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Continuation-in-part of application Ser. No.
665,635, Sept. 5, 1967, now Patent No.
3,497,948, dated Mar. 3, 1970, and a
continuation-in-part of 785,209, Dec. 19,
1968.

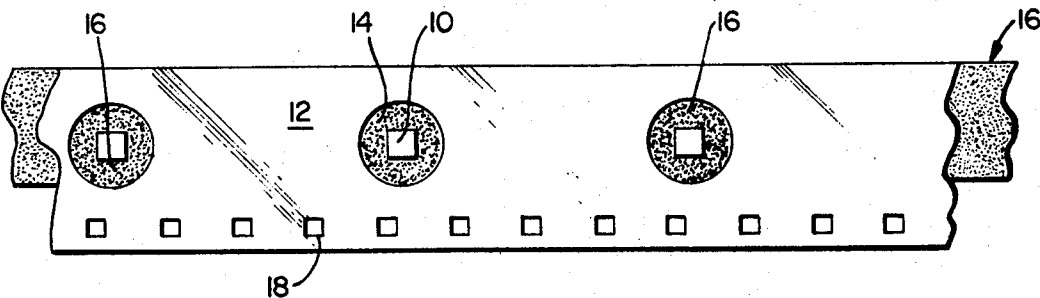
[50] Field of Search..... 206/65, 65
F, 56 A, 46 H, 1, 80; 40/2

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[54] PACKAGE FOR ELECTRONIC DEVICES AND THE
LIKE
11 Claims, 5 Drawing Figs.
[52] U.S. Cl..... 206/56 A
[51] Int. Cl..... B65d 85/30,
B65d 73/02

ABSTRACT: Small, fragile products such as transistors, diodes and integrated-circuit dice are packaged on a tape which may be indexed through various production stages. The tape is formed with spaced apertures closed on one side by means of a pressure-sensitive adhesive wall bonded to one side of the tape. Devices are dropped onto the wall and adhere thereto. Sprocket holes are formed along the marginal edge of the tape for engagement with an indexing drive mechanism.



