

Sept. 19, 1967

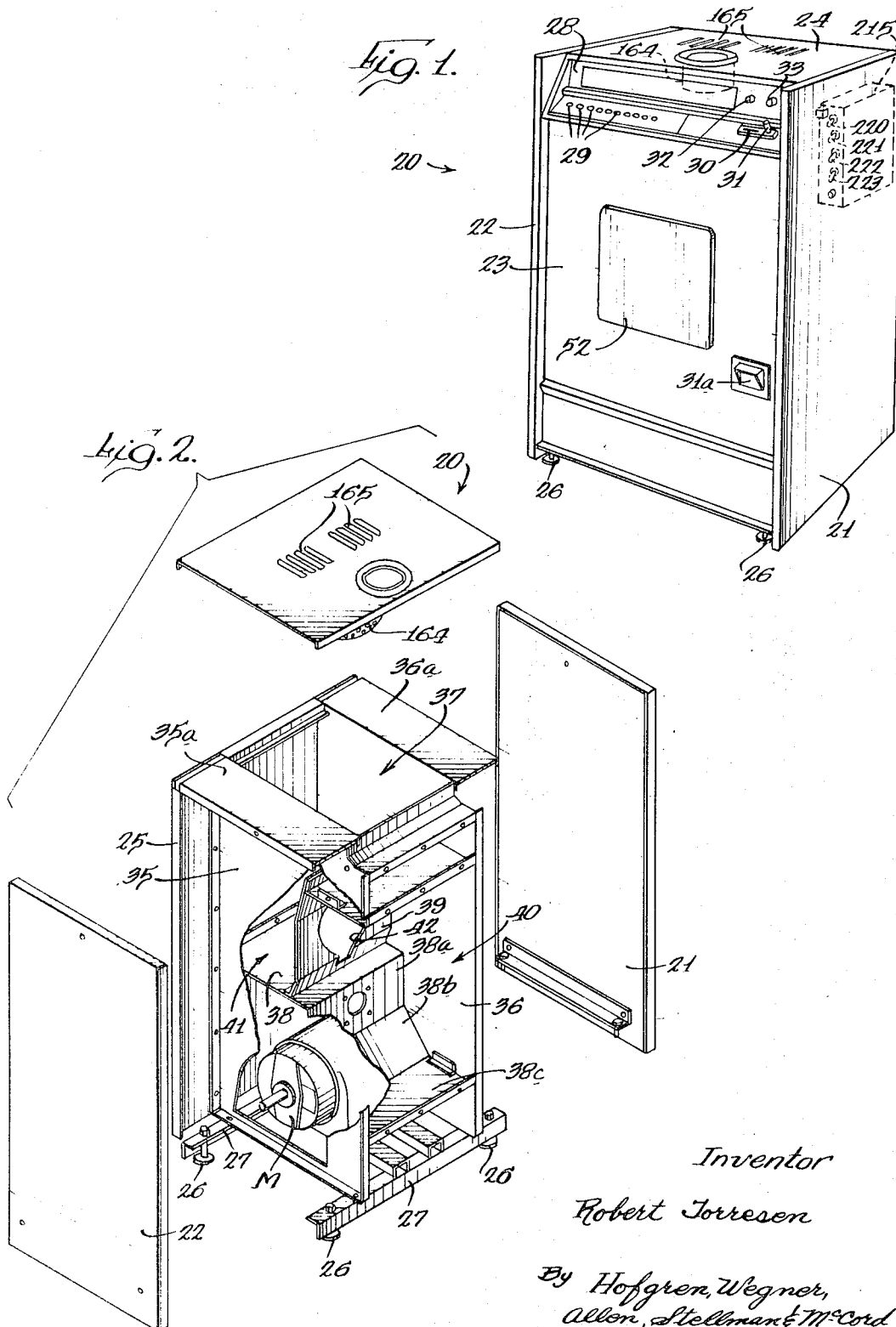
R. TORRESEN

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BOWLING BALL POLISHING MACHINE

Filed March 22, 1965

9 Sheets-Sheet 1



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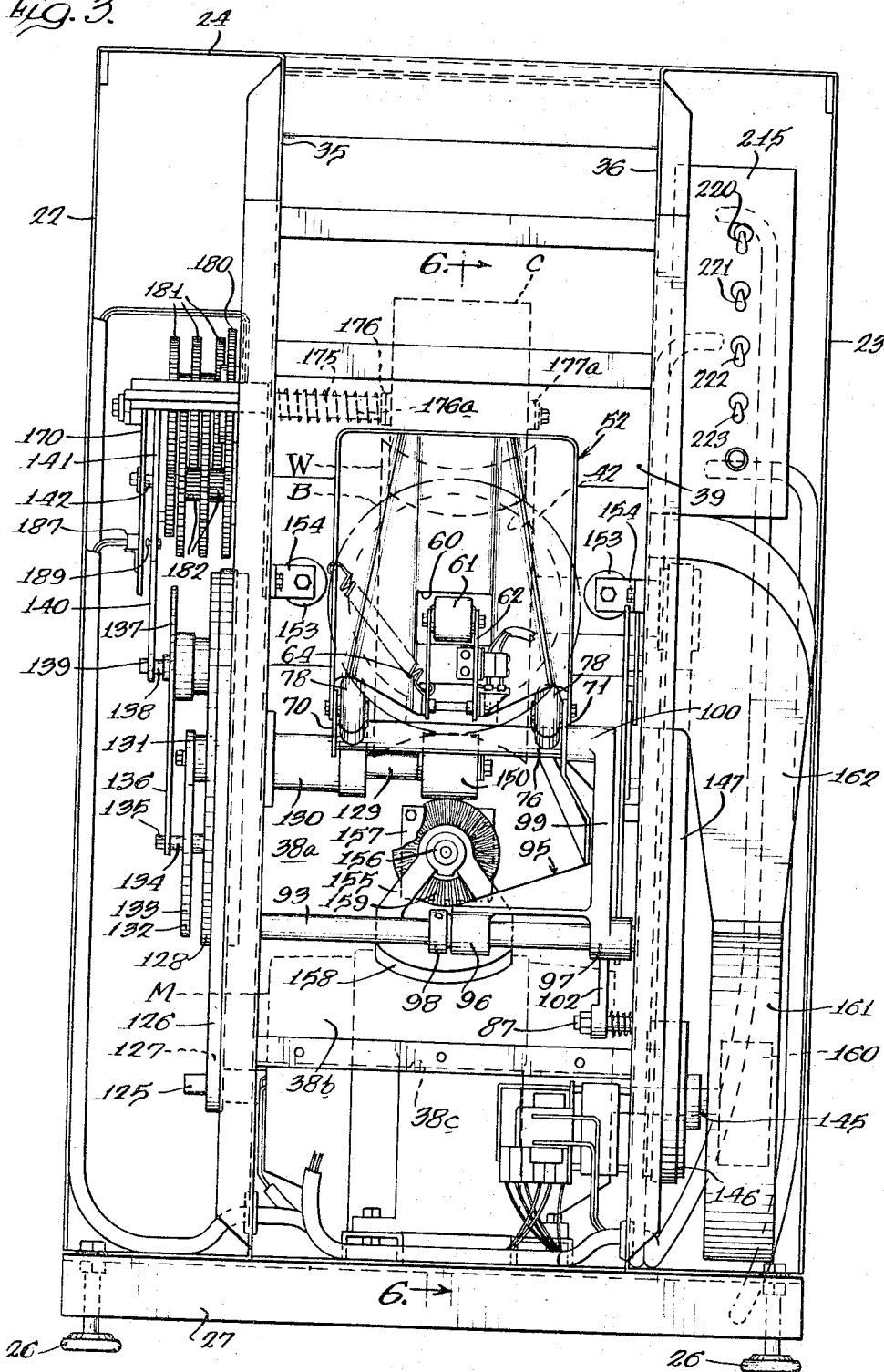
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Fig. 3.



