

are then secured to the carrier **170** by the tape **510**, as is best shown in FIG. **5d**. This process utilizes a mechanism which places light pressure to secure the tape to the assemblies **550** and the tape **170**. The use of cover tapes **510** for securing electronic components to carrier tapes **170** are well understood in the electronic packaging arts and as such will not be discussed further herein. It will be appreciated, however, that other approaches may be used in place of the aforementioned taping process, such as coating the relevant side of the carrier tape with an adhesive (which could also be activated and/or cured upon exposure to heat, UV light, electrical current, etc.), thereby allowing the crimp/filament assemblies **150** to be placed atop the carrier tape strips **170** and bonded directly thereto. Spot-application of adhesives or other bonding agents could also be utilized.

[0141] Referring now to FIG. **4f**, the singulation station **420** is shown which comprises a singulation die adapted to remove the end and central crimp element carriers **130** after the assemblies **550** have been secured to their respective carrier tapes **170**. The singulation station **420** comprises one or more hardened steel dies **421** operated by a pneumatic press **418**, similar to the first singulation station **412**. The die and anvil set of the present singulation die **421** removes the end and central crimp carriers (salvage strips) **130**, rather than singulating the crimp element carrier assemblies **150**, **160** from the reeling station **402**. The singulation station **420** will also advantageously separate the filament wire at a pre-designated location to further separate the carrier assemblies so that they each comprise two (2) end crimping elements **100**; a filament wire **120**; and a center crimping element **180**. As best shown in FIG. **5e**, the resultant assembly **190** with the end crimping element carrier **130** assemblies' removed effectively results in two separate carrier tape assemblies **570**.

[0142] While primarily contemplated as processing two separate carrier tape assemblies **570** in parallel, in order to reduce material waste during the initial progressive stamping of the crimp element carrier assemblies **150**, **160**, more or less tape assemblies could be processed at the same time, as would be readily apparent to one of ordinary skill given the present disclosure. For example, the apparatus **400** can be readily adapted to process four (4) carrier tape strips **170** and two sets of parallel end crimps **100** and central crimps **180**, so as to produce four final assemblies **570**.

[0143] It will be recognized that while certain aspects of the invention are described in terms of a specific sequence of steps of a method, these descriptions are only illustrative of the broader methods of the invention, and may be modified as required by the particular application. Certain steps may be rendered unnecessary or optional under certain circumstances. Additionally, certain steps or functionality may be added to the disclosed embodiments, or the order of performance of two or more steps permuted. All such variations are considered to be encompassed within the invention disclosed and claimed herein.

[0144] While the above detailed description has shown, described, and pointed out novel features of the invention as applied to various embodiments, it will be understood that various omissions, substitutions, and changes in the form and details of the device or process illustrated may be made by those skilled in the art without departing from the invention. The foregoing description is of the best mode presently contemplated of carrying out the invention. This description is in no way meant to be limiting, but rather should be taken as

illustrative of the general principles of the invention. The scope of the invention should be determined with reference to the claims.

What is claimed is:

1.-57. (canceled)

58. A filament crimping element, said element comprising: a first plurality of cavities, said first set of cavities disposed at a spacing which creates a first plurality of features; and

a second plurality of cavities, said second set of cavities disposed at a spacing which creates a second plurality of features;

wherein said first and second pluralities of cavities are substantially opposite one another when said crimping element is crimped, said first plurality of features adapted to be placed at least partially within said second plurality of cavities, and said second plurality of features adapted to be placed at least partially within said first plurality of cavities; and

wherein said first and second pluralities of features comprises substantially rounded edges, said substantially rounded edges mitigating deformation of at least a portion of said filament during crimping.

59. The crimping element of claim **58**, wherein said first and second pluralities of cavities and features form a substantially serpentine channel therebetween for said filament when said crimping element is crimped.

60. The crimping element of claim **59**, further comprising a body having at least one leg, said at least one leg being useful for a purpose other than crimping.

61. The crimping element of claim **60**, further comprising at least one feature disposed proximate said body, said at least one feature having a substantially planar surface formed thereof adapted for pickup by a pick-and-place machine.

62. The crimping element of claim **58**, wherein said crimping element is formed from a material which has a hardness less than that of said filament, said lesser hardness of said material at least mitigating deformation of said filament by said crimping element during crimping.

63. The crimping element of claim **58**, wherein said filament is formed from a Titanium-containing metal, and said crimping element is formed at least in part from a copper-containing alloy.

64. A crimping element comprising a crimped filament, said element comprising:

a first plurality of pre-formed cavities, said first plurality of pre-formed cavities disposed so as to at least partly define a first plurality of crimp features; and

a second plurality of pre-formed cavities, said second plurality of pre-formed cavities so as to at least partly define a second plurality of crimp features;

wherein said first and second pluralities of cavities are substantially opposite to and substantially offset from one another when said crimping element is crimped; and wherein said pre-forming of said pre-formed cavities mitigate over-compression of said crimped filament thereby preventing damage to said crimped filament.

65. The crimping element of claim **64**, wherein when said crimping element is crimped around said filament, at least part of said first plurality of crimp features is received within said second plurality of pre-formed cavities, and at least part of said second plurality of crimp features is received within said first plurality of pre-formed cavities, thereby forming a substantially serpentine channel for said filament.