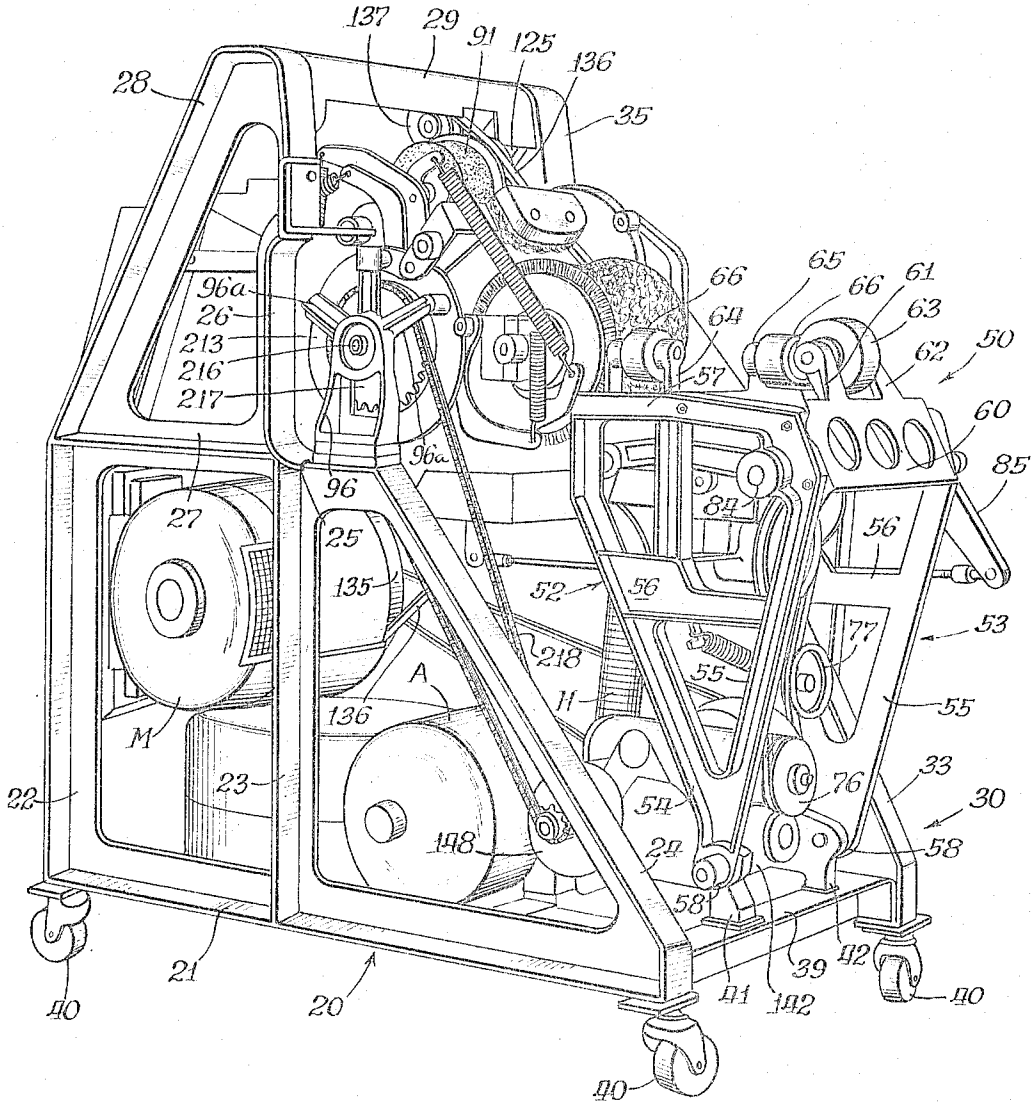
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BALL RECONDITIONER

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Fig. 1.