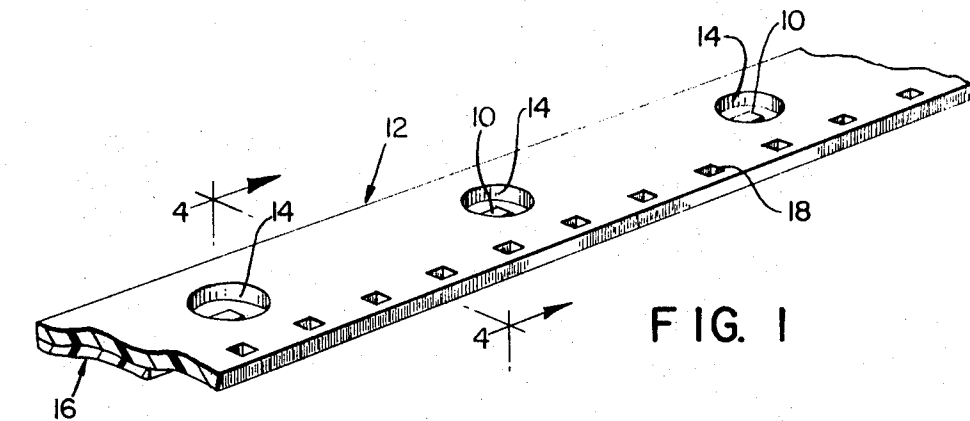


FIG. 1

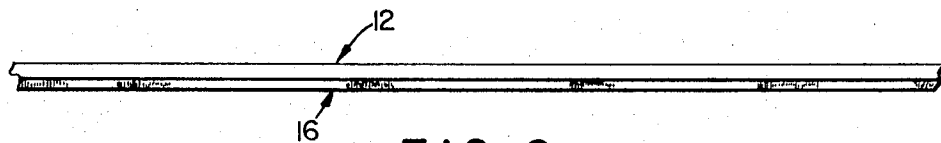


FIG. 2

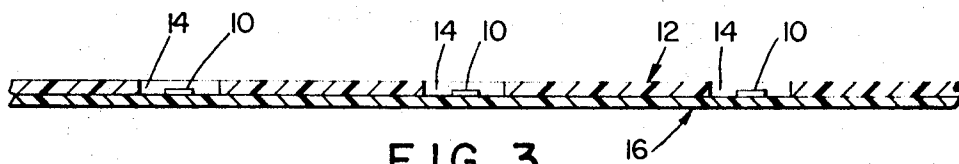


FIG. 3

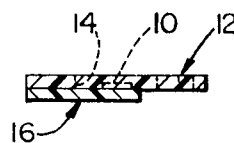


FIG. 4

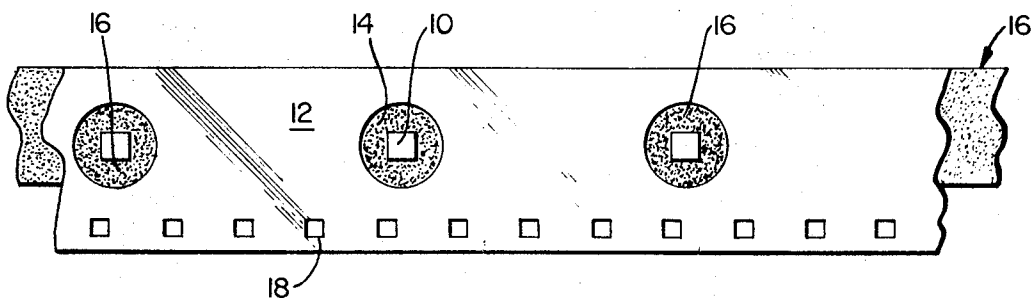


FIG. 5

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PACKAGE FOR ELECTRONIC DEVICES AND THE LIKE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. application Ser. No. 665,635 filed Sept. 5, 1967 entitled "Method & Apparatus for Sorting Semiconductor Devices," now U.S. Pat. No. 3,497,948 dated Mar. 3, 1970 and of U.S. application Ser. No. 785,209 filed Dec. 19, 1968 entitled "Die Sorting System," both applications being commonly assigned to the assignee of the present application.

Background of the Invention

1. Field of the Invention

This invention relates generally to the packaging of small, fragile products such as electronic devices and more particularly is directed towards a new and improved package for use in the testing, sorting and packaging of individual semiconductive dice formed from monolithic wafers.

2. History of the Prior Art

In the production of semiconductive devices, particularly integrated circuits, there has been a need for a simple and efficient packaging system. Integrated-circuit dice are extremely small, light and fragile and heretofore have presented problems in handling and packaging by reason of their physical characteristics. It is an object of the present invention to provide a packaging system for small, fragile products and particularly semiconductor dice wherein the dice may be individually packaged for convenient storage and handling or for transfer operations from stage to stage in an assembly process.

Summary of the Invention

This invention features a package for fragile devices such as semiconductive dice and is comprised of a flexible strip of material of a thickness exceeding that of the device to be packaged and formed with longitudinally spaced openings, closed on one side by means of a pressure sensitive wall on which the device is deposited and held. Sprocket holes are provided for indexing the tape through a feed mechanism. The tape may be rolled up for storage or shipment without damage to the parts.

Detailed Description of the Drawings

FIG. 1 is a fragmentary view in perspective showing a section of packaging tape made according to the invention, FIG. 2 is a view in side elevation thereof, FIG. 3 is a sectional view in side elevation thereof, FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 1, and, FIG. 5 is a top plan view thereof.

Detailed Description of the preferred Embodiment

Referring now to the drawings the reference character 10 generally indicates a small fragile product such as an integrated circuit die packaged by a tape 12 for storage, shipment or transfer through processing and assembling stations. The tape 12 is characterized by a plurality of openings 14 evenly spaced along the length of the tape 12 and each of a size sufficient to receive a device 10. Applied to the rear or bottom face of the tape 12 is a stratum 16 of pressure-sensitive adhesive which closes one side of the openings 14 to form a pocket for the part 10. The adhesive serves not only to bond the stratum 16 to the bottom face of the tape but also serves as a mounting means for holding the part 10 in position once deposited in the pocket.

Formed along one marginal edge of the tape 12 are sprocket holes 18 for engaging a driving sprocket wheel in an indexing mechanism by which the tape is advanced longitudinally through various assembly stations.

In practice, the tape 12 is of a thickness at least equal to and preferably greater than the thickness of the part 10 which is packaged. As best shown in FIG. 3 this feature will provide

clearance between the top of the part 10 and the upper surface of the tape. Thus the top surface of the part 10 will be protected against abrasion or the like should the tape be wound up into a roll insofar as the top will not contact a facing convolution of the rolled tape, it is also desirable that the opening 14 be somewhat larger than the lateral dimensions of the part 10, not only to permit receiving a wide range in sizes of parts, but also to provide clearance for transfer mechanisms and the like employed to deposit parts in the pockets and remove the same therefrom.

