Oct. 8, 1963 J. ARPAIO, JR., ETAL 3,106,133

SURFACE FINISHING MACHINE FOR BOWLING BALLS

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FIG. 1

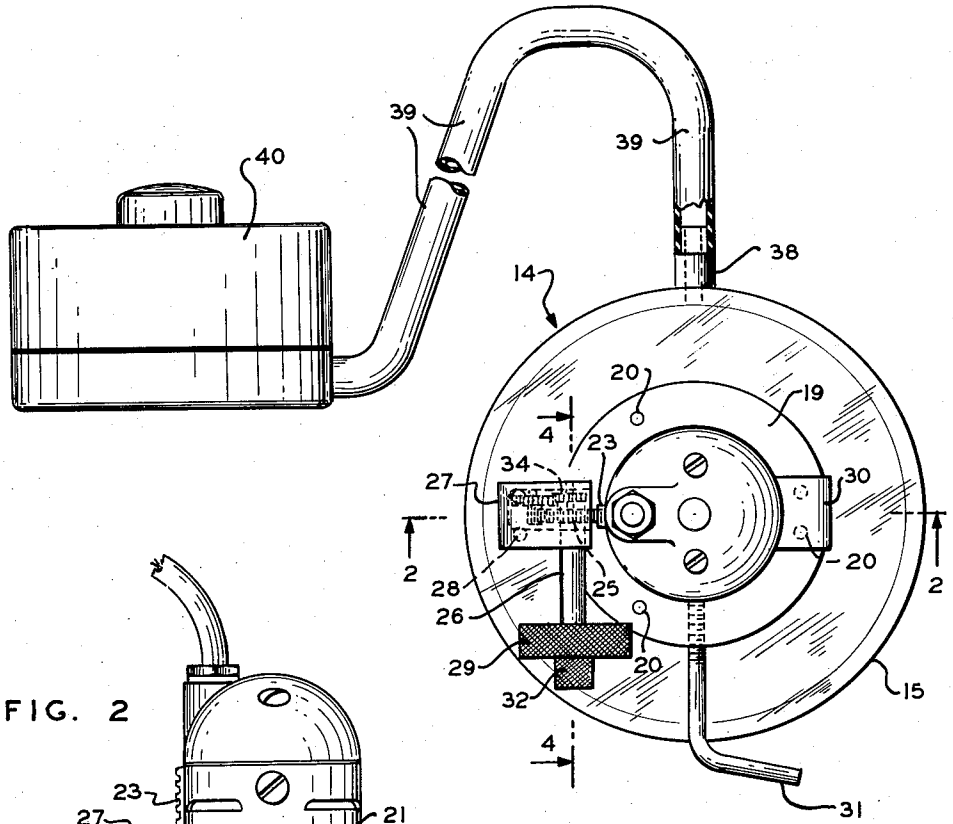
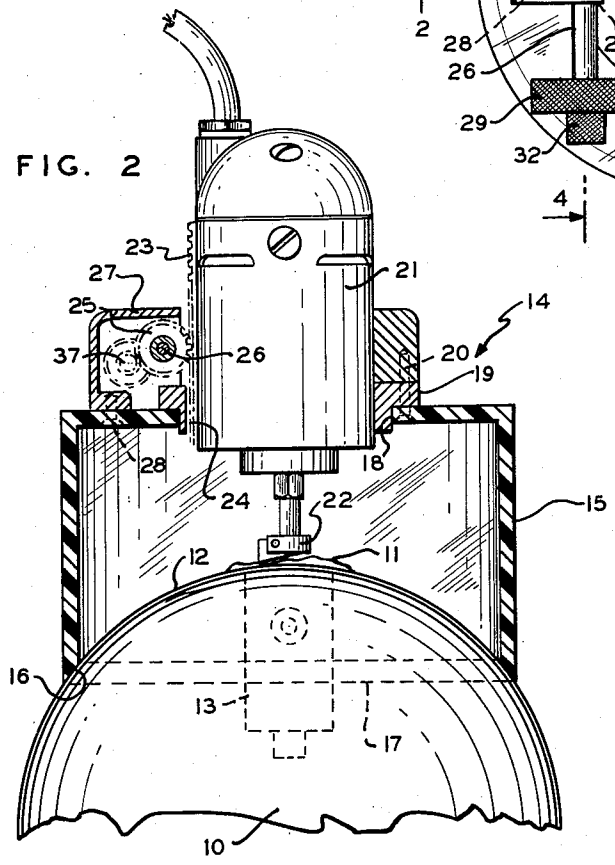


