April 14, 1942. H. H. CANTERBURY 2,279,616

WORK HOLDER FOR FACING MACHINES

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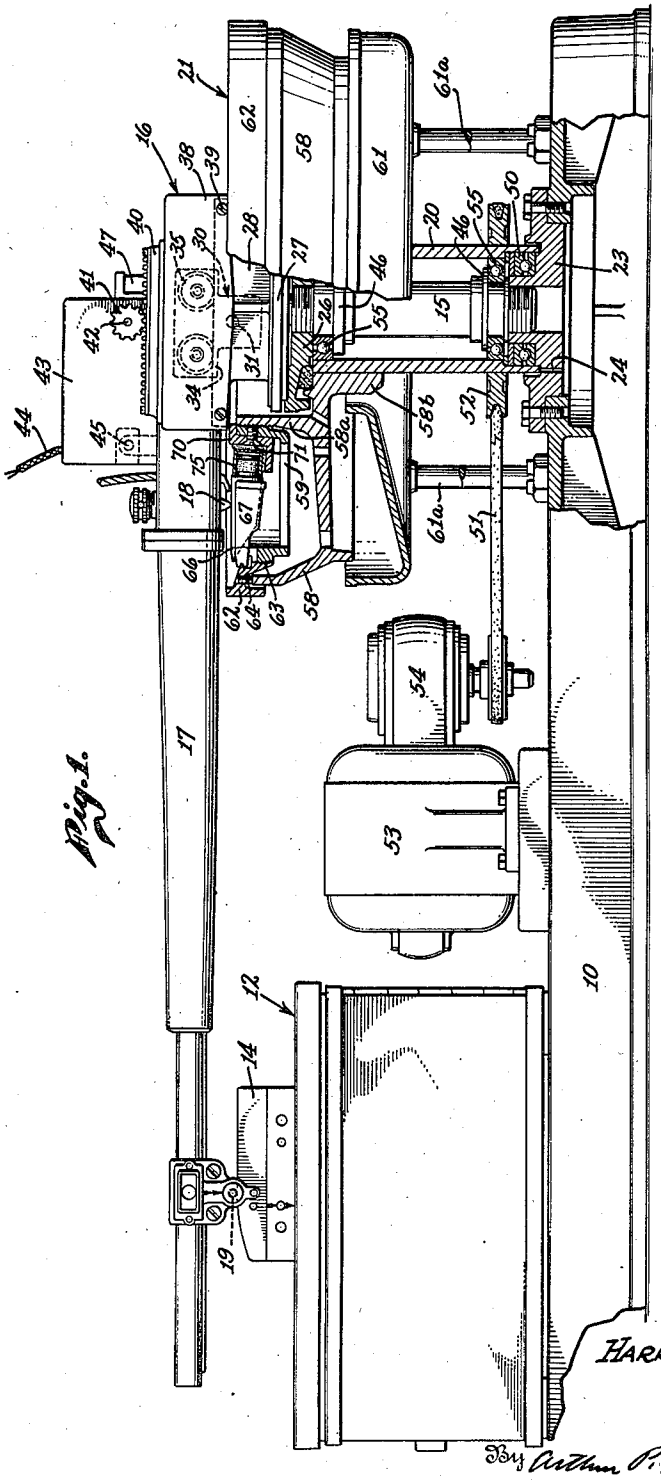


Fig. 1.

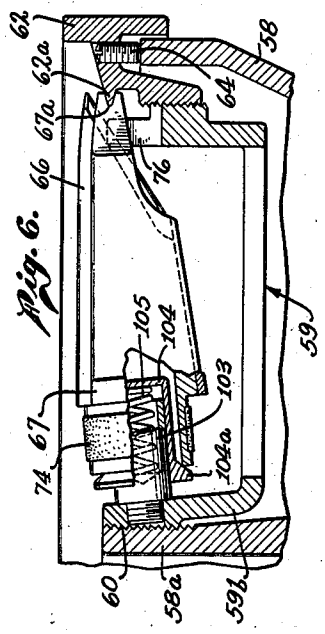


Fig. 6.

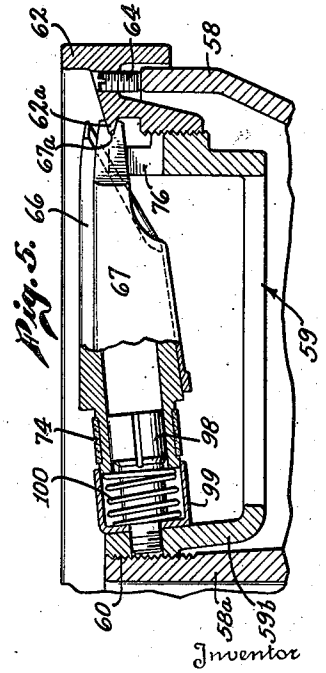


Fig. 5.