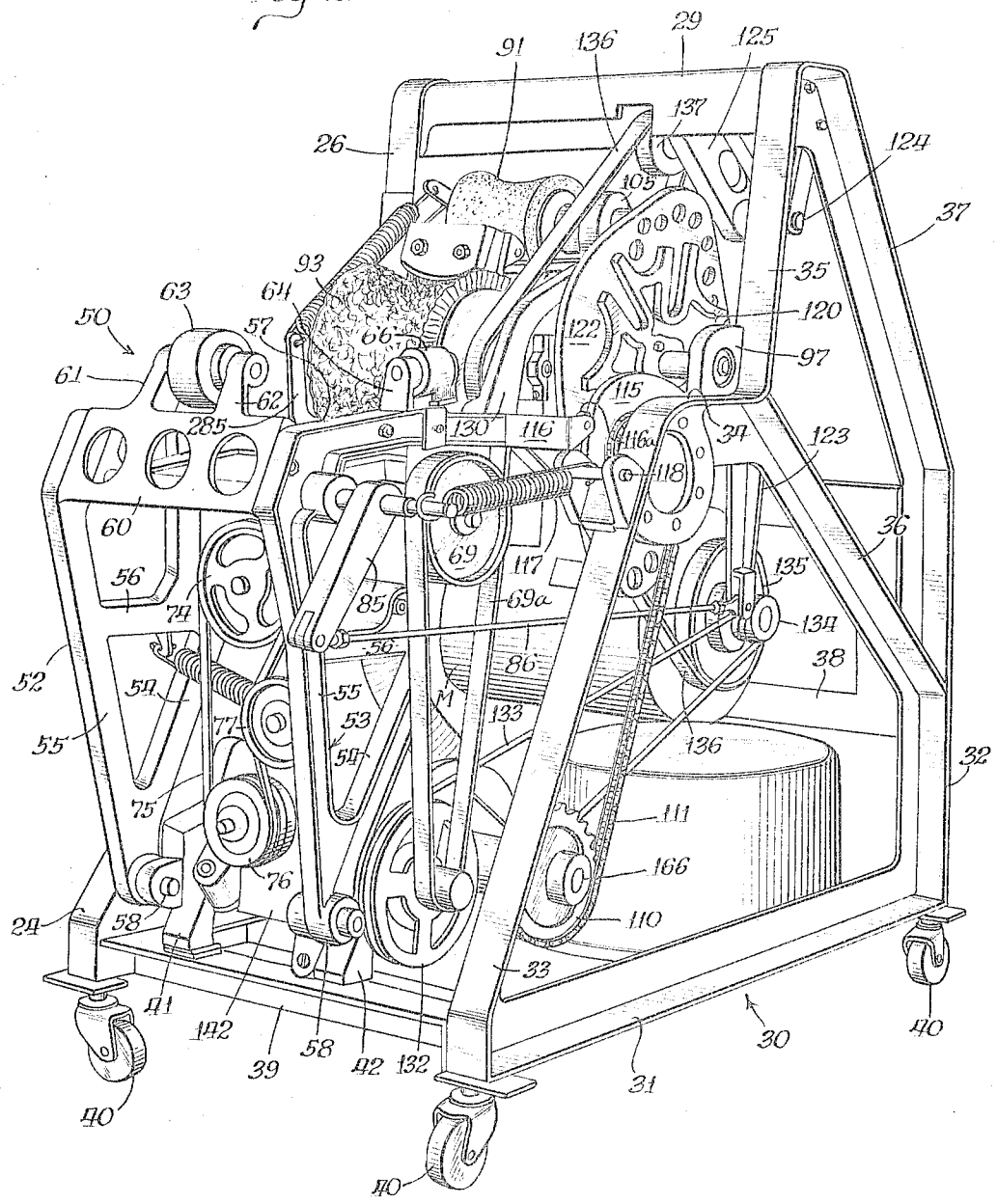

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Fig. 2.



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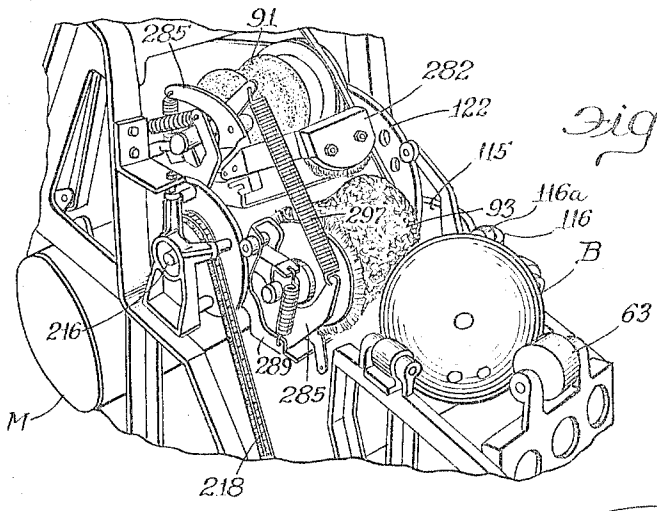



Fig. 3.

Fig. 11.

