

[72] Inventor **Robert A. Morrison**
La Canada, Calif.
 [21] Appl. No. **877,274**
 [22] Filed **Nov. 17, 1969**
 [45] Patented **Jan. 11, 1972**
 [73] Assignee **Aerojet-General Corporation**
El Monte, Calif.

2,964,587 12/1960 Minot..... 174/117
 3,166,370 1/1965 Parker..... 339/21 R

FOREIGN PATENTS

1,319,821 1/1963 France 174/117.6
 1,322,037 2/1963 France 339/17 F

Primary Examiner—Marvin A. Champion
Assistant Examiner—Terrell P. Lewis
Attorneys—Edward O. Ansell, Arthur Decker and D. Gordon Angus

[54] **ELECTRICAL CONNECTORS AND ATTACHMENTS**
 13 Claims, 9 Drawing Figs.

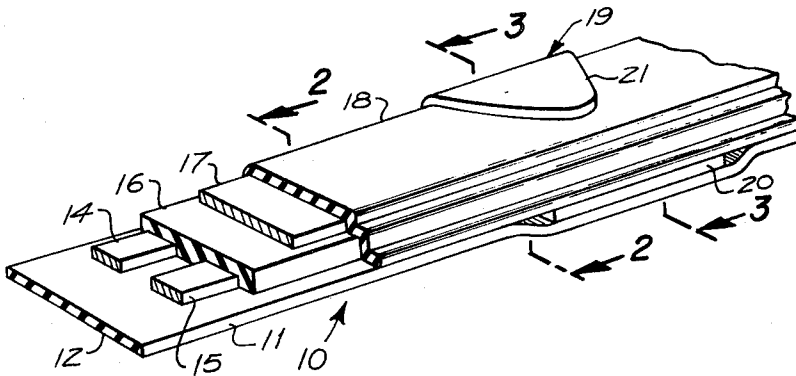
[52] U.S. Cl. **339/21 R,**
 174/117 F, 339/17 F

[51] Int. Cl. **H01r 9/00,**
H02g 3/00

[50] Field of Search..... 339/17, 18,
 19, 20, 21, 22, 176; 174/117, 70, 117.1-117.6,
 68.5; 317/101

[56] **References Cited**
UNITED STATES PATENTS
 2,437,579 3/1948 Wilson 339/21 R

ABSTRACT: A conductor tape according to this disclosure comprises a first insulator layer having an adhesive for attaching the insulator to a wall surface. Conductors are attached to the opposite surface of said first insulation layer, and a second insulation layer overlaps the conductors. A metallic layer, such as a steel ribbon, is disposed over the second insulation layer. Spacers may be provided at regular intervals along the length of the tape to separate the conductors from the first insulator layer so that a connector lip of an electrical attachment may be wedged between the first insulator layer and the conductors to make electrical contact with the conductors to supply the attachment with electrical energy.