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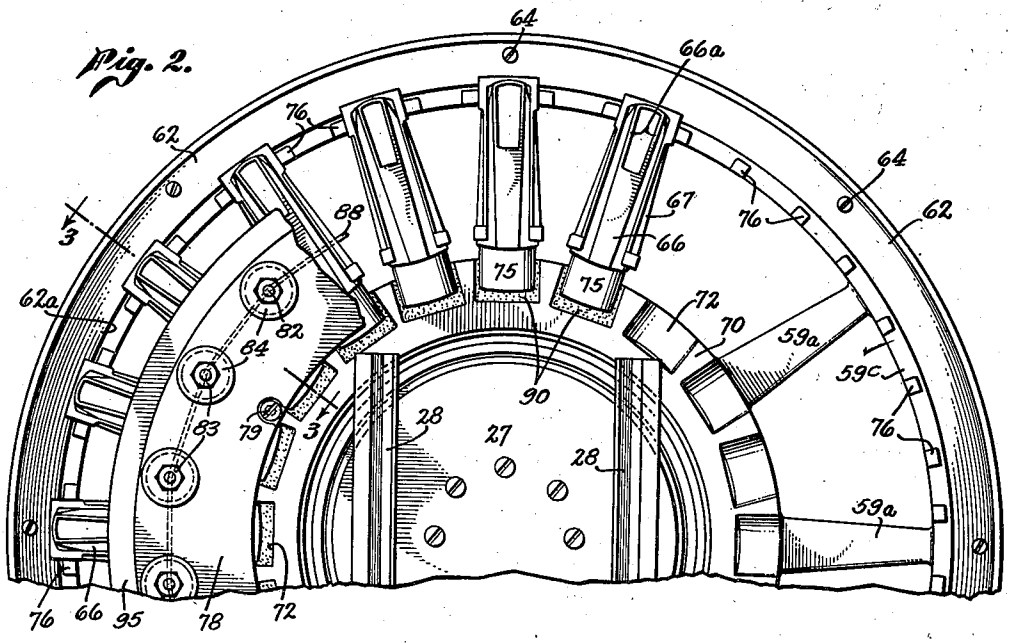
Attorneys

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WORK HOLDER FOR FACING MACHINES

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Fig. 2.



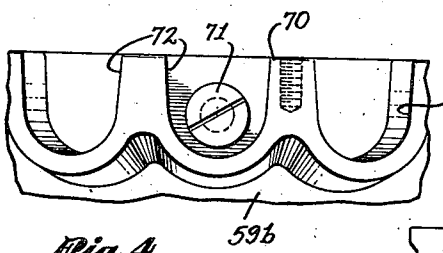


Fig. 4.

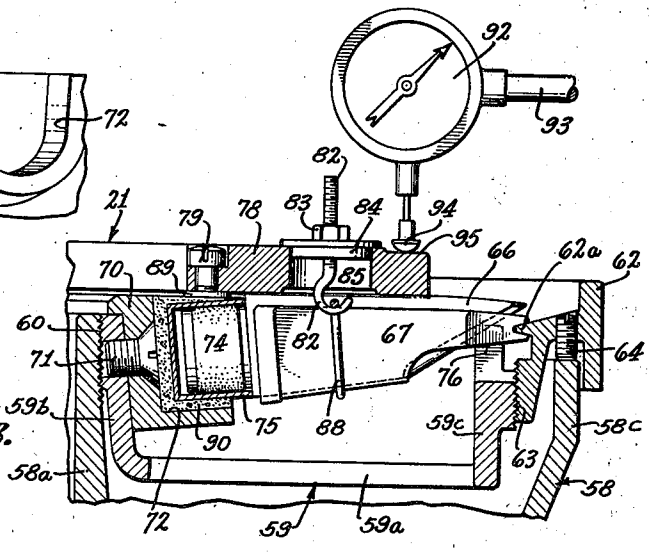


Fig. 3.

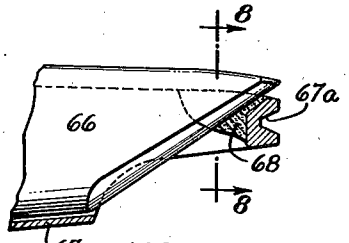


Fig. 7.

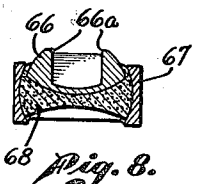


Fig. 8.

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UNITED STATES PATENT OFFICE

2,279,616

WORK HOLDER FOR FACING MACHINES

Harry H. Canterbury, Whittier, Calif.

