

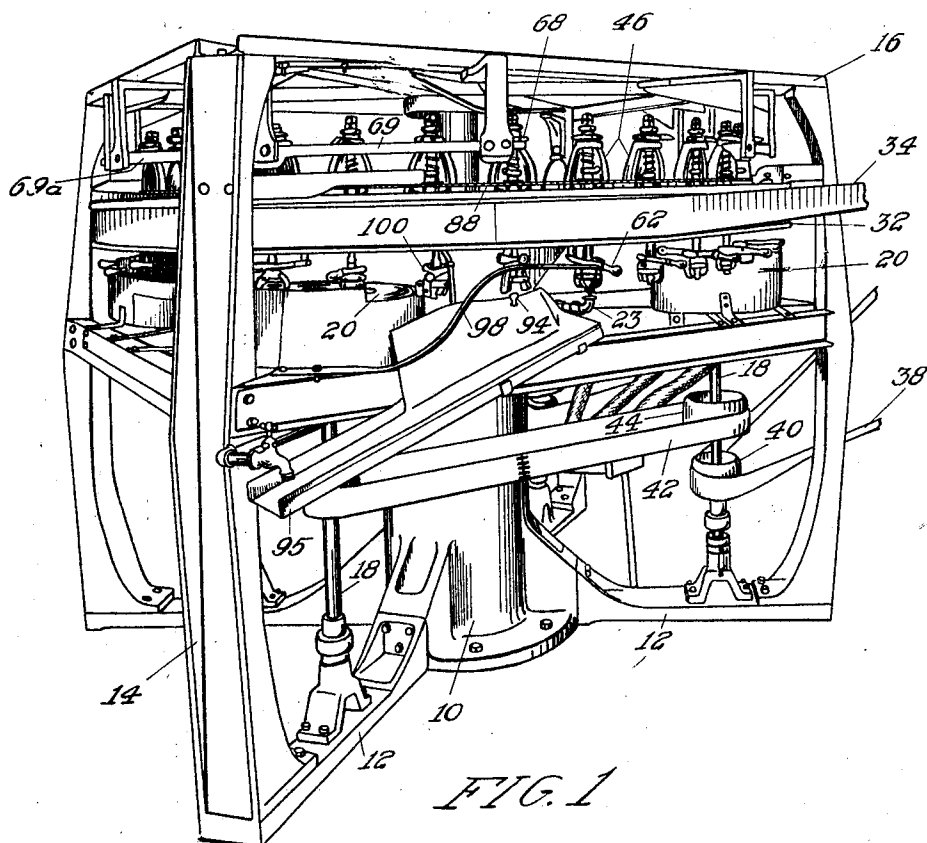
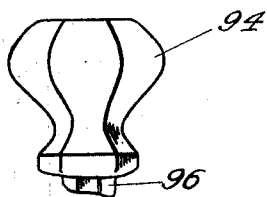
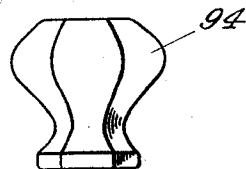
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W. A. ANDERSON  
KNOB GRINDING MACHINE

