

TECHNOLOGICAL OFFER - CELLS

MOTOR DEVICE FOR ACTUATING ELEMENTS IN ULTRA-HIGH VACUUM ENVIRONMENTS

Engineers of the ALBA Synchrotron have developed a full compatible ultra-high vacuum (UHV) motion system for 5 mm movement range and achieving up to 0.05 μm resolution.

The mechanical devices used in ultra-high vacuum environments require technical characteristics that, in some cases, have still not been resolved due that mechanical elements materials, design or lubrication for instance are not UHV compatible or they couldn't work under the conditions of such environment.

In order to deal with such issues, a new ultra-high vacuum compatible motion system has been designed at ALBA (Figure 1). The device operates with a step by step motor that includes a reducer of 500 and actuates on an axis with an eccentric cam fixed on a base by a support. The cam also includes bearings that prevent friction between the rotational part and the part to be pushed. The step motor enables precise turns in a controlled manner so as to make possible the rotation of the shaft to a specific and precise position. All the moving components of the mechanism of the device are rolling elements thus eliminating dry friction between the components and, therefore, not requiring lubrication. All elements could support temperatures up to 150 C to allow baking out of vacuum chambers. It is a full UHV compatible motion system for 5 mm movement range and achieving up to 0.1 μm resolution. The unit is very compact and has been designed for loads up to 25kg.

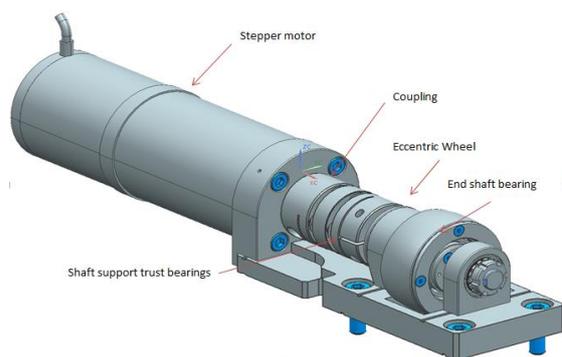


Figure 1: Ultra-high vacuum motion system with no lubrication or maintenance requirements developed at CELLS.

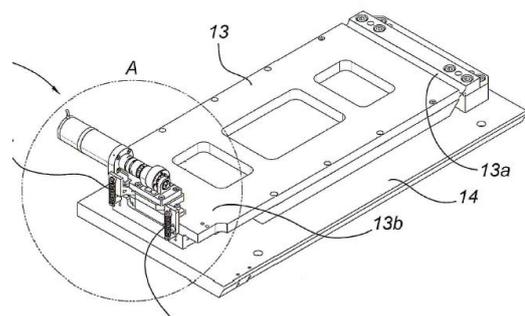


Figure 2: The drive device of the present invention mounted on an element to be driven by the device. In this case, the element consists of a platform to move a mirror used in a particle accelerator.

The device of the present invention enables rotational or translational movements of an element in ultra-high vacuum environments (environments with pressures down to 10^{-10} mbar). All elements of this motion system are intrinsically vacuum compatible thus the device can operate without the need of air encapsulations or lubrication thanks to this use of UHV compatible components and does not require maintenance. The device can move a driven element with an accuracy of up to $2 \mu\text{m}$ in a range of motion of 5 mm, with loads up to 25 kg and can also be heated to 150 C for baking out purposes. It is a compact mechanism, easy and cheap to manufacture that can operate continuously, eliminating or reducing the repose periods and has a prolonged life, due to the few frictions and contact between its components.

In summary, researchers of ALBA synchrotron have developed a motor device for ultra-high vacuum environments that can move elements with an accuracy of up to $0.05 \mu\text{m}$ in a range of motion of 5 mm, with loads up to 25 kg with no lubrication or maintenance requirements.

ALBA Synchrotron is the owner of the present invention and is offering it to the technological industries for its commercialization. Those companies interested in obtaining more information on this technology or the status of the intellectual property protection, please, do not hesitate to contact the ALBA Industrial Liaison Office in the below email:

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