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Fuller et al.

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[45] **Oct. 15, 1974**

[54] **PIN-TERMINAL CARRIER STRIP**

[75] Inventors: **Ross Fuller,** Bucks County; **Kenneth Munshower,** Montgomery County; **William E. Lightkep,** Bucks County, all of Pa.

[73] Assignee: **Elco Corporation,** Willow Grove, Pa.

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[52] **U.S. Cl.** **206/329,** 198/131, 206/485

[51] **Int. Cl.** **B65d 73/02,** B65g 15/40

[58] **Field of Search** ..... 206/65 F, 329, 485; 198/131

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Primary Examiner—Leonard Summer

Attorney, Agent, or Firm—D. R. Pressman; Alan L. Newman

[57] **ABSTRACT**

A carrier strip for pin terminals comprises an elongated channel member of flexible material, such as a polyester, having a U-shaped cross section. The sides of the channel contain aligned carrier slots, each with a seating portion, for holding terminal pins in an orthogonal relation to the strip. Relief slots are provided intermediate the carrier slots and indexing holes are provided in the middle section of the U. The strip is an economical, versatile carrier from which pins can be removed in either an axial or a transverse direction by automated means.

4 Claims, 6 Drawing Figures

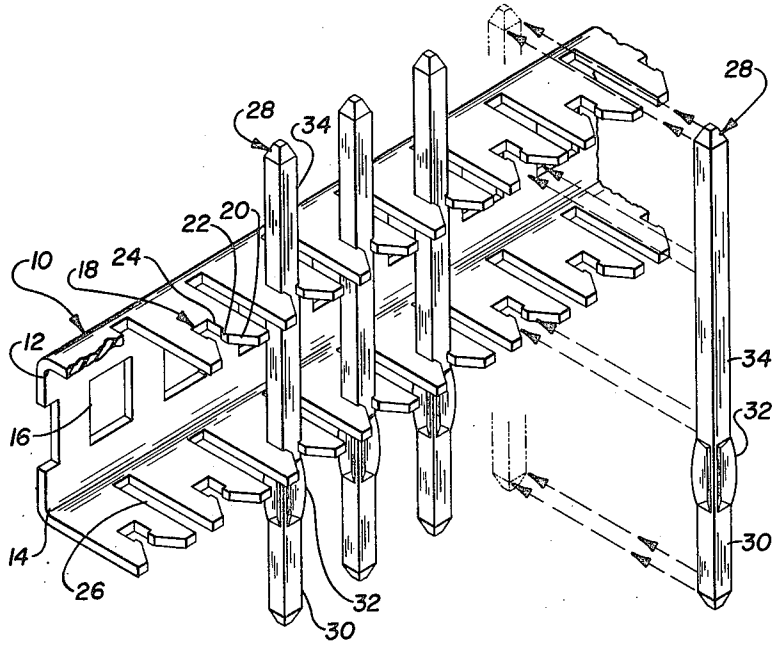
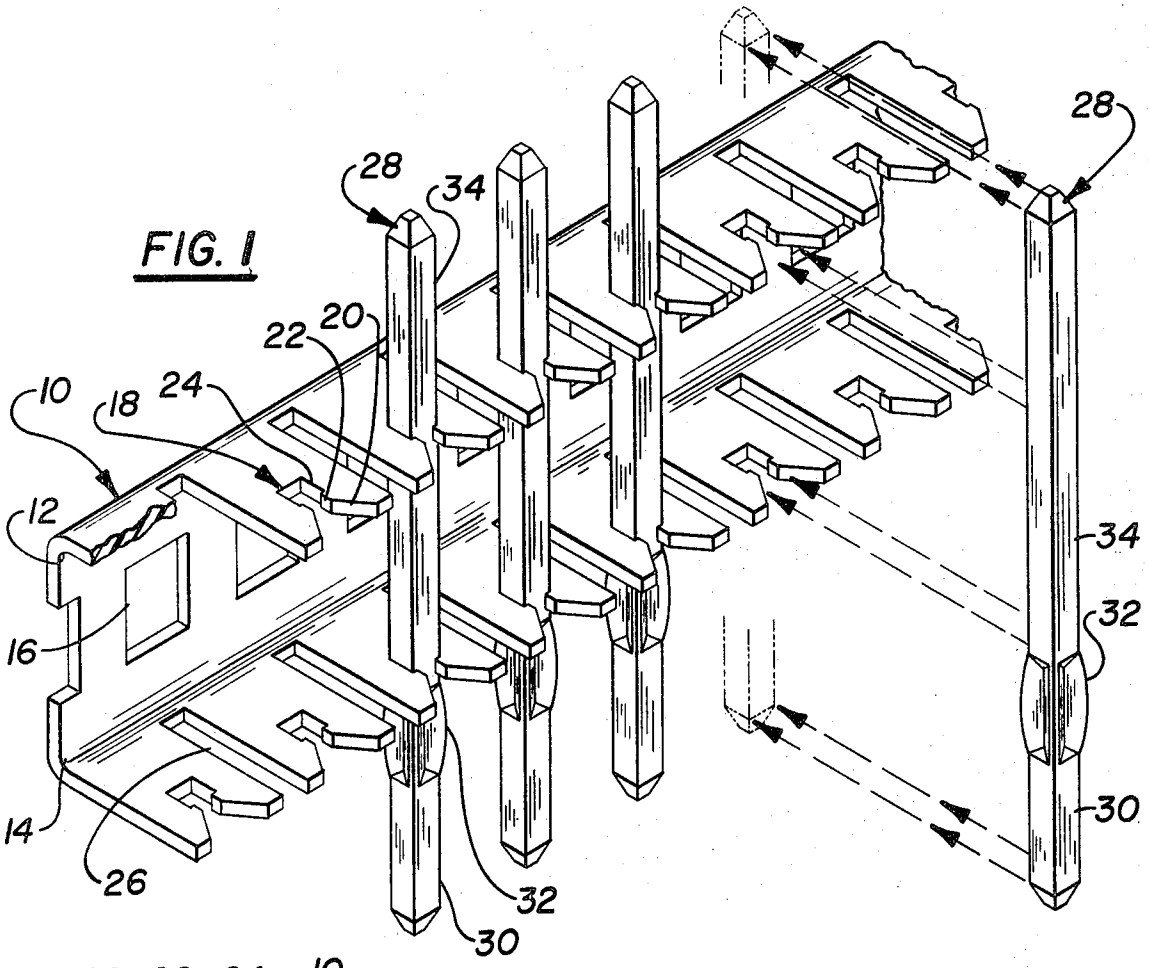