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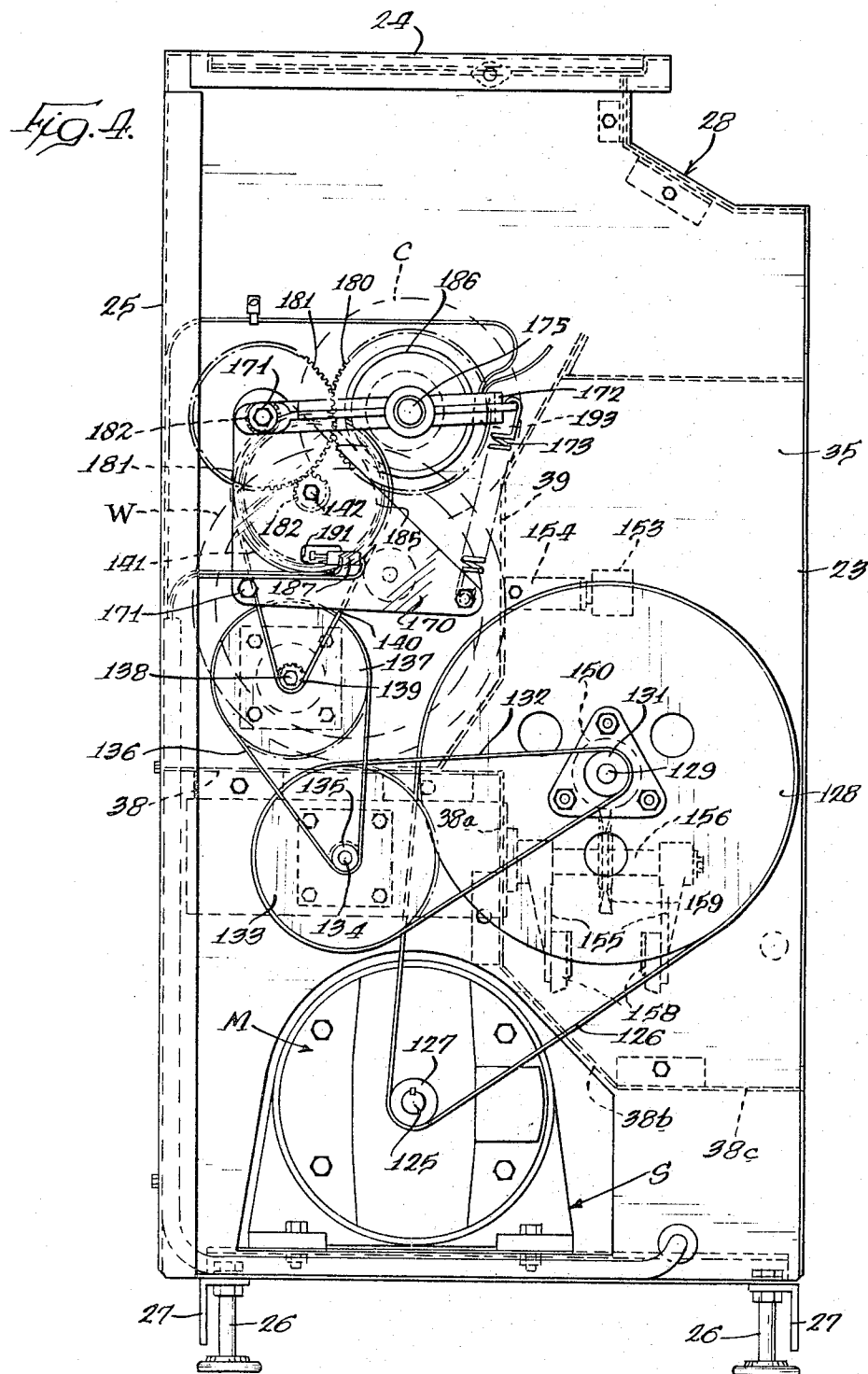
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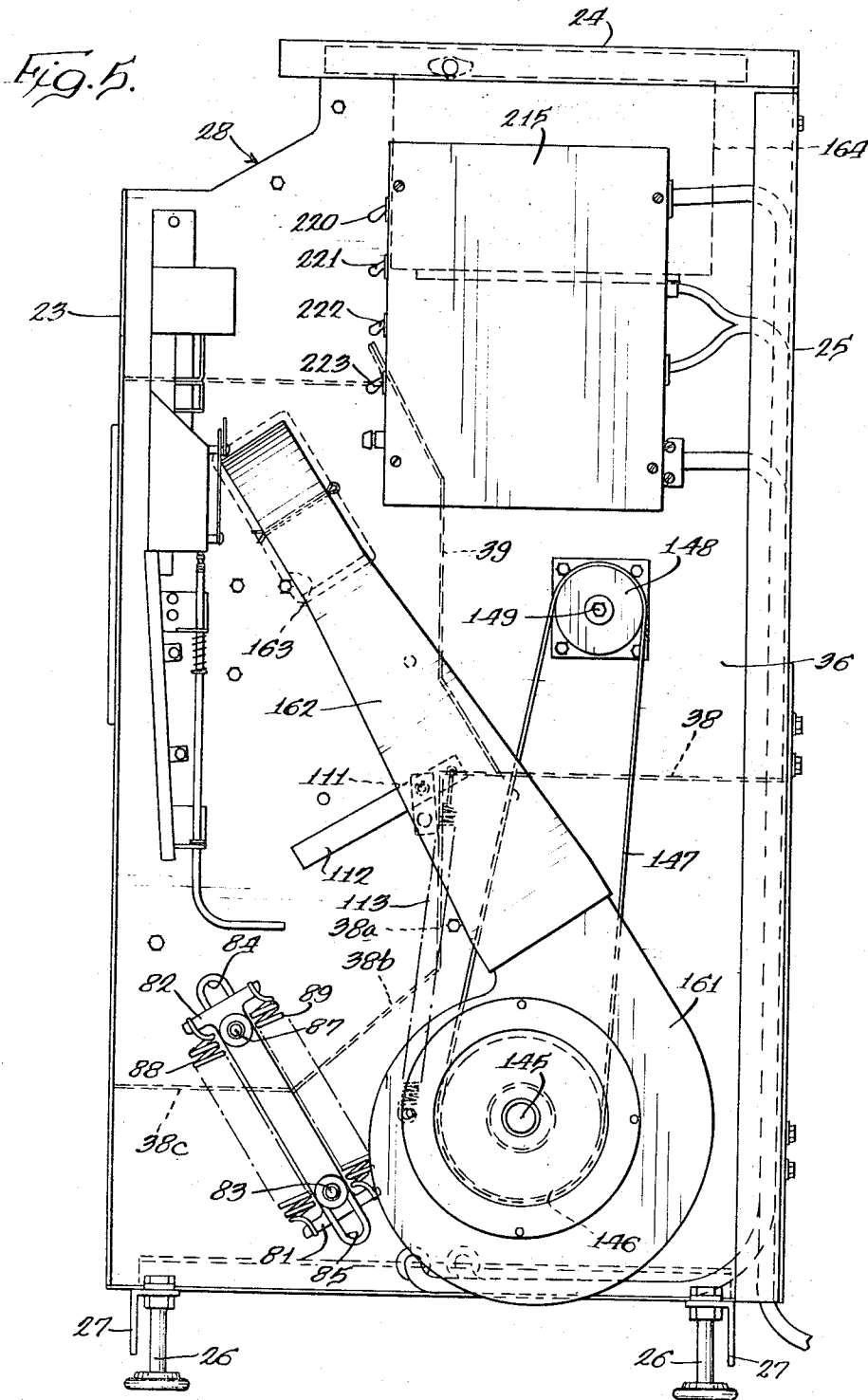
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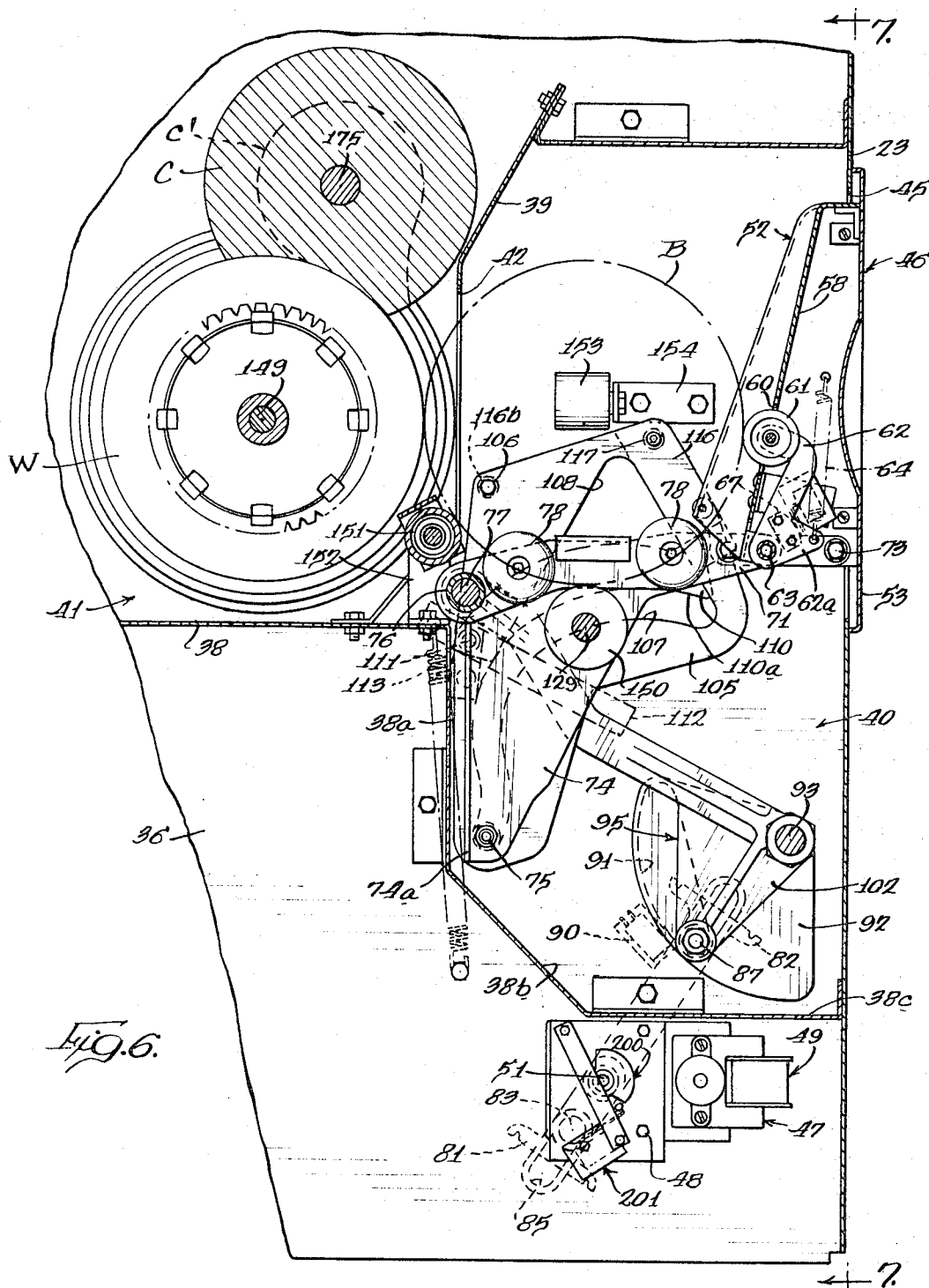
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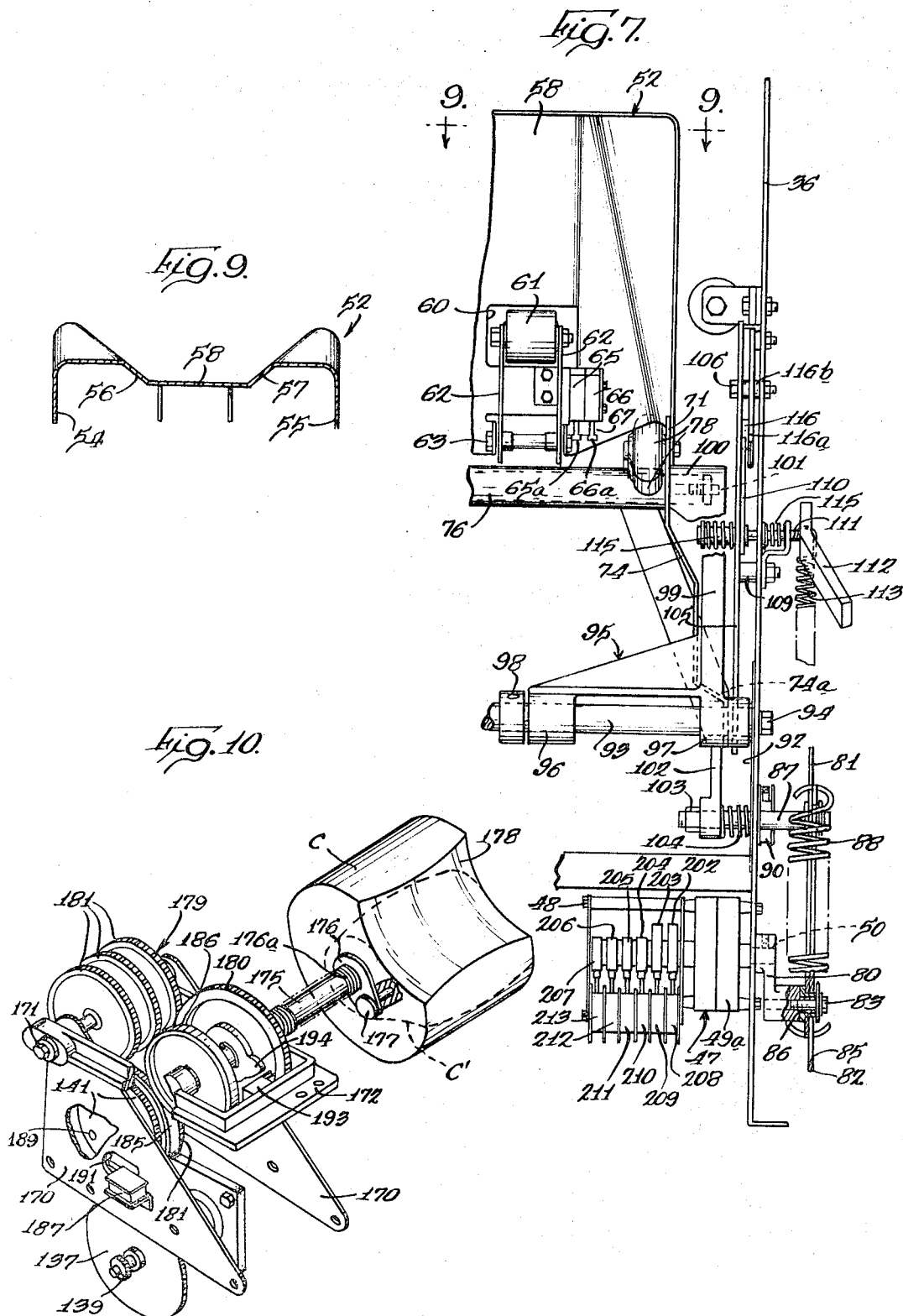
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BOWLING BALL POLISHING MACHINE

