal stock to define a first plurality of contact members integral with and extending generally perpendicularly of a first side carrier strip and a second plurality of contact members integral with and extending perpendicularly of a second side carrier strip, the side carrier strips being integrally connected in spaced parallel relation by means of two spaced end carrier strips, the contact members being formed with contact arms at their mutually proximate ends; forming the blank into a channel configuration by bending the end strips at two spaced locations and by bending the contact members such that the contact arms and intermediate portions of the end strips extend across the base of the channel; and deforming the end strips so as to displace the side strips closer to each other and cause overlapping of at least two of the contact arms.

Preferably each end strip of the lead frame is bent inwardly at both junctions of the intermediate portion with the remainder of the end strip.

The present invention gives the advantage that the lead frame can provide overlapped relatively movable contact portions capable of providing a switching function, and thus a separate reed relay is not required to provide the switching function.

The invention will now be described, by way of example, with reference to the drawings, in which:—

Figure 1 is a view of a stamped blank of a lead frame, formed as a first step in the method according to the invention;

Figures 2 and 3 are fragmentary perspective views of the blank of Figure 1 after consecutive further steps in the method according to the invention have been carried out thereon; and

Figure 4 is a perspective view of a con-

tact member arrangement formed from the blank of Figure 1.

The lead frame 18 which is for use in forming a contact member arrangement for an electromechanical relay, is stamped and formed from a sheet or strip of conductive material such as phosphor bronze which is preferably plated with gold along a narrow band which will become the points of physical contact.

The first step is a stamping operation to produce a blank as shown in Figure 1, the blank including a top side strip 80, a bottom side strip 81, a left end strip 82 and a right end strip 83. Within the surrounding strips 80-83 are sixteen contact members 84, eight of which are integral with and project inwardly from the side strip 80, and the other eight of which are integral with and project inwardly from the side strip 81.

The sixteen contact members 84 are arranged in two sets each of which is the precursor of a double pole-double throw switch, two dampening arms, and two coil contact arms. One set is to the right and the other is to the left of a dashed line 104 shown in Figure 1. The two sets of contact members are identical, and thus only the right-hand set in Figure 1 will be described.

After stamping the blank 18 is formed into the channel shape shown in Figure 2 by bending the end strips 82 and 83 at two spaced locations and by bending the contact members 84 to provide contact arms 118 which extend across the base of the channel and are carried by the side strip 81.

The two outer contact arms 118 of each set are each formed into two branches, the outermost branches 114 being bent downwardly so as to be generally parallel to the sides of the channel. The innermost branches 116 remain extending across the base of the channel.

The two inner contact arms 118 of each set constitute movable contact or switch arms, and are the mirror image of each other. Near its inner end each of these contact arms 118 is formed into two fingers, the outermost finger 120 being offset and downwardly displaced from the contact arm 118 proper and serving as a normally open contact.

The innermost finger 122 is a continuation of the contact arm 118 proper, and serves as a normally closed contact 122.

Also projecting across the base of the channel are four fixed contact arms which extend from the side strip 80. The outermost arms form normally open fixed contacts 124, and the innermost arms form normally closed fixed contacts 126.

At the stage of manufacture shown in

Figure 2 the movable contacts 120 and 122 are not engageable with, but are spaced away from, the fixed contacts 124 and 126.

To overlay the contacts, a jogging or offset forming operation is performed on the end strips 82 and 83, a mid-section of each end strip being offset as shown in Figure 3 by forming bends 128 in the end strips 82 and 83. This operation reduces the distance between the side strips 80 and 81, and causes the fixed and movable contacts to overlay one another the required distance. The proper configuration is that shown where movable contact 120 underlies fixed contact 124, and movable contact 122 overlies fixed contact 126.

After the above described lead frame has been mounted in the housing of an electromechanical relay as required and such that the contact members 84 are secured in their relative positions as required, excess parts of the lead frame, i.e. the end strips 82 and 83 and portions of the side strips 80 and 81 between the contact members 84, are removed to electrically isolate the contact members 84 from each other as shown in Figure 4. As shown, portions of the side strips 80 and 81 are removed so as to leave a contact pin 106 at the end of each contact member 84 whereby the relay can be mounted in appropriately positioned holes in a printed circuit board (not shown), and such that the contact members 84 terminate in outwardly facing shoulders 110 which will in use serve to position the relay above the printed circuit board by engagement therewith.

WHAT WE CLAIM IS:—

1. A method of making an electrical lead frame, comprising stamping a lead frame blank from sheet metal stock to define a first plurality of contact members integral with and extending generally perpendicularly of a first side carrier strip and a second plurality of contact members integral with and extending generally perpendicularly of a second side carrier strip, the side carrier strips being integrally connected in spaced parallel relation by means of two spaced end carrier strips, the contact members being formed with contact arms at their mutually proximate ends; forming the blank into a channel configuration by bending the end strips at two spaced locations and by bending the contact members such that the contact arms and intermediate portions of the end strips extend across the base of the channel; and deforming the end strips so as to displace the side strips closer to each other and cause overlapping of at least two of the contact arms.