Application December 7, 1938, Serial No. 244,411

8 Claims. (Cl. 90—59)

The present invention relates generally to precision facing machines, and more particularly to work holders in such machines for holding the blanks being faced, such as blanks being made into mouthpieces for musical instruments. Because my invention has been developed for the manufacture of these mouthpieces and is especially adapted thereto, I describe it in that connection; but it is to be understood that I am not necessarily limited by such description since the invention is capable of use in connection with other types of blanks.

This application contains subject matter common to my copending application filed August 13, 1937, Serial No. 158,933, entitled "Mouthpiece facing machine," and may be considered to be a continuation-in-part of said earlier filed case. The claims in the earlier application are directed to broad aspects of the entire machine described herein, while the claims of this application are directed to certain particular phases of the invention set out in the following description.

In making mouthpieces, a very high degree of accuracy is desired because the longitudinal curvature of the face and rails must closely conform to the shape assumed by the playing reed when it vibrates to produce musical tones, since the playing quality of the mouthpiece is seriously impaired by inaccuracy of the face and rails. Among the various defects are irregular curvature causing flat spots, wrong rate of curvature, and uneven height of the two side rails. These deviations from the proper outline are frequently caused, at least in part, by inadequate means for holding the blank properly and securely during the facing operation.

Mouthpieces have in the past been made largely by hand methods, especially the mouthpieces of better quality, because mechanical methods have been subject to various shortcomings, some of which are mentioned above. Manual methods are fundamentally objectionable because of the inaccuracy of the curve given to the face and rails unless great pains are taken, and because of the non-uniformity of the product. Each mouthpiece individually made by hand is unique and it is not possible to exactly reproduce an especially good mouthpiece except by the trial and error method and at considerable expense. As a consequence of manual methods, the best mouthpieces have been relatively expensive and greatly prized since they could not be easily reproduced.

It thus becomes a general object of my invention to provide means for properly and securely holding the mouthpiece blanks during mechanical cutting operations in order to obtain the extreme accuracy desired in the cut face.

It is also an object of the invention to provide means for holding one or more blanks in such a manner that exactly the same cutting can be given to a number of blanks, or one or more mouthpieces can be refaced to a desired outline.

Another object is to provide a work holding means adapted to hold simultaneously a number of blanks during mechanical cutting in order to obtain the advantages of mechanical production in quantity.

A further object is to provide in a work holder means for accurately aligning a plurality of blanks prior to commencement of the cutting operation in order to obtain exactly similar cuts on all the blanks in the holder.

Still another object of my invention is to provide a novel method of quickly and accurately holding the blank or blanks in an adjusted position on the work holder by a cementitious body.

These objects have been attained in a device constructed in accord with my invention by providing, in combination with a suitable cutting tool and means for controlling its path, a rotary work holder comprising a drum rotating preferably about a vertical axis and having mounting means for mounting a plurality of blanks in positions radial of the drum and with their upper portions exposed to the cutting tool past which the blanks are moved by rotation of the drum. The blanks are supported at their inner and outer ends, the supports being capable of independent vertical movement in order to adjust the position of the blank relative to the cutting tool, either by bodily vertical movement or by angular movement in a vertical plane. Aligning means is also preferably provided to align the top faces of the blanks in a common horizontal datum plane prior to starting the cutting operation, the aligning means being detachable from the drum to permit free access of the cutting tool to the top faces of the blanks.

How the above objects and advantages of my invention, as well as others not specifically mentioned, are attained, will be more clearly understood by reference to the following description and the annexed drawings, in which:

Fig. 1 is a side view of a mouthpiece facing machine with portions broken away in vertical medial section;

Fig. 2 is an enlarged fragmentary plan of half the drum, showing the blanks in various stages

of mounting and also a portion of the aligning plate;

Fig. 3 is a vertical radial section through one side of the drum, as on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary elevation of one form of support for the inner ends of the blanks;

Figs. 5 and 6 are vertical sections, similar to Fig. 3, showing variation forms of supports for the inner ends of the blanks;

Fig. 7 is a fragmentary elevation of one end of a blank with the cartridge broken away; and

Fig. 8 is a vertical section on line 8—8 of Fig. 7.

In order that the operation of my improved mouthpiece facing machine as a whole may be understood, the entire machine as shown in Fig. 1 will be described briefly, and reference may also be made to my copending application for additional details of construction and mode of operation. Particular attention will be given to the rotary work holder and the mounting and aligning means for the blanks which constitute the chief subject matter of this application.

