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08 September 2006

Double-Drawer PINLESS Indubond Machine

Introduction:

Strong of the success of Indubond 130 Machine, with very high quality level of inner layer alignment and reliability, Cedal Equipment developed a new and innovative machine called *Double-Drawer Pinless*.

The conjunction of inductive welding system with the camera registration system provides an high productive and reliable technology.
The *New-Pinless* aligns the layer to layer within 12 micron (0.5 mils). The panel alignment speed is estimate to be about 3 second per layer.
Several advantages are easily noticed:

- No need post-etch punching/drilling anymore.
- No limit on layer number.
- Very high productivity by using the double-drawer system.
- Process cost reduction: not dedicated tooling for inner layers registration and lamination press.
- No over thickness on the bonding area.
- Able to bond up to 10 mm multilayer thick

The process:

The blacked inner layers are aligned one over the other and than welded by using inductive current.

Every inner layer has to have copper dot targets and copper nets for bonding process according to our specification.

Two camera system locates the copper dots and supplies information to a dedicate software.

The computer supplies information to a vacuum platform, it picks-up the layer and moves it to the loading station. During the translation the layer position is adjusted in X-Y and rotation mode until it find the zero position.

When the correct position is found, the vacuum platform put the layer down on the template and the clamp system holds it guaranteeing the registration.

The operator positions the prepreg requested for the lamination process over the inner.

The next layer will be pick-up and positioned over the first one.

When the book is ready moves in the bonding machine for the welding process.

Machine configuration:

- Inner layers loading station
  The inner layers are here loaded in stack.
- Vacuum pick and place platform with alignment system composed of:
  - vacuum plate for inner layers pick up
  - camera for layer targets localization
  - mechanism for layer alignment: X,Y movements, rotation
  - mechanical registration platform system and tray for stack preparation. The system assures constant alignment between the vacuum plate and template.
- Lay-up station
  - A properly template of panel size, is present at the station. Template has mechanical clamps in order to clamp the layer when it's aligned.

  The vacuum platform lined down the inner layers and the operator put the prepreg. Book will be positioned vertically when ready.
- Transit station
  The welded book is positioned vertically in order to have the possibility of stationing of two books in the same place.
  The book to weld comes at this station vertically; when the welded book comes out it's positioned horizontally and than loaded into the welding module
- Welding module
  4 inductive welding heads, stick the inner layers of the book together on the copper nets.
- Computer
  It controls all the process functions and store data: working cycle, data production, statistical data.

The process flow:

- Inner layers, blacked without reference holes, are positioned one over the other according the sequence necessary for a correct multilayer lay-up preparation.
  Eg. Layer 9/8, L 7/6, L 5/4, L 3/2.
  This operation is done beside the *New-Pinless* machine.
- The stack will be transferred into the machine and production cycle will be started.
- The vacuum platform, supplied with camera, comes over the stack, locates the targets of first inner layer, pick it up by vacuum, and transfers it on the lay-up position. During translation the inner layer position will be correctly aligned.
- In the lay-up module, the aligned inner layer is laid down on the template and mechanically clamped. Alignment between platform and template is assured by several clamps.
- The operator lay-ups the prepreg according the request.
- Seconds inner layers will be laid down automatically.
- Again the prepreg
- Other inner layer, prepreg etc.

When the multilayer book is complete:

- The tray revolves in vertical position and move forward when the welded book will be positioned vertically into the transit module.
- Welded book comes out vertical into loading/unloading station and then removed after it is horizontal.
- New book goes inside the welding station and process begins.

Performances:

Panel side mm (inches)	minimum	457 x 304 (18" x 12")
	Maximum	635 x 584 (25" x 23")
Panel thickness mm (mils)	minimum	not limit
	Maximum	10 (400)
Inner layers thickness mm (mils)	minimum	0,050 (2)
	Maximum	1 (185)
Copper thickness Microns (Oz)	minimum	12 (1/3)
	Maximum	140 (4)

Overhaul dimension:

Machine size

Length	mm 3100
Width	mm 1450
Height	mm 1400
Working level	mm 950

Utility

Electrical power

Voltage	400V (other on request) 3 Phases
KVA	14
Amperes	30
Wire section	10 mm

Compressed air

pressure	6 bar
volume	21 NL/min

Inner layers lay-out:

Targets

Copper dots only on top side	Ø 0,8 mm	(31 mils)
Etched area around	13 mm	(0,5 inches)

Copper nets for welding

Net N°	4
Net pattern	net or full copper