Section XVI

Machinery and Mechanical Appliances; Electrical Equipment; Parts Thereof; Sound Recorders and Reproducers, Television Image and Sound Recorders and Reproducers, and Parts and Accessories of Such Articles

Notes

1. This section does not cover:
   (a). Transmission, conveyor or elevator belts or belting, of plastics of chapter 39, or of vulcanized rubber (heading 4010), or other articles of a kind used in machinery or mechanical or electrical appliances or for other technical uses, of vulcanized rubber other than hard rubber (heading 4016);
   (b). Articles of leather or of composition leather (heading 4205) or of furskin (heading 4303), of a kind used in machinery or mechanical appliances or for other technical uses;

   (c). Bobbins, spools, cops, cones, cores, reels or similar supports, of any material (for example, chapter 39, 40, 44 or 48 or section XV);
   (d). Perforated cards for Jacquard or similar machines (for example, chapter 39 or 48 or section XV);
   (e). Transmission or conveyor belts or belting of textile material (heading 5910) or other articles of textile material for technical uses (heading 5911);
   (f). Precious or semiprecious stones (natural, synthetic or reconstructed) of headings 7102 to 7104, or articles wholly of such stones of heading 7116, except unmounted worked sapphires and diamonds for styli (heading 8522);
   (g). Parts of general use, as defined in note 2 to section XV, of base metal (section XV), or similar goods of plastics (chapter 39);
   (h). Drill pipe (heading 7304);
   (ij). Endless belts of metal wire or strip (section XV);
   (k). Articles of chapter 82 or 83;
   (l). Articles of section XVII;
   (m). Articles of chapter 90;
   (n). Clocks, watches and other articles of chapter 91;
   (o). Interchangeable tools of heading 8207 or brushes of a kind used as parts of machines (heading 9603); similar interchangeable tools are to be classified according to the constituent material of their working part (for example, in chapter 40, 42, 43, 45 or 59 or heading 6804 or 6909);
   (p). Articles of chapter 95; or
   (q). Typewriter or similar ribbons, whether or not on spools or in cartridges (classified according to their constituent material, or in heading 9612 if inked or otherwise prepared for giving impression).

2. Subject to note 1 to this section, note 1 to chapter 84 and to note 1 to chapter 85, parts of machines (not being parts of the articles of heading 8484, 8544, 8545, 8546 or 8547) are to be classified according to the following rules:
   (a). Parts which are goods included in any of the headings of chapter 84 or 85 (other than headings 8409, 8431, 8448, 8466, 8473, 8487, 8503, 8522, 8529, 8538 and 8548) are in all cases to be classified in their respective headings;Springs and leaves for springs, of base metal, other than clock or watch springs (heading 9114); and
   (b). Other parts, if suitable for use solely or principally with a particular kind of machine, or with a number of machines of the same heading (including a machine of heading 8479 or 8543) are to be classified with the machines of that kind or in headings 8409, 8431, 8448, 8466, 8473, 8503, 8522, 8529 or 8538 as appropriate. However, parts which are equally suitable for use principally with the goods of headings 8517 and 8525 to 8528 are to be classified in heading 8517;
   (c). All other parts are to be classified in headings 8409, 8431, 8448, 8466, 8473, 8503, 8522, 8529, or 8538 as appropriate or, failing that in heading 8487 or 8548.

3. Unless the context otherwise requires, composite machines consisting of two or more machines fitted together to form a whole and other machines designed for the purpose of performing two or more complementary or alternative functions are to be classified as if consisting only of that component or as being that machine which performs the principal function.

4. Where a machine (including a combination of machines) consists of individual components (whether separate or interconnected by piping, by transmission devices, by electric cables or by other devices) intended to contribute together to a clearly defined function covered by one of the headings in chapter 84 or chapter 85, then the whole falls to be classified in the heading appropriate to that function.

5. For the purposes of these notes, the expression "machine" means any machine, machinery, plant, equipment, apparatus or appliance cited in the headings of chapter 84 or 85.

Statistical Note

1. Provisions for semiconductor manufacturing and testing machines and apparatus cover products for the growth and processing of semiconductor materials, such as silicon and gallium arsenide, the processing of such materials into semiconductor devices and the testing of such devices (in general the testing equipment, as well as some of the processing equipment, is classified in chapter 90). More specifically the goods include the following:
   (a). Wafer manufacturing equipment:
      (i). Crystal growers and pullers – used to produce extremely pure monocrystalline semiconductor boules from which wafers can be sliced. Most common methods employed in these crystal growers and pullers are the Czochralski and float zone methods.
      (ii). Wafer preparation equipment:

(A). Crystal grinders – used to grind the crystal boule to precise diameter required for wafers and to grind the flats on the boule to indicate the conductivity type and resistivity of the crystal.

(B). Wafer slicing saws – used to slice wafers from a boule of monocrystalline semiconductor material.

(C). Wafer grinders, lappers and polishers – used to prepare the semiconductor wafer for the fabrication process. This involves bringing the wafer within dimensional tolerances. Especially critical is the flatness of its surface.

