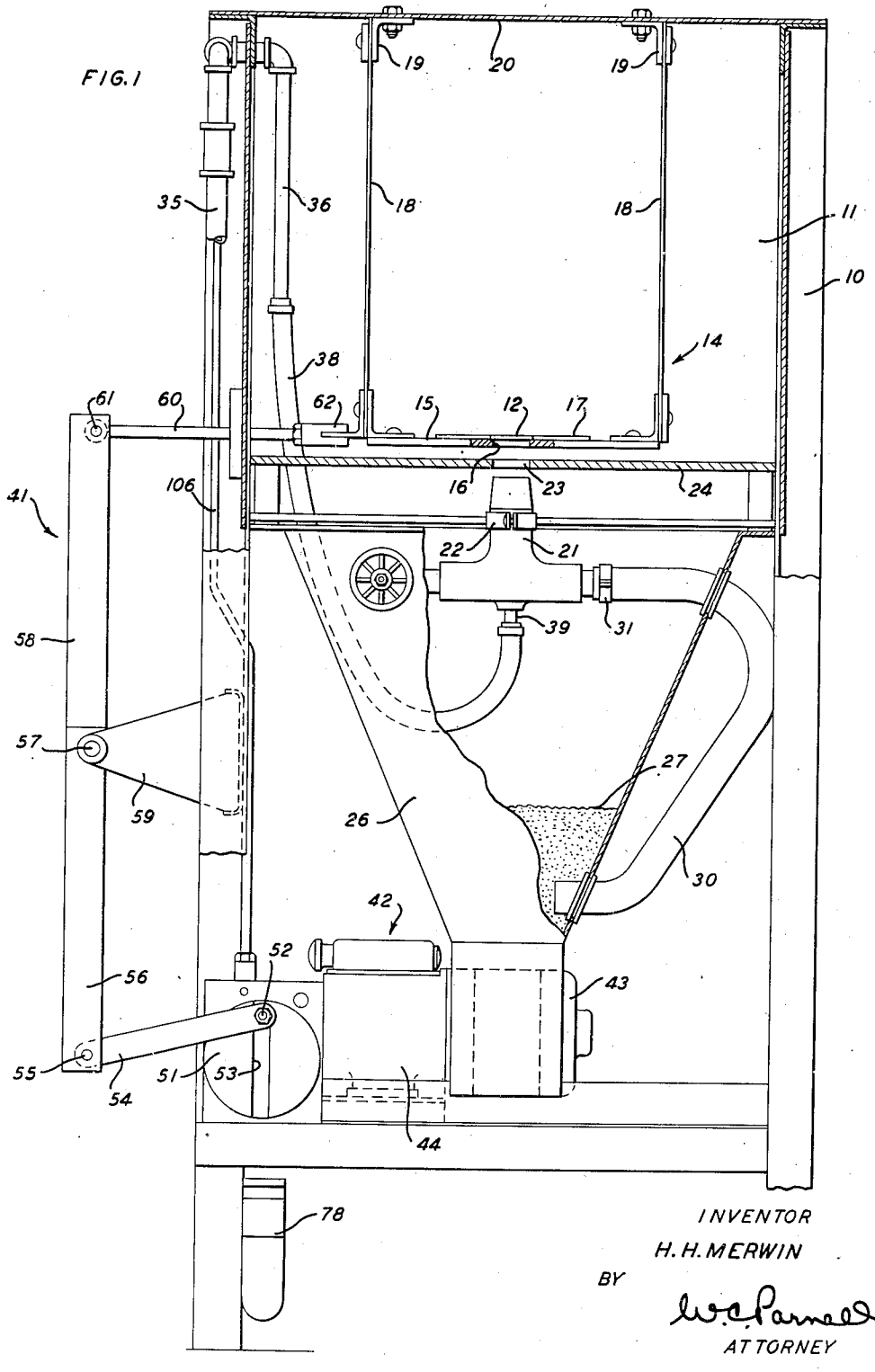
March 8, 1949. H. H. MERWIN 2,463,895

ARTICLE WORKING APPARATUS

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FIG. 