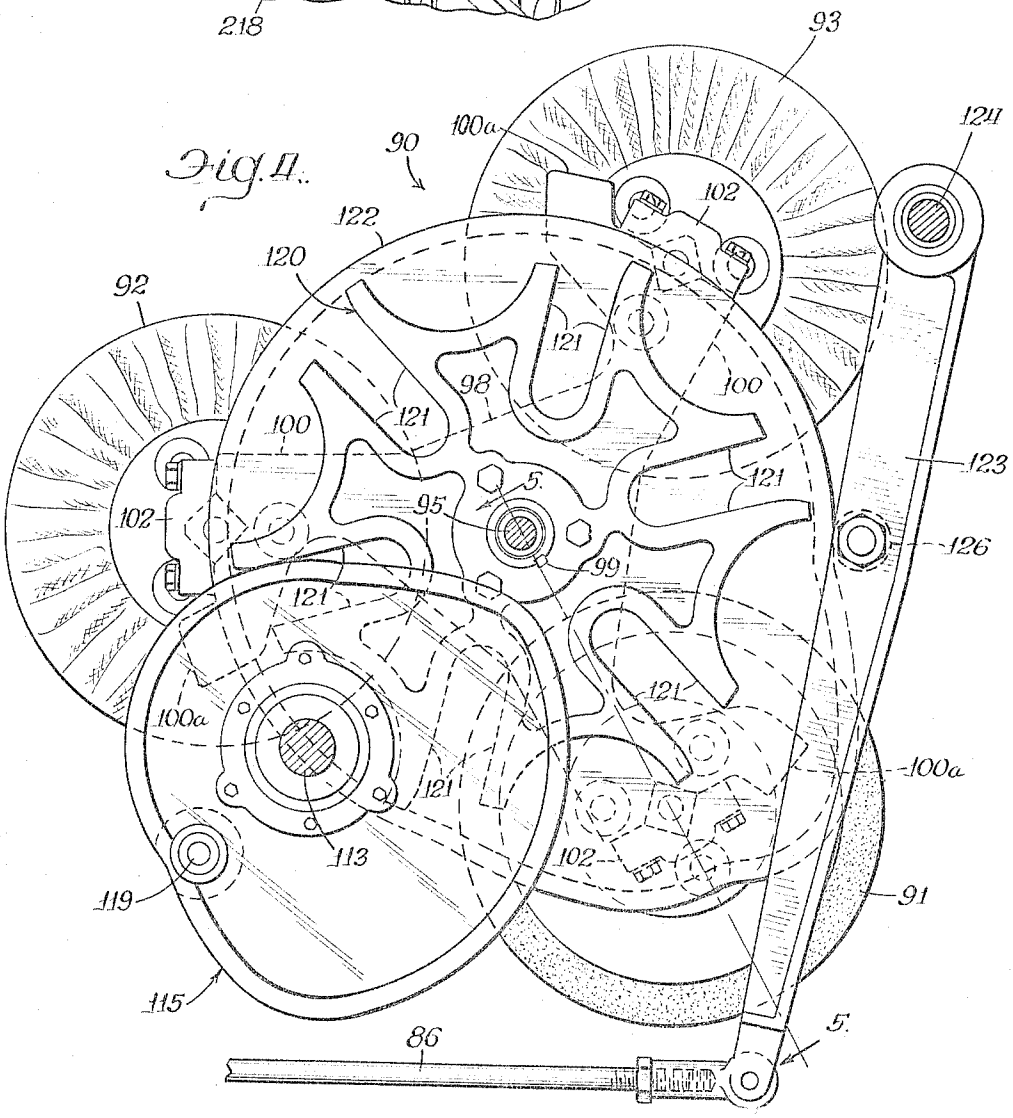


Fig. 5.

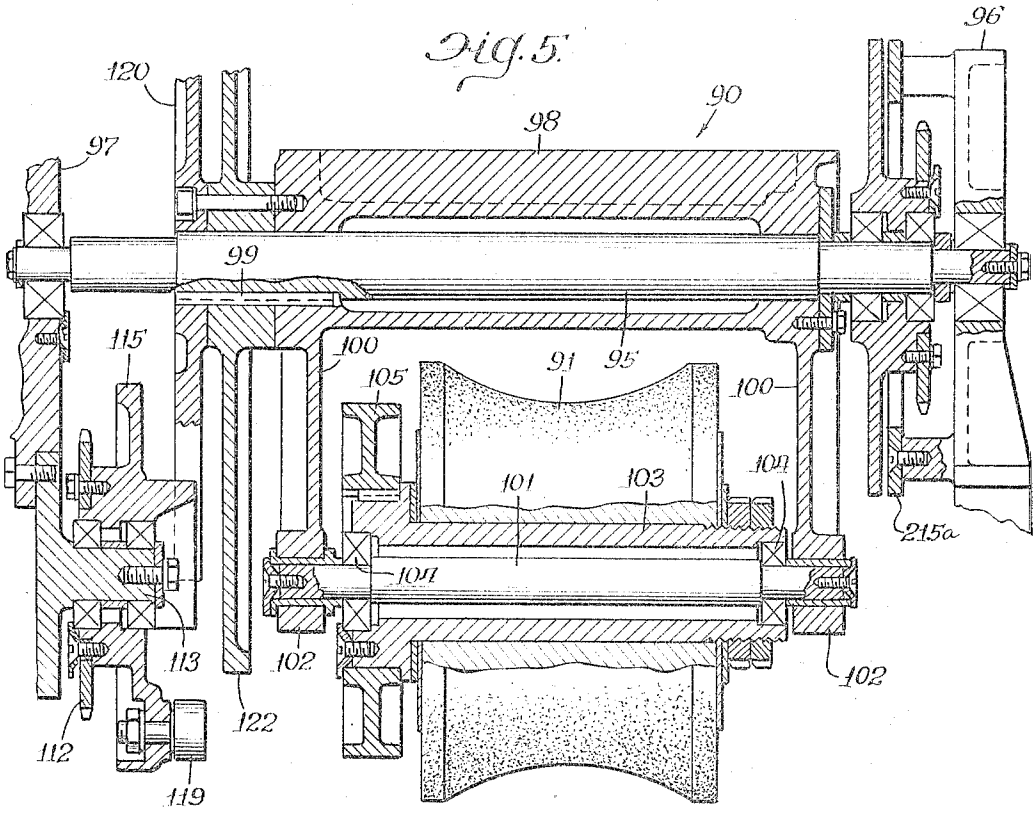
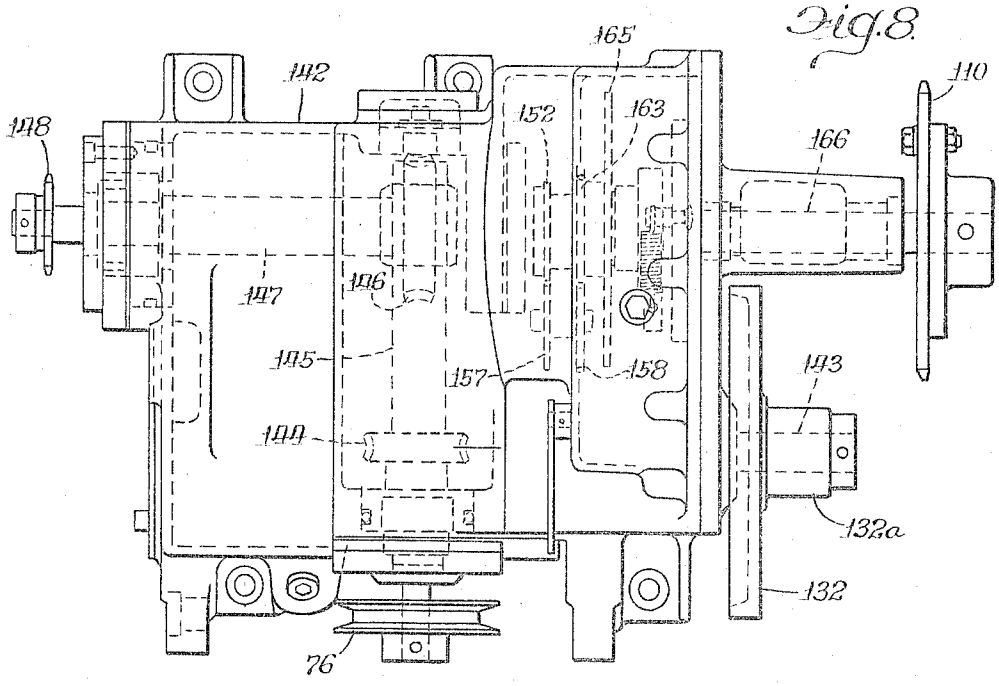

