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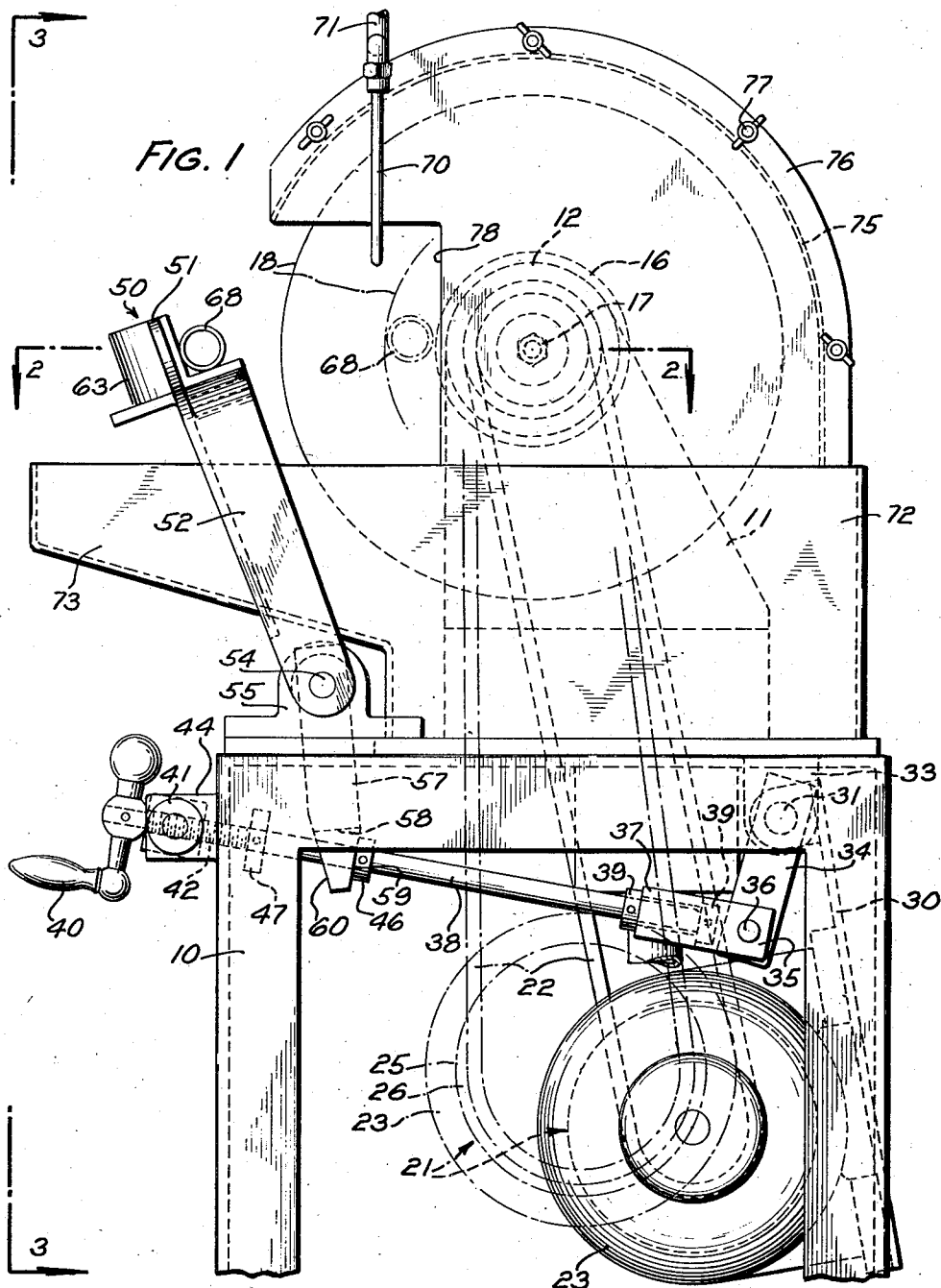
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MATERIAL WORKING APPARATUS

