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[54] **OMNI ANGLE ROTARY TABLE**

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[52] **U.S. Cl.** **118/500,** 118/53, 269/55

[51] **Int. Cl.** **B05c 11/12**

[58] **Field of Search** ..... 118/48, 49, 49.1, 49.5, 118/53, 56, 319, 320, 321, 500, 503; 259/81 R, 89, 90; 269/55, 58, 62

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[57] **ABSTRACT**

An omni angle rotary table having a cam cylinder with an angularly disposed cam surface on its end, and a shaft which is axially and rotatably disposed with respect to the cam cylinder. A platform assembly is pivotally affixed to the end of the shaft and supports cam means which slidably engage with the cam surface on the cam cylinder, so that the platform assembly is caused to rotate and to pivot back and forth as the shaft and/or cam cylinder is rotated.

11 Claims, 4 Drawing Figures

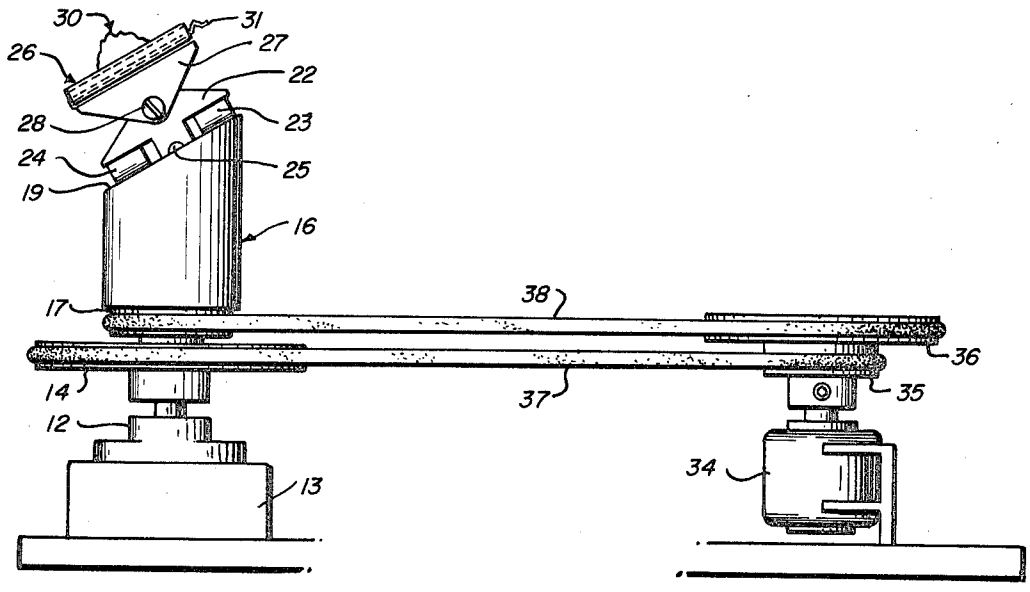


FIG. 1

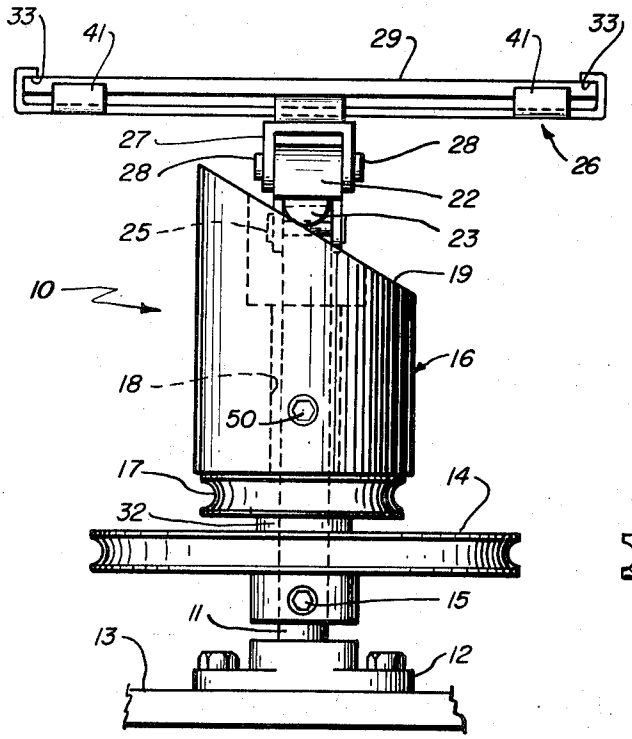
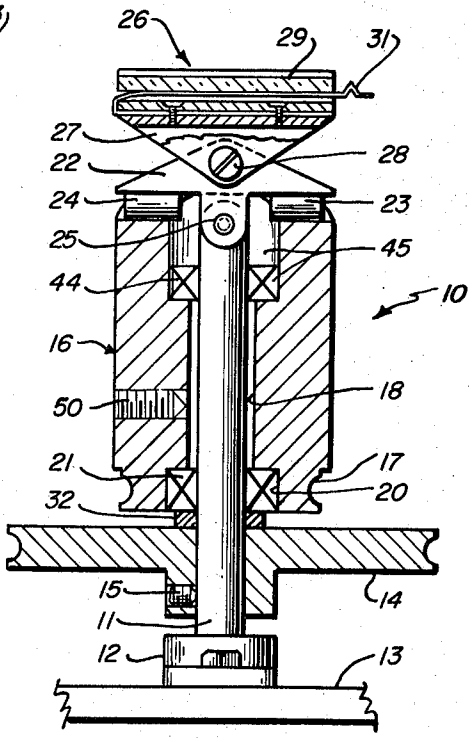