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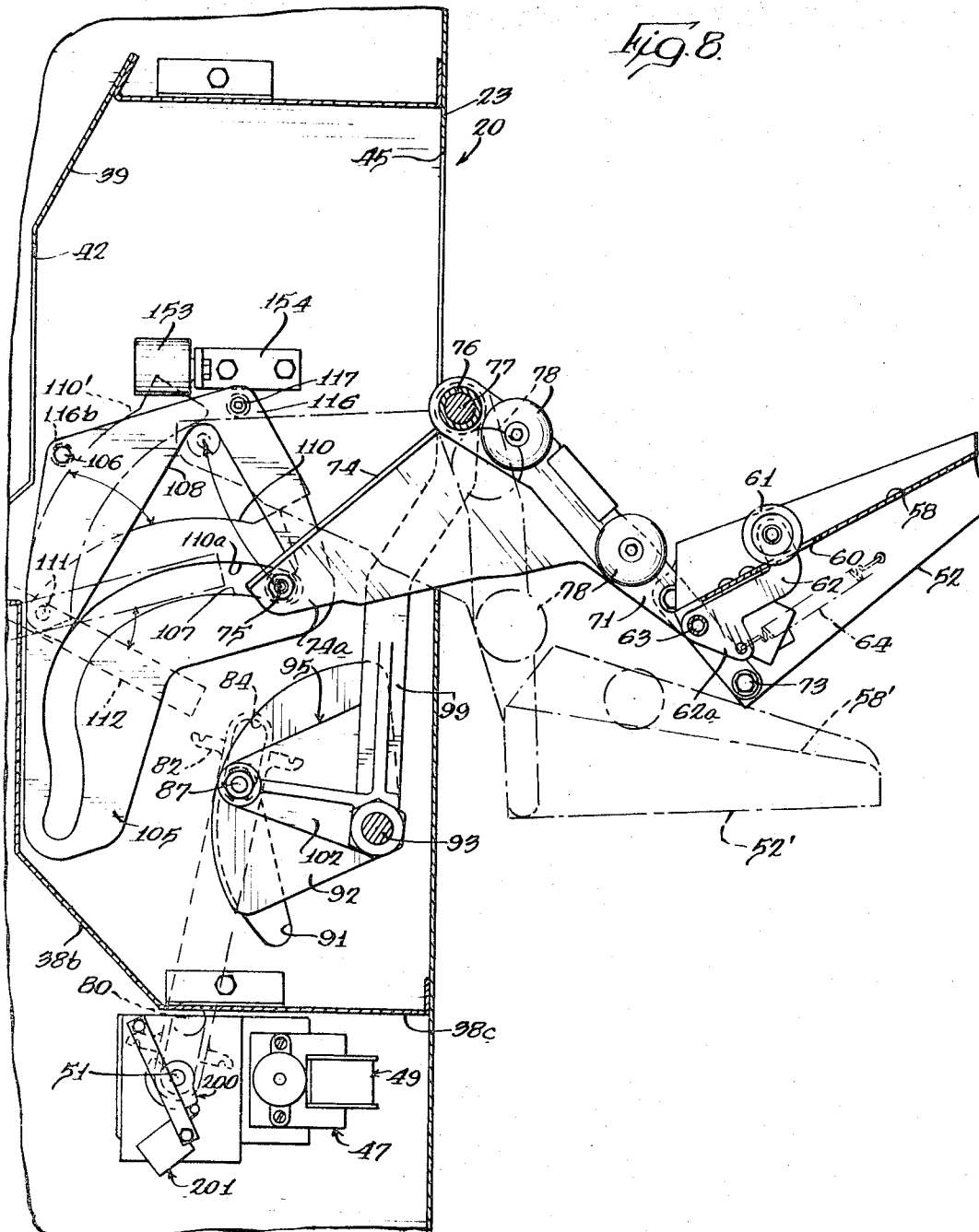
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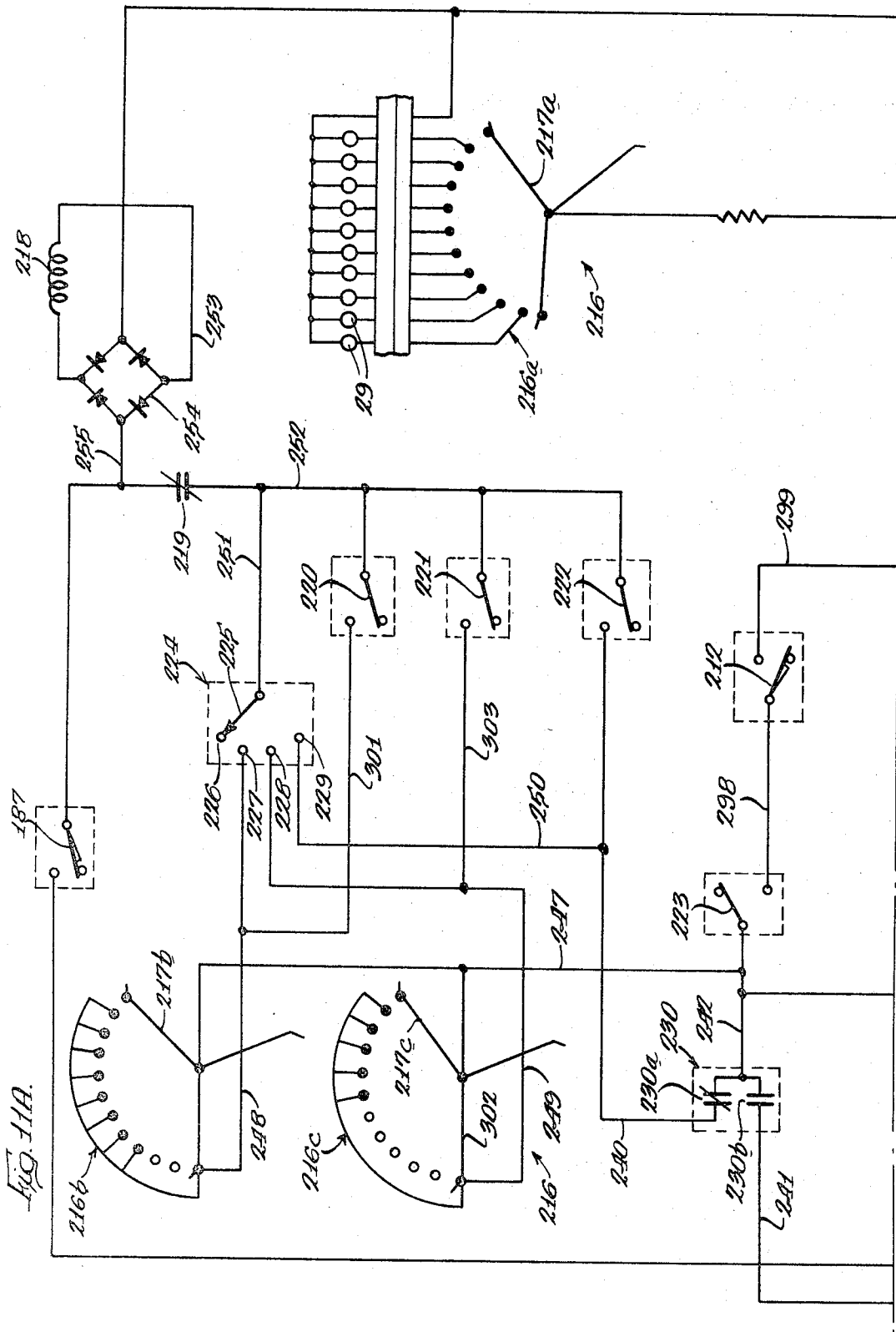
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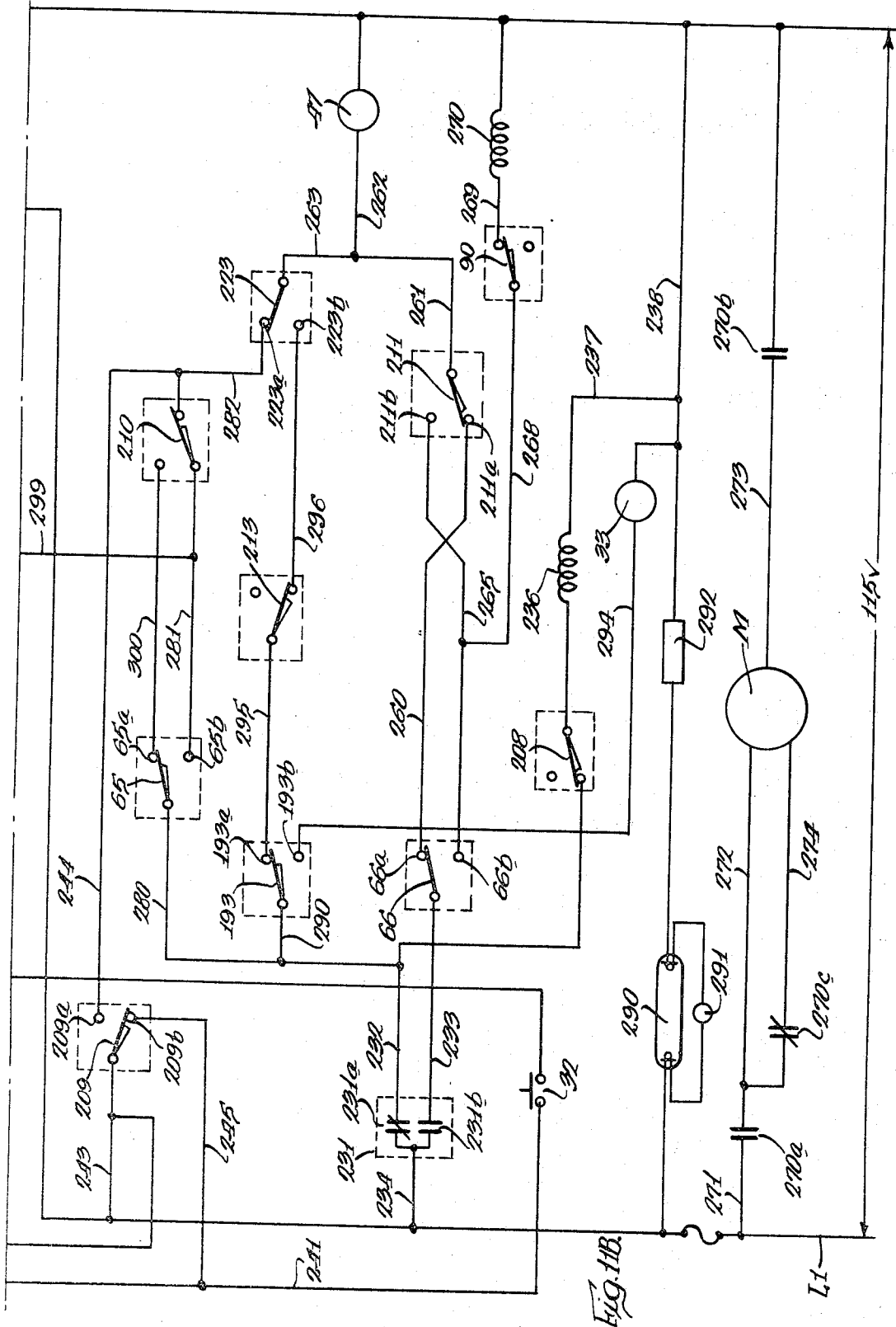
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3,341,982