Referring now more particularly to Fig. 1 it will be seen that the machine comprises in general a base 10 which can be secured to any desired foundation by means of anchor bolts. At the left-hand end of base 10 is bridge 12 supporting template 14. At the right-hand end of base 10 is mounted a vertical stationary post 15 upon which rests the supporting assembly generally indicated at 16 for one end of arm 17. Arms 17 interconnects cutting tool 18 with follower 19 mounted to move over the curved surface of template 14 in order to control the movement of cutting tool 18. Also mounted at the right-hand end of base 10 is the assembly for supporting the blanks in position to engage cutting tool 18, this assembly comprising column 20 rotatably mounted upon the base and concentric with stationary post 15, and, on the upper end of column 20, rotatable drum 21 which is provided with means for supporting the blanks.

Considering the construction now in greater detail, there is shown in Fig. 1 an opening in the top surface of base 10 into which is fitted flanged ring 23 that is bolted to the machine base. Ring 23 provides a footing for stationary vertical post 15 which is threaded at its lower end and received in a central threaded bore in ring 23. To the upper end of post 15 is attached cap plate 26, preferably circular in form, the two parts being connected by a screw thread. Resting upon cap plate 26 and secured thereto by screws or other means, is base plate 27, likewise circular in outline, which is formed with two upright rail members 28 located one on either side of the center line and parallel to each other and parallel to the axis of arm 17. Only one rail member 28 is seen in Fig. 1. The two members 28 (Fig. 2) have top surfaces lying in the same horizontal plane to provide a pair of parallel guide rails that define the longitudinal movement of one end of arm 17.

Placed between the two side rails 28 is cradle 30 on which the right hand end of arm 17 is supported by pivot pin 31, the only other support for arm 17 being follower 19. The ends of pivot pin 31 are preferably held firmly in cradle 30, while the central portion of the pin rotatably supports the arm to permit the necessary vertical movement of arm 17 as follower 19 moves over template 14. Each side of cradle 30 has an upwardly extending side plate 34 that rises above rails 28 and carries short bearing shafts upon which are journaled rollers 35 resting on rails 28. Rollers 35 support the cradle and arm 17 on rails 28 over which the rollers ride to permit arm 17 to move longitudinally; and rails 28 preferably have longitudinal grooves of V-shape that are engaged by the rollers to guide the cradle in a straight line. The cradle and pivot pin 31 are thus constrained to horizontal linear movement. Pivot pin 31 is mounted with its axis in a horizontal plane parallel to the plane of rails 28, and perpendicular to the direction of movement of cradle 30. Consequently, linear movement of the pivot pin axis is limited by the construction described to a single definite horizontal plane. The movement of pivot 31 being limited as described, the movement of the other support of arm 17, viz., follower 19 which is controlled by template 14, produces the desired vertical component of movement of cutting tool 18 during facing operations.

An L-shaped cover 38 is attached to each outside face of rails 28 by screws 39. Covers 38 enclose side rails 28 and the rollers moving therealong so that no dirt or foreign material will collect upon the rails and impair their accuracy. The upper leg of each of the two covers 38 is horizontal, and each leg supports on it a rack 40. Each of these two racks, only one of the racks being shown in Fig. 1, is engaged by a pinion 41 carried in the outer end of drive shaft 42. Shaft 42 is driven by an electric motor and reducing gear mechanism, of any suitable type, enclosed within housing 43, power being supplied to the motor through wires 44. The motor in housing 43 drives shaft 42 counter-clockwise, as viewed in Fig. 1, and the rack and pinion construction moves arm 17 and cradle 30 slowly to the left, rollers 35 rolling along the top surface of rails 28. The longitudinal motion of arm 17 carries cutting tool 18 radially of drum 21, thus imparting to the tool the necessary horizontal movement to traverse the blanks carried by drum 21, and at the same time follower 19 is carried longitudinally over the surface of template 14 to impart to tool 18 the necessary vertical component of motion to cut the desired curved outline on the mouthpiece blanks.

Motor housing 43 is mounted at its forward end to arm 17 by a ball and socket joint 45, or other suitable type of pivotal connection. A pivotal connection is preferred since it, together with the two pinions 41, provides a three-point support for the weight of the motor and housing and allows an even distribution of load on the two pinions 41. A further advantage of this construction is that pinions 41 may be readily disengaged from rack 40. At the rear end of housing 43 is placed a lift 47 by which the housing may be grasped and raised to swing it about pivot 45, thus raising pinions 41 entirely clear of racks 40.

At this time it is desired to point out how arm 17 and cradle 30 may easily be removed temporarily from the facing machine. First, the rear end of motor housing 43 is lifted upwardly to disengage pinions 41 and racks 40. Then screws 39 are taken out to permit the removal of side plates 38. Now arm 17 may be lifted bodily upward, taking with it cradle 30 and motor 43 and leaving the top surface of drum 21 entirely open and uncovered, as shown in Fig. 2. As will be pointed out later in detail, it is preferable to remove arm 17 in order to carry out certain of the aligning operations performed for the purpose of bringing the top surfaces of the

blanks into a common datum plane prior to the facing operation.