FIG. 2



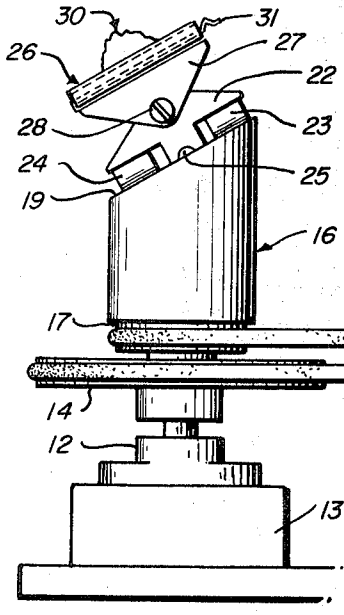


FIG. 3

FIG. 4

OMNI ANGLE ROTARY TABLE

SUMMARY OF THE INVENTION

This invention relates to an improved omni angle rotary table.

The omni angle rotary table of the present invention is particularly adapted for use in coating irregular specimens with a uniform carbon or metallic coating in a vacuum evaporator, for subsequent observation in a scanning electron microscope. The motion of the table presents the specimen to the metal vapor being deposited at all angles. Higher resolution photographs can be obtained than is possible with other methods because of the uniformity of the evaporated layer in all the surface irregularities of the specimen.

The direct action of the cam surface on the table's platform and the virtually balanced condition of the platform results in a unit that sweeps a wider excursion with much less wear than other similar commercially available units. Its simplicity lends itself to a low manufacturing cost and low power requirement for operation with an increase in efficiency over the same similar commercially available units.

The design of the omni angle rotary table also is such that the specimen can be adjusted initially so it faces the vapor source in its median position. Also, a platen holding a number of specimens may be used in place of a single slide, enabling the operator to coat many specimens uniformally in one operation.

Accordingly, it is an object of the present invention to provide an improved omni angle rotary table.

Another object of the invention is to provide an improved omni angle rotary table having a 60° angle of excursion, 30° either side of center.

Still another object is to provide an improved omni angle rotary table of the above type having a ratio of approximately 3½ tilts to 1 revolution, with the same being designed such that this ratio may be maintained with little wear.

Further still, it is an object to provide an improved omni angle rotary table having a virtually balanced platen which is pivoted in the center of the platen, in line with the cam faces thereof. In this respect, no springs are used, thus little wear on the cam shoes results.

Still another object is to provide an improved omni angle rotary table wherein slight wear on the cam shoes or cam surface thereof shows up as looseness, not detrimental to the function of the table, which wear or looseness can be easily and quickly compensated for.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is a side plan view of the omni angle rotary table;

FIG. 2 is an end plan view of the omni angle rotary table, partially sectionalized to illustrate its construction;

FIG. 3 is a side plan view of the omni angle rotary table, with a drive mechanism attached thereto; and

FIG. 4 is a top plan view of a multi specimen holder.

Similar reference characters refer to similar parts throughout the several views of the drawings.