BOWLING BALL POLISHING MACHINE

Robert Torresen, Muskegon, Mich., assignor to Brunswick Corporation, a corporation of Delaware
Filed Mar. 22, 1965, Ser. No. 441,551
14 Claims. (Cl. 51—263)

ABSTRACT OF THE DISCLOSURE

A bowling ball polishing machine wherein a generally cylindrical body of buffing material is normally spaced from the periphery of a buffing wheel and is periodically movable into engagement therewith to apply buffing compound thereto. The body of buffing material is continuously indexed when the machine is operating by means driven synchronously with the means rotating the buffing wheel, to present different surfaces of the body of buffing material to the buffing wheel so that the body of material will be uniformly worn. An arcuate concave recess is provided in the periphery of the body buffing compound material and presents an outwardly facing axially convex surface that is shaped complimentary with the buffing wheel so that the buffing material will be uniformly applied to a wide area of the wheel.

This invention relates in general to a bowling ball polishing machine, and more particularly to a bowling ball polishing machine having a selectable first cycle for polishing individual balls, and a selectable second cycle for automatically and sequentially polishing a plurality of balls.

It is a general object of the invention to provide a new and improved control means for operating a ball polishing machine of the character described.

A more specific object of the invention is to provide new and improved control means for operating a bowling ball polishing machine having a motor driven door mechanism which is movable between a normally closed position, a first open position for discharging a polished ball from the machine, and a second open position for accepting a ball.

Another object of the invention is to provide a ball polishing machine of the character described with a buffing compound applicator mechanism for periodically applying a desired quantity of buffing compound material to the buffing wheel.

A further object of the invention is to provide a bowling ball polishing machine as described above with means for indexing the supply of buffing compound material, so that substantially the entire quantity of buffing compound material will be utilized.

Still another object of the invention is to provide control means for a bowling ball polishing machine as described above which are operatively responsive to the periodic movement of the buffing compound material into engagement with the buffing wheel for controlling the duration of the buffing cycle.

A still further object of the invention is to provide control means for a bowling ball polishing machine as described above which includes suitable switch means whereby a bowling alley proprietor can select buffing cycles of different duration for the polishing of house balls, and coin operated switch means whereby a bowling alley customer can select buffing cycles of different duration for the polishing of his individual ball.

These and other objects of the invention will become more fully apparent from the following description taken in connection with the annexed drawings, wherein:

FIG. 1 is a front perspective view of a preferred embodiment of the invention;

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FIG. 2 is an exploded perspective view of the ball polisher housing with certain parts broken away for clarity of illustration;

FIG. 3 is an enlarged front elevational view of the ball polisher shown in FIG. 1, with the front panel removed;

FIG. 4 is a left hand side elevational view of the ball polisher illustrated in FIG. 1 with the outer left hand side panel removed;

FIG. 5 is a right hand side elevational view of the ball polisher illustrated in FIG. 1 with the outer right hand side panel removed;

FIG. 6 is a fragmentary sectional view taken generally along line 6—6 of FIG. 3;

FIG. 7 is a view taken generally along line 7—7 of FIG. 6;

FIG. 8 is a view similar to FIG. 6 and showing the door in the open positions;

FIG. 9 is a sectional view taken generally along line 9—9 of FIG. 7;

FIG. 10 is a fragmentary perspective view of the buffing compound applicator, with certain parts being broken away for clarity of illustration.

FIGS. 11A and 11B are a schematic electrical circuit diagram.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

The present invention is primarily concerned with a bowling ball polishing machine which is adapted for use by bowling alley customers, as well as by the bowling alley proprietor. The polishing machine includes a door assembly which moves a bowling ball into the interior of the polishing machine, and holds the ball against a single buffing wheel. Means are provided for selecting the duration of the buffing cycle, and coin operated control means are provided for customer use, while suitable switch means are provided for the polishing of house balls by the bowling alley proprietor. The present invention contemplates a machine wherein three different length buffing cycles may be selected; namely, a two minute cycle, a five minute cycle, and a ten minute cycle. The aforementioned door structure for introducing a bowling ball into the interior of the polishing machine is movable between a single closed, and two different open positions. One of the open positions corresponds to customer operation of the machine, and the other open position corresponds to proprietor operation of the machine. In the door open position for customer use, the door structure is positioned so as to support a ball when a ball is placed in the door structure by a customer. In the door open position for the polishing of house balls, the door structure is movable from a first location for automatically discharging a ball from the machine, and a second location for automatically receiving a ball for introducing the same into the interior of the machine. The second door open position in the polishing of house balls corresponds to the door open position for the polishing of customers' balls. Thus, a ball polishing machine is provided which is well adapted for customer use, as well as for the automatic polishing of house balls, in that balls may be automatically fed into the machine for polishing thereof, and automatically expelled therefrom when the polishing cycle is completed.

Referring now to FIG. 1, the ball polishing machine is illustrated in its entirety by reference numeral 20. The ball polisher 20 includes a box-like housing or cabinet defined by spaced side panels 21 and 22, a front panel 23, a top panel 24, and a rear frame member 25. Suitable

mounting feet 26 are provided on lower frame members 27 for supporting the housing on a suitable support surface, such as a floor. An illuminated control panel 28 is provided adjacent the upper portion of front panel 23, and at the forward end of top panel 24. A plurality of indicating lights 29 are provided on the control panel 28 for indicating the time remaining on the selected polishing cycle. Control panel 28 also includes a coin slot 30 for accepting suitable denomination coins to initiate the desired polishing cycles, a coin reject button 31, and a coin return slot 31a. A manually depressable start button 32 is provided adjacent the right hand end of control panel 28, and an indicating light 33 is provided adjacent thereto for indicating a "sold out" condition of the machine.

As can be best seen in FIG. 2, the ball polisher 20 includes an inner or subframe defined by spaced side frame members 35 and 36, which are secured to the rear frame member 25 and to the lower frame members 27. The upper ends of side frame members 35 and 36 are bent outwardly at generally right angles with respect thereto at 35a and 36a respectively, and define therebetween a generally rectangularly shaped opening 37.