FIG. 2



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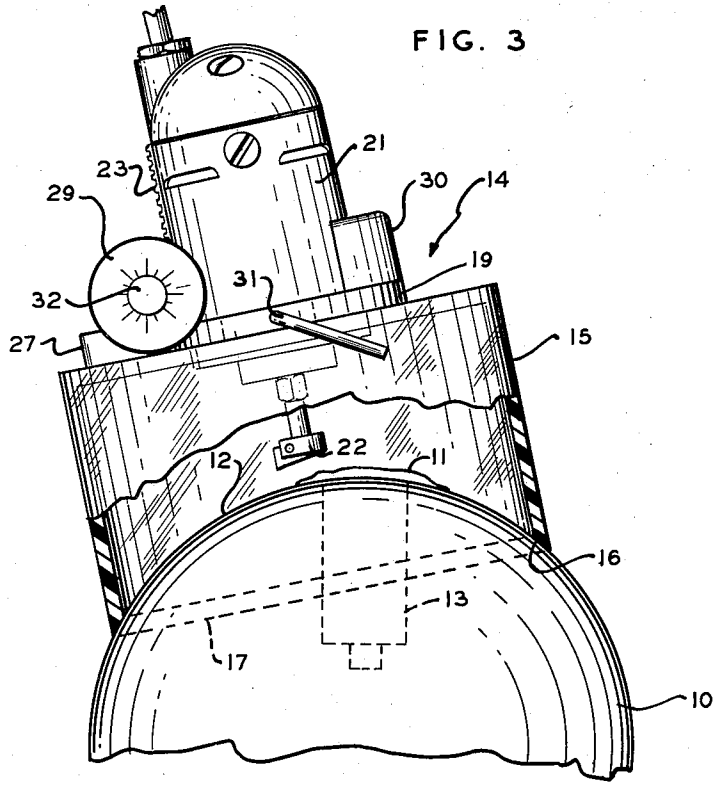
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FIG. 3