DESCRIPTION OF THE INVENTION

Referring now to the drawing, particularly FIGS. 1 and 2 thereof, the omni angle rotary table **10** is shown and can be seen to include a shaft **11** which is retained and rotatably supported in a vertically disposed position by means of a bracket **12** fixedly secured to a supporting surface **13.** The bracket **12** includes two ball bearings (not shown) which are stacked and in which the shaft **11** rotates. The bracket **12** further has elongated slots (not shown) formed in it through which the threaded bolts **43** extend. These slots permit the pulley belt tension to be adjusted. A rotational pulley **14** is secured to the shaft **11** by means of a set screw **15,** for rotating the shaft **11** in the manner described more particularly below.

A cam cylinder **16** which is generally of a solid cylindrical configuration having a bore **18** extending axially through it for receiving the shaft **11** is rotatably supported atop the rotational pulley **14.** A scan pulley or groove **17** is formed in the peripheral surface of the cam cylinder **16,** preferably adjacent the lower end thereof, and a bearing cavity **20** is provided in the lower end for receiving a bearing race **21.** A similar bearing race **44** is disposed with a cavity **45** in the upper end of the cam cylinder, for supporting the shaft **11.** A thrust washer **32** preferably and advantageously is provided between the rotational pulley **14** and the cam cylinder **16,** to permit them to rotate at different speeds without rubbing, as described more particularly below. The upper end of the cam cylinder **16** is tapered to provide a cam surface which is at an angle of approximately 30°. A tilting platform **22** is pivotally secured by means of a pivot pin **25** to the upper end of the shaft **11** and supports two laterally positioned cam shoes **23** and **24.** These cam shoes **23** and **24** preferably and advantageously are of teflon or other similar material, and are disposed to ride on the cam surface **19** on the cam cylinder **16.**

A slide holder or platform **26** has a generally U-shaped bracket **27** fixedly secured below and centrally positioned between the opposite ends thereof, for affixing the slide holder **26** to the tilting platform **22.** The latter is received between the two downwardly depending arms of the U-shaped bracket **27,** and the bracket **27** and the tilting platform **22** are adjustably affixed together by means of threaded screws **28.** With this construction, the slide holder **26** can be pre-set in a horizontal position, as illustrated, or at an initial angle up to and slightly in excess of 30°, by merely loosening the threaded screws **28,** adjusting the angle and then retightening the threaded screws **28** to secure the slide holder **26** in the angularly adjusted position.

The slide holder **26** preferably is of dimension such that a glass slide **29** of the dimensions normally used in most laboratories can be supported and retained atop of it. For this purpose, the opposite ends of the slide holder **26** are reversely bent to form channels **33** into which the glass slide can be slidably extended to engage a pair of stops **41.** A spring steel locking lever **31** is provided for locking the glass slide **29** in position atop the slide holder **26.** To remove the glass slide **29,** the outwardly extending terminal end of the locking lever **31** is pressed down to permit the glass slide **29** to be re-

moved by sliding it out of the U-shaped channels **33.** A glass slide **29** of the type illustrated is generally used to support a specimen **30,** as illustrated in FIG. **3,** which is to be coated in a vacuum evaporator.

From the above-described construction of the omni angle rotary table **10,** it can be seen that when the rotational pulley **14** is rotated, the shaft **11** and the tilting platform **22** and the slide holder **26** affixed to its upper end is rotated with it. As the shaft **11** rotates, the cam shoes **23** and **24** ride on the cam surface **19** on the cam cylinder **16,** thus causing the tilting platform **22** and the slide holder **26** to tilt back and forth through a 60° angle of excursion, 30° either side of center of the end of the shaft **11.** An oscillating motion is imparted to the slide holder **26,** by rotating the cam cylinder **16.** In this respect, the rotational pulley **14** and the scan pulley **17** are proportionally sized to provide a ratio of approximately 3½ tilts to 1 revolution. Various methods can be used to drive the omni angle rotary table **10,** such as, for example, by use of friction wheels, gears, a direct drive from a motor shaft, or by means of rubber drive belts **37** and **38** which are in turn rotatably driven by means of a variable speed motor **34** having pulleys **35** and **36** affixed to its drive shaft. Rubber drive belts such as those illustrated are preferred over a chain and sprocket type drive, since the rubber drive belts have no slack and therefore run the table more smoothly, whereas the chain and sprockets run rough and it is difficult to keep both chains tight.