Considering now in detail the means for supporting the blanks in a suitable predetermined position to engage cutting tool 18, it will be seen from Fig. 1 that rotating column 20 is mounted vertically and concentrically of post 15. The lower end of column 20 is supported on bearing 50 which transmits the load of the rotating parts to footing ring 23. Excess oil drains from the bearing through drain hole 24. Column 20 is rotated by means of belt 51 passing around pulley 52 attached to the lower end of column 20, the belt being driven from motor 53 which may be of any suitable type and is preferably provided with a speed reducer 54 or other similar means for reducing the rotational speed of column 20 to within the desired limits. For the sake of unitary construction and compactness of arrangement, motor 53 is here shown as mounted on base 10, but it will be realized that other arrangements and placement of the motor may be utilized if desired. Ball bearings 55 are placed at both the upper and lower ends of column 20 and fit snugly in the space between the stationary post and the rotating column so that the column turns about the post as an axis. The bearings are held in position by means of suitable flanges 46 secured to post 15.

Rotating drum 21 which carries the blanks is fastened to the upper end of column 20. Drum 21 comprises several parts, including outer shell member 58 formed with a central recess in which the previously described stationary structure forming supporting assembly 16 is placed so that shell inner flange 58*a* surrounds plates 26 and 27. The shell has a central hub 58*b* by means of which it is attached to the upper end of column 20. Drum 21 further includes spider 59 which is attached to shell 58 to rotate therewith, the connection between the shell and spider preferably being an adjustable one, for reasons which will be later mentioned, and preferably taking the form of a screw thread connection, shown at 60 in Fig. 3, by which the spider is attached to inner flange 58*a* of the shell. Spider 59 is composed of an inner hub 59*b* which engages shell flange 58*a*, and an outer rim 59*c*, these two parts of the spider being connected by a number of spokes 59*a*, as shown in Figs. 2 and 3. The open spoke formation is preferred in order to permit cutting fluid to drain through the spider into annular pan 61 which is supported on base 10 by posts 61*a*.

Outer ring 62 forms a portion of drum 21, and this ring is mounted on rim 59*c* of spider 59, the connection between the two members preferably taking the form of the threaded joint 63 (Fig. 3) extending around the periphery of the spider to provide adjustability between the two members. A number of lock screws 64 are placed at suitable intervals around drum ring 62 in positions to engage the upper edge of outer flange 58*c* of shell 58. When screws 64 are turned down to frictionally engage the shell flange they lock the shell and outer ring together in any selected position and prevent unintended rotation of either or both the spider or ring 62 relative to each other or relative to shell 58. Of course, any other suitable type of locking means may be used.

Spider 59 and ring 62 are each provided with fittings by which the blanks are mounted radially of drum 21. Each blank 66 is held in an individual cartridge 67, or other similar device, that provides means for engaging or mounting the outer end of the blank by the drum. The cartridge is generally circular in cross-section and tapered longitudinally to approximately the same shape as the outside of the blank 66. Cartridge 67 is open at one end so that the blank can be inserted and moved longitudinally of the cartridge, and is likewise open at the top throughout its entire length so that the top face of the blank is exposed to cutting tool 18 for the facing operation. Cartridge 67 encloses or surrounds at least a portion of the circumference of blank 66, preferably more than half, in order to secure a firm grip upon the blank. The cartridge is also open on its under side near the tip end of the blank so that a quick setting, low tensile strength cement, for example pattern makers' cement, may be inserted around the tip of the blank and between it and the cartridge. This cement, shown at 68 in Figs. 7 and 8, fills in all spaces between the blank and the surrounding cartridge and forms a bed of material that is easily shaped to fit the blank and that firmly holds the blank in place against rotation or twisting movement in the cartridge. After the blank is completely faced, it is forced longitudinally out of the cartridge, the motion breaking it away from the frangible cement 68, which may be cleaned out of the cartridge in preparation for using the latter again. Fig. 8 is taken near the tip of the mouthpiece and shows the side rails 66*a* at either side of the throat opening.

The inner ends of blanks 66 are supported in drum 21 by an annular member 70 which surrounds and is in engagement with the inner hub 59*b* of spider 59. Support ring 70 is secured to the spider by a number of screws 71 which fasten the ring to the spider and shell so that they all rotate as a unit. Blank supporting means 70 has a number of recesses 72 which open upwardly and radially outward, as shown in Fig. 4. The bottom wall of each of these recesses is rounded to a radius somewhat larger than the portion of the mouthpiece blank 66 to be received within the recess, while the side walls of the recesses diverge slightly upwardly as the draft thus afforded facilitates removal of the blanks and the cement holding the blanks in place.