Filed June 28, 1944

2 Sheets-Sheet 1



INVENTORS
P. KOMROFF
S. PITT
D.V. WATERS
BY E.R. Nowlan
ATTORNEY

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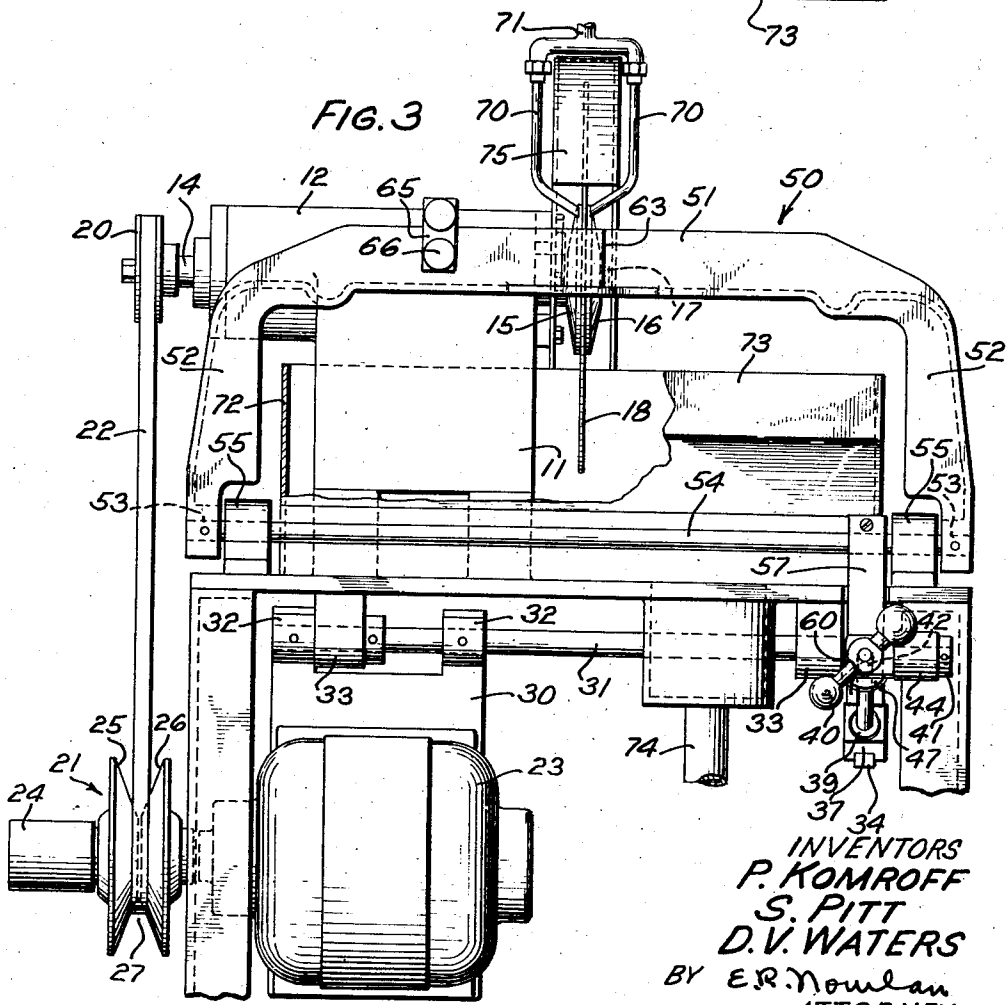
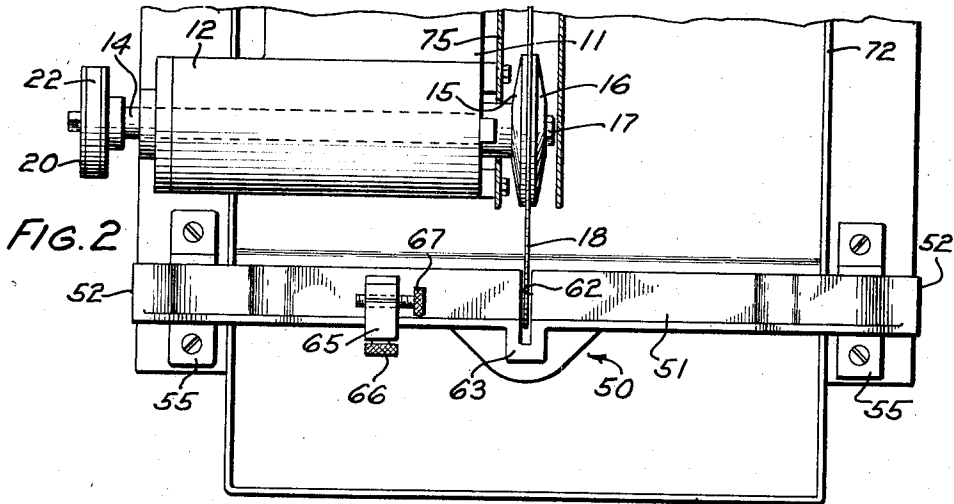
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S. PITT
D.V. WATERS
BY E.R. Nowlan
ATTORNEY