Filed Feb. 19, 1925

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

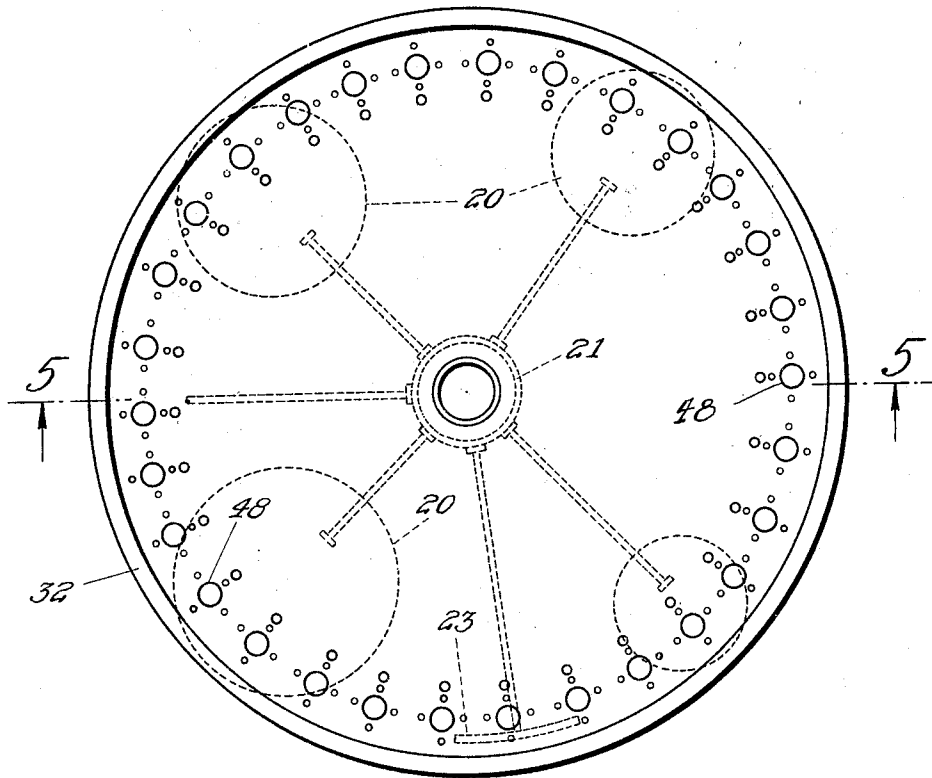


FIG. 4

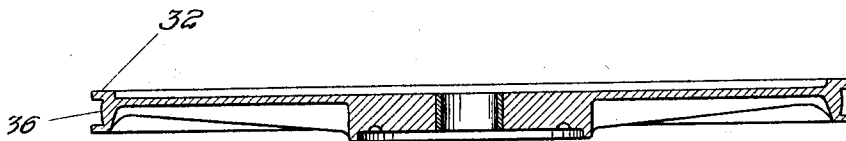


FIG. 5

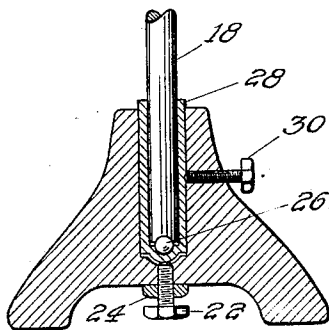


FIG. 6

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## UNITED STATES PATENT OFFICE.

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## KNOB-GRINDING MACHINE.

Application filed February 19, 1925. Serial No. 10,424.

This invention relates to improvements in grinding machines and has for its particular object the provision of a grinding machine especially adapted for grinding, finishing and polishing the burs, broken ends, rough edges, and the like of glass door and drawer knobs or other objects of similar material.

One of the important objects of this invention is the provision in a grinding machine designed more particularly for grinding and finishing glass or porcelain drawer knobs, of means whereby the knobs or other articles of glass or like materials are automatically ground upon a succession of stones, from coarse to fine, so as to produce a finished product while in transit through the machine.

Another important object of this invention is the provision, in a grinding machine, of a plurality of work carrying means for orbital movement through a path in which the grinding operations are accomplished, and wherein the work is automatically discharged from the machine at the end of the grinding operations.

Another important object of this invention is the provision, in a grinding machine for drawer knobs or the like, of means for producing a relative grinding movement between the work and the grinding stones, whereby the work itself will traverse a curvilinear path over the grinding stones, which themselves revolve with a circular movement about their centers, whereby a more effective grinding operation will result, and the faces of the grinding stones may be utilized for as great a portion of their diameters as is desired.

Still another important object of this invention is the provision, in a grinding machine having a plurality of grinding stones, of means for automatically vertically moving the work incident to its path of travel from one grinding stone to another and at the same time maintaining a desired pressure against the face of a stone when work is being operated upon.

Still another and further important object of the invention is the provision of an improved chuck whereby work of various sizes and shapes may be accommodated, and whereby such objects may be held in various desired positions so as to afford a wide range of operations, together with automatic stop or limiting means for safeguarding against undesired excess grinding or cutting.

Another and still further important ob-

ject of the invention is the provision, in a grinding machine, of means for automatically rotating the work while being operated upon, and a further means of adjusting by elevation or depression the plane in which the grinding elements revolve, to compensate for wear.