Although my invention is not so limited, it is preferred that the mouthpiece blanks be previously rough cut or moulded to approximately their final shape, as this provides a face which may be utilized to align the blanks accurately in the machine. It is, of course, possible to perform the rough cut operations on this machine of my invention, but it has been found that better results are obtained in practice if the rough cutting is done on another machine, and the present device is used to make the finishing cut which requires extreme accuracy. Since this procedure makes better use of the advantages of the present invention, it will be assumed in the following description that the blanks have either had a face rough cut or else are blanks once finished but now being recut. In the drawings the blanks are shown as being ready for the final facing operation.

Each of the blanks which is to be finished or recut is first placed in an individual cartridge 67 and cemented in place, as previously described, with some suitable material, preferably a fast-setting cement of low tensile strength which is sufficiently strong to hold the blank in the cartridge against any twisting or rotational movement. The blank is placed in the cartridge with the face to be finished exposed above the open top side of the cartridge, the face being parallel

to and a predetermined, uniform distance from groove 67*a* in the outer end of the cartridge. Any suitable means may be used to position the blanks in the cartridges. After the cement at 68 has set, the blank and its surrounding cartridge is ready to be mounted on drum 21. In preparation for this, the cylindrical end portion of the mouthpiece by which it is attached to the musical instrument is covered with a cylindrical cap 75 which protects the cork ring 74. Cap 75 preferably has an end wall that covers the open bore in the mouthpiece to prevent cement from entering, although this end wall may be replaced by a separable member. Cap 75 fits snugly around cork ring 74 and seats against the shoulder on the mouthpiece just above the cork ring, as shown in Fig. 3.

At this stage in the operations, if it has not already been done, arm 17 and cradle 30 are removed from the facing machine, in the manner previously described, in order to leave the entire top face of drum 21 unobstructed, as shown in Fig. 2. The drum now appears as shown at the right side of Fig. 2. The mouthpiece blanks are mounted on the drum in the radial positions shown at top center of Fig. 2 by engaging grooves 67*a* of the cartridge with lip 62*a* on ring 62 at a point radially opposite one of recesses 72. Lip 62*a* extends continuously around the inner circumference of ring 62 and groove 67*a* extends horizontally across the entire width of the cartridge, the lip and groove establishing the outer end of each blank in a predetermined position vertically. Spider 59 is provided with a number of pairs of spaced lugs 76 properly positioned to receive snugly between them the outer end of a cartridge, thus holding the cartridge against circumferential or horizontal movement along lip 62*a*. The inner end of the blank, which is protected by cap 75, is dropped into a recess 72 on blank supporting ring 70. In order for these operations just described to take place, the clearance between the end wall of cap 75 and the back vertical wall of recess 72 should be greater than the radial depth of groove 67*a*.

After drum 21 has been filled with blanks, which are now resting loosely in recesses 72, surface plate 78 is then placed on the drum and bolted to it by screws 79 which are received in threaded holes in support ring 70. The surface plate may conveniently be made in the shape of an annulus, and is of sufficient diameter to extend over the flat portions of the faces on the blanks as shown in Fig. 3 and at the left-hand side of Fig. 2. The horizontal underface of surface plate 78 defines a horizontal datum plane in which the faces on the blanks are aligned by bringing the blank faces into contact with the under surface of plate 78. Other means than an annular plate may be used to position vertically the several blanks, although the plate 78 is preferred because of its simplicity and accuracy.

It will be readily apparent to those skilled in the art that many different types of devices may be used for bringing and holding the blanks in engagement with the surface plate, and the means shown is intended merely to be illustrative of those devices. This means comprises a plurality of hooks 82 with a threaded shank each of which carries a nut 83 resting against the top surface of a washer 84. Each hook 82 is placed in an opening 85 in surface plate 78 located in the interval between two blanks 66. The washer 84 supports the hook in place, while the hook is vertically adjustable by turning nut 83. Wire 88, or other flexible member, passes alternately under the blanks and cartridges and over the hooks 82 at either side of each blank. Wire 88 may have coupling means for connecting its ends or it may be a continuous loop which has been laid in the drum before the blanks were placed in position. Rotation of nuts 83 on the several hooks 82 tightens wire 88 and lifts every mouthpiece into firm engagement with the under surface of plate 78 as in Fig. 3, thus bringing all faces of the mouthpieces which are to be finished, into alignment in a common horizontal datum plane of which the position is known with reference to the cutting tool. All blanks are now properly positioned axially of the drum with respect to the cutting tool.