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115
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215a
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112
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Fig. 8.


165
142
110
148
152
163
166
147
106
145
157
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144
132a
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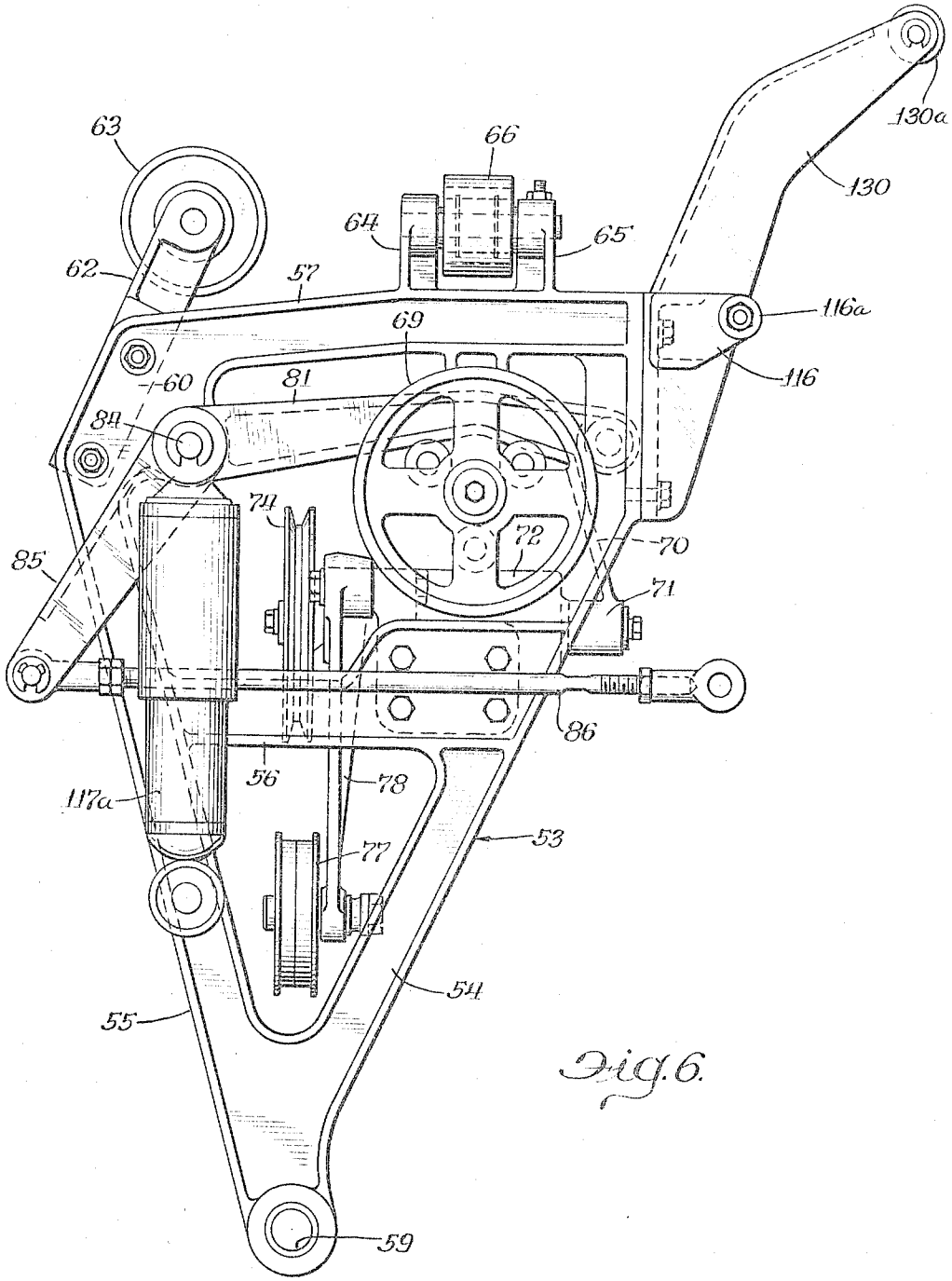