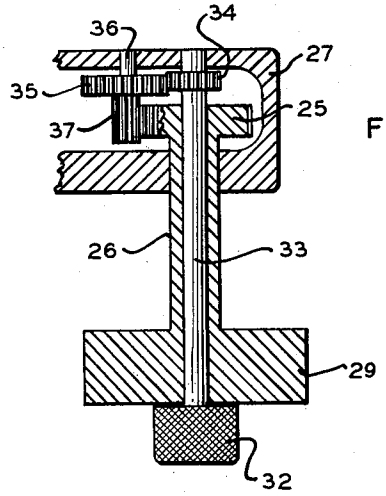


FIG. 4

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SURFACE FINISHING MACHINE FOR BOWLING BALLS

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FIG. 5

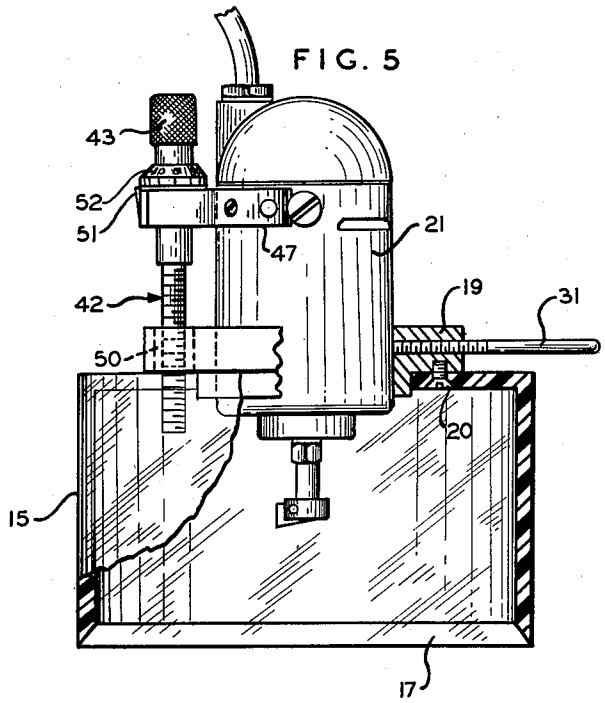


FIG. 7

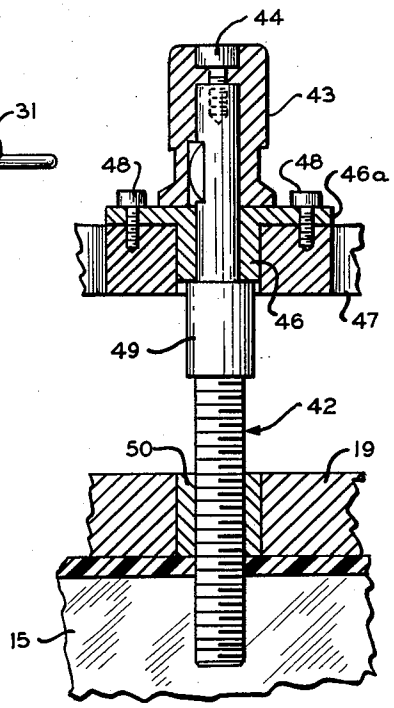
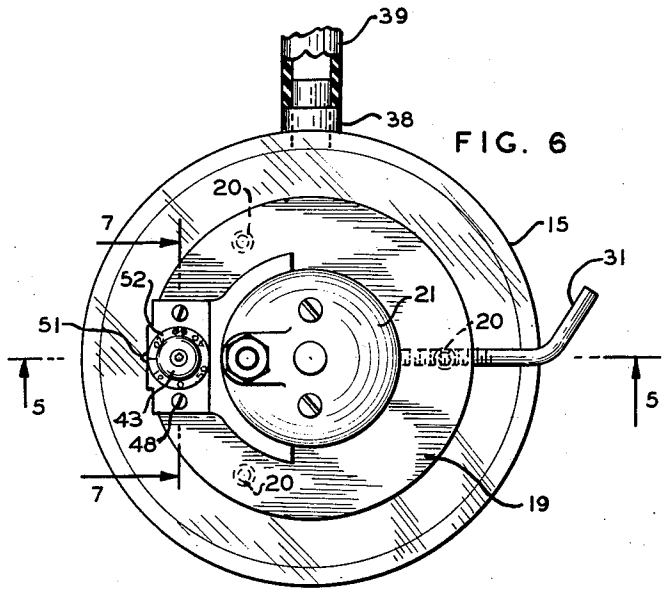


FIG. 6



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3,106,133
SURFACE FINISHING MACHINE FOR BOWLING BALLS

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3 Claims. (Cl. 90—12)

This application is a continuation-in-part application of our pending application S.N. 111,031, now abandoned, filed May 18, 1961, and entitled Surface Finishing Machine for Bowling Balls.

This invention relates to a machine for finishing curved surfaces, and particularly the invention relates to a novel machine for finishing surface areas of bowling balls to an even spherical contour.

The invention is especially useful in connection with the production of bowling balls with individualized grips in accordance with the teachings of the pending application Serial No. 92,881 of Jerry Arpaio, Jr., one of the present applicants, filed March 2, 1961. In the process of producing a bowling ball with an individualized grip as described in the aforesaid application, a form of the player's finger is cast of a suitable material and thereafter the cast form is used in an oversized hole of the bowling balls to case a ball-forming material therearound and form an individualized finger hole in the ball. In this casting operation excess ball forming material is left projecting beyond the surface contour of the ball and must thereafter be removed to the exact spherical contour of the ball. The present invention resides in a novel surface finishing machine which can be seated on a bowling ball and moved relative thereto with a progressive back and forth motion to cut away the excess ball forming material over a localized area to the exact spherical contour of the ball.

An object of the invention is to provide an improved power driven surface-finishing machine of the character mentioned which can be finely adjusted to finish any localized protruding surface area of a body to its normal peripheral contour by seating the machine on to the body and shifting it gradually relative thereto.

A further object is to provide such finishing machine with a seating chamber which is subjected to suction during operation of the machine to remove all particles which are cut away from the body during the finishing operation.

A still further object is to provide a motor driven routing tool in a bell jar-type of chamber which can be seated on a surrounding area of a bowling ball and shifted gradually relative thereto to finish any protruding localized area of the ball down to its exact spherical contour.

These and other objects and features of the invention will be apparent from the following description and the appended claims.