A first baffle member 38 is secured to rear frame member 25, and extends forwardly therefrom in a horizontal plane generally perpendicularly to side frame members 35 and 36. The forward end of baffle member 38 includes a downwardly extending, generally vertically disposed first portion 38a, and a downwardly inclined second portion 38b extends forwardly from the lower end of baffle portion 38a. Baffle 38 further includes a third portion 38c which is disposed in a generally horizontal plane, and extends forwardly from the lower edge of baffle portion 38b. A second baffle member 39 extends generally vertically upwardly from baffle member 38, and divides the interior of the ball polisher housing into a first or "ball" compartment 40, and a second or "buffing" compartment 41 rearwardly and upwardly therefrom. Baffle member 39 has an opening 42 therein, for a purpose to hereafter appear.

As can be seen in FIG. 6, a buffing wheel W is rotatably mounted in compartment 41, and a ball B is adapted to be held in compartment 40 by a door mechanism to be hereafter described. The ball B is adapted to extend into the compartment 41 through the opening 42 in baffle member 39, where it is held in engagement with the outer periphery of the buffing wheel W by the door mechanism. A bar of buffing compound material C is also provided in compartment 41, and is adapted to be periodically moved into engagement with the periphery of the buffing wheel W by means to be hereafter described to apply a desired amount of buffing compound material to the wheel W. The construction of the buffing wheel W is set forth in detail in the application Serial No. 441,552 filed Mar. 22, 1965 in the name of Otto E. F. Puhlmann and now abandoned.

A generally rectangular doorway 45 is provided in front panel 23, and a door assembly 46 normally closes the doorway 45, as can be seen in FIG. 6. Means are provided for opening the door assembly 46 so that a ball may be introduced into the compartment 40, and includes a door motor assembly 47 held on the side frame member 36 as by bolts 48 and including a motor 49 and a gear reducer unit 49a. The door drive motor 49 has a double ended shaft, including a first portion 50 which extends outwardly through the side frame member 36 for driving the door moving mechanism, and a second portion 51 which extends inwardly from the side frame member 36 for driving a timer cam means for controlling the sequence of operation of the door actuating mechanism.

The door assembly 46 includes a first door panel 52 having a cover plate 53 secured thereto and adapted to overlie the doorway 45 when the door assembly 46 is closed. Door member 52 is somewhat W-shaped in cross-

section, as can be best seen in FIG. 9, and includes a pair of spaced generally parallel side walls 54 and 55, downwardly extending inclined walls 56 and 57 diverging inwardly from the upper ends of side walls 54 and 55 respectively, and a central wall 58 generally perpendicular to side walls 54 and 55. Inclined walls 55 and 56 cooperate with the central wall 58 to define a trackway for reception of a bowling ball. Central portion 58 is provided with a generally rectangular opening 60, and a rotatably mounted cylindrical ball engaging roller 61 is positioned in the opening 60. Roller 61 is carried by a pair of generally identical brackets 62 that are pivotally mounted to the door member 52 by a pivot member 63. Brackets 62 include an apertured enlarged portion 62a at the lower ends thereof, and a spring 64 is connected between the bracket portions 62a and the door to bias the roller 61 through the opening 60. A pair of switches 65 and 66 are mounted adjacent brackets 62, and a suitable cam member 67 is operatively associated with the brackets 62, for engaging the operating levers 65a and 66a of the switches 65 and 66 respectively. Thus, when a ball is present on the track of door member 52, the roller 61 will be depressed to pivot the bracket 62 and actuate the switches 65 and 66. Thus, roller 61 and switches 65 and 66 cooperate to define means for sensing the presence or absence of a bowling ball on the door assembly.

The door assembly 46 further includes a rearwardly extending cradle assembly defined by a pair of spaced plates 70 and 71 each fixed to door member 52 as by bolts 73. A somewhat triangularly shaped plate 74 extends downwardly from cradle member 71 to effectively define a bell crank member, and a cam follower roller member 75 is fixed to the offset lower portion 74a of plate 74 for tracking cam means to be hereafter described. A hollow sleeve 76 is fixedly secured adjacent the rearward end of cradle members 70 and 71, and defines a horizontal axis for rotation of a shaft 77 received in sleeve 76. Two spaced rubber rollers 78 are rotatably mounted on each of cradle members 70 and 71, with the rollers on cradle member 70 being aligned with the rollers on cradle member 71. The rollers 78 cooperate to collectively define a cradle upon which the bowling ball B is adapted to be seated when the door assembly is in a door open position.

The means for moving the aforescribed door assembly 46 from the closed position shown in FIG. 6 to the open positions shown in FIG. 8 includes a crank 80 fixed to the shaft portion 50 of the door drive motor 49. A pair of generally identical, T-shaped crank links 81 and 82 are held on crank 80, as by a screw 83. Crank links 81 and 82 are provided with respective longitudinally extending slots 84 and 85 adjacent one end thereof, and circular openings 86 are provided in the crank links adjacent the other end thereof. As can be seen in FIG. 7, the crank arm 80 extends outwardly through the circular opening 86 in crank link 81 and the longitudinal slot 85 in crank link 82; while a shaft 87 extends through the circular opening 86 in crank link 82 and the longitudinal slot 84 in crank link 81. Springs 88 and 89 are connected between the cross pieces of the T-shaped crank links 81 and 82 to urge the same toward one another, and to retain the end of crank arm 80 and the shaft 87 at the end of slots 85 and 84. Thus, crank links 81 and 82 cooperate to define a yieldably extensible connecting rod for crank 80. If a foreign object, such as a hand, is caught in the doorway during the door closing cycle, the links 81 and 82 will move relative to one another to prevent damage to the object. A switch 90 is mounted on the outer side of frame member 36 adjacent shaft 87, and as will hereinafter be more fully explained, switch 90 is closed by downward motion of the shaft 87 when it is in the lowest position to provide a signal indicating the closed condition of the door structure.

Shaft 87 extends inwardly of the side frame member

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36 through a suitable opening 91 therein, and a pivotally mounted generally triangularly shaped cover plate 92 is positioned in face abutting engagement with the inner surface of side frame member 36 to normally cover the opening 91. Cover plate 92 includes a first opening, which receives the shaft 87 therethrough, and a second opening adjacent the apex thereof which pivotally mounts the cover plate on a transversely extending fixed shaft 93. As can be best seen in FIG. 3, shaft 93 extends completely across the polishing machine housing between side frame members 35 and 36, and suitable means, such as screws 94 (FIG. 7) are provided to retain the shaft 93 on the side frame members 35 and 36.

A crank lever 95 is pivotally mounted on shaft 93, and is connected between shafts 77 and 87 for operation of the door assembly 46 from the closed position of FIG. 6 to the open positions of FIG. 8. The mid portion of crank lever 95 includes a pair of spaced journal members 96 and 97 which pivotally mount the crank lever 95 on the shaft 93. A suitable collar 98 is fixed on the shaft 93 to retain the crank lever 95 in the desired position. Crank lever 95 includes an angulated upwardly extending portion 99, which terminates in a sleeve 100 that is secured to the shaft 77 by a screw 101. Crank lever 95 further includes a downwardly extending bell crank portion 102, which is apertured for reception of shaft 87. A suitable lock nut 103 retains the bell crank portion 102 on shaft 87 against the bias of spring 104. Thus, it will be readily apparent that as the door motor shaft 50 rotates the crank 80, the connecting rod defined by crank links 80 and 81 oscillates the crank lever 95 to move the door assembly 46 between the closed position shown in FIG. 6 and the open positions shown in FIG. 8.

Means are provided for controlling the open position to which the door is moved, and includes a cam 105 fixed adjacent the inner surface of side frame member 36 as by screws 106. Cam 105 includes a cut out central portion, which defines a pair of cam surfaces 107 and 108. Cam follower roller 75 rides along the cam surfaces of cam member 105 to control the open position of the door assembly, and suitable spacers 109 space the cam 105 from the side frame member 36 so that the cam follower roller 75 may move freely along the cam surfaces.

Means are provided for selecting which of the cam surfaces the cam follower roller 75 is to follow, and includes a movable cam member 110 fixed to a shaft 111 which is mounted in the frame member 36 for both pivotal and axial movement. A manually operable handle 112 is fixed to shaft 111 outside of frame member 36, and a spring 113 is connected between the handle 112 and a suitable post on the frame member 36 to bias the handle 112 in a clockwise direction as viewed in FIG. 5. Spring 113 normally urges the cam 110 into the position shown in FIG. 6, where the arcuate cam surface 110a on the undersurface of cam 110 cooperates with the cam surface 107 on the cam 105 to define a generally semi-circular path of travel for cam follower roller 75. Shaft 111 is free to move transversely outwardly of side frame member 36, and springs 115 surround the shaft 111 and bear against collars fixed on the shaft 111 to urge the cam 110 axially into the position shown in FIG. 7. A first stop member 116 is fixed to the outer surface of cam 105, and functions to retain the cam member 110 in the solid line position shown at 110 in FIG. 8, against the bias of spring 113. A latch plate 116a is positioned to retain the cam 110 against axial movement. On pivoting cam 110 clockwise in FIG. 8 to clear latch plate 116a, the cam may be moved axially outwardly and released to move counterclockwise to the broken line position 110' in FIG. 8, resting against stop 116b on bolt 106. When the cam member is in the broken line position shown at 110' in FIG. 8, the cam follower roller 75 is free to move along the cam surface 108 upon oscillation of the crank lever 95 and the door may move to the open position shown in broken lines. It will be readily understood that when it is

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desired to move the door into the full line open position shown in FIG. 8, it is necessary merely to rotate handle 112 in a clockwise direction, and to push the handle inwardly toward frame member 36 to engage the cam member 110 with the latch members 116 and 116a whereupon the spring 113 will hold the cam member 110 in the position shown in FIG. 6.