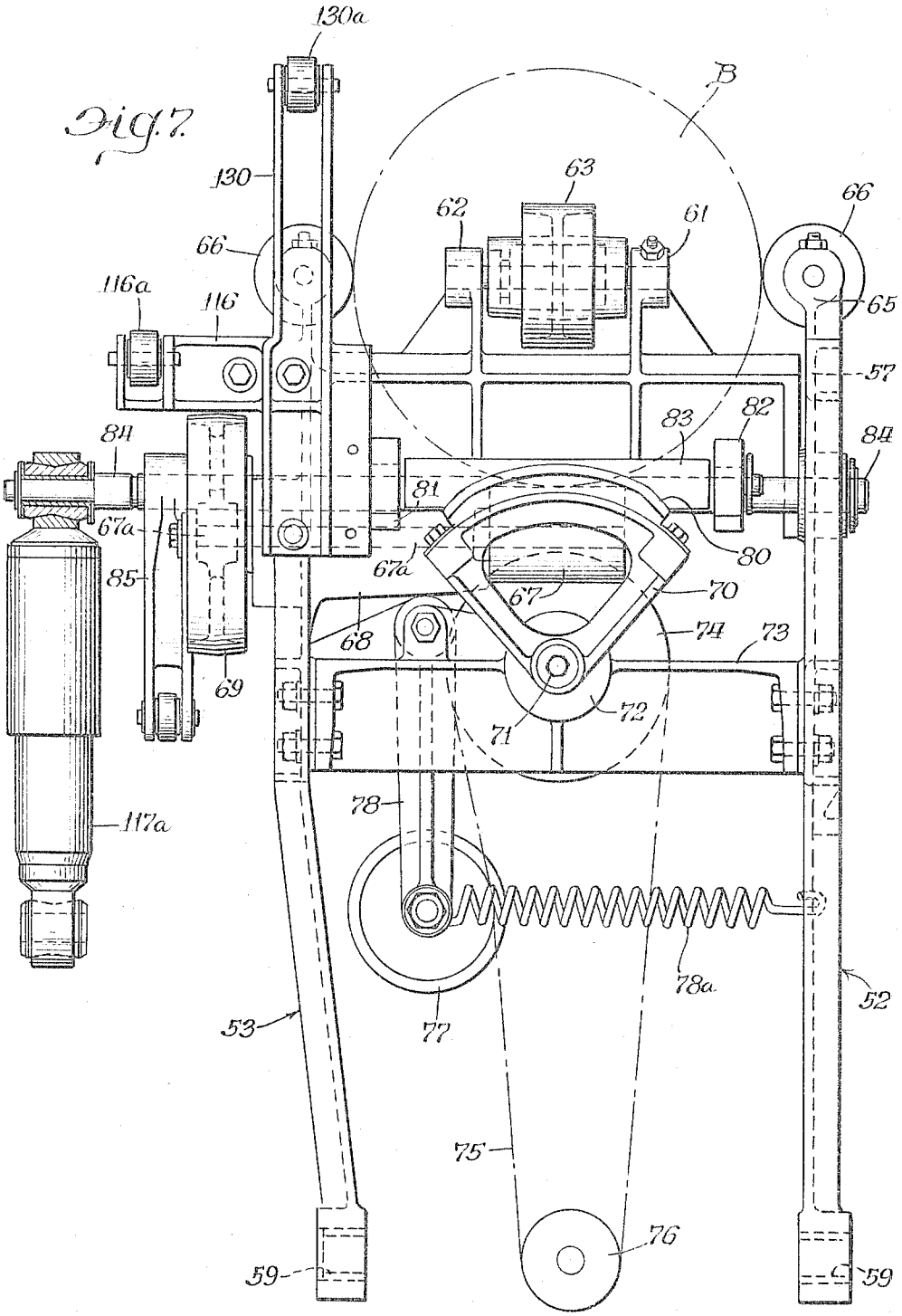

Fig. 6.

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Fig. 7.



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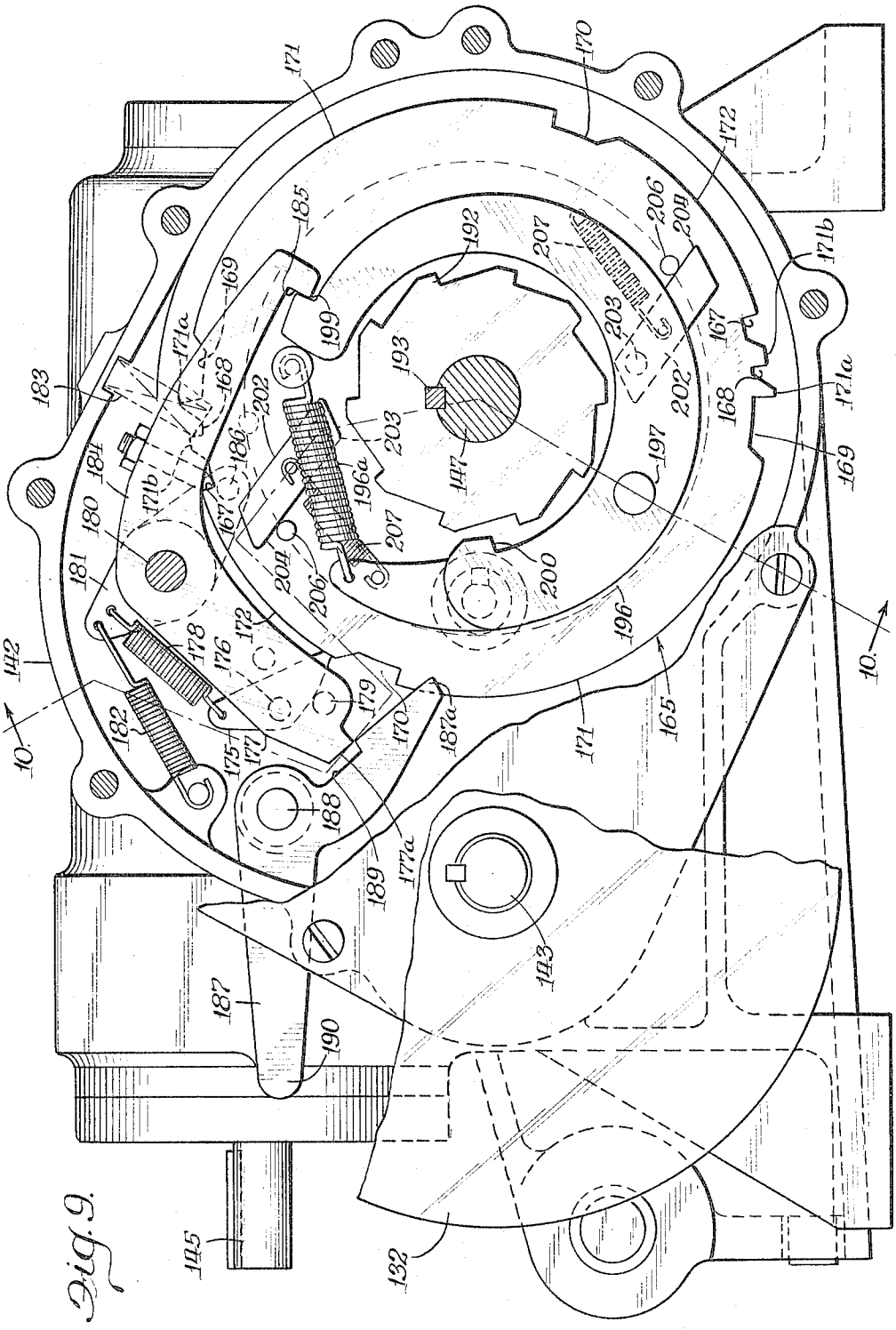