While various materials including metal may be employed for the tape 12 a polyester such as sold under the trademark MYLAR has been found to be particularly satisfactory since it provides longitudinal stability, provides protection against crushing, distortion and the like and is easy to handle, particularly with respect to threading the tape to an indexing mechanism.

The stratum 16 preferably is quite thin and its adhesive layer should have low tack characteristics sufficient to hold the part in position during handling yet permit a clean, easy release of the part when required. A polyvinyl chloride stratum 16 of perhaps 1.5 mils thickness and an adhesive stratum of low tack characteristics also 1.5 mils thickness may be employed to advantage. Typically the die 10 will range in size from 4 to 6 mils in thickness and perhaps 15 mils square to 40×60 mils.

The tape 12 should therefore exceed the 6 mils thickness of the part and may be on the order of 10 mils or so, for example.

The openings 14 may be circular as shown or may be of other configurations such as square, for example. The pressure-sensitive stratum 16 preferably is narrower in width than the tape 12 to leave the sprocket hole margin of the tape clear for free access to the sprocket holes.

Some pressure-sensitive adhesives lose most of their tackiness at low temperatures although a small release force may still be required. While cold release is not necessary it may be found useful in certain applications, Adhesives of this nature must exhibit a marked change in viscosity with temperature. In this way a soft tacky material can be frozen into a hard brittle one. Certain combinations of polymers and tackifier resins are well suited for the formation of these adhesives.

The polymers must be thermoplastic; that is they must soften when heated and harden when cool. The ethylene vinyl acetate copolymer such as Dupont Elfax resins are thermoplastic materials which are quite suitable for this particular application. The tackifier resins also must be thermoplastic. It has been found that the combination of two resin derivatives, namely Staybilite, Ester 3 and Staybilite Ester 10 works well, these products being made by Hercules Powder Co. Optimum formulation has been found to be 30 parts by weight of Elfax 150, 10 parts by weight of Staybilite Ester 3, and 60 parts by weight of Staybilite Ester 10.

The ingredients are first blended in a molten state at 300° F. and then dissolved in a toluene for coating on the tape. A 30 percent solution is used for coating and an adhesive film between 0.75 and 1.0 mils works well.

Numerous modifications may be made to the invention. For example, sprocket drive holes can be provided along both margins of the tape and multiple rows of pockets for the parts 10 may be provided. Also, while a top cover is not necessary it may be found useful to apply a pressure-sensitive adhesive ply to the top of the tape once the parts have been deposited in their respective pockets, the cover tape, of course, having to be removed prior to removal of the part. Further, in place of through holes closed by the adhesive ply to form pockets, the tape may be formed with spaced depressions and a patch of adhesive deposited at bottom thereof.

Having thus described the invention what I claim and desire to obtain by Letters Pat. of the U.S. is:

1. A package for fragile objects such as integrated circuit dice and the like, comprising:

a. a longitudinally flexible elongated tape formed with a plurality of spaced pockets in one face thereof, each said

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pocket defining an opening larger than the lateral dimension of each said fragile object, each said pocket having a depth at least equal to the thickness of each said fragile object; and

- b. an adhesive stratum disposed in each said pocket for mounting said fragile object depositing therein, each said fragile object secured within each said respectively, by said adhesive stratum.

2. A package according to claim 1 wherein said stratum is pressure sensitive.

3. A package according to claim 1 wherein said tape is formed with sprocket holes spaced lengthwise along said tape.

4. A package according to claim 1 wherein said tape is formed with openings spaced along said tape and a stratum of pressure sensitive adhesive tape is mounted along one face of the tape to close one side of said opening to form said pockets.

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5. A package according to claim 1 wherein said tape is plastic.

6. A package according to claim 1 wherein said tape is metal.

7. A package according to claim 5 wherein said plastic is polyester.

8. A package according to claim 6 wherein said metal is stainless steel.

9. A package according to claim 1 including a removable stratum applied to said tape over the pocket openings.

10. A package according to claim 2 wherein said stratum is of a low tack characteristic.

11. A package according to claim 1 wherein the depth of said pockets is greater than the thickness of said objects.

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