In the description of the invention reference is had to the accompanying drawings, of which:

FIGURE 1 is a top plan view of a surface-finishing machine according to the invention;

FIGURE 2 is a vertical view of this machine showing the suction chamber in section on the line 2—2 of FIGURE 1 and mounted on a bowling ball fractionally shown with a portion of the suction chamber broken away;

FIGURE 3 is an elevational view of the device in partial section similar to FIGURE 2 and showing the device set at a different angle with respect to the workpiece.

FIGURE 4 is a fractional section on the line 4—4 of FIGURE 1 showing a vernier adjustment for adjusting the routing tool relative to the suction chamber.

FIGURE 5 is a side elevational view of the present

finishing machine with the suction chamber partly in section on the line 5—5 of FIGURE 6 and showing a vernier screw means for adjusting the cutting tool relative to the chamber;

FIGURE 6 is a plan view of this modified machine shown in FIGURE 5;

FIGURE 7 is a fractional sectional view to enlarged scale taken on the line 7—7 of FIGURE 6.

In the accompanying figures there fractionally is shown a bowling ball 10 as having a localized surface area 11 which projects beyond the normal spherical contour 12 of the ball. As is described in the appending application aforementioned, such projecting area 11 may comprise an outer end portion of a cast form of a player's finger or may comprise a circular ridge of ball-forming material which has been cast into an enlarged cylindrical hole 13 of the ball around a cast form to provide the ball with an individualized grip. The surface finishing machine 14 according to the invention comprises a mounting or suction chamber 15 generally in the form of a bell jar having a lower seating edge 16 which is beveled to conform evenly to a circular surface area 17 of the ball surrounding the localized protruding area 11 to be finished down to the normal contour of the ball. The jar 15 may for example be cylindrically shaped and have a flat end wall provided with an axial opening 18. Fitted into this opening is a flanged collar 19 secured to the end wall as by screws 20. A motor 21 of cylindrical shape extends slidably through this collar into the jar and has a shaft at its inner end provided wtih a cutting or routing tool 22. The motor is shiftable axially of the jar by a rack 23 extending along one side of the motor through a notch 24 in the collar 19, and by a gear is mounted in a narrow housing 27 secured by screws 28 to the end wall of the jar. The housing has sidewalls which confine the gear 25 laterally of the motor and which are provided with bearings for the shaft of the gear. The housing is open at its side facing towards the motor so that the gear can project there beyond into engagement with the rack 23. Secured to an outer end portion of the shaft 26 is a knob 29 by which the gear can be turned to shift the motor axially of the jar 15 and thus to set the routing tool at a desired position relative to the bowling ball 10. In order that the motor will slide evenly through the collar 19 responsive to turning the gear 25 a long bearing member 30 is provided on the collar 19 in sliding engagement with the motor at the side diametrically opposite the rack 23. When the motor has been set into a desired position it is secured firmly in place by a set screw 31 threaded through the collar 19.

In order that the tool 22 may be set precisely at any desired position along the axis of the mounting jar 15 a vernier knob 32 is mounted at the center of the knob 29 on a shaft 33 which extends axially through the shaft 26 for the gear 25. As shown in FIGURE 4 the shaft 33 extends through the gear 25 and beyond the far side thereof to engage a bearing in the corresponding sidewall of the housing 27. Affixed to the shaft 33 between the gear 25 and one side wall of the housing 27 is a pinion gear 34 which is in mesh with a relatively large gear 35 journalled to a stud 36 secured to the side wall of the housing 27. Affixed in concentric relation to the gear 35 is a smaller gear 37 which is in mesh with the gear 25. Thus a step-down transmission ratio is provided between the vernier knob 32 and the gear 25. When the knob 29 is turned the gear 25 is turned in unison therewith to provide a coarse adjustment in the positioning of the tool 22 with respect to the mounting jar 15. On the other hand, when the vernier knob 32 is turned the gear 25 will be turned with a step-down transmission ratio to provide a very fine adjustment in the positioning of the cutting tool.