Other and further important objects of the invention will be apparent from the disclosures in the accompanying drawings and following specification.

The invention, in a preferred form, is illustrated in the drawings and hereinafter more fully described.

In the drawings:

Figure 1 is a perspective view of the improved grinding machine of this invention, illustrating the arrangement and correlation of the parts,

Figure 2 is a perspective view illustrating a glass or other drawer knob adapted to be ground in the machine of this invention, showing the knob as in its rough, unfinished form.

Figure 3 is similar to Figure 2, illustrating the drawer knob after being ground and finished in the machine of this invention.

Figure 4 is a top plan view illustrating the improved rotary work table provided for supporting the knob holding chucks, and showing in dotted lines the pipes for distributing water to the grinding stones and also for spraying and washing the finished work.

Figure 5 is a vertical sectional view, taken on the line 5-5 of Figure 4.

Figure 6 is a detail view, partly in section, illustrating the improved means for adjusting the height of the grinding stones and their supporting shafts.

Figure 7 is an enlarged vertical elevation of one of the improved chucks for supporting the work and carrying it in its desired path through the machine.

Figure 8 is a central vertical section of a portion of the chuck illustrated in Figure 7.

As shown in the drawings:

The reference numeral 10 indicates generally the pedestal comprising one of the main supporting elements of the improved machine of this invention, having attached thereto horizontally extending base members 12, which, in turn, support vertical frame members 14 and top braces 16, all as illustrated in Figure 1.

Each of the horizontally extending base

members 12 has mounted thereon a grinding stone supporting shaft 18, each of which, in turn, supports for proper revolution a grinding stone 20, the said grinding stones being of various sizes and grades as best indicated in Figures 1 and 4.

Immediately above the grinding stones 20 is a series of connected water pipes 21, as best shown in the dotted lines in Figure 4, the ends of which are adapted to spray the stones, and an extension 23 is also provided adapted for a spraying of the work as it passes through the machine.

In Figure 6 is illustrated an improved means for vertically adjusting and fixing the height of the grinding stones 20 in the machine to compensate for wear, the same comprising essentially an adjusting bolt 22 fitted into the under side of the supporting element 20 for the shaft 18, and provided with a lock nut 24. The shaft 18 is, in turn, mounted upon a single ball bearing, as illustrated at 26, the ball bearing and the shaft being in turn positioned in a supporting sleeve 28, which is adapted to be moved vertically by means of the adjusting screw 22. A set screw or the like 30 is positioned in the side of the base member, having its point adapted to co-operate with the sleeve 28 to prevent any undesired rotation thereof.

Rotatably mounted on a suitable support in the pedestal 10 is a chuck wheel 32, as best illustrated in Figures 1, 4, and 5, the same adapted to be rotated by means of a driving belt or the like 34, operating in a suitable groove 36 in the edge of the chuck wheel. A driving belt for the grinding stones and their supporting shafts 18 is also provided, as shown at 38, adapted to co-operate with a pulley 40 on one of the shafts, and this shaft or spindle 18 in turn drives the remaining shafts by means of a series of suitable connecting belts, as shown at 42, each mounted on pulleys 44.

Fixed in the chuck wheel 32 and adapted to be rotated therewith is a plurality of chucks or work holding members, illustrated at 46 in Figure 1 and shown in detail in Figures 7 and 8. In the preferred embodiment of the invention thirty of these chucks 46 are provided, but it is evident that the number may be varied as desired. A chuck 46 is positioned in each hole 48 in the chuck wheel 32 and suitably secured in position by means of bolts or the like 50.

Each chuck comprises essentially a means for gripping the work, including a plurality of gripping fingers, as best illustrated at 52 in Figure 7, each of which is pivotally mounted to fulcrum about a point 54 and having its upper end pivotally connected with a short operating toggle bar or the like 56, these in turn being each connected to a supporting element 58 adapted to be slidably vertically moved on the chuck shaft 60 by means of a suitable operating handle 62. It will be ob-

vious that an upward movement of the handle 62 will operate to throw open the gripping fingers 52 by moving their lower ends outwardly. Each of the gripping fingers 52 is provided with a suitable screw or other fastening member 64, whereby a work holding element 66 of some soft metal, rubber, or the like, can be firmly affixed to the inner face of the gripping finger 52. The elements 66 are interchangeable and of various sizes and shapes so as to readily accommodate different pieces of work.