As can be seen in FIG. 8, when the cam surface 110a has been selected, the door assembly 46 is movable to the full line position where the cradle assembly and the door panel 52 are positioned entirely outwardly of the cabinet of the polishing machine, with the door panel 52 and the cradle assembly each being inclined upwardly and converging toward one another. The cam surface 110a operation is selected for customer use of the polishing machine, and it will be readily apparent that a bowling ball placed upon the door panel 52 will roll down the trackway thereon into engagement with the rollers 78 on the cradle assembly. As will hereafter be more fully explained in detail, the placement of a ball on the door panel member 52 pivots the roller 61 and brackets 62 to actuate the switches 65 and 66 for moving the door assembly to the closed position. When the cam surface 108 has been selected, the door assembly will move into the position shown generally in broken lines in FIG. 8. In this position the door panel 52' is positioned generally horizontally, and the trackway thereon is inclined downwardly at a very small angle, as evidenced by the inclination of central portion 58' of the door panel 52'. This position corresponds to the ball discharging position in automatic operation of the machine for polishing house balls, and it will be understood that due to the downward inclination of the door panel trackway, balls will roll off of the door structure onto a suitable support device. After the polished ball has been discharged from the machine, means to be hereafter described move the door assembly from the broken line position of FIG. 8 to the full line position of FIG. 8, where the door assembly is in position for accepting an additional ball from the ball supporting device.

After the bowling ball B has been positioned in the door assembly 46, and the door assembly has moved into the closed position shown in FIG. 6, rotation of the buffing wheel W is initiated to accomplish the polishing of the ball B. As can be best seen in FIGS. 3 and 4, a drive motor M is fixed on the frame by a suitable support structure S. The motor M has a double ended shaft, and one end 145 extends outwardly through the side frame member 36. A pulley 146 is fixed on motor shaft portion 145, and an endless belt 147 is trained over the pulley 146, and over a pulley 148 fixed on a shaft 149 which is rotatably mounted in the side frame member 36. As can be best seen in FIG. 6, the buffing wheel W is fixed on shaft 149 for rotation therewith.

A drive system is positioned between side frame member 35 and side panel 22 for operating various mechanisms of the ball polishing machine to be later described. An endless belt 126 is trained over a small diameter pulley 127 fixed on the motor shaft portion 125 extending outwardly through side frame member 35, and over a large diameter pulley 128 fixed on a shaft 129 rotatably supported in side frame member 35 by suitable bearing means 130. A small diameter sprocket 131 is fixed to shaft 129, and an endless chain 132 is trained thereover and over a relatively large diameter sprocket 133 fixed to a shaft 134 rotatably mounted in side frame member 35. A very small diameter sprocket 135 is fixed to shaft 134, and an endless chain 136 is trained thereover, and over a relatively large diameter idler sprocket 137 that is fixed to a shaft 138, which is rotatably mounted in the side frame member 35. A small diameter sprocket 139 is fixed to shaft 138 and an endless chain 140 is trained thereover, and over a relatively large diameter sprocket 141 that is fixed on a shaft 142 rotatably mounted in the side frame member 35.

Means are provided for creating relative movement between the ball and the buffing wheel W, and include a brake roller 150 formed of rubber or the like, and fixed on shaft 129. Roller 150 is positioned between the cradle rollers 78 (FIG. 3), and is adapted to engage the undersurface of a ball carried by the door structure when the same is closed to lift the ball off of the cradle rollers. Because of the step down relationship between pulleys 127 and 128, shaft 129 rotates at a speed substantially less than the speed of rotation of shaft 149. Thus, since the roller 150 is rotating at a slower speed than the buffing wheel W, the roller 150 serves as a brake, which impedes the rotation of the bowling ball B to thereby create relative movement between the bowling ball and the buffing wheel. The relative movement between the bowling ball and the buffing wheel creates the polishing action on the ball.

A suitable metal roller 151 (FIG. 6) is rotatably mounted between a pair of brackets 152 that are secured to the baffle member 38. Roller 151 extends upwardly into the buffing compartment 41, and is adapted to be engaged by a bowling ball when the door assembly 46 is closed. Additional metal rollers 153 are secured by brackets 154 to the side frame members 35 and 36 to guide the bowling ball during the buffing operation. Thus, when the door assembly 46 is closed the ball which has been placed on the track member 52 and the cradle rollers 78 will be lifted out of engagement with the cradle roller 78 by the brake roller 150. The center of gravity of the bowling ball is positioned slightly to the left of the pivotal axis 150 as viewed in FIG. 6, so that the ball is supported by the brake roller 150, and the metal roller 151 during the buffing action, with the rollers 153 serving to prevent lateral movement of the ball.

Means are provided for periodically twisting the bowling ball B so as to present new surfaces to the buffing wheel for polishing thereof, and includes a pair of segment shaped members 155 rotatable with a fore and aft extending horizontal shaft 156. Shaft 156 is disposed at right angles with respect to shaft 134, and suitable worm gear means (not shown) in housing 157 connect the shaft 134 to the shaft 156 for rotation thereof. Rubber bumper members 158 are carried at the outer end of each of the segment members 155, and are adapted to engage the undersurface of the bowling ball upon rotation of the shaft 156 to lift the bowling ball off of its supports and move a new surface into engagement with the buffing wheel W. Brush 159 is mounted on shaft 156 between the segment shaped members 155, and is adapted to engage the brake roller 150 upon rotation of the shaft 156 to maintain the brake roller in a clean, grit free condition.

A forced air ventilation system is provided through the ball compartment 40 and the buffing compartment 41 to insure that all dirt and dust is removed from the ball during a polishing cycle. To this end, an impeller type blower wheel 160 is fixed to the outer end of motor shaft 145 and communicates with a scroll-like housing 161 for directing air upwardly through an elongated duct 162 and into the ball compartment 40 through an opening 163 in side frame member 36. The ball compartment 40 is substantially air tight, so that the air introduced therein through opening 163 passes into the buffing compartment through the opening 42. The air flows past the bowling ball and the buffing wheel at a high velocity so as to remove all dirt and dust from the ball. Air vents 165 are provided in the top panel 24 in communication with the buffing compartment 41, and a suitable filter 164 is removably carried by the top panel 24 to remove impurities from the air passing outwardly from the machine.

Means are provided for periodically moving the buffing compound material C into engagement with the buffing wheel W and for indexing the buffing compound material, and will be best understood from a consideration of FIGS. 3, 4 and 10. A pair of generally triangularly shaped

plates 170 are mounted in spaced relation to the side frame member 35 by bolts 171. A generally U-shaped driving housing 172 straddles the plates 170, and the rearward ends of the legs of housing 172 are pivotally mounted on the uppermost rear bolt 171. A spring 173 is connected between the housing 172 and the forwardmost bolt 171 to bias the housing 170 downwardly toward the buffing wheel. A shaft 175 is rotatably mounted on the legs of the housing 172, and extends into the buffing compartment through a suitable opening in side frame member 35. The buffing compound material is keyed to the inner end of shaft 175 by means of a drive hub 176 fixed on the shaft 175 and having a drive pin 177 positionable in the compound material. A spiral spring 176a surrounds shaft 175, and bears against hub 176 to force the compound against a collar 177a fixed to the end of shaft 175. The compound material is initially a generally cylindrically shaped member, which has an arcuate cut out or recess portion 178 extending the length thereof. The curvature of arcuate portion 178 is convex axially to correspond generally to the axially concave outer periphery of the buffing wheel W, so that when the compound C is moved into engagement with the buffing wheel, compound will be generally uniformly applied to the wheel.

Means are provided for rotating the shaft 175 at a very slow speed so that the compound material C will be indexed slowly. It will be readily appreciated that after the shaft 175 has rotated through approximately 270°, the compound material remaining on the shaft 175 will have the shape shown at C' in FIG. 10. Thus, by indexing the compound material, substantially all of the same is used in applying compound to the buffing wheel. The means for rotating the shaft 175 at the desired speed includes a reduction gearing system 179 nested between the arms of the U-shaped drive housing 172. The reduction gearing system 179 includes an output gear 180 fixed on shaft 175 for rotation thereof. A series of relatively large diameter gears 181 (three in the illustrated embodiment) are rotatably mounted on each of the axes defined by the uppermost rear bolt 171 and shaft 142. Each of gears 181 is a compound gear, and has a small diameter pinion 182 formed integrally therewith, and the gears 181 on bolt 171 each mesh with a pinion 182 on shaft 142, while the gears 181 on shaft 142 each mesh with a pinion 182 on bolt 171. The last gear 181 on bolt 171 engages gear 180 to rotate the same. A cam 185 is mounted on shaft 142 and is coupled to sprocket 141 for rotation therewith. Thus, the shaft 142 is rotated by the action of chain 140 on sprocket 141, and this rotational speed is stepped down through the reduction gears 181 and pinions 182 to impart the desired slow output rotational speed to the gear 180. Cam 185 engages a cam follower 186 that is provided on shaft 175 for periodically allowing the spring 173 to move the compound material C into engagement with buffing wheel W. Cam 185 rotates at approximately one r.p.m., and is shaped so as to allow the compound material C to engage the buffing wheel W once each minute of polishing operation and for approximately 30° of cam rotation.

A switch 187 is mounted on the outer triangular plate 170, and a bolt head 189 is provided on the sprocket 141 for actuating switch 187. The actuating lever for the switch 187 projects inwardly through a suitable opening 191 in the outer plate 170 where it is positioned in the path of travel of bolt head 189. Since cam 185 and sprocket 141 rotates at approximately one r.p.m., it will be readily apparent that switch 187 gives a signal once each minute during a polishing operation. A "sold out" switch 193 is mounted on the U-shaped drive housing 172, and is adapted to be closed by a cam profile 194 on the hub of gear 180 when the gear 180 has made a complete revolution to indicate that the supply of compound material has been exhausted.