Leading off from one side of the jar 15 is a nipple 38 to which is connected a tube 39 leading to a suction pump or vacuum cleaner 40. During operation of the finishing machine the vacuum cleaner 40 is operated to provide a partial vacuum in the jar 15 and to draw away all the particles which are cut from the ball by the tool 22. A certain amount of leakage between the motor 21 and collar 19 and between the jar and the ball is beneficial in this connection in enabling sufficient inflow of air to permit all of the loose particles which are cut from the ball to be drawn from the jar or suction chamber 15. Also, such partial vacuum in the chamber 15 is beneficial in maintaining a firm seating engagement of the mounting jar on the bowling ball—which is necessary to assure a uniform cutting action as the jar is shifted relative to the ball. Still further, the drawing away of all of the particles as they are cut from the ball prevents these particles from getting lodged between the mounting jar 15 and the bowling ball as the jar is moved progressively back and forth on the ball during the finishing operation. This assures that the fine setting of the cutting tool relative to the ball will be maintained during the surface finishing operation. Moreover, the use of a suction chamber for drawing away all of the particles as they are cut from the ball provides a very clean operation without creating any dust or dirt in the working area to the discomfort of the operator of the finishing machine.

In the embodiment shown in FIGURES 5, 6 and 7 the motor 21 is adjustable axially of the mounting chamber 15 by means of a machine screw 42 positioned alongside the motor. A manual knob 43 has a blind hole receiving the head of the screw 42 and is held thereon by a short axial screw 44 and locked rotatably thereto by a key 45. The machine screw 42 is journalled below the knob in a bearing 46 carried by a bracket 47 mounted on one side of the motor. The bearing has a flange 46*a* secured by screws 48 to the bracket. The machine screw 42 is held against displacement lengthwise of the bearing by abutment of a shoulder 49 on the screw against the lower end of the bearing and by abutment of the knob 43 against the upper end of the bearing. The threaded lower portion of the machine screw engages an insert 50 staked in the flange of the collar 19.

As the knob is turned to the right and left the motor 21 is shifted along the axis of the mounting chamber 15 in one direction and the other to change the depth of cut of the tool 22 in the bowling ball. On the bracket 47 is a fixed scale line 51 and on the lower flange of the knob 43 is a cooperating movable scale 52. The screw 42 may have, for example, a ¼–20 thread and the movable scale may have 50 divisions so that adjustments in the cutting depth of the tool may be read directly in thousandths of an inch in the manner of a vernier. Thus, the tool 22 can be set with precision to any selected depth of cut.

The particular embodiments of our invention herein shown and described are intended to be illustrative and not necessarily limitative of our invention since the same are subject to changes and modifications without departure from the scope of our invention, which we endeavour to express according to the following claims.

We claim:

1. A machine for finishing a protruding portion of a bowling ball to a spherical contour comprising a cylindrical housing having an open end provided with a circular bevelled edge adapted to seat slidably with even contact on an annular surface portion of the ball surrounding said protruding portion, a motor mounted on said housing for movement along the axis thereof, a cutting tool secured to the end of the shaft of said motor within said housing, adjustable means for shifting said motor along the axis of said housing to enable said cutting tool to be set to the said ball while said housing is seated thereon, said housing having a limited air-inlet leakage while seated on said ball, and a suction pump connected to said housing to provide a partial vacuum therein whereby to hold the housing in firm seating engagement with the ball and to draw out the particles from the housing as the same are cut from the ball by the tool.

2. The finishing machine set forth in claim 5 including a circular opening in the outer end wall of said housing and a mounting collar in said opening slidably receiving said motor, wherein said shifting means comprises an adjusting screw along one side of said motor having a shaft portion and a threaded portion, a bearing for said shaft portion held against displacement lengthwise thereof, said screw being interposed between said motor and said collar with said bearing being secured to one and said threaded portion of the screw engaging the other, a manual knob secured to a head portion of said adjusting screw, and a scale for reading angular adjustments of said knob to indicate the adjustment of said tool relative to said ball.

3. A machine for finishing off a protruding portion of a bowling ball to a spherical contour comprising a cylindrical housing having an open end at the bottom provided with a bevelled edge for seating evenly and slidably on the ball in a plane about halfway between a point on the normal contour of the ball and the center of the ball, said housing having a central opening in its outer end wall, a mounting collar fitted in said opening, a motor mounted slidably in said collar for shifting movement along the axis of the housing, said motor having a cutting tool secured to its shaft within said housing, a side bracket on said motor, a machine screw extending through said bracket along said motor and threaded into said collar, said machine screw and collar having interlocking means preventing movement of the machine screw lengthwise thereof relative to said bracket so that turning movement of the machine screw will shift said motor to change the setting of said tool relative to said ball, scale means for reading the positioning of said machine screw relative to said bracket, and suction means connected to said housing for drawing out the particles cut from said ball.

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