Fig. 9.

Fig. 12.

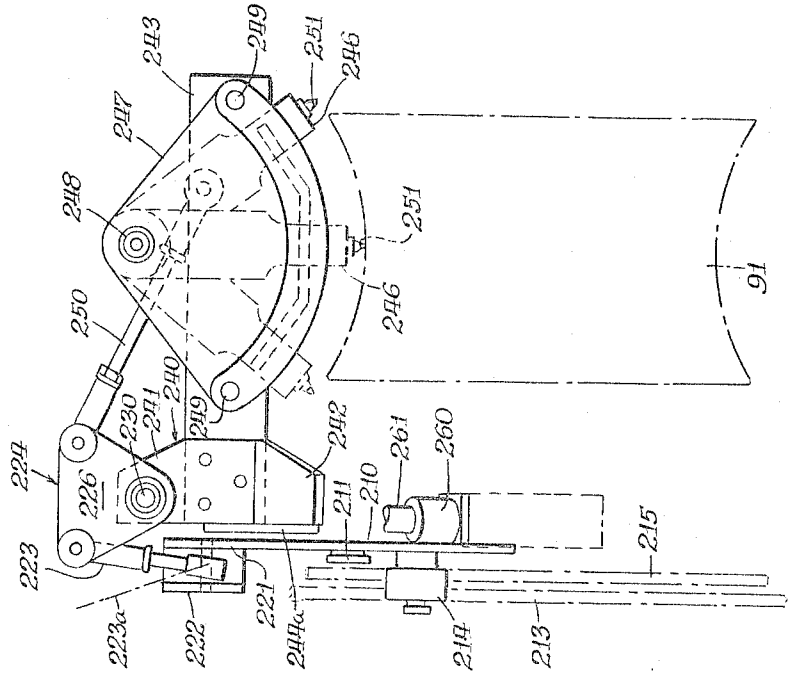
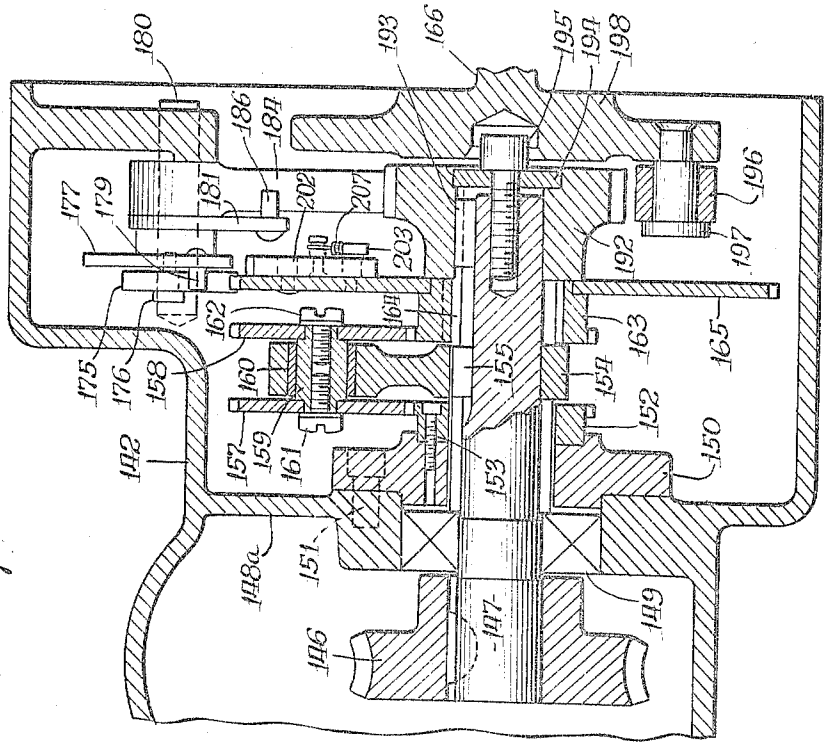

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223a
222
244a
214
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Fig. 10.