1



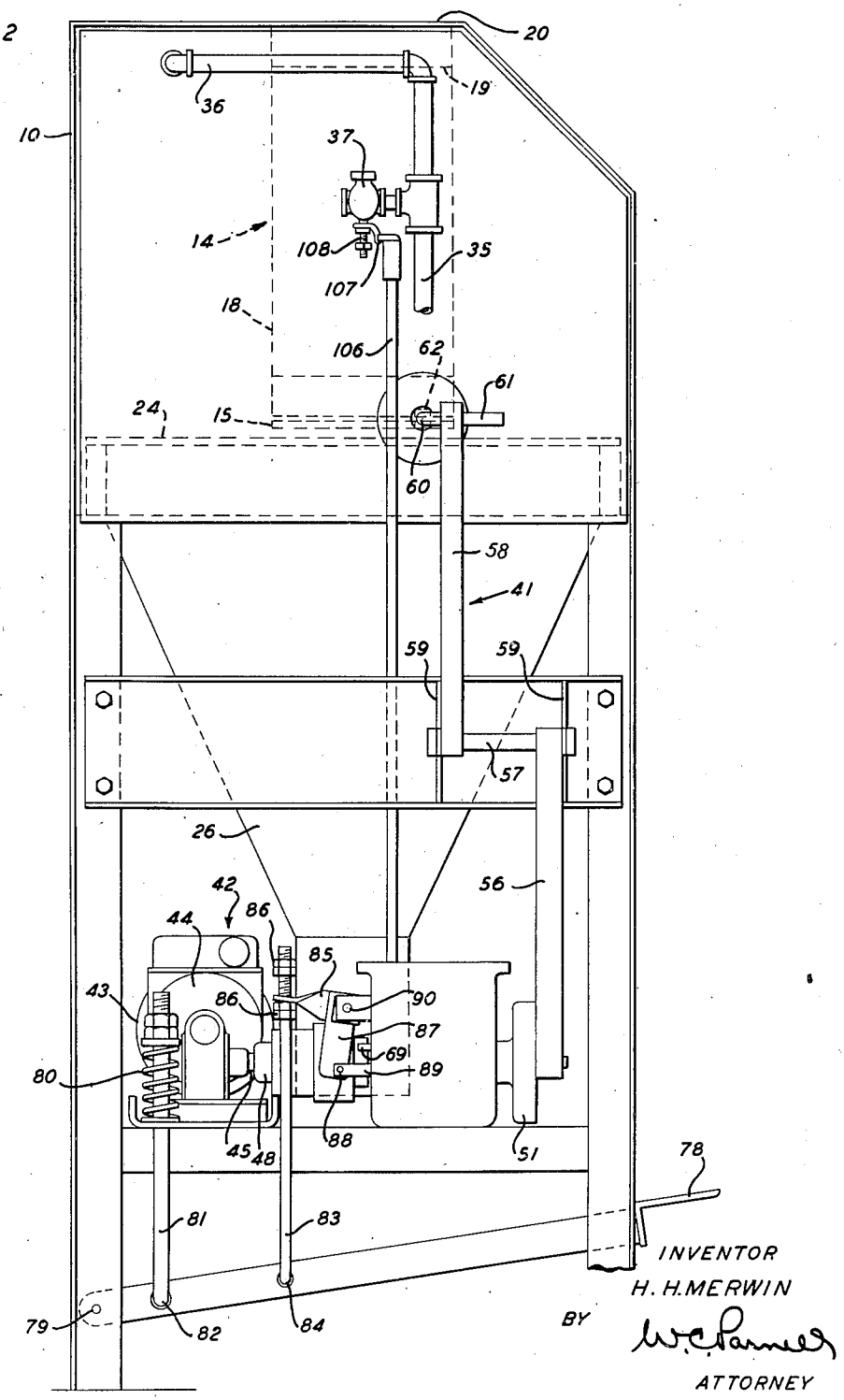
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ARTICLE WORKING APPARATUS