The chuck shaft 60 extends upwardly through the body of the chuck 46 and is adapted for slidable vertical motion therein and is also rotatably mounted in suitable bearings in the chuck.

Means for elevating the shaft 60 together with its attached gripping elements 52—66 and the operating handle 62 is provided in the form of a lifting lever 68 pivotally mounted at the top of the chuck 46 and adapted to surround and pivotally co-operate with a suitable shaft lifting element 70. The member 70 is rotatably fitted about the shaft 60 and has its upper face adapted to rotatably bear against the lower face of a supporting nut 72, screw threaded to the upper end of the shaft 60 and adjustably fixed in position by means of a lock nut or the like 74. A bushing 76 is splined to the shaft 60 by means of a key 78 and adapted to rotatably support the shaft in the upper end of the housing 46, while at the same time allowing a free vertical movement of the shaft with respect to the bushing. A helical spring 80 having its upper end bearing against the member 76 surrounds the shaft 60 at this point and has its lower end adapted to co-operate with a stop in the form of a gripping element 82 fixedly mounted on the shaft 60 and adapted to grip the same by means of a locking bolt 84.

Likewise splined to the shaft for slidable but non-rotatable operation thereon is a sprocket wheel or gear member 86 mounted adjacent the base plate of the housing 46, the teeth of which are adapted to co-operate with a suitable sprocket chain or the like 88 extending completely around the machine and fixed to the four corner posts thereof, as best illustrated in Figure 1. A bearing sleeve 90 is mounted in the lower end of the housing 46 and held in suitable position by means of a set screw 92, whereby the shaft 60 is allowed to freely rotate with respect to the housing 46 and also to be vertically moved therein.

The operation is as follows:

A knob or the like 94 adapted to be ground and finished in the machine, and particularly to have the extending bur 96 shown in Figure 2 removed therefrom, is placed in the gripping fingers 52 of one of the chucks 46 when the said chuck arrives at the point designated by the reference numeral 100 in Figure 1, the gripping elements 52 at that time being open

on account of the operating handle 62 having been lifted upwardly by riding upon the end of the projecting cam arm 98 fixed to the machine at the discharge point best illustrated in Figure 1. At this point the gripping fingers 52 are shown as discharging a finished knob 94 into a delivery trough or the like 95. After the rough knob 94 has been inserted by the operator and fixed in position by a manual depression of the handle 62 the operation of the machine gradually carries the chuck into co-operative relation with the first grinding stone adjacent the point 100. Just before the chuck arrives at or near the grinding stone 20 the shaft 60 is elevated vertically with respect to the chuck housing 46 by the action of the lever 68 riding upwardly upon a cam member 69 mounted in the frame of the machine in proper co-operative relation thereto, as best illustrated in Figure 1. The shaft 60, together with the chuck elements at the lower end thereof, are maintained in this elevated position until the chuck is immediately above the grinding stone, when the circular motion of the chuck table about its center will carry the lifting lever 68 away from and off of the cam element 69, and the burred end 96 of the knob will be allowed to contact with the grinding stone 20, proper pressure being maintained between the stone and the knob by reason of the helical spring 80. This pressure is maintained until approximately the point at which the work has been carried past the stone, when the supporting shaft 60 is again lifted by means of the lifting lever 68 and another suitable cam element 69<sup>a</sup> until such time as the work arrives into proper operating relation with the next stone, when it is again lowered thereonto. This operation is repeated four times, each successive stone being of finer grinding material, until the entire circuit of the machine has been completed, whereupon the knob 94 is released into the trough as above described. The relation between the spring 80 and the stop 82 is such that grinding action cannot proceed beyond a certain point on the knobs 94.

At the same time that the work is being carried through the machine it is being continually revolved on account of the action between the sprocket wheels 86 and the chain 88, whereby a highly desirable and very satisfactory grinding operation results on account of the compound relative motion between the revolving grinding stones and the separately revolving knobs themselves. After the last grinding operation, the work is washed by water flowing from the spout positioned at the end of the chute 95.