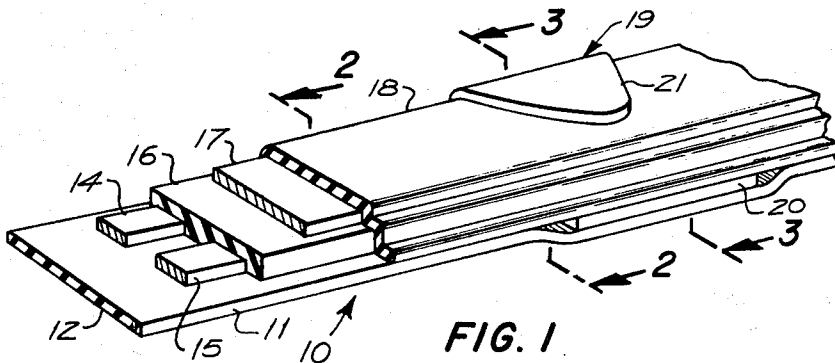


FIG. 1

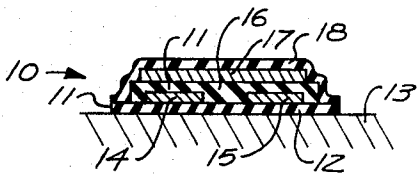


FIG. 2

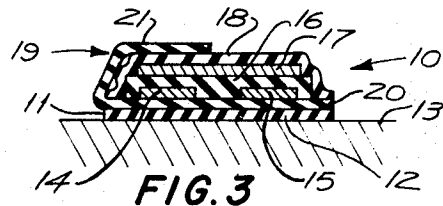


FIG. 3

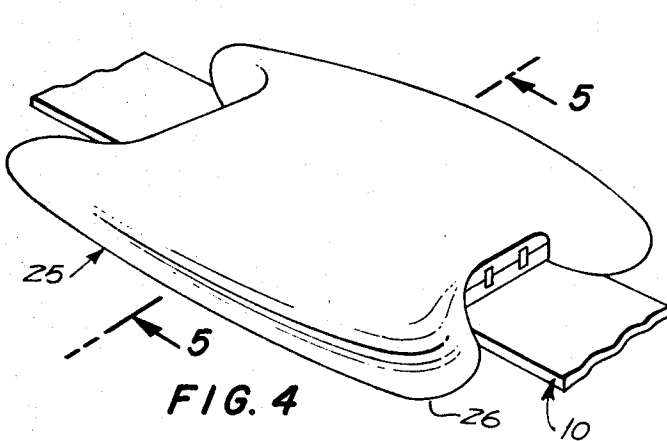


FIG. 4

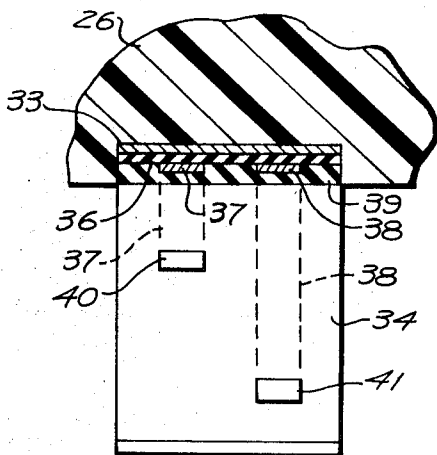


FIG. 6

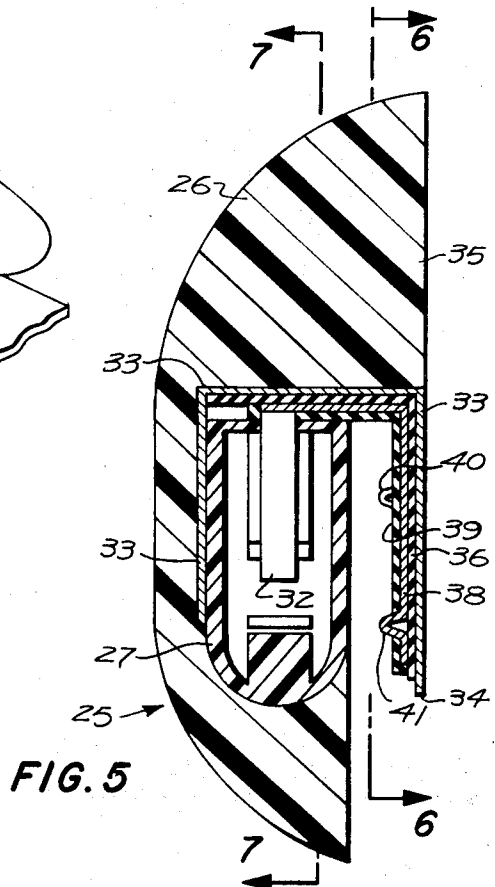


FIG. 5

INVENTOR.
ROBERT A. MORRISON

BY *J. Gordon Angus*
ATTORNEY

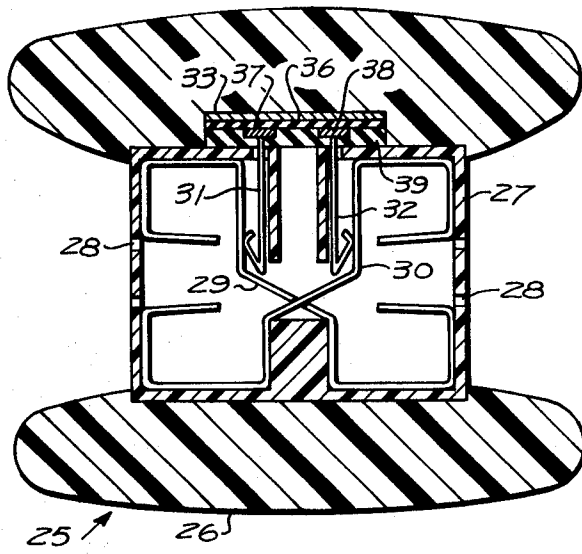


FIG. 7

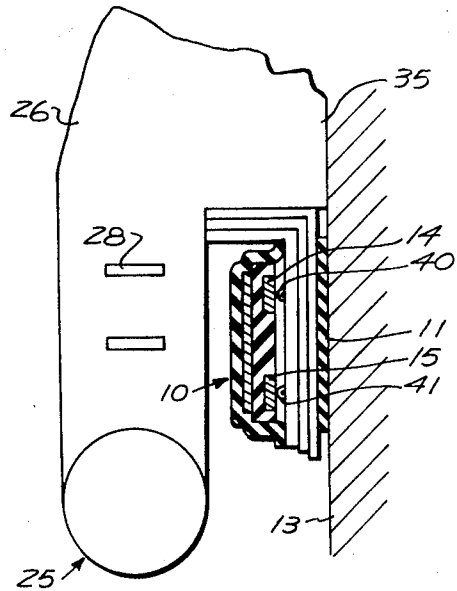


FIG. 8

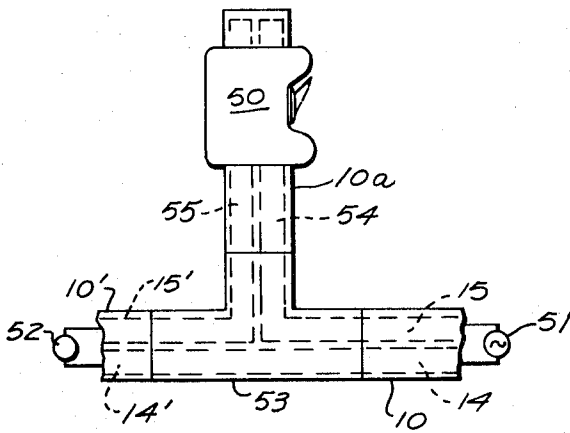


FIG. 9

INVENTOR,
ROBERT A. MORRISON
BY
D. Gordon Angus
ATTORNEY

ELECTRICAL CONNECTORS AND ATTACHMENTS

This invention relates to electrical conductors, and particularly to electrical conductors capable of being adhesively attached to a wall surface and to electrical appliances or attachments for connection to the conductors.

The present invention is particularly useful in connection with building modules and prefabricated walls for building construction wherein electrical conductors are to be attached to a surface of a wall rather than embodied within the wall.

It is an object of the present invention to provide an electrical conductor which may be attached to a wall surface and which does not protrude appreciably from such wall surface.

Another object of the present invention is to provide an electrical conductor which may be adhesively attached to a wall surface.

Another object of the present invention is to provide a conductor capable of being attached to a wall surface wherein electrical attachments may be readily attached to such conductor.

Another object of the present invention is to provide electrical connectors which may be readily attached to electrical conductors without permanent connection.

In accordance with the present invention, an electrical conductor is attached to a suitable insulator, such as a Mylar film having an adhesive attached to one side thereof for attachment to a wall surface. A metal strip is spaced from the electrical conductor by an insulator strip to provide a ground shield for the conductor, to protect the insulator layers from damage due to abrasion and to provide structural support for the assembly. The resulting assembly is in the form of an elongated tape having conductors supported thereon. The tape is capable of being adhesively attached to a wall surface.

In accordance with an optional and desirable feature of the present invention, insulative tabs are inserted between the conductor strips and the adhesive backed insulator strip at spaced intervals along the length of the tape. The tabs may be removed so that an electrical attachment may be connected to the conductors.

In accordance with another feature of the present invention, an electrical connector for attachment to the conductors includes a lip capable of being inserted into the region between the adhesive-backed insulation and the conductor strips of the tape. The lip is inserted into the region left by removing an insulator tab so that the connector makes electrical contact with the conductor strips.