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FIG. 2



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FIG. 3

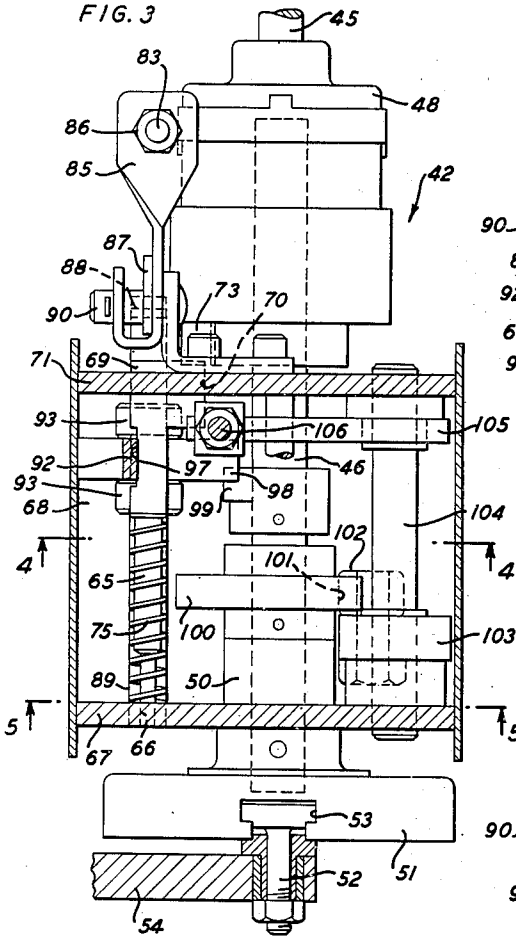


FIG. 4

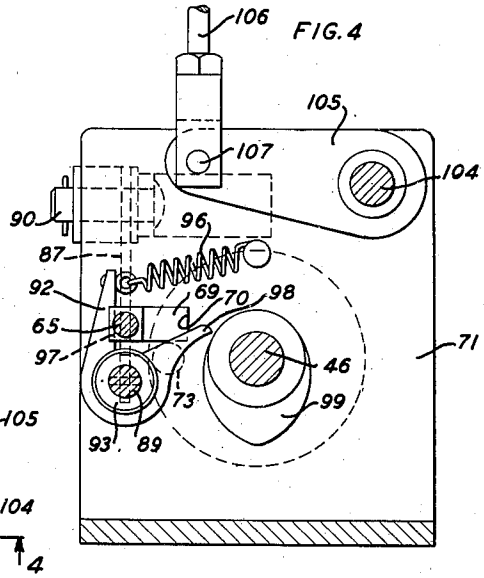


FIG. 5

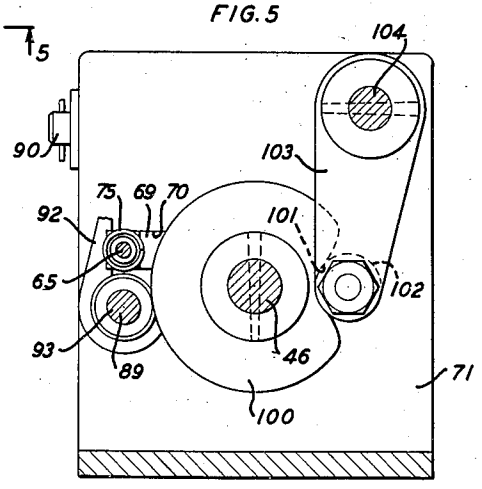
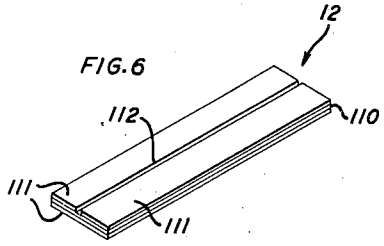


FIG. 6



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Patented Mar. 8, 1949

2,463,895

UNITED STATES PATENT OFFICE

2,463,895

ARTICLE WORKING APPARATUS

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Application June 9, 1947, Serial No. 753,535

6 Claims. (Cl. 51—14)

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This invention relates to article working apparatus, and more particularly to an apparatus for cutting grooves in the metallic coverings on quartz crystals by sand blasting.

In the manufacture of quartz crystals for use in the communication arts, metallic coatings are formed on opposing sides of the crystals and in some instances the coatings on each side are to be divided into two or more parts. The quartz crystals are wafer-like structures and the metallic coatings are relatively thin. Heretofore, the metallic coatings have been divided into two or more parts by a scraping process wherein the crystals could be readily damaged unless extreme care was taken in scraping portions of the metallic coatings from the crystal. In some instances, a straight path through the metallic coatings is satisfactory while with certain types of crystals it is desirable to form an irregular path of a given contour through the coatings, these irregular paths requiring additional accuracy and patience to avoid damage to the crystal and the coatings thereon. In either instance, it is essential that the coating on each side of the crystal be completely separated into two or more parts without varying the thickness of the crystal at the separating lines and without damaging the remaining metallic coatings.

An object of the invention is to provide a simple, efficient and highly practical article working apparatus, particularly adapted for removing metallic coatings from articles such as quartz crystals at restricted areas by sand blasting.