2. An electrical lead frame made by a method as claimed in Claim 1.

tact member arrangement formed from the blank of Figure 1.

The lead frame 18 which is for use in forming a contact member arrangement for an electromechanical relay, is stamped and formed from a sheet or strip of conductive material such as phosphor bronze which is preferably plated with gold along a narrow band which will become the points of physical contact.

The first step is a stamping operation to produce a blank as shown in Figure 1, the blank including a top side strip 80, a bottom side strip 81, a left end strip 82 and a right end strip 83. Within the surrounding strips 80-83 are sixteen contact members 84, eight of which are integral with and project inwardly from the side strip 80, and the other eight of which are integral with and project inwardly from the side strip 81.

The sixteen contact members 84 are arranged in two sets each of which is the precursor of a double pole-double throw switch, two dampening arms, and two coil contact arms. One set is to the right and the other is to the left of a dashed line 104 shown in Figure 1. The two sets of contact members are identical, and thus only the right-hand set in Figure 1 will be described.

After stamping the blank 18 is formed into the channel shape shown in Figure 2 by bending the end strips 82 and 83 at two spaced locations and by bending the contact members 84 to provide contact arms 118 which extend across the base of the channel and are carried by the side strip 81.

The two outer contact arms 118 of each set are each formed into two branches, the outermost branches 114 being bent downwardly so as to be generally parallel to the sides of the channel. The innermost branches 116 remain extending across the base of the channel.

The two inner contact arms 118 of each set constitute movable contact or switch arms, and are the mirror image of each other. Near its inner end each of these contact arms 118 is formed into two fingers, the outermost finger 120 being offset and downwardly displaced from the contact arm 118 proper and serving as a normally open contact.

The innermost finger 122 is a continuation of the contact arm 118 proper, and serves as a normally closed contact 122.

Also projecting across the base of the channel are four fixed contact arms which extend from the side strip 80. The outermost arms form normally open fixed contacts 124, and the innermost arms form normally closed fixed contacts 126.

At the stage of manufacture shown in

Figure 2 the movable contacts 120 and 122 are not engageable with, but are spaced away from, the fixed contacts 124 and 126.

To overlay the contacts, a jogging or offset forming operation is performed on the end strips 82 and 83, a mid-section of each end strip being offset as shown in Figure 3 by forming bends 128 in the end strips 82 and 83. This operation reduces the distance between the side strips 80 and 81, and causes the fixed and movable contacts to overlay one another the required distance. The proper configuration is that shown where movable contact 120 underlies fixed contact 124, and movable contact 122 overlies fixed contact 126.

After the above described lead frame has been mounted in the housing of an electromechanical relay as required and such that the contact members 84 are secured in their relative positions as required, excess parts of the lead frame, i.e. the end strips 82 and 83 and portions of the side strips 80 and 81 between the contact members 84, are removed to electrically isolate the contact members 84 from each other as shown in Figure 4. As shown, portions of the side strips 80 and 81 are removed so as to leave a contact pin 106 at the end of each contact member 84 whereby the relay can be mounted in appropriately positioned holes in a printed circuit board (not shown), and such that the contact members 84 terminate in outwardly facing shoulders 110 which will in use serve to position the relay above the printed circuit board by engagement therewith.

WHAT WE CLAIM IS:—

1. A method of making an electrical lead frame, comprising stamping a lead frame blank from sheet metal stock to define a first plurality of contact members integral with and extending generally perpendicularly of a first side carrier strip and a second plurality of contact members integral with and extending generally perpendicularly of a second side carrier strip, the side carrier strips being integrally connected in spaced parallel relation by means of two spaced end carrier strips, the contact members being formed with contact arms at their mutually proximate ends; forming the blank into a channel configuration by bending the end strips at two spaced locations and by bending the contact members such that the contact arms and intermediate portions of the end strips extend across the base of the channel; and deforming the end strips so as to displace the side strips closer to each other and cause overlapping of at least two of the contact arms.

2. An electrical lead frame made by a method as claimed in Claim 1.



(12)

3. A lead frame as claimed in Claim 2, in which each end strip is bent inwardly at both junctions of the intermediate portion with the remainder of the end strips.

5 4. A method of making an electrical lead frame, substantially as hereinbefore described with reference to Figures 1, 2 and 7 of the drawings.

10 5. An electrical lead frame substantially as hereinbefore described with reference to Figures 1, 2 and 3 of the drawings.

6. An electrical switch device including a

contact member arrangement formed from a lead frame as claimed in Claim 2, Claim 3 or Claim 5, by removing parts of the side 20 strips to form a pin portion at the end of each contact member and to isolate electrically from one another the contact members.

7. An electromechanical relay according to Claim 6.

For the Applicants:
R. G. STUART-PRINCE,
Chartered Patent Agent.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1977.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L M S *