The above and other features of this invention will be more fully understood from the following detailed description and the accompanying drawings, in which:

FIG. 1 is a perspective view in cutaway section of a tape having conductor strip in accordance with a presently preferred embodiment of the present invention;

FIGS. 2 and 3 are section views taken at lines 2-2 and and 3-3, respectively, in FIG. 1;

FIG. 4 is a perspective view of an electrical connector attached to the conductor illustrated in FIG. 1;

FIG. 5 is a section view of the connector taken at line 5-5 in FIG. 4;

FIG. 6 is a view of contacts for use in the connector illustrated in FIGS. 4 and 5 taken at line 6-6 in FIG. 5;

FIG. 7 is a section view taken at line 7-7 in FIG. 5;

FIG. 8 is a view showing a portion of an end view of the connector illustrated in FIGS. 4-7 attached to the tape illustrated in FIGS. 1-3, the tape being shown in section; and

FIG. 9 is a top view elevation of the tape in accordance with the present invention used in connection with a switch.

Referring to the drawings, and particularly of FIGS. 1 to 3, there is illustrated a pressure sensitive conductor tape 10 in accordance with the presently preferred embodiment of the present invention. Tape 10 comprises a layer 11 of insulator, such as polypropylene or Mylar film. Surface 12 of layer 11 carries a suitable pressure sensitive adhesive capable of bonding against surface 13 of a wall. Layer 11 carries elongated conductor strips 14 and 15 on the surface opposite surface 12 of layer 11. Bonded to layer 11 and containing strips 14 and

15 is insulator strip 16 which may likewise be constructed of suitable Mylar film or polypropylene. By way of example, strip 16 may be ultrasonically bonded to strip 12 to contain conductor strips 14 and 15. Metallic strip 17 is positioned over strip 16 opposite strip 11 for structural support of tape 10. Strip 17 may be grounded to provide a ground shield for the conductor tape. Also, strip 16 protects the conductors from damage due to abrasion or accidental abuse. Preferably, insulator strip 18 is positioned over strip 17 and is bonded to strips 16, 17 and 11. Like strips 16 and 11, insulator strip 18 may be constructed of suitable polypropylene or Mylar film and may be ultrasonically bonded to strips 16 and 11.

By way of example, the insulator material used for strips 11, 16 and 18 may be a suitable Mylar or polypropylene film having a resistivity of approximately 500,000 volts per inch. Preferably, film 11 has a thickness of about 0.002 inches so that the breakdown voltage between conductors 14 and 15 and the surface 13 of the wall is at least approximately 1,000 volts.

Each conductor 14 and 15 is preferably constructed of drawn copper having a thickness of approximately 0.001 inch and a width of approximately one-half inch to be equal to 16 gauge copper wire. The thickness of insulator layer 16 is approximately 0.001 inches above conductor strips 14 and 15 so that the breakdown voltage is at least 500 volts between each conductor and metal strip 17. Preferably, metal strip 17 is constructed of suitable steel ribbon having a thickness of approximately 0.002 inches, and insulator strip 18 covering the entire unit preferably has a thickness of about 0.002 inches. Conductors 14 and 15 are preferably spaced at least one-eighth inch apart so that the breakdown voltage between conductors is about 60,000 volts.

Spaced at regular intervals along the length of tape 10 are suitable insulator tabs 19 having a body 20 wedged between insulator strip 11 and conductor strips 14 and 15. Tabs 19 carry suitable tab handles 21 on the outer portion of tape 10 which enable a person to grasp and remove tab body 20 from the region between insulator layer 11 and conductor strips 14 and 15. For purposes to be more fully understood hereinafter, it is preferred that the thickness of tab 19 be relatively thick compared to the other films, a thickness of approximately 0.012 inches being typical. The tab is preferably approximately 1/4 inches wide.

The overall width of the conductor tape may be in the vicinity of 2 1/2 to 3 inches wide, depending upon the number of conductor strips and desired edge taper or chamfer. It is to be understood that although two conductor strips are illustrated, the invention is likewise useful for three or even four conductor strips for carrying polyphase alternating current. Conductor strips according to this invention may be used for non-power applications such as conductors for speaker connections for high-fidelity equipment, as well as other communication purposes. Since the tape is ordinarily less than 0.010 inches thick (except at the locations of tabs 19 where it is about 0.020 inches thick), the tape is flexible and capable of being bent through relatively sharp angles in a plane normal to the plane of the tape.