Broadly, the invention comprises an article working apparatus including a unit such as a sand blast nozzle operable to perform work on an article. The unit is mounted at a fixed position relative to a carriage for the article which is movable between given limits. A rotatable driving means, such as an electric motor, is connected to a driven member or shaft through a clutch control means, such as a foot treadle. Other associated mechanism is provided to actuate the clutch for one revolution to move the carriage between its limits and to operate the unit and hold it operated during movement of the carriage.

The driven member is a shaft, rotated by the clutch and carrying cams, one of which operates a latch to release a clutch stopping element to stop the clutch after one cycle of operation and hold the clutch unoperated until after the carriage has completed its cycle of movement between its given limits. The other cam rotating with the driven shaft actuates the unit and more particularly, an air valve in an air-line to a sand

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blast nozzle which is a more specific title for the unit. Operating mechanism connected eccentrically with the driven shaft in an adjustable manner to vary the limits of the carriage causes movement of the carriage from a starting position to a given position and back to the starting position.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein;

Fig. 1 is a front elevational view of the apparatus, portions thereof being shown in section;

Fig. 2 is a side elevational view of the apparatus;

Fig. 3 is a fragmentary top plan view of the operating mechanism of the apparatus;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 3; and

Fig. 6 is a perspective view of an article to be formed by the apparatus.

The apparatus as shown in the drawings includes a frame-like structure 10 having an upper compartment 11 open at the front whereby an operator may place articles indicated generally at 12 upon a carriage 14. The carriage 14 includes a table 15 provided with a slot 16 through which sand or other particles may be forced to a given portion of the article 12. A locating member 17 is mounted on the table 15 to assist in positioning the article relative to the slot 16. In the present embodiment, the table is supported by the lower ends of resilient members 18 suspended from brackets 19 mounted within the compartment 11 to the top 20 thereof.

A material working unit 21 in the present embodiment of the invention is a nozzle supported in the frame 10 by a bracket 22 in alignment with an aperture 23 in the lower wall 24 of the compartment 11. The aperture 23 is in general alignment with the slot 16 of the table 15. A receptacle 26 for an abrasive material 27 is mounted in the lower portion of the frame 10, the unit 21 being mounted within the receptacle near the upper central portion thereof. A supply line 30 extends externally of the receptacle 26 from a position adjacent the lower end of the receptacle and again enters the receptacle near the upper end thereof where it is connected at 31 to the unit 21. In this manner, the abrasive material 27 is fed in the conventional manner to the nozzle or unit 21. A main air supply line 35 is connected to a line 36 through a valve 37, a line 36 extending

into the compartment 11 where a flexible line 38 connects the line 36 to the unit 21 or nozzle at 36.

The table 15 is moved laterally between given limits relative to the nozzle 21 by an actuating mechanism indicated generally at 41 driven by a mechanism indicated generally at 42. The mechanism 42 includes an electric motor 43 which drives a speed reducing unit 44 known commercially as a standard Graham drive. The output shaft 45 of the unit 44 is periodically connected to a driven shaft 46 through a one revolution clutch 48. The shaft 46 is journalled in a bearing 50 and has a fly wheel 51 mounted on the outer end thereof. A stub shaft 52 adjustably mounted in a T-slot 53 relative to the axis of the shaft causes actuation of the connecting means 41 to move the table 15 between variable limits relative to the unit 21. The actuating means 41 includes a link 54 having one end mounted on the shaft 52 and the other end pivotally connected at 55 to a lever 56. The lever 56 has its upper end fixedly mounted on a shaft 57 which is journalled in a bearing bracket 59 mounted on the main frame 10. A lever 58 extends vertically from the shaft 57 where its lower end is fixedly mounted. A reciprocating arm 60 pivotally connected at 61 to the upper end of the lever 58 extends through the adjacent wall of the main frame 10 and into the compartment 11 where it is connected at 62 to the table 15.

A clutch control element 65 has one end supported for longitudinal movement in an aperture 66 in a wall 67 of a housing 68 and an enlarged end portion 69 substantially rectangular in cross-section slidably disposed in an aperture 70 of similar contour in another wall 71 of the housing 68. The portion 69 is normally held in the path of a pin 73 of the clutch 48 to hold the clutch unoperated until released by longitudinal movement of the element 65 free of the pin 73. A spring 75 disposed concentric with the element 65 normally urges the element toward the clutch 48 to position the portion 69 in the path of the pin 73.