180
193
166
195
194
198
186
184
177
179
181
202
207
196
203
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148a
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146

BALL RECONDITIONER

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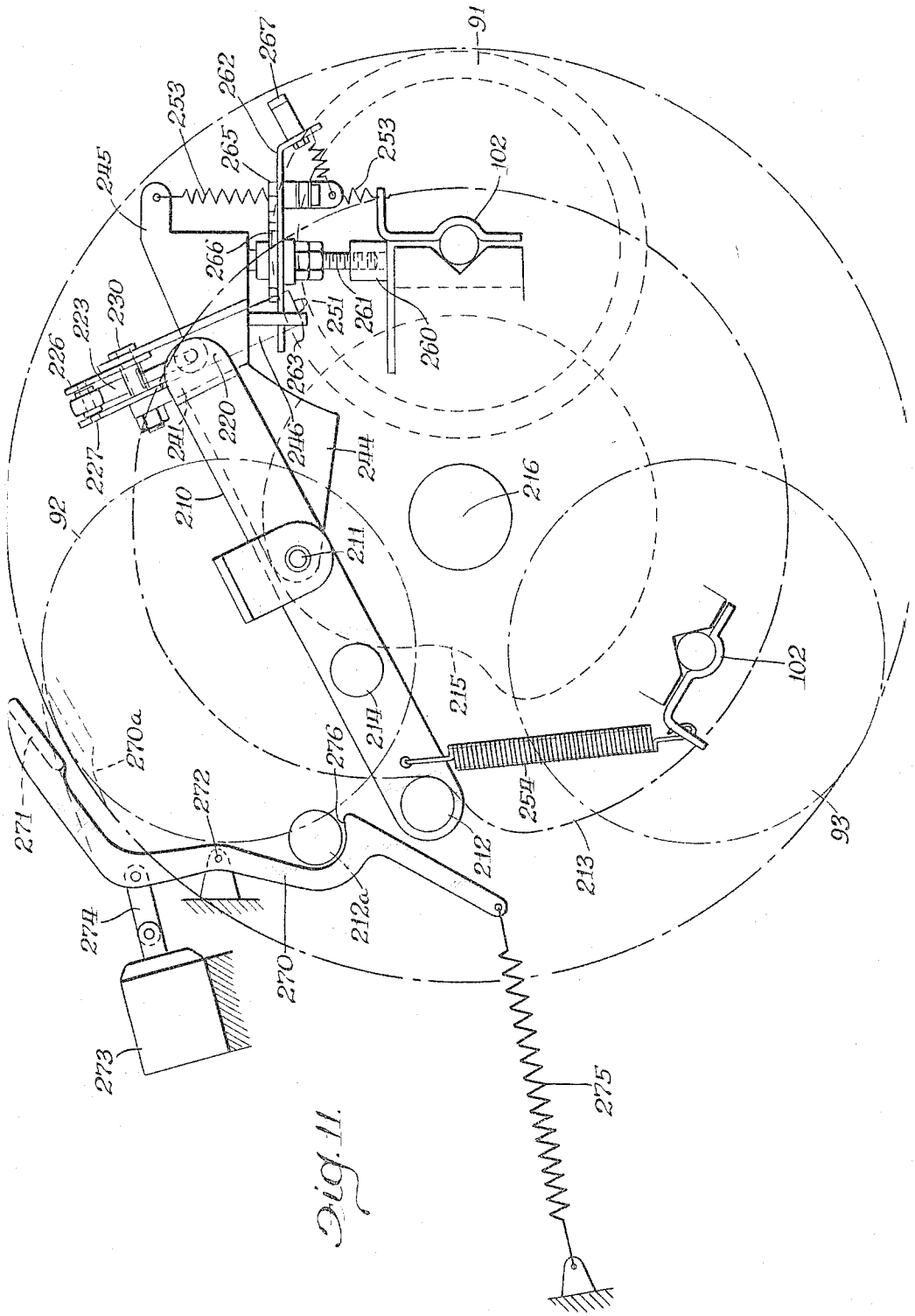
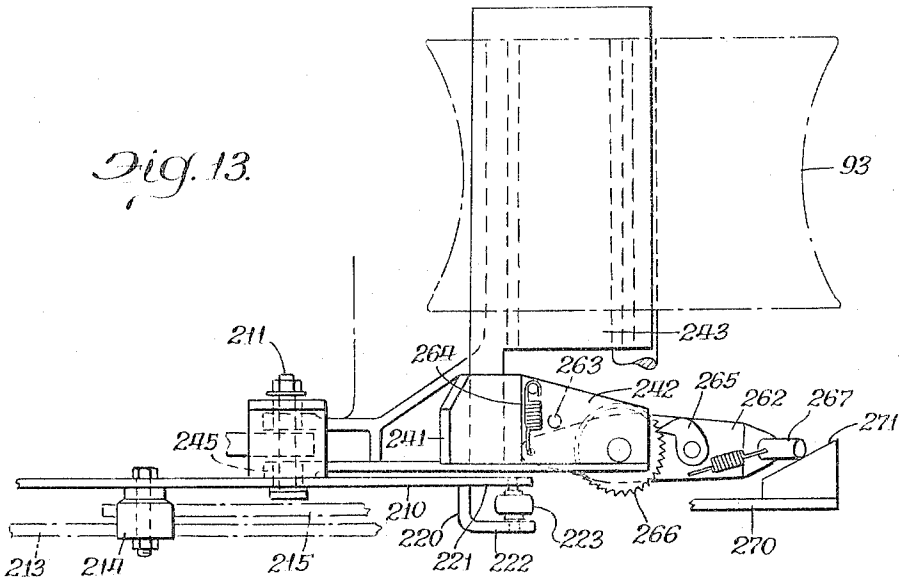



Fig. 11

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Fig. 13.