FIGS. 4 through 7 illustrate an electrical connector or attachment 25 adapted to be connected to the conductor tape 10, and FIG. 8 illustrates such connector attached to the tape. Appliance 25 comprises a housing 26 which is designed in a manner which is aesthetically pleasing to the interior decor of the wall to which it is to be attached. Housing 26 carries an internal housing 27 which contains the electrical connector and the associated circuitry. In FIGS. 4-8, electrical connector 25 is illustrated as an electrical outlet into which electrical equipment may be attached by means of standard wall plugs well known to those skilled in the art. In the case of an electrical outlet, housing 27 includes suitable apertures 28 adapted to receive the prongs or male conductors of a wall plug (not shown). Conductor strips 29 and 30 are supported by housing 27 adjacent apertures 28 for carrying electrical power to the region of apertures 28 so that when the prongs of a wall plug

(not shown) are inserted in apertures 28, they will make contact with conductors 29 and 30. Conductors 29 and 30 are connected to spring-loaded conductors 31, and 32, respectively.

Bracket 33, which may for example, be constructed of bronze, is supported by housing 26 and is fastened between housings 26 and 27. Lip 34 of bracket 33 extends downwardly at the rear of housing 26 to continue the rear surfaces 35 of housing 26. Insulator film 36 is bonded to one surface of bracket 33, and conductor strips 37 and 38 may be encapsulated in another insulator strip 39 in such a manner that contacts 40 and 41 protrude outwardly from the film. Preferably bracket 33 and lip 34 have a thickness of about 0.020 inch, conductors 37 and 38 have a thickness of about 0.011 inch, and films 36 and 39 each have a thickness of about 0.003 inch. Hence, the total thickness of the depending portion of appliance 25 is about 0.037 inch.

To connect an appliance, such as the outlet illustrated in FIGS. 4 through 8 to tape 10, tab insert 19 is removed from the position illustrated in FIGS. 1 and 3, and lip 34 of connector 25, together with the insulator and conductors attached thereto is inserted into the region left by the removed tab. Body 26 of the electrical connector is pushed downwardly until the upper portion of tape 10 contacts the uppermost portion of the inside of the lip. When in this position, contacts 40 and 41 of the appliance are positioned to make electrical contact with conductor strips 14 and 15, respectively, of tape 10. Thereafter, electrical equipment may be attached to connector 25 by means of an ordinary wall plug to deliver electrical power to such equipment. Since the thickness of the depending contact portion of connector 25 is about three times thicker than the space left by the removal of tab 19, the contact portion is wedged between conductors 14 and 15 and insulator strip 11 to assure proper electrical contact.

It is to be understood that appliance 25 may be other suitable types of electrical devices which are ordinarily permanently attached into an electrical power system of a structure. For example, and as shown in FIG. 9, attachment 26 may be a suitable switch 50 attached to tape 10a with the same type of contacts as illustrated in FIGS. 6 and 7. Switch 50 is capable of making and breaking electrical connection from a power source 51 to an electrical device 52. A tee splice 53 may be inserted between tapes 10, 10a and 10b to make connection between 54 and 55 which connected to conductors 15 and 15' of tape 10, 10'.

Although the present invention has been described in connection with conductor strips being attached to a wall surface, it is to be understood that tape 10 may be attached to other objects, such as desks, chairs and tables. Furthermore, it is to be understood that the conductor strips in accordance with the present invention may be utilized for carrying electrical communications or signals and the use of the conductor strips is not limited to conduction of electrical power or to two conductor tapes as described herein. Furthermore, the steel strip 17 may be connected to electrical ground and serve as a source of ground if desired.

The small thickness (about 0.008 inches) of the conductor-bearing tape in accordance with the present invention makes the tape particularly inconspicuous when used on a wall surface or other device. Hence, a tape according to this invention may be used on a wall surface which may later be painted to hide the tape or render it inconspicuous.

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation.

What is claimed is:

1. An elongated electrical conductor comprising a first elongated insulator layer; adhesive means on one surface of said first insulator layer for adhering said first insulator layer to a surface; elongated electrical conductor means on a surface of said first insulator layer opposite said one surface; a second elongated insulator layer overlapping said conductor means; and an elongated metallic layer attached to said second insulator layer opposite said conductor means.

2. Apparatus according to claim 1 further including removable spacer means between said conductor means and said first insulator layer and disposed at intervals along the length of said conductor for separating said conductor means from said first insulator layer, said second insulator layer disposed along substantially the entire length of said conductor except in the vicinity of said spacer means.