UNITED STATES PATENT OFFICE

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MATERIAL WORKING APPARATUS

Paul Komroff, Flushing, N. Y., and Samuel Pitt, Westfield, and Daniel Vaughn Waters, Flemington, N. J., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

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6 Claims. (Cl. 51—98)

This invention relates to material working apparatus, and more particularly to apparatus for cutting glass tubes into predetermined lengths.

In the manufacture of articles such as vacuum tubes, lamps or the like wherein glass tubes of given lengths are employed, the latter are frequently cut from lengths of tubing through the aid of abrasive wheels such as Carborundum or diamond studded wheels. To accomplish the best results it has been found that the glass tubes may be cut most efficiently by the abrasive wheels rotating at a given peripheral speed. Due to the rapid wearing of abrasive wheels of this type, the peripheral speed thereof varies rapidly if the abrasive wheels are rotated at a constant speed.

An object of the invention is to provide a material working apparatus particularly adapted for cutting glass wherein efficient means maintains a constant peripheral speed of the cutting means.

With this and other objects in view, the invention comprises a material working apparatus including a rotatable material working element variable in peripheral dimensions with wear, a support to move material relative to the element to cause cutting of the material, and means to vary the rotary speed of the element with its variation in peripheral dimensions to maintain a substantially constant peripheral speed of the element.

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 side elevational view of the apparatus, portions thereof being broken away;

Fig. 2 is a fragmentary sectional view taken substantially along the line 2—2 of Fig. 1, and

Fig. 3 is a fragmentary front elevational view taken substantially along the line 3—3 of Fig. 1.

Referring now to the drawings, the apparatus includes a supporting frame 10 upon which a bracket 11 is mounted, the latter having an upper bearing portion 12 to rotatably support a shaft 14. At the inner end of the shaft 14 a fixed mounting plate 15 is disposed to cooperate with a removable mounting plate 16 through the aid of a retaining screw 17 for use in mounting a material working or cutting element 18 upon the shaft. The element 18 is an abrasive wheel formed of Carborundum, diamond particles or the like adapted for use in cutting glass tubes or other like material.

At the outer end of the shaft 14 a pulley 20 is mounted for operative connection with a

variable pulley indicated generally at 21 through the aid of a belt 22. The variable pulley 21 is driven by a motor 23 and includes a variable speed control unit 24 of any commercially known type. The unit 24 with its pulley 21 is well known in the art, and it is believed that a detailed description and illustration thereof are not essential for a complete understanding of the invention. It should be understood, however, that the spring control mechanism within the unit 24 allows movement of pulley members 25 and 26 relative to each other cooperating to provide a V-shaped pulley groove 27 which varies with variation in the position of the axis of the motor or the motor shaft, upon which this structure is mounted, relative to the axis of the shaft 14.