FIG. 1



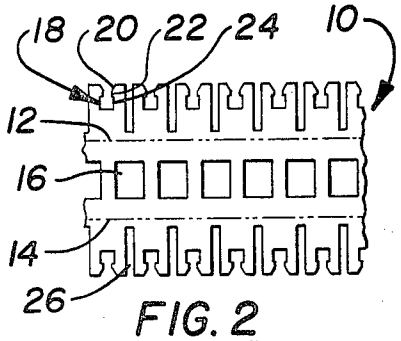


FIG. 2

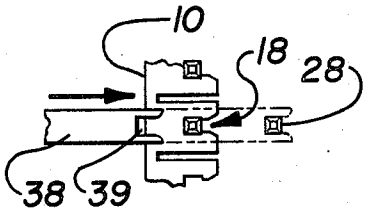


FIG. 4

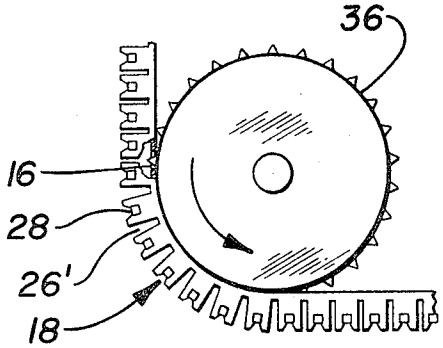


FIG. 3

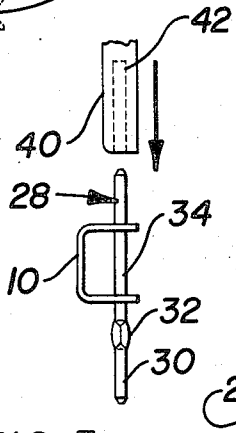


FIG. 5A

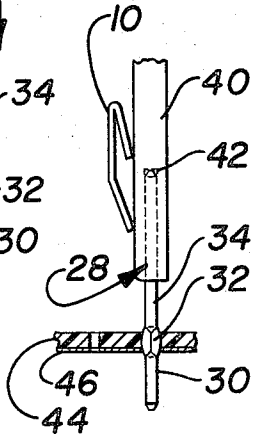


FIG. 5B

PIN-TERMINAL CARRIER STRIP

BACKGROUND: FIELD OF INVENTION

This invention relates to the electronic packaging art and particularly to the art of packaging and carrying male pin terminals for handling by automated means. The invention comprises a flexible carrier strip for facilitating the handling and installation of such pins.