Means is provided to actuate the element 65 against the force of its spring 75 to release the clutch 48. This means includes a treadle 78 (Fig. 2) pivotally supported at 79 and normally urged upwardly by a spring 80 applying its force to a rod 81 connected to the treadle at 82. An actuating rod 83 connected to the treadle at 84 extends through an aperture in one arm of a bell crank lever 85 where spaced collars or adjustable nuts 86 on the threaded end of the rod are positioned to engage the adjacent arm of the lever 85 to cause actuation thereof. The downwardly projecting arm 87 of the lever 85 is pivotally connected at 88 to a latch rod 89, the lever being pivotally supported at 90 intermediate its ends. The latch rod 89 is supported for longitudinal movement parallel with the element 65 at a position beneath the element as shown in Figs. 4 and 5. A latch 92 is mounted to move with the rod 89 between collars 93 which are disposed concentric with the rod 89 and fixed thereto. The latch 92 is normally urged in a clockwise direction by a spring 96 (Fig. 4) to hold the latch against the element 65. The adjacent portion of the element 65 is provided with a recess 97 to receive the latch 92 and in this manner connect the element 65 to the latch rod 89 whereby the element may be moved against the force of its spring 75 during movement of the latch rod.

The latch 92 has a cam follower 98 positioned to be engaged by a cam 99 mounted on the shaft 46 whereby the latch will be actuated against the force of its spring 96 to release the element 65 during rotation of the shaft and before it completes one cycle of rotation.

Means for actuating the valve 37 to cause the unit 21 to function during movement of the table 15 includes a cam 100 mounted on the shaft 46. The major portion of the cam 100 may be described as a high portion, a low portion 101 being normally positioned to receive a cam roller 102 at the idler position of the shaft 46. The cam roller 102 is supported by the lower end of a lever 103 which is fixedly mounted on a shaft 104. A lever 105 is fixedly mounted on the shaft 104 and has a pull rod 106 pivotally connected at 107 to its outer end. The pull rod 106 (Fig. 2) extends upwardly to a point adjacent the valve 37 where an arm 107 connects the pull rod to the valve 108 to open the valve to admit air under pressure to the unit 21 when the roller 102 rides on the high portion of the cam 100.

The article 12 in the present embodiment of the invention is a quartz crystal 110 with coatings 111 of a suitable metallic material such as silver. These coatings are to be divided into two parts by sand blasting the coatings in a given path 112.

During the operation of the apparatus, the table 15 may be termed a mask in that it serves to cover all portions of the article against the abrasive material forced from the unit 21, except the portion of the article represented by the path 112 which is in alignment with the aperture 16 of the table. Normally the apparatus is idle, at which time an article 12 may be placed on the table in a given position over the aperture 16. The operator may then actuate the treadle 78 to cause the lever 85 actuated by the pull rod 83 to move the latch rod 89 inwardly of the housing 68 to move the element 65 against the force of its spring 75 to move the portion 69 free of the pin 73 of the clutch 48. The motor 43 and the unit 42 will then be directly connected to the shaft 46 through the clutch 48. The table 15 will be moved through one operating cycle from its starting position to the end of its oscillating stroke and back to the starting position. During this interval, the cam 99 has engaged the cam follower 98, moving the latch 92 against the force of its spring 96 free of the element 65, that is, out of the recess 97 of the element to allow the spring 75 to return the element 65 to its normal position. The portion 69 of the element 65 will be positioned to be engaged by the clutch pin 73 at the end of one revolution of the shaft 46 to stop the shaft by effectively disengaging the clutch 48.

At the beginning of the operating cycle of the shaft 46 and its associated mechanism to move the table, the cam 100 will actuate its associated mechanism to open the valve 37 admitting air under pressure through lines 35 and 38 to the nozzle 21. This produces in the nozzle a partial vacuum which draws given quantities of the abrasive material 27 in a constant stream from the receptacle 26 through the line 30, forcing the abrasive material through the aperture 23 and also through the slot or aperture 16 in the table to the selected portion of the article to remove the covering material 111 along the path 112. After the apparatus has completed one cycle of operation, to remove the covering 111 from a given portion at one side of the article, the article may be turned and placed on the table in the desired position over the aperture 16 whereby during the next cycle of operation of the appa-

ratus, the other coating 111 may be divided into two parts along a path parallel with the path 112. Although the present embodiment illustrates a straight aperture 16 for removing portions of the coating material 111 along a straight path, the size and contour of this path may be readily varied by varying the size and contour of the aperture 16. Furthermore, the length of the aperture 16 depending upon the length of the article, may require variations in the limits of the movement of the table, this being accomplished by adjustment of the shaft 52, at the T-slot 53 of the fly wheel 51.