3. Apparatus according to claim 2 further including third insulator means overlapping said metallic layer and attached to said second insulator layer.

4. Apparatus according to claim 2 wherein said metallic layer has a thickness of about 0.002 inch.

5. Apparatus according to claim 2 wherein said conductor means comprises a plurality of electrical conductor strips each having a thickness of about 0.001 inch, and said first and second insulator layers each have a thickness of about 0.002 inch.

6. Apparatus according to claim 5 wherein said spacer means is constructed of electrically insulative material and has thickness of about 0.012 inch.

7. An elongated electrical conductor comprising a first elongated insulator layer; adhesive means on one surface of said first insulator layer for adhering said first insulator layer to a surface; a plurality of elongated electrical conductor strips on a surface of said first insulator layer opposite said one surface; a second elongated insulator layer overlapping said conductor strips; an elongated metallic layer attached to said second insulator layer opposite said conductor strips; removable spacer means, constructed of electrically insulative material, between said conductor strips and said first insulator layer and disposed at intervals along the length of said conductor for separating said conductor strips from said first insulator means, said second insulator means along substantially the entire length of said conductor except in the vicinity of said spacer means; an electrical device connected to said conductor, said device having a housing, contact means supported by said housing having a lip sandwiched between said conductor strips and said first insulator layer, second conductor means supported by said lip extending into said housing, said second conductor means being so disposed and arranged relative to said plurality of conductor strips as to selectively make electrical contact with selected strips; and circuit means in said housing connected to said second conductor means.

8. Apparatus according to claim 7 wherein said lip has a thickness of about 0.037 inches, whereby said lip is wedged between said conductor strips and said first insulator layer thereby attaching said device to said conductor.

9. An elongated electrical conductor comprising a first elongated insulator layer; adhesive means on one surface of said first insulator layer for adhering said first insulator layer to a surface; elongated electrical conductor means on a surface of said first insulator layer opposite said one surface; a second elongated insulator layer overlapping said conductor means; an elongated metallic layer attached to said second insulator layer opposite said conductor means; an electrical device connected to said conductor, said device having a housing, contact means supported by said housing having a lip sandwiched between the first-named conductor means and said first insulator layer; second conductor means supported by said lip extending into said housing, said second conductor means being so disposed and arranged relative to said first conductor means as to selectively make electrical contact with said first conductor means; and circuit means in said housing connected to said second conductor means.

10. Apparatus according to claim 9 wherein said lip has a thickness of about three times the spacing between said first conductor means and said first insulator layer whereby said lip is wedged between said first insulator layer and said first conductor means thereby attaching said device to said conductor.

11. An electrical device adapted to be connected to an electrical conductor having a plurality of conductor strips supported by an insulator strip, said device having a housing; contact means supported by said housing having a substantially flat lip adapted to be sandwiched between said conductor

5

strips and said insulator strip; a plurality of conductor means supported by said lip, said conductor means being in a plane substantially parallel to said lip and so disposed and arranged relative to said conductor strips as to selectively make electrical contact with selected conductor strips when said lip is sandwiched between said conductor strips and said insulator strip; and circuit means in said housing connected to said conductor means.

- 12. An electrical conductor and fitting means comprising:
 - a first elongated insulator layer having adhesive means on one surface thereof for adhering said first insulator layer to a surface;
 - a plurality of elongated electrical conductor strips on the surface of said first insulator layer opposite said one surface;
 - a second elongated insulator layer overlapping said conductor strips;
 - an elongated metallic layer in juxtaposition with said second insulator layer opposite said conductor strips;

5

10

15

20

25

30

35

40

45

50

55

60

65

70

75

6

- a housing;
- electrical contact means supported by said housing having a substantially flat lip adapted to be sandwiched between said conductor strips and said first insulator layer;
- a plurality of conductor means supported by said lip, said conductor means being in a plane substantially parallel to said lip and so disposed and arranged as to selectively make electrical contact with selected conductor strips when said lip is sandwiched between said conductor strip and said first insulator layer; and
- circuit means in said housing connected to said conductor means.

- 13. Apparatus according to claim 12 wherein said lip has a thickness about three times the spacing between said conductor strips and said first insulator layer whereby said lip may be wedged between said first insulator layer and said conductor strips.

* * * * *