Since the pivot point for the tilting platform **22** and the slide holder **26** affixed to it is on the end of the shaft **11** and centrally or axially positioned to or with the cam surface **19,** there is very little wear on the cam shoes **23** and **24.** Furthermore, this provides a virtually balanced slide holder **26,** so that there is an even load on the drive motor **34.** Even loading of the slide holder **26** results only in added weight to be oscillated, but the latter will still be balanced. Any slight wear which does result on the cam shoes **23** and **24** only shows up as looseness which can be easily and quickly compensated for, simply by loosening the set screw **15** and raising the rotational pulley **14** and the cam cylinder **16** with respect to the cam shoes **23** and **24.**

The initial angle of tilt of the slide holder **26** can be adjusted from the horizontal position shown, to any angle up to approximately 30° by simply loosening the threaded screws **28** and adjustably positioning the slideholder **26** with respect to the tilting platform **22.** Thereafter the threaded screws **28** are tightened to secure the slide holder **26** in the adjusted position. The rotational pulley **14** and the cam cylinder **16** also may be locked together at any position, by means of a set screw **50,** a pin or even a piece of rubber wedged between them, and one belt removed to permit the table to be used as an adjustable rotary turntable, with additional tilt available at the pivot on the slide holder **26.** When driven in this fashion, the slide holder **26** can be adjusted to provide an initial angle in excess of **30°.**

A multi specimen slide holder **39** having a number of apertures **40** (**21** apertures in the illustrated example) formed in it for supporting a number of specimens also can be removably secured to the slide holder **26,** by means of a bracket with the approximate dimensions of the glass slide, in place of the glass slide **29.** When the multi specimen slide **39** is used, an operator may coat many specimens uniformally in one operation.

From the above description, it can be seen that the omni angle rotary table **10** functions in a manner that sweeps the specimen on the glass slide **29** affixed to the slide holder **26** back and forth through a 60° arc several times per revolution. This motion will present the specimen to the metal vapor being deposited at all angles so that there is greater uniformity of the evaporated layer on all of the surface irregularities of the specimen. The direct action of the cam surface on the slide holder **26** and the virtually balanced condition of the table results in a unit that sweeps a wider excursion with much less wear, particularly in comparison to other similar types of units commercially available. Further still, its simplicity lends itself to a low manufacturing cost and low power requirements for operation with an increase in efficiency over these other commercially available units.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and certain changes may be made in the above construction. Accordingly, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An omni angle rotary table comprising, in combination: a shaft supported for rotation; a cam axially and rotatably disposed about said shaft and having one end thereof tapered to provide an angularly disposed cam surface; a platform assembly pivotally secured to the end of said shaft and having cam means slidably engaged with said cam surface on said cam; said platform assembly being caused to rotate and to tilt back and forth through an arc of excursion as said shaft is rotated relative to said cam.

2. The omni angle rotary table of claim **1,** wherein both said shaft and said cam are rotated, whereby said platform assembly rotates and tilts in an oscillatory pattern.

3. The omni angle rotary table of chain **2,** wherein said shaft and said cam are rotated at respective rates of speed such that several tilt cycles occur for each rotational cycle.

4. The omni angle rotary table of claim **2,** wherein said shaft and said cam are rotated so that the resulting oscillatory pattern is not reentrant.

5. The omni angle rotary table of claim **2,** wherein said cam means comprises a pair of cam shoes laterally disposed on opposite sides of said shaft and arranged to slidably engage on said cam surface.

6. The omni angle rotary table of claim **2,** wherein said cam is adjustable with respect to said platform assembly to compensate for any wear on said cam means.

7. The omni angle rotary table of claim **2,** wherein said platform assembly comprises a tilting platform pivotally affixed to the end of said shaft and a platen adjustably secured to said tilting platform, whereby said platen can be initially adjusted at a pre-determined angle of tilt.

8. The omni angle rotary table of claim **2,** wherein said cam surface is at an angle of approximately 30°, and said platform assembly tilts back and forth through an arc of excursion of approximately 60°, 30° either side of center.

9. The omni angle rotary table of claim 2, wherein said shaft and said cam both are adapted to be driven by means of rubber drive belts.

10. The omni angle rotary table of claim 2, wherein said platform assembly is affixed to said shaft by an axial pivot in line with the cam surfaces so as to provide a virtually balanced assembly, free of springs or other impairments.

11. The omni angle rotary table of claim 1, wherein said shaft and said cam can be locked together at any position and driven together for use as an adjustable rotary turntable.

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