(b). Mask fabrication and repair equipment:

(i). Fabrication equipment – used to transfer design patterns to a mask of reticle, this equipment generally utilizes optical, electron beam or X-rays to write circuit patterns on photoresist coated substrates. After development, these substrates become the mask or reticle for wafer fabrication.

(ii). Repair equipment – this equipment generally utilizes focused ion beams or laser beams. They are used directly on the mask or reticle to remove chrome.

(c). Wafer fabrication equipment:

(i). Film formation equipment – used to apply or produce various films on the surface of the wafer during the fabrication process. These films serve as conductors, insulators and semiconductors on the finished device. They may include oxides and nitrides of the substrate surface, metals, and epitaxial layers. The processes and equipments listed below are not necessarily limited to the generation of a particular type of film.

(A). Oxidation furnaces – used to form a "film" of oxide on the wafer. The oxide is formed by the chemical reaction of the top molecular layers of the wafer with the applied oxygen or steam under heat.

(B). Chemical Vapor Deposition (CVD) equipment – used to deposit various types of films which are obtained by combining the appropriate gases in a reactant chamber at elevated temperatures. This constitutes a thermochemical vapor-phase reaction. Operations may take place at atmospheric or low pressure (LPCVD) and may use a plasma enhancement (PECVD).

(C). Physical Vapor Deposition (PVD) equipment – used to deposit various types of films which are obtained by vaporizing a solid.

(1). Evaporation equipment – in which the film is generated by heating the source material.

(2). Sputtering equipment – in which the film is generated by bombarding the source material (target) with ions.

(D). Molecular Beam Epitaxy (MBE) equipment – used to grow epitaxial layers on a heated monocrystalline substrate in an ultrahigh vacuum using beams of molecules. The process is similar to "PVD".

(ii). Doping equipment – which is used to introduce dopants into the wafer surface in order to modify the conductivity or other characteristics of a semiconductor layer:

(A). Thermal diffusion equipment – in which the dopants introduced into the surface of the wafer by the application of gases under high temperatures.

(B). Ion Implantation – in which the dopants are "driven" into the crystal lattice structure of the surface of the wafer in the form of a beam of accelerated ions.

(C). Annealing furnaces – which are used to repair the crystal lattice structures of the wader damaged by ion implantation.

(iii). Etching and stripping equipment – used for etching or cleaning surfaces of the wafers.

(A). Wet etching equipment – in which chemical etching materials are applied by spraying or immersion. Spray etchers provide more uniform results than bath etchers, since they perform the operation on one wafer at a time.

(B). Dry plasma etching – in which etching materials are presented as gases within a plasma energy field, providing an anisotropic etch profile.

(C). Ion beam milling equipment – in which ionized gas atoms are accelerated toward the wafer surface. The impact results in the top layer being physically removed from the surface.

(D). Strippers or ashers – using techniques similar to etching, this apparatus removes the spent photoresist from the surface of the wafer after it has served its purpose as a "stencil". This equipment is also used for the removal of nitrides, oxides, and a polysilicon, with an isotropic etch profile.

(iv). Lithography equipment – used to transfer the circuit designs to the photoresist coated surface of the semiconductor wafer.

(A). Equipment for coating wafers with photoresist – these include the photoresist spinners which are used to apply liquid photoresist evenly over the surface of the wafer.

(B). Equipment for exposing the photoresist coated wafer with the circuit design (or a part thereof):

(1). Using a mask or reticle and exposing the photoresist to light (generally ultraviolet) or, in some instances, X-rays:

(a). Contact printers – where the mask or reticle is in contact with the wafer during exposure.

(b). Proximity aligners – similar to contact aligners except actual contact does not take place between the mask or reticle and the wafer.

(c). Scanning aligners – which use projection techniques to expose a continuously moving slit across the mask and wafer.

(d). Step and repeat aligners – which use projection techniques to expose the wafer a portion at a time. Exposure can be by reduction from the mask to the wafer or 1:1. Enhancements include the use of an excimer laser.

(2). Direct write on wafer equipment – these apparatus operate with no mask or reticle. They use a computer controlled "writing beam" (such as, an electron beam (E-beam), ion beam or laser) to "draw" the circuit design directly on the photoresist wafer.

(C). Equipment for developing exposed wafers – these include chemical baths similar to those used in photographic laboratory applications.

(d). Assembly equipment:

(i). Dicing equipment - these include sawing machines and scribing machines (including laser scribers) and dicing accessories such as water breaking equipment.

(ii). Die bonding equipment - which installs the die to the package by soldering or gluing.

(iii). Wire bonding equipment - used for attaching thin wires or tapes (usually of gold, aluminum or copper) from the die bonding pads to the corresponding pads on the package.

(iv). Packaging equipment - which are used to encapsulate or package a semiconductor device. They include sealing furnaces, lid welders, plastic encapsulation presses, lead trim and form equipment, package deflashers, and tin dip and solder plate equipment.

(e). Testing and inspection equipment:

(i). Optical inspection equipment - these include equipment that "examines" portions of the wafer surface and compares them either to a standard pattern or to other portions of the wafer surface.

(ii). Electrical testing equipment - these include computer controlled systems that test the functions and electrical specifications of semiconductor devices through the application and detection of electrical signals or patterns. Testing is performed on both unencapsulated dice and packaged integrated circuits.