It will be seen that herein is provided a grinding machine adapted for quite a wide variety of work, wherein the work is automatically carried through the machine, successively brought into contact with a plural-

ity of grinding elements of various degrees of fineness, and when completely finished and polished is then washed and discharged from the machine, all of the operations being entirely automatic and requiring no manual labor with the exception of the insertion of the work into the machine at regular intervals. Further, an improved form of work holding chuck adapted to elevate and depress the work at proper intervals, and further, to maintain the same in proper co-operative relation with the grinding stones, has been provided.

I am aware that many changes may be made and numerous details of construction varied throughout a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon otherwise than as necessitated by the prior art.

I claim as my invention:

1. In a grinding machine, a circular rotary work holding table adapted for relatively slow movement about the center of the machine, a plurality of rotatable grinding elements mounted below said work holding table and in co-operative relation therewith, each of said grinding elements adapted for a successive operation upon the work as it passes through the machine, and adapted for relatively fast movement about their centers, and means for automatically applying the work to the grinding elements in succession while at the same time revolving the work about a further independent center with respect to the center of rotation of the work holding table and the center of rotation of the grinding elements, said means comprising automatically raised and lowered chucks for gripping the work, and means for rotating said chucks while moving with the table, said means comprising a fixed chain extending around the machine, and sprockets on the chucks meshing with said chain.

2. In a grinding machine, a circular rotary work holding table adapted for relatively slow movement about the center of the machine, a plurality of rotatable grinding elements mounted below said work holding table and in co-operative relation therewith, each of said grinding elements adapted for a successive operation upon the work as it passes through the machine, and adapted for relatively fast movement about their centers, and means for automatically applying the work to the grinding elements in succession while at the same time revolving the work about a further independent center with respect to the center of rotation of the work holding table and the center of rotation of the grinding elements, said means comprising automatically raised and lowered chucks for gripping the work, the means for raising and lowering the chucks comprising cams mounted in the path of travel of the chucks, and

means for rotating said chucks while moving with the table, said means comprising a fixed chain extending around the machine, and sprockets on the chucks meshing with said chain, said chucks including automatically operated work gripping members and a cam in the machine for releasing said gripping members at the end of the grinding operations upon the work.

3. In a grinding machine, a circular rotary work holding table adapted for relatively slow movement about the center of the machine, a plurality of rotatable grinding elements mounted below said work holding table and in co-operative relation therewith, each of said grinding elements adapted for a successive operation upon the work as it passes through the machine, and adapted for relatively fast movement about their centers, and means for automatically applying the work to the grinding elements in succession while at the same time revolving the work about a further independent center with respect to the center of rotation of the work holding table and the center of rotation of the grinding elements, said means comprising automatically operated chucks for gripping the work, and means for simultaneously rotating and raising and lowering said chucks while moving with the table, said rotating means comprising a fixed chain extending around the machine, and sprockets on the chucks meshing with said chain, said chucks including automatically operated work gripping members and a cam in the machine for releasing said gripping members at the end of the grinding operations upon the work, together with means on each chuck for co-operating with said cam, said means comprising a work gripping lever adapted to be manually depressed into work gripping position.

4. In a grinding machine, a circular rotary work holding table adapted for relatively slow movement about the center of the machine, a plurality of rotatable grinding elements mounted below said work holding table and in co-operative relation therewith, each of said grinding elements adapted for a successive operation upon the work as it passes through the machine, and adapted for relatively fast movement about their centers, and means for automatically applying the work to the grinding elements in succession while at the same time revolving the work about a further independent center with respect to the center of rotation of the work holding table and the center of rotation of the grinding elements, said means comprising automatically raised and lowered chucks for gripping the work, and means for rotating said chucks while moving with the table, said means comprising a fixed chain extending around the machine, and sprockets on the chucks meshing with said chain, said chucks including automatically operated work gripping members and a cam in the machine for releasing said gripping members at the end of the grinding operations upon the work, together with means on each chuck for operating with said cam, said means comprising a work gripping lever adapted to be manually depressed into work gripping position, and means for automatically elevating each chuck clear of an abrading element at the commencement and at the end of the operating path of same, said means comprising a cam adjacent each abrading stone, and a chuck elevating lever on each chuck positioned to ride over the cams.

In testimony whereof I affix my signature.

WILLIAM A. ANDERSON.