BACKGROUND: DESCRIPTION OF PRIOR ART

In the electronic packaging and connecting art it is often necessary to install a plurality of objects, such as pin terminals, on a substrate, such as a printed circuit board. Such terminals can be installed manually and individually, but it is obvious that in a mass-production operation where many thousands or tens of thousands of pins must be installed, manual and individual installation means have severe drawbacks.

Automated means are also available for installation of terminal pins. In such automated means, a large number of pins are randomly placed in a vibrating bowl hopper designed to feed the pins upwardly along a spiral ramp on the inside of the bowl. The end of the ramp at the rim of the bowl contains means for feeding any pins which arrive with the wrong orientation back into the bowl, whereby only those pins with the desired orientation are allowed to leave the bowl. The exiting, correctly-oriented pins are now grasped by complex mechanical fingers and other handling means and are inserted by press-fit into holes in a printed circuit board.

As will be recognized by those skilled in the art, such automated handling means have major drawbacks. The speed of operation of such machines is limited by the rate at which correctly-oriented pins can be feed out of the bowl. The means for handling the pins once they are fed out of the bowl is awkward, expensive, unreliable, and therefore also limited in speed by virtue of the foregoing drawbacks.

Carrier strips for pin terminals and other types of contacts also exist but these have heretofore had major drawbacks. Some required heat for contact removal, some were not flexible enough to be transported through automated means, some required complex mechanical means for contact removal, some did not allow contact removal in a plurality of directions, and others were to costly to be disposable.

The present invention overcomes the foregoing drawbacks and provides a novel carrier strip for holding and facilitating the handling of terminal pins. Therefore several objects of the present invention are to provide a novel, economical, reliable, simple, and versatile carrier of terminal pins or other discrete parts. Further objects and advantages will become apparent from a consideration of the ensuing description thereof.

DRAWINGS

FIG. 1 is an isometric view of a carrier strip according to the invention, including several pin terminals.

FIG. 2 is a top view of a blank for said strip.

FIG. 3 is a top view of said strip and a carrier sprocket wheel therefor.

FIG. 4 is a top view of said strip illustrating a lateral pin removal operation.

FIG. 5 (A & B) is a side view of said strip illustrating vertical pin removal and mounting operations.

DESCRIPTION & OPERATION

A carrier strip **10** according to the invention, shown in isometric view in FIG. **1** and in blank form in FIG. **2**, comprises a member of sheet material which has been folded along two bend lines **12** and **14** to have a U or channel shape. Member **10** is preferably formed of a shape-retaining, yet yieldable and bendable material, such as the polyester sold under the trademark Mylar.

The center portion of the channel is relatively flat and has a plurality of evenly-spaced, rectangular indexing holes such as **16** which are preferably oriented to have their major axis normal to the orientation of the major axis of the strip.

Each side portion of the strip, also flat, contains a plurality of carrier slots such as **18**, each of which contains a flared portion **20** whose taper opens toward the edge of strip **10**, a neck portion **22** adjacent flared portion **20**, and a widened contact holding portion **24**. Between each pair of carrier slots is a relief slot such as **26** which extends from the edge of strip **10** substantially to the center portion thereof. The carrier and relief slots on each side of the strip are aligned.

The strip is designed to hold, in each pair of aligned carrier slots, a terminal pin such as **28**, which is of a type well-known in the art. Each pin comprises an elongated member having a "tail" portion **30**, a widened body portion **32** formed by upsetting, and a contact portion **34**. Both ends of pin **28** are tapered to facilitate insertion. Pin **28**, when mounted on a printed circuit board or other substrate, is designed to advantageously mate with the box-type receptacle shown in the copending U.S. application of R. H. Matthews, Ser. No. 224,549, filed 8 Feb. 1972, now U.S. Pat. No. 3,711,819, granted Jan. 16, 1973.

Contact strip **10** may be fabricated from an endless polyester strip 10 mils thick and seven-sixteenth inch wide by stamping such strip according to the configuration of FIG. **2** and thereafter, used a heated die, folding the strip to the U shape of FIG. **1**. Carrier pins **28** may be inserted laterally in the direction indicated in FIG. **1** by automated means comprising a vibrating hopper which feeds the pins in a predetermined orientation into slots of a rotating drum. The drum rotates over a moving strip and forces the pins into their slots as indicated at the righthand side of FIG. **1**. Flared portion **20** facilitates such insertion. Each pin snaps past neck portion **22** of its slot and seats in an aligned pair of contact holding portions **24**. Alternatively the pins can be inserted in an axial direction if the strip **10** is rigidly mounted.