Although specific improvements of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined by the appended claims.

What is claimed is:

1. An article working apparatus comprising a unit operable to perform work on an article, a carriage for the article supported for movement between given limits relative to the unit, a rotatable driving means, a driven member operatively connected to the carriage, a clutch actuable to connect the driven member with the driving means, means operable to actuate the clutch whereby the carriage will be moved between its limits, and means actuated by the driven member to cause operation of the unit during movement of the carriage.

2. An apparatus for forming an article by the abrasive division of a coating on an article such as a metallic coating on a quartz crystal, the apparatus comprising a unit for directing an abrasive material in a given path mounted at a fixed position, a mask, mounted for movement transversely of the said path, to support the article and having an aperture through which the abrasive material may pass to a predetermined area of the article, a drive member, a driven shaft, a clutch actuable to connect the shaft to the drive member, means operatively connecting the shaft to the mask to cause movement of the mask between given limits relative to the unit during each revolution of the shaft, means to actuate the clutch to cause rotation of the shaft, and means under the control of the shaft to render the clutch ineffective after one rotary cycle of the shaft.

3. An apparatus for forming an article by the abrasive division of a coating on an article such as a metallic coating on a quartz crystal, the apparatus comprising a unit for directing an abrasive material in a given path mounted at a fixed position, a mask, mounted for movement transversely of the said path, to support the article and having an aperture through which the abrasive material may pass to a predetermined area of the article, a drive member, a driven shaft, a clutch actuable to connect the shaft to the drive member, means operatively connecting the shaft to the mask to cause movement of the mask between given limits relative to the unit during each revolution of the shaft, means to actuate the clutch to cause rotation of the shaft, means under the control of the shaft to render the clutch ineffective after one rotary cycle of the shaft, and means under the control of the shaft to cause operation of the unit during movement of the mask.

4. An apparatus for forming an article by the abrasive division of a coating on an article such as a metallic coating on a quartz crystal, the apparatus comprising a unit for directing an abrasive material in a given path mounted at a fixed position, a mask, mounted for movement transversely of the said path, to support the article and having an aperture through which the abrasive material may pass to a predetermined area of the article, a drive member, a driven shaft, a clutch actuable to connect the shaft to the drive member, means operatively connecting the shaft to the mask to cause movement of the mask between given limits relative to the unit during each revolution of the shaft, a clutch control element normally holding the clutch unactuated, means to move the element to cause actuation of the clutch to drive the shaft, and means rotatable with the shaft to release the element whereby the element will render the clutch ineffective to rotate the shaft at the completion of one rotary cycle of the shaft.

5. An apparatus for forming an article by the abrasive division of a coating on an article such as a metallic coating on a quartz crystal, the apparatus comprising a unit for directing an abrasive material in a given path mounted at a fixed position, a mask, mounted for movement transversely of the said path, to support the article and having an aperture through which the abrasive material may pass to a predetermined area of the article, a drive member, a driven shaft, a clutch actuable to connect the shaft to the drive member, means operatively connecting the shaft to the mask to cause movement of the mask between given limits relative to the unit during each revolution of the shaft, a clutch control element normally holding the clutch unactuated, means including a latch to move the element to cause actuation of the clutch to drive the shaft, and a cam driven by the shaft to actuate the latch to release the element whereby the element will render the clutch ineffective to rotate the shaft at the completion of one rotary cycle of the shaft.

6. An apparatus for forming an article by the abrasive division of a coating on an article such as a metallic coating on a quartz crystal, the apparatus comprising a unit for directing an abrasive material in a given path mounted at a fixed position, a mask, mounted for movement transversely of the said path, to support the article and having an aperture through which the abrasive material may pass to a predetermined area of the article, an air line including a valve to direct air under pressure through the unit to force the abrasive material toward the mask, a drive member, a driven shaft, a clutch actuable to connect the shaft to the drive member, means operatively connecting the shaft to the mask to cause movement of the mask between given limits relative to the unit during each revolution of the shaft, means to actuate the clutch to cause rotation of the shaft, and means under the control of the shaft to open the valve and hold it open during movement of the mask.

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