Cam means 200 are mounted on the door motor shaft

51 for operation of a bank of switches 201 to control the sequence of operation of the door assembly 46. The cam means 200 includes six cams 202-207, and six switches 208-213 are provided in switch bank 201 for respective operation by the cams. Switch 208 is controlled by cam 202 which has a low dwell from 355° to 15° of each door cycle. Switch 208 is therefore closed during each door cycle from 355° to 15° and is open between 15° and 355° of each ball door cycle. Switch 209 is controlled by cam 203 which has two low dwells, one occurring between 5° and 25° and the other occurring between 190° and 210°. Switch 209 is unactuated during each ball door cycle between 5° and 25°, and again between 190° and 210°. Switch 209 is actuated at all other times during the ball door cycle. Switch 210 is a two position switch and is controlled by cam 204. Cam 204 has an extended low dwell from 300° through 180°, and thus switch 210 is in one position from 300° to 180°, and in its other position between 180° and 300°. Switch 211 is a two position switch, and is controlled by cam 205. Cam 205 has an extended low dwell from 320° through 175°, and therefore switch 211 is in one position from 320° to 175°, and in its other position between 175° and 320°. Switch 212 is an "open-close" switch which is controlled by cam 206. Cam 206 has an extended low dwell from 290° to 240° of each ball door cycle, so that the switch 212 remains open from 290° to 240°, and closes between 240° and 290°. Switch 213 is an open-close switch that is controlled by cam 207, which has an extended low dwell from 310° to 260° of each ball door cycle. Switch 213 therefore closes during each ball door cycle between 310° and 260°, and is open from 260° to 310°.

An electrical control box 215 is mounted on side frame member 36, and a rotary stepping switch 216 is mounted therein. The rotary stepping switch includes three banks of contacts 216a, 216b, and 216c each arranged in an arc of a circle. Each bank of contacts has eleven points, which are contacted respectively by wipers 217a, 217b, and 217c as the wipers rotate through a mechanical ratchet and coil mechanism. The top bank of contacts 216a are each connected to the 10 individual indicating lights 29 on the control panel. As the wiper 217a advances one position per minute, the remaining minutes in the ball polishing cycle are indicated to the customer by the lights on the control panel. The middle bank 216b of the rotary step switch is utilized to control the timing mechanism for a two minute polishing cycle. When the proper amount of money is deposited in the coin slot 30 to obtain a two minute cycle, an interrupter, to be hereafter described, causes the wiper 217b to step off the contacts until it reaches the first open position, where it stops to make a two minute cycle. The bottom bank 216c of the rotary stepping switch is utilized to obtain a five minute polishing cycle, and operates in a manner similar to the middle bank of contacts. The rotary stepping switch 216 is operated by a coil 218, which when energized, pulls down on the ratchet lever of the stepping switch, thus causing the wiper to advance one position.

An interrupter switch 219 is connected in series with the stepping coil 218, and when voltage is applied through the interrupter switch contacts, the coil 218 becomes energized to pull down on the ratchet and rotate the wiper one position. As the ratchet is pulled down, the circuit to the interrupter is broken and removes current from the rotary switch coil 218. The ratchet mechanism then moves upwardly and advances the wiper one position on the rotary stepping switch 216, and simultaneously closes the contacts of the interrupter switch 219 to again energize the coil 218. This action continues until the wiper 217 reaches the first open contact. The ball polisher is then set for the proper time cycle.

A coin switch 224 is operably responsive to the deposit of an appropriate number of coins in the coin deposit slot 30, and includes a movable wiper arm 225 which moves between a dead contact 226, a contact 227 for a two min-

ute polishing cycle, a contact 228 for a five minute polishing cycle, and a contact 229 for a ten minute polishing cycle. A bank of house ball switches 220-223 is mounted on the control box 215, and switches 220, 221 and 222 are connected in parallel with coin switch 224 and are used by the bowling alley proprietor to select cycles of two, five and ten minutes duration respectively, for the polishing of house balls. House ball switch 223 is an "on-off" switch which remains off during normal customer operation, and is used only during house ball polishing operation.

The operation of the ball polishing machine will be best understood from a consideration of FIGS. 11A and 11B. During customer use of the machine, a specific number of coins are deposited in the coin slot 30, to select a polishing cycle. The control system for the machine includes a first master control switch 230, and a second master control switch 231. Switch 231 is a two position switch that is controlled by a cam on the wiper 217 of the stepper switch 216. Switch 231 includes closed contacts 231a in a line 232 that is connected between switch 208 and lead L1 by a line 234, and open contacts 231b in a line 233 that is connected between lead L1 and door switch 66. A coin rejecter coil 236 is connected in series with switch 208 in a line 237 that is connected to lead L2 through line 238. The coil 236 operates a conventional coin rejecter mechanism which accepts coins when the coil is energized and which rejects coins when the coil is deenergized. Since switch 208 is closed during each door cycle from 355° to 15°, the coin mechanism will only accept coins deposited during this portion of the cycle. Thus, assuming that the switch 208 is closed, and that the appropriate number of coins have been accumulated by the coin mechanism for selection of a two minute polishing cycle, the wiper arm 225 of coin switch 224 will move from contact 226 to contact 227.

Master control switch 230 is also a two-position switch, and is controlled directly by the same cam action as master control switch 231. Switch 230 includes normally closed contacts 230a in a line 240 and normally closed contacts 230b in a line 241. A line 242 connects the switch 230 with the house ball switch 223, and line 240 connects the closed contacts 230a with house ball switch 222 while line 241 connects the open contacts 230b in circuit with the start button 32. Switch 209 is connected to lead L1 by a line 243, and contact 209a of switch 209 is connected in a line 244, while contact 209b of switch 209 is connected by a line 245 to line 241. Push button 32 is connected to the wiper 217 of the rotary stepping switch by a line 247, and it will be readily understood that prior to the depressing of the start button 32, no current flows to the wiper 217. When the start button 32 is depressed, a circuit is completed to the wiper 217 through lead L1, line 243, switch 209, line 245, line 241, and line 247. Lines 248 and 249 respectively connect the wipers 217b and 217c with the respective contacts 227 and 228 in the coin switch 224, while a line 250 connects line 240 to the contact 229 of the coin switch 224. Thus, when the appropriate number of coins have been deposited to select a two minute cycle, and the start button 32 is depressed, a circuit will be completed to the interrupter switch 219 through line 248, contact 227 of coin switch 224, and a line 251 connected to the line 252 in which the interrupter switch 219 is provided. Thus, a circuit is completed to the stepping coil 218 in line 253 through a rectifier 254, which is connected between lead L2 and line 255. The rectifier 254 changes the 115 volt alternating current source connected across leads L1 and L2 to direct current for the stepping coil 218. The energization of stepping coil 218 causes the ratchet mechanism of the stepping switch to rotate the wiper 217 off of its home position to the first contact, which movement actuates master control switches 230 and 231 to their alternate positions. Master control switch 231 will retain the stepping coil 218 energized after the push button 32 is released. The rotary stepping switch 216 will then step until it reaches the first open contact to

establish the duration for the polishing cycle. Simultaneously, current will flow through lead L1, line 234, contact 231b, line 233, switch 66, contact 66a, line 260, switch 211, line 261, and line 262 to energize the motor 47. When the door motor becomes energized, the ball door mechanism starts the ball door in its opening motion to accept a ball. The door continues to open until switch 211 changes position at 175° from contact 211a to contact 211b. When the door motor rotates through 25°, the switch 209 closes into engagement with contact 209a, so that a circuit is completed to the drive motor 47 through lead L1, line 243, switch 209, contact 209a line 244, switch 233, line 263, and line 262 to retain the door motor energized even after the switch 211 moves into engagement with contact 211b. At 190° of rotation, the switch 209 opens to deenergize the motor 47 and the door assembly 46 remains open awaiting a ball.

When a customer places a ball on the ball door cradle, switches 65 and 66 are actuated, and a circuit is completed to the door motor 47 through lead L1, line 234, contact 231b, line 233, switch 66, switch contact 66b, line 265, contact 211b, switch 211, line 261, and line 262. The door motor then begins to move the door assembly to the closed position, and at 210° the switch 209 moves into engagement with the contact 209a to retain the door motor energized when the switch 211 moves from contact 211b to contact 211a at 320°. The door motor continues to rotate to a 5° position at which time switch 209 moves into engagement with contact 209b to interrupt the circuit to the door motor. At that time the door assembly 46 is in the closed position shown in FIG. 6, with the ball there-in positioned against the buffing wheel W.

When the door assembly reaches its fully closed position at 5°, a circuit is completed to a buffing motor relay 270 through lead L1, line 234, contact 231b, line 233, switch 66, contact 66b, line 265, switch 90, and line 269. Relay 270 includes a first pair of normally open motor start contacts in a line 271 that are connected to the motor M through line 272, and a second pair of normally open motor start contacts 270b in a line 273 which is connected to the motor M. Relay 270 further includes a pair of normally closed brake contacts 270c in a line 274 which is connected between line 271 and the motor M. Thus, when the relay 270 is energized, contacts 270a and 270b close to place the buffing motor M across the 115 volt power line to rotate the buffing wheel W and start the polishing cycle.

As the ball is being polished by the buffing wheel, the compound applicator mechanism moves the compound material C against the buffing wheel W one time per minute. Each time the compound material C is moved against the buffing wheel W, the compound applicator switch 187 is closed, which allows current to flow to the coil 218, thereby advancing the wipers of the stepping switch 216 to the next set of contacts. This action occurs one time during each minute of operation until the wipers pass the last contact position, at which time the wipers reposition themselves in the "home" position. As the wipers reach the home position, the master control switches 230 and 231 return to their original positions, thus deenergizing the buffing motor relay coil 270. Relay contacts 270c are then closed and act as a brake on the buffing motor M.

At the completion of the buffing cycle, it is necessary to open the door assembly to present the polished ball to the customer, and to then close the door assembly to await the next customer. With switch 231 in its original position, a circuit is completed to the door motor 47 through lead L1, line 234, contacts 231a, line 232, line 280, door switch 65, contact 65a, line 281, switch 210, line 282, house ball switch 223, line 263, and line 262. The door motor continues to rotate to 190° even though the switch 210 changes positions at 180°, since the switch 209 remains in engagement with contact 209a until 190°, at which time switch 209 moves into engagement with

contact 209b to stop the door motor 47. The customer then removes the polished ball from the ball door cradle, and door switches 65 and 66 moves into engagement with contacts 65a and 66a respectively. The door motor 47 is then energized through a circuit including lead L1, line 234, contact 231a, line 232, line 280, switch 65, contact 65a, line 300, switch 210, line 282, switch 223, line 263, and line 262. The door mechanism will move to a completely closed position at 5° even though switch 210 changes positions at 300°, since the switch 209 remains in engagement with contact 209a until 5°. At that time the switch 209 moves into engagement with the contact 209b to stop the door motor 47 with the door completely closed and waiting the next customer.

