

CLAIMS

Among my claims are:

1. A system for the placement of dies on a substrate comprising:
 - a frame;
 - a housing fixed to said frame, said housing comprising a guide channel encompassing a force application rod, which extends from a distal end of said housing, said force application rod configured for linear motion relative to said housing and the application of linear force, a measurement device configured to measure the linear motion of said force application rod, said force application rod further comprising a die placement head holding aperture at a distal end thereof;
 - a turret rotatably fixed to said frame comprising a rotation measuring device and a plurality of die placement head holding portions positioned substantially adjacent a periphery thereof wherein each die placement head holding portion comprises two concentric apertures, a first aperture and a second aperture, said first aperture positioned adjacent the distal end of said housing and extending fully through said turret, said second aperture positioned on the side of the turret opposite said first aperture and concentric therewith, wherein said first aperture is of a size only slightly larger than that of said force application rod and said second aperture extends only partially into said turret and wherein, upon rotation, each of said plurality of die placement head holding apertures can be brought into alignment with said force application rod; and
 - a motor fixed to said frame and configured to rotate said turret upon activation.

1 2. The system of claim 1 further comprising at least one die
2 placement head having a proximal end configured to be held in said die
3 placement head holding aperture of said force application rod during use in
4 a die placement operation, a central region configured to be removably
5 retained in said second aperture of said turret upon retraction of said force
6 application rod above said turret and a distal end including a die holding
7 and retaining portion.

1 3. The system of claim 1 wherein said plurality of die placement
2 head holding portions of said turret are configured in multiple concentric
3 rows.

1 4. The system of claim 1 wherein said die placement head holding
2 aperture of said force application rod further comprises magnets configured
3 to retain a die placement head inserted therein.

1 5. The system of claim 4 wherein said magnets are permanent
2 magnets.

1 6. The system of claim 4 wherein said magnets are electro-
2 magnets.

1 7. The system of claim 1 wherein said turret further comprises
2 magnets therein configured to retain a die placement head in an aperture
3 thereof.

1 8. The system of claim 7 wherein said magnets are permanent
2 magnets.

1 9. The system of claim 7 wherein said magnets are electro-
2 magnets.

1 10. The system of claim 1 wherein said die placement head holding
2 aperture of said force application rod is in operative communication with a
3 controllable vacuum source.

1 11. The system of claim 10 further comprising a die placement
2 head configured to allow vacuum to be drawn therethrough, whereby a die
3 to be placed may be retained securely in said die placement head through
4 the use of such vacuum.

1 12. The system of claim 1 wherein a portion of said force
2 application rod external to said housing further comprises a projection,
3 wherein said projection is restricted from rotation but substantially
4 unrestricted during normal usage against linear motion.

1 13. The system of claim 12 wherein said projection is hollow,
2 thereby allowing vacuum to be pulled therethrough or pressure forced
3 therein.

1 14. The system of claim 1 wherein said force application rod is an
2 air piston, said guide channel is an air cylinder, and said guide channel is
3 in communication with a vacuum or pressure source, wherein the
4 introduction of vacuum or pressure into said guide channel results in a
5 linear movement of or application of force to the force application rod.

1 15. The system of claim 14 wherein said guide channel further
2 comprises a spring configured to bias linear movement of said force
3 application rod.

1 16. The system of claim 14 wherein said force application rod is of
2 a polygonal shape and said guide channel is of a corresponding polygonal
3 shape, whereby said polygonal shape provides resistance to rotation of said
4 force application rod.

1 17. The system of claim 1 further comprising at least one voice
2 coil which at least partially surrounds said force application rod, wherein
3 said at least one voice coil is configured to induce linear movement of or
4 the application of linear force into said force application rod.

1 18. The system of claim 1 wherein said motor produces rotational
2 movement of said turret via a belt and pulley drive system.

1 19. The system of claim 18 wherein said belt is a timing belt and
2 said pulleys are timing pulleys.

1 20. The system of claim 1 further comprising a hall-effect sensor,
2 wherein said hall-effect sensor is configured to measure the location of
3 said force application rod.

1 21. The system of claim 1 wherein said die placement head holding
2 aperture is tapered, having a larger opening adjacent the distal end of the
3 force application rod and becoming relatively narrower further from said
4 distal end of said force application rod.

1 22. The system of claim 21 wherein said tapered die placement
2 head holding aperture is conical in shape.

1 23. The system of claim 21 further comprising at least one die
2 placement head having a proximal end configured to be held in said tapered
3 die placement head holding aperture of said force application rod during
4 use in a die placement operation, a central region configured to be
5 removably retained in said second aperture of said turret upon retraction of
6 said force application rod above said turret and a distal end including a die
7 holding and retaining portion.

1 24. The system of claim 1 wherein vacuum or pressure held
2 between said force application rod and an end of said housing guide
3 channel is used as an air spring.