The above operations are advantageously done at a factory such that pin-loaded carrier strips several hundred or thousand feet long may be sold in coiled form to users thereof.

FIG. **3** indicates the manner in which a loaded carrier strip may be handled by automated means. A sprocket wheel **36** having sprockets spaced according to indexing holes **16** of the strip may convey the strip around bends or may actually drive the strip. Since relief slots **26** of the strip extend substantially to the center portion thereof, these slots can open wide as indicated at **26'** when the strip goes around a bend; this allows carrier slots **18**, which do not extend to the center portion and

hence cannot open when the strip is bent, to retain pins **28.**

FIG. **4** indicates the lateral removal of a pin. Assuming the carrier strip is properly indexed and transported in continuous steps, each pin-loaded carrier slot **18** will arrive in proper position at a removal station. A removal means **38** comprises upper and lower arms (only upper arm illustrated) which moves to the right when a pin arrives and pauses at the removal station. The upper and lower arms proceed under the strip, respectively, so that the slot **39** thereof embraces the contact and pushes it out of its upper and lower carrier slots. Thereafter other automated means may install contact **28** in any desired manner.

The preferred direction of pin removal, however, is axial as illustrated in FIG. **5** (A & B). When the strip reaches it removal station, a removal member **40** (FIG. 5A) having a recess **42** proceeds downward such that recess **42** embraces upper end **34** of contact **28.**

Thereafter, as illustrated in FIG. **5B**, post **40** continues its downward movement, pushing pin **28** out of the carrier strip and preferably inserting it directly into a hole in a printed circuit board **44** as illustrated. Since strip **10** is made of yieldable material, the outer portions thereof can be pushed downwardly by post **40** as illustrated. The axial removal method thus can be used to remove and install a pin in one stroke.

The hole in board **44** into which pin **28** is inserted preferably is circular and has a slightly smaller diameter than the diagonal dimension of pin **28.** Thus the pin can be inserted and retained in its hole in board **44** by press (force) fit. However, retention of the pin in its mounting hole is enhanced because the dimension of body portion **32** is greater than the diagonal dimension of the non-upset portions of pin **28.** The length of the stroke of post **40** should be such that upset portion **32** of pin **28** is centered in board **44** as the stroke is completed. Thereafter extending tail portion **30** of pin **28** on the underside of board **44** may be soldered to a conductor **46** on the board in conventional fashion.

While the above description contains many specifities, these should not be construed as limitations upon the scope of the invention but merely as an exemplification of one preferred embodiment thereof. The true scope of the invention is indicated by the subject matter of the appended claims an their legal equivalents.

We claim:

1. An elongated carrier strip for carrying pin members to facilitate the handling thereof by automatic equipment comprising:

an elongated unitary U-shaped channel member formed from shape-retaining yieldable material;

said U-shaped channel member having a center portion and parallel side portions extending from opposite edges of said center portion;

a plurality of aligned carrier means spaced longitudinally along said side portions for releasably, firmly, holding pin members at axially spaced points transverse to the longitudinal axis of said channel member, each of said carrier means comprising a slot extending inwardly from an outer edge of said side portion, said slot including a seating portion and a narrow neck portion, and;

aligned relief means formed in said side portions between each of said carrier means for isolating each aligned pair of said carrier means from adjacent carrier means to prevent said carrier means from losing hold of a pin member held therein due to bending of said channel member or removal of pins carried in adjacent carrier means, each of said relief means comprising a slot extending from an outer edge of said side portion substantially to said center portion.

2. The carrier strip of claim **1** further including indexing holes spaced along said center portion.

3. A pin terminal carrier strip comprising an elongated strip of elastically flexible material folded to form a U-shaped channel member having parallel extending side portions each of said side portions having carrier slots alternately disposed with relief slots, each of said carrier slots includes a seating portion adapted to receive and releasably firmly hold a pin terminal and a narrow neck portion extending from said seating portion to a flared portion adjacent the free edge of said side portion and opening thereof, each of said relief means comprising a slot extending from an outer edge of said side portion substantially to said center portion, said carrier slots and said relief slots in said sides being aligned to form pairs of carrier strips alternately disposed with pairs of relief slots, the aligned pairs of relief slots on both sides of each pair of aligned carrier slots cooperating to isolate that pair of aligned carrier slots from the remainder of said carrier strip.

4. The pin terminal carrier strip of claim **3** wherein said channel member further includes indexing holes.

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