In the example discussed above, a two minute cycle was used to described the electrical sequence. If however a five minute cycle had been selected by the customer, the deposited coins would have moved coin switch arm 225 into engagement with contact 228, and this would have allowed a five minute polishing cycle to again position the wipers in their home position. If a ten minute cycle had been selected, the coin switch arm 225 would have been moved into engagement with the contact 229, and the interrupter 219 would only advance the rotary stepping switch one position from home. The rotary stepping switch would then require a ten minute cycle to again position the wipers at their home position. The top bank of contacts 216a indicates the remaining minutes of each cycle to the customer by the indicator lamps 29 on the control panel.

Means are provided for illuminating the control panel 28 and includes a fluorescent lamp 290 connected in circuit with a starter 291 and a ballast 292 in a line 238 that extends between leads L1 and L2. The "sold out" switch 193 is connected by a line 294 to the sold out lamp 33, and as explained above, switch 193 is closed in response to the buffing compound material C being exhausted.

When the above described machine is to be used by the bowling alley proprietor in polishing house balls, the movable cam is moved to the latched position shown at 110' in FIG. 8 by moving the handle 112, so that the cam follower roller 75 tracks along cam surface 108. The house ball switch 223 is then closed, and one of switches 220-222 is closed to establish the desired duration for the polishing cycle. When house ball switch 223 is closed, current will immediately flow through lead L1, line 234, master control switch contact 231a, line 232, line 280, line 290, sold out switch 193, contact 193a, line 295, switch 213, line 296, contact 223b, switch 223, line 263, and line 262 to energize the door motor 47. The ball door mechanism will open to its furthest position; and then start its closing motion, and at 260° switch 213 opens to break the circuit to the motor 47 and stop the motion of the ball door mechanism in its ball receiving position. As the first ball is delivered to the ball door, the ball will actuate ball door switches 65 and 66 to complete a circuit to stepping coil 218 through the selected one of house ball switches 220-222, lead L1, line 234, contact 231a, line 232, line 280, switch 65, contact 65a, line 299, switch 212 (closed at 240°), line 298, switch 223, and either one of lines 242 or 247.

The wipers will advance one step and the contact 231a will open deenergizing coil 218. The stepping switch is thus set for a ten minute cycle. If a two or five minute cycle has been selected the stepping switch will be positioned at 5° when power is available to the coil 218 from L1, line 243, switch 209, contact 209b, line 245, line 241, contact 230b, line 242, line 247 and either (1) wiper 217b, 216b, line 248, line 301, switch 220, or (2) line 302, wiper 217c, segment 216c, line 249, line 303, switch 221; to line 252, stepper switch 219, line 255, rectifier 254, and coil 218. The rotary stepping switch wiper 217 will advance, thus actuating master control switches 230 and 231 to their alternate positions, current

immediately flows from lead L1 to the door motor 47 through line 234, contact 231b, line 233, switch 66, contact 66b, line 265, contact 211b, switch 211, line 261, and line 262. The ball door mechanism then completely closes the ball door, and the closing motion of the door does not stop at 320° when switch 211 moves into engagement with contact 211a, because current flows through switch 209, contact 209a, line 244, switch 210, line 281, contact 65b, switch 65, line 280, line 290, switch 193, contact 193a, line 295, switch 213, line 296, contact 223b, switch 223, line 263, and line 262 to the motor 47. The ball door stops at 5° when the switch 209 returns to its open position. With the ball door closed, current passes from lead L1, line 234, contact 231b, line 233, switch 66, contact 66b, line 265, line 268, switch 90, and line 269 to energize the buffing motor relay 270 and energize the buffing motor to start the polishing cycle.

The polishing cycle continues until the wipers of the rotary stepping switch 216 reach their home positions, as previously explained, at which time master control switches 230 and 231 return to their original positions. Current then passes through lead L1, line 234, contact 231a, line 232, line 280, line 290, switch 193, contact 193a, line 295, switch 213, line 296, contact 223b, switch 223, line 263, and line 262 to energize the ball door motor 47 and open the ball door. As the door motor rotates 290°, the door opens far enough to permit the polished ball to roll from the ball door panel 52 onto the supporting structure, and the discharge of the polished ball actuates switches 65 and 66. The motion of the ball door does not stop at 190°, but continues until switch 213 is opened at 260°. The ball door remains open at 260° until the next ball is automatically delivered onto the door cradle structure, at which time the entire process is then repeated until all balls have been polished and delivered to the ball supporting structure. At the completion of house ball operation, the selected one of house ball switches 220-222, and house ball switch 223 are moved to their other positions. Current then flows through lead L1, line 234, contact 231a, line 232, line 280, switch 65, contact 65a, line 300, switch 210, line 282, switch 223, line 263, and line 262 to energize the door motor 47 for closing the door. The door mechanism does not stop when switch 210 changes positions at 300° and continues to close until switch 209 opens at 5°. The movable cam member 110 is then actuated by handle 112 to again prepare the machine for customer use.

The bar or wheel of buffing material, preferably initially in the shape illustrated in FIG. 10, generally cylindrical with an arcuate recess in the periphery and of convex shape axially, is comprised of a suitable compound, of somewhat chalklike consistency, including for example, an abrasive material, a cleaning solvent, and a suitable binder, such as paraffin wax. The material picked up by the buffing wheel is transferred by the wheel to the bowling ball, either of hard rubber or plastic. The surface of the ball is thereby cleaned of the film of foreign matter which accumulates thereon from contact with other objects. The solvent aids in dissolving the film and the abrasive agent on the wheel mechanically rubs the residue off and polishes the surface of the ball to a high lustre.

I claim:

1. A device for applying buffing compound to a buffing wheel comprising: a buffing compound holder mounted adjacent a buffing wheel for periodic movement toward and away from said wheel, and carrying a bar of buffing compound material; means normally retaining said holder in a set position away from said wheel; means for moving said holder toward said wheel; means for returning said holder to said position after engagement with said wheel; and means driven in timed relation with said buffing wheel for indexing said holder so that different portions of said bar move into engagement with said wheel upon movement of said holder toward said wheel.

2. In a device for buffing a spherical object, the combination of: a support; a buffing wheel rotatably mounted on said support and adapted to engage said object; means for rotating said buffing wheel; a buffing compound applicator mounted for movement toward and away from said wheel, and carrying a bar of buffing compound material; a housing pivotally mounted on said support and carrying said applicator; means for pivoting said housing in a first direction to move said bar into engagement with said wheel; means for retaining said bar in engagement with said wheel for a predetermined length of time; means for pivoting said housing in a direction opposite to said first direction to move said bar away from said wheel; and means continuously driven in timed relation with said buffing wheel for indexing said holder so that different portions of said bar move into engagement with said wheel upon movement of said holder toward said wheel.

3. In a ball polishing machine including a buffing wheel for polishing a ball, a buffing compound applicator mechanism comprising: a shaft carrying a bar of buffing compound material; means normally retaining said material spaced from said wheel; means for periodically moving said bar into engagement with said wheel; and means driven in timed relation with said buffing wheel for rotatably indexing said shaft so that different portions of said bar will engage said wheel upon actuation of said last named means.

4. A ball polishing machine as defined in claim 3 wherein said means for indexing said shaft includes a rotatable input member, a rotatable output member coupled to said shaft, and speed reducer means connecting said input member to said output member for rotation of said shaft at a desired slow speed.

5. A ball polishing machine as defined in claim 4 including means responsive to said shaft indexing means for indicating when the supply of buffing compound material is exhausted.

6. A ball polishing machine as defined in claim 3 wherein said bar of buffing compound material is a generally cylindrical member having an arcuate concave recess in the periphery and extending from end to end of the member, said recess defining an outwardly facing axially convex surface.

7. A ball polishing machine as defined in claim 3 wherein said shaft is carried by a pivotally mounted housing, and wherein said means for moving said bar into engagement with said wheel includes spring means biasing said housing toward said wheel.

8. A ball polishing machine as defined in claim 7 wherein said means normally retaining said material spaced from said wheel includes a cam follower associated with said shaft, and a rotatable cam engaging said cam follower.

9. A bar of buffing compound having a generally cylindrical configuration and an arcuate recess in the periphery, said bar having means for mounting the same upon an indexing drive for rotating the bar about the axis thereof.

10. A unitary formed body of buffing material of chalklike consistency adapted to be engaged by the periphery of a buffing wheel having an axially concave periphery for transfer of material by the wheel from said body to a spherical object to be buffed, said body having a generally cylindrical shape and including an arcuate concave recess in the periphery and extending from end to end of the body, said recess defining an outwardly facing axially convex surface.

11. A body as defined in claim 10, including an axial aperture for receiving a drive shaft.

12. A body as defined in claim 11, including a recess in the body parallel and eccentric to the axial aperture for receiving a drive pin.

13. A body of buffing material adapted to be engaged by the periphery of a buffing wheel for transfer of material by the wheel from said body to an object to be buffed,

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said body having an arcuate recess in the periphery thereof and said body having means for mounting the same upon an indexing drive for rotating the bar about the axis thereof, whereby said buffing material may be fed to said buffing wheel by actuation of said indexing drive.

14. A ball polishing machine as defined in claim 3 wherein said bar of buffing compound material includes an arcuate recess in the periphery thereof, whereby actuation of said indexing means feeds compound material to said buffing wheel.

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References Cited

UNITED STATES PATENTS

334,296	1/1886	Smith	51—263
2,177,992	10/1939	Moon	51—263
2,588,714	3/1952	Fleming	51—263 X
2,763,971	9/1956	Andersen	51—263 X
3,289,354	12/1966	Stevens et al.	51—263 X

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Disclaimer

3,341,982.—*Robert Torresen*, Muskegon, Mich. BOWLING BALL POLISHING MACHINE. Patent dated Sept. 19, 1967. Disclaimer filed Jan. 15, 1973, by the assignee, *Brunswick Corporation*.

Hereby enters this disclaimer to claims 9-13, inclusive, of said patent.
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