The motor 23 is mounted upon a support 30, hanging from a shaft 31 and fixed thereto as at 32 (Fig. 3). The shaft 31 is journaled in suitable bearings 33 of the frame 10 and has a lever arm 34 fixed thereto as illustrated in Fig. 1. A yoke 35 is pivotally connected, as at 36, to the outer end of the lever arm 34 and has a portion 37 centrally apertured for free rotation upon a threaded control shaft 38 between a pair of fixed collars 39. The outer end of the threaded shaft 38 has a crank 40 fixed thereto for manual actuation of the shaft, to rotate it relative to a threaded element 41 through which a threaded portion 42 of the shaft extends. The threaded element 41 is held in a given position by journal portions 44 integral with the frame 10, only one of which is shown in Fig. 1, to enable the element to pivot or rotate the necessary distance for the movement of the threaded shaft in moving the lever arm 34 to vary the position of the motor 23.

Locating collars 46 and 47 are fixedly mounted upon the threaded shaft 38 at given spaced positions to control the movement of a material support indicated generally at 50. The material support is U-shaped in general contour, as illustrated in Fig. 3, and includes a central portion 51, angular in cross-section, with leg portions 52 which extend downwardly, their lower ends being apertured for mounting, as at 53, upon the outer ends of a supporting rod or shaft 54. The rod 54 is journaled in suitable bearings 55 mounted upon the frame 10 and has a control arm 57 fixedly mounted thereon as illustrated in Fig. 3. The lower end of the control arm 57 is bifurcated, as at 58, to straddle the threaded shaft 38, tapered surfaces 59 and 60 thereof

being adapted to engage the locating collars 46 and 47 respectively.

Returning to the central portion 51 of the material support 50, a slot 62 is formed therein to receive the cutting element 18 so that it may cut completely through any article or material disposed on the support. A reenforced portion 63 extends about the slot 62. A variable stop or locating unit 65 is clamped at any suitable position upon the vertical part of the central portion 51 of the material support, as illustrated in Figs. 2 and 3, it being held in any desired position through the aid of a thumb screw 66. Another screw or threaded element 67 is included in the unit 65 to serve as a variable stop to locate the material, which in the present instance is a glass tube 68, on the support relative to the cutting element 18.

A lubricant is necessary in the present instance for the cutting element 18. This lubricant is supplied to both sides of the element through nozzles 70 extending from a joint connection 71 with a suitable supply means (not shown). A receptacle or reservoir 72 mounted upon the frame 10 receives the lubricant, a lip 73 of the reservoir extending forwardly beneath the material support 50. A drain 74 for the reservoir may be connected, if desired, with any recirculating means (not shown). A hood 75, in cooperation with its cover 76 removably secured in place by wing bolts 77 or the like, partially surrounds the cutting element to eliminate outward splashing of the lubricant. The hood and its cover are cut away, as at 78, so that the major portion of the cutting element may be utilized as its diameter decreases due to wear.

Considering now the operation of the apparatus, let it be assumed that the solid line illustration of the cutting element represents the full diameter thereof when new. The motor and its pulley unit 21 will at this time be in the solid line position shown in Fig. 1, causing rotation of the cutting element at a given peripheral speed. At this time the limits of movement of the material support 50 are controlled by the positions of the collars 46 and 47. Therefore, with the motor 23 in operation, the cutting element is driven at its original rotary speed and the operator may place the material or glass tube 68 upon the support 50, that is, the central portion 51 thereof, its position being controlled by the unit 65 or its screw 67. By holding the material at desired positions away from the slot 62, the operator may move the support about its pivot, namely the bearings for the rod 54, to move the material into engagement with the rotating element until the latter cuts through the material. The material support may then be returned to its normal position, the length of the material removed therefrom, the material advanced again to the stop or screw 67, and the cutting operation repeated. During each movement of the support 50 in the inverted pendulum-like manner, it is controlled by the surfaces 59 and 60 of the control arm 58 engaging their respective collars 46 and 47.