The exact position of this datum plane may conveniently be controlled by spacing washers 89 placed between surface plate 78 and the top face of support ring 70, the thickness of the spacers 89 controlling the position of the plane. It is of course preferable that this plane be somewhat above the top face of support 70 or adjacent parts of the drum in order that cutting tool 18 may traverse the entire length of the blank without striking any metal parts of the drum.

While an aligning means common to all the blanks is obviously preferable, individual means may be provided for each blank to bring the blank into engagement with the aligning means.

After all of the blanks are aligned as described, a body of quick-setting cement is placed around the cap 75 in each recess 72, as at 90. This cementitious body in which the end of the blank is embedded, when hard, firmly holds the inner end of the blank immovable with respect to the blank support 70. The parts now appear as shown at the left side of Fig. 2. When the cement at 90 has set, hooks 82 are lowered to disengage them from wire 88, and all the blanks are held in their proper positions. Face plate 78 is then removed from the drum and the cutting arm and cradle replaced in order to perform the cutting operations.

As a means of checking the accuracy and location of the datum plane established by the underside of base plate 78, there may be provided a micrometer dial gauge 92 which is supported from base 10 in any suitable position by means of standard 93. The dial gauge carries a rounded button 94 on the end of the plunger arm, the button riding upon a finished surface 95 on the upper side of plate 78. Surface 95 is exactly parallel to the underside of the face plate and a known distance above it. From the dial gauge readings the exact location of the common plane in which the faces of the blanks lie can be computed. Also, as the drum is slowly revolved with button 94 riding against face 95, the indicator on the dial gauge will remain stationary when the datum plane is exactly horizontal.

The method of mounting and aligning the blanks in drum 21 just described is preferred because of the extreme accuracy with which it is possible to locate the blanks relative to the cutting tool. This accuracy enables the operator to face each blank precisely and to make exactly the same cut on all of the blanks carried by the drum. It will be apparent that any other means and method of mounting and aligning the blanks on the drum may be used as long as a sufficiently high degree of accuracy is obtained in positioning the blanks. As illustrative of simplified means

and methods, the constructions illustrated in Figs. 5 and 6 will now be described.

One variational form of fitting carried on the hub of spider 59 for mounting a blank in place comprises a split plug 98 threaded into the spider hub and adapted to enter the throat of the blank as shown in Fig. 5. A cylindrical cup 99 is held between a shoulder on plug 98 and the outer face of the spider hub, cup 99 being of proper size to accommodate the exterior of blank 66. To mount the blank, its throat opening is placed over plug 98 and the blank forced into cup 99, compressing spring 100 which presses against the blank. The outer end of cartridge 67 is then lowered to bring it into alignment with lip 62a on outer ring 62 and the blank with its holder is permitted to move radially outward under pressure exerted by spring 100 until lip 62a seats in horizontal slot 67a of cartridge 67. Groove 67a holds the blank against rotation while spring 100 keeps the cartridge firmly seated against lip 62a at all times. As previously mentioned, lugs 76 are properly spaced to fit snugly against the sides of cartridge 67, thus holding the cartridge against any circumferential movement around the spider. Lip 62a is preferably continuous so that cartridges 67 can be mounted in any relative position of the spider and ring 62.

Another variational form of fitting for mounting a blank on the hub of spider 59 is illustrated in Fig. 6. This telescope-type fitting comprises an inner sleeve 103 attached to the spider hub by a threaded stud, and an outer sleeve 104 which bears against compression spring 105 within sleeve 103. Since the outer sleeve has a diameter somewhat smaller than the diameter of the throat in blank 66, the outer sleeve is provided with a flared skirt 104a against which the end of the blank abuts. The blank and its cartridge are mounted by inserting sleeve 104 in the throat of the mouthpiece blank and compressing spring 105 sufficiently to permit groove 67a of the cartridge to engage lip 62a as described above. Skirt 104a, being conical, centers the mouthpiece with respect to the fitting, and has the further advantage that it will accommodate mouthpieces with any size of throat in the range between the minimum and maximum diameters of the skirt.

It may be desirable to adjust the blanks and cartridges axially of the drum with respect to the cutting tools. This is accomplished by first loosening lock screws 64. The spider 59 and ring 62 may then be raised or lowered together relative to tool 18, carrying all the mounted blanks bodily up or down, by turning spider 59 on threaded flange 58a. Because of the threaded connection 60, the spider as it rotates moves vertically relative to the flange. In a similar manner the thread at 63 can be used, alone or in conjunction with thread 60, to tilt the blanks angularly in a vertical plane, since by turning ring 62 on spider 59, the ring alone may be relatively raised or lowered, and so raise or lower the cutter ends of the blanks and cartridges. Thus the blanks may be raised or lowered bodily or may be tilted angularly, in a vertical plane, as may be desired. This adjustability is especially valuable when mounting means of the types shown in Figs. 5 and 6 are used without an aligning plate 78.

