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Electromagnetic Drive Device

The invention concerns an electromagnetic drive device of the type named in the preamble of Claim 1.

Such drive devices are used advantageously in Wire Bonders for the horizontal movement of the bondhead.

- 5 An electromagnetic drive device of the type named in the preamble of Claim 1 is known from the Swiss patent specification CH 678 907. The drive device has a fixed, E-shaped stator which is contactlessly combined with a coil. The windings of the coil are formed in such a way that the coil is movable along a drive direction as well as orthogonally to the drive direction. The coil is rigidly connected to a working body, for example the bondhead of a Wire Bonder, via a support element. The support element must
10 have a high torsional resistance. If it is desired to keep the material mass to be accelerated as low as possible, then the application of light but more expensive materials is necessary.

The object of the invention is to propose an electromagnetic drive device comprising a stator and a coil for driving a working body which enables a simple connection of the coil to the working body.

The named task is solved in accordance with the invention by means of the characteristics of Claim 1.

- 15 In the following, embodiments of the invention are explained in more detail based on the drawing.

It is shown: Fig. 1, 2 the cross-section of the stator of an electromagnetic drive device, and
Fig. 3 - 5 further embodiments of the stator.

- Fig. 1 shows the cross-section of an electromagnetic drive device 1 presented not true to scale. The drive device 1 comprises a stator 2 and a coil 3 which is contactlessly combined with the stator 2. The coil 3
20 has a coil body 4 which is rigidly connected to a working body 6 which slides on a horizontally arranged slide plate 5. The working body 6 supports for example the bondhead of a Wire Bonder which is not shown. The working body 6 runs almost frictionlessly on the slide plate 5 preferably via an air bearing charged with vacuum. A table movable in two orthogonal directions X and Y can also be envisaged instead of the slide plate 5 and the working body 6 whereby the upper plate of the table is then rigidly
25 connected to the coil body 4. The drive device 1 serves to drive the working body 6 in X direction. The coil 3 is formed in accordance with the teaching of the Swiss patent CH 678 907 so that it is also movable in the horizontal Y direction which extends orthogonal to the X direction.

In the profile section, the stator 2 is essentially E-shaped. The stator 2 has a vertical bar 7 and three horizontally running bars 8 - 10 arranged at intervals to one another. A first air gap 11 is formed between

the upper bar 8 and the middle bar 9 and a second air gap 12 is formed between the middle bar 9 and the lower bar 10. The windings of the coil 3 run through these two air gaps 11 and 12. Magnets 13 are located on the sides of bars 8 and 10 facing the air gaps 11 and 12 which are combined with the coil 3 in the known way.

- 5 In accordance with the invention, the middle bar 9 of the stator 2 has a gap 14 open towards the working body 6. A bar 15 connected to the coil body 4 is located in the gap 14. The bar 15 connects the two vertically running sidewalls of the coil body 4 and increases the rigidity of the coil body 4. The bar 15 is also connected to the wall of the coil body 4 facing towards the working body 6. In the drawing, the bar 15 is only presented schematically. In the simplest embodiment, the bar 15 is a plate. Preferably, the bar 10 15 is a shaped three-dimensional body which is designed in its form so that it is as stable as possible with the least possible weight.

- The gap 14 enables the pronounced increase in the mechanical stability of the connecting element which connects the coil 3 to the working body 6 by means of the additional bar 15 or, with given stability, to distinctly reduce the weight of the connecting element. In particular, in this way, the coil body 4 can be 15 strengthened in the area of the windings of the coil 3 and therefore the rigidity of the coil 3 can be increased without a large increase in weight. Furthermore, the bar 15 can be formed as a heat sink, for example with cooling fins, so that the heat generated in the coil 3 by the drive can be better dissipated to the surrounding air.

- Fig. 2 shows a cross-section of the stator 2 along the line A-A of Fig. 1. The bar 15 protrudes out of the 20 gap 14 laterally, ie, in a direction transverse to the drive direction and is connected to the sidewalls 4a of the coil body 4.

Fig. 3 shows a drive device 1 formed as a voice coil motor with a stator 2 with which the two air gaps 11, 12 are closed by further bars 16 and 17 on the sides facing towards the working body 6.

- Figs. 4 and 5 show embodiments with which the gap 14 is not open towards the working body 6 but 25 which is closed off by means of a bar 18: the gap 14 becomes a slot 19. The bar 18 increases the mechanical stability of the stator 2 and prevents its tendency to oscillate, however it prevents a direct connection of the bar 15 with the working body 6.



PATENT CLAIMS

1. Electromagnetic drive device for driving a working body (6), with a stator (2) and a coil (3) contactlessly combined with the stator (2), the stator (2) having a vertical bar (7) and three horizontally running bars (8, 9, 10) arranged at intervals to each other and the coil (3) having a coil body (4) connected to the working body, characterised in that the middle bar (9) of the stator (2) has a gap (14) open towards the working body (6) or a slot (19) and in that a bar (15) connected to the coil body (4) is located in the gap (14) or slot (19).
2. Electromagnetic drive device in accordance with Claim 1, characterised in that the bar (15) connected to the coil body (4) is rigidly connected to side walls (4a) of the coil body (4).
- 10 3. Wire Bonder with at least one electromagnetic drive device in accordance with Claim 1 or 2.