As the cutting element wears, it is necessary for the operator to adjust the locations of the collars 46 and 47, in order that the material may be completely severed. This adjustment is made through the aid of the crank 40, to rotate the threaded shaft 38 and thus move the collars 46 and 47 the desired distance. This distance is also controlled by the reenforcing structure 63 of the support 50, limiting the inward movement of the

support. As previously stated, it is important that the peripheral speed of the cutting element be maintained substantially constant. This is substantially automatically brought about through the linking of the control means for moving the motor with the control means for the material support. During the adjustment of the collars 46 and 47 through the movement of the threaded shaft 38, the lever arm 34 is also moved to move the motor 23 arcuately together with its pulley unit 21, to shorten the distance between the axis of the motor and its pulley unit 21 and the axis of the cutting element. The belt being of a constant size, will enable the control unit 24 to function to move the pulley members 25 and 26 closer together to increase the driving diameter of the variable pulley 21, and thus increase the speed of rotation of the cutting element 18. This variation continues for each adjustment of the threaded shaft made necessary to bring about variations in the positions of the collars 46 and 47. The extreme variation is illustrated in dot and dash lines in Fig. 1, where the driving diameter of the pulley members 25 and 26 has increased to substantially twice its original diameter, as illustrated in the solid lines in this figure. Furthermore, the dot and dash lines in the cutting element in Fig. 1 illustrate approximately the extreme wear of the element and also the position of the material 68 when severed by the cutting element reduced to this diameter.

It will, therefore, be understood that the material working or cutting element 18 decreases in peripheral dimensions with wear, and through the aid of the threaded shaft 38 and its control means, the rotary speed of the cutting element may be increased with the decrease in the peripheral dimensions thereof to maintain a constant and peripheral speed thereof, all of this being accomplished through the variation in the control means for the material support. Furthermore, to install a new cutting element it is necessary to return the support 50 to its original position, thus making it impossible to cause driving of the new cutting element at an excessive peripheral speed.

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. A material working apparatus comprising a material working element rotatable about a given axis, a support for material mounted for movement toward and away from the axis of the element, between given limits, means to cause variation in the rotary speed of the element, and means under the control of the last named means to vary the limits of movement of the support.

2. A material working apparatus comprising a rotatable material cutting element decreasing in peripheral dimensions with wear, a support for material mounted for movement relative to the element, between given limits, means to increase the rotary speed of the element with the decrease in the peripheral dimensions thereof to maintain a substantially constant peripheral speed of the element, and means under the control of the last named means to vary the limits of movement of the support.

3. A material working apparatus comprising a rotatable material cutting element decreasing in peripheral dimensions with wear, power means,

variable means operatively connecting the power means with element to cause rotation of the element, means to vary the said connecting means with the decrease in the peripheral dimensions of the element to maintain a substantially constant peripheral speed of the element, a support for the material movable toward and away from the element between given limits, and means under the control of the last named means to vary the limits of movement of the support.

4. A material working apparatus comprising a rotatable material cutting element decreasing in peripheral dimensions with wear, a support pivotally mounted for movement of material toward and away from the element, a control member, stops carried by the control member to limit the movement of the support, means to actuate the control member to vary the positions of the stops relative to the element and thus vary the limits the support may be moved toward and away from the element, and means affected by the control member to cause variation in the peripheral speed of the cutting element.

5. A material working apparatus comprising a rotatable material cutting element decreasing in peripheral dimensions with wear, a support pivotally mounted for movement of material toward and away from the element, a control member, stops carried by the control member to limit the movement of the support, means to actuate the

control member to vary the positions of the stops relative to the element and thus vary the limits the support may be moved toward and away from the element, and means actuable by the control member to increase the rotary speed of the element with the decrease in the peripheral dimensions thereof to maintain a substantially constant peripheral speed of the element.

6. A material working apparatus comprising a rotatable material cutting element decreasing in peripheral dimensions with work, a motor, means including a variable pulley to operatively connect the motor with the cutting element to cause rotation of the element when the motor is energized, means to support the motor for movement relative to the cutting element, a support pivotally mounted for movement of material toward and away from the element, a control member, stops carried by the control member to limit the movement of the support, means to actuate the control member to vary the positions of the stops relative to the element and thus vary the limits the support may be moved toward and away from the element and means actuated by the control member to move the motor relative to the cutting element to cause the variable pulley to increase the rotary speed of the cutting element.

PAUL KOMROFF.

SAMUEL FITT.

DANIEL VAUGHN WATERS.