When a surface plate 78 is used to adjust or position the blanks properly axially of the drum, thread 63 may be omitted if desired, and spider 59 and ring 62 may be integral. The proper angular adjustment is obtained with the surface plate, since the inner end of the blank is movable vertically until the cement at 90 hardens.

Having described a preferred form of my invention along with certain modifications thereof, it will be understood that various changes in construction and arrangement of parts may be made without departing from the spirit and scope of my invention; and therefore the foregoing description is to be considered as illustrative of rather than limitative upon the appended claims.

I claim:

1. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular rotary drum having an inner flange and mounted to rotate about a vertical axis; blank mounting means including supporting means adjacent the inner flange for the inner end of a plurality of blanks arranged radially of the drum, and supporting means adjacent the periphery of the drum for the outer ends of all the blanks; and means permitting axial movement of all blank mounting means to position all the blanks axially of the drum relative to the cutting tool.

2. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular shell mounted to rotate about a central axis; a spider adjustably mounted on the shell to rotate therewith; a ring adjustably mounted on the spider; lock means on the ring engaging the shell to hold the spider and ring against movement relative thereto; means on the spider supporting one end of a blank; means on the ring supporting the other end of the blank; the position of the blank relative to the cutting tool being adjustable by movement of the spider or ring relative to the shell.

3. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular shell mounted to rotate about a central axis; a spider adjustably mounted on the shell to rotate therewith; a ring adjustably mounted on the spider; lock means on the ring engaging the shell to hold the spider and ring against movement relative thereto; means on the spider supporting the inner ends of a plurality of radially extending blanks; means on the ring supporting the outer ends of the blanks; the position of all the blanks relative to the cutting tool being adjustable simultaneously by movement of the spider or ring relative to the shell.

4. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular rotary drum having an inner flange and mounted to rotate about a vertical axis; blank mounting means including supporting means adjacent the inner flange for the inner ends of a plurality of blanks arranged radially of the drum, and supporting means adjacent the periphery of the drum for the outer ends of all the blanks, said supporting means being independently adjustable axially of the drum to adjust the blanks angularly in a vertical plane.

5. In a machine for cutting faces on blanks to form mouthpieces for musical instruments and having a cutting tool for facing the blanks, blank supporting means comprising a rotatable drum mounting a plurality of blanks radially of the drum in position to engage said tool as rotation of the drum moves the blanks past the tool, said drum comprising a rotatably mounted shell, a spider adjustably mounted on the shell to rotate

therewith, a ring adjustably mounted on the spider, means on the ring engaging the shell to hold the spider and ring against movement relative thereto, fittings on the spider adapted to support one end of each blank, and a fitting on the ring adapted to support the opposite end of each blank, whereby the position of the blanks relative to the tool is adjustable.

6. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular shell mounted to rotate about a central axis; a spider adjustably mounted on the shell to rotate therewith; a ring adjustably mounted on the spider; lock means on the ring engaging the shell to hold the spider and ring against movement relative thereto; a plug member on the spider adapted to be engaged in a central bore in the blank by endwise movement of the blank and when so engaged to support one end of the blank; means on the ring supporting the other end of the blank; the position of the blank relative to the cutting tool being adjustable by movement of the spider or ring relative to the shell.

7. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular shell mounted to rotate about a central axis; a spider adjustably mounted on the shell to rotate therewith; a ring adjustably mounted on the spider; lock means on the ring engaging the shell to hold the spider and ring against movement relative thereto; a plug member having a conical abutment skirt mounted on the spider adapted to be engaged in a central bore in the blank by endwise movement of the blank and when so engaged to support one end of the blank; means on the ring supporting the other end of the blank; the position of the blank relative to the cutting tool being adjustable by movement of the spider or ring relative to the shell.

8. A work holder for holding blanks during movement relative to a cutting tool adapted to cut faces on the blanks, comprising an annular rotary drum having an inner flange and mounted to rotate about a vertical axis; blank mounting means including supporting means adjacent the inner flange for the inner ends of a plurality of blanks arranged radially of the drum, and supporting means adjacent the periphery of the drum for the outer ends of all the blanks; and blank aligning means including a face plate detachably secured to the drum and having an under face that establishes a known datum plane, and means for bringing each blank into engagement with said under face to align the top faces of all blanks in said known datum plane prior to commencement of cutting operations; said blank mounting means being adapted to hold the blanks in aligned position.

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