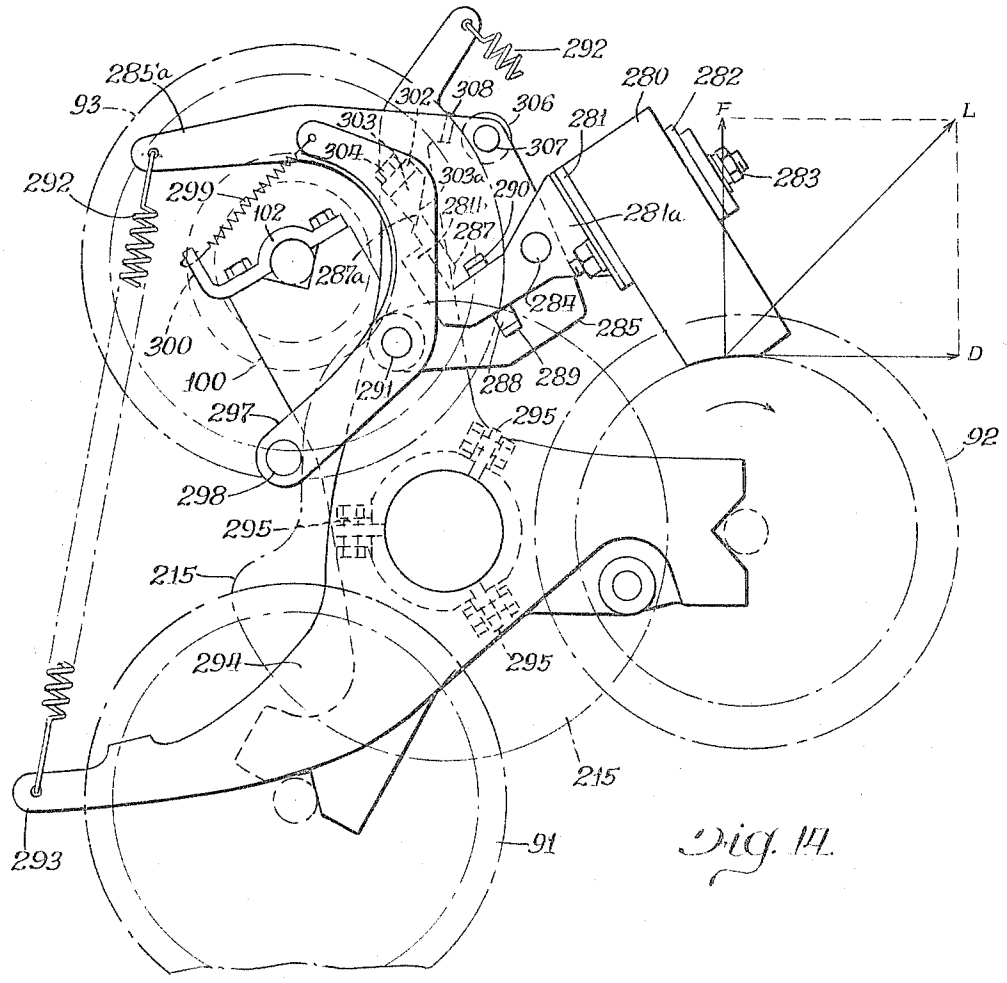




Fig. 14.

United States Patent Office 3,289,354 Patented Dec. 6, 1966



3,289,354

# BALL RECONDITIONER

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Filed Mar. 11, 1964, Ser. No. 350,983
23 Claims. (Cl. 51—5)

This invention relates in general to reconditioning apparatus, and more particularly to apparatus for reconditioning the outer surface of a bowling ball or the like.

Those familiar with the game of bowling are aware that as a ball is rolled down a bowling lane, dirt, grit, and other foreign particles have a tendency to accumulate on the outer surface of the bowling ball, and mar its appearance, as well as change the effect of spin deliberately imparted to the ball. It is well known in the prior art to provide means for polishing the outer surface of a bowling ball so that the ball is relatively clean and is provided with a lustrous exterior. Known bowling ball polishing machines have proven unsatisfactory in that they have not been capable of removing nicks, gouges, and scratches from the exterior of a bowling ball, which are commonly formed upon contact with particles on the bowling lane surface, and with the bowling pins; and also by the ball return mechanisms utilized in present day bowling establishments.

Accordingly, one of the general purposes of the present invention is to provide a ball reconditioning machine which will remove a predetermined amount of material from the outer surface of a bowling ball, so as to remove undesirable indentations from the outer surface of the ball.

It is also known to those skilled in the art to provide apparatus for grinding the outer surface of spherical objects. Such known devices have been unsatisfactory for use with bowling balls for several reasons. For example, many devices have not been capable of removing a uniform amount of material from the entire outer surface of a bowling ball, and therefore have been unsatisfactory because only precision grinding will retain the perfectly spherical shape that is required for a bowling ball. Other devices have either removed too much or too little material from the outer diameter and have not been susceptible of close control throughout the desired grinding operation. Also, prior art grinding devices are typified by a long grinding cycle which renders them undesirable for a commercial bowling establishment.

One of the more serious drawbacks of prior art grinding machines is that it has been necessary to completely remove the ball from the grinding machine after the grinding operation, and physically transfer it to a polishing machine wherein the grinding marks are removed and the ball is polished to a lustrous finish. This provides an undesirably lengthy delay, and makes it necessary for anyone who wishes to completely recondition a bowling ball to have a multitude of equipment.

Therefore, another general object of the present invention is to provide a single machine wherein a bowling ball may be completely reconditioned in stages akin to production techniques.

An object of the present invention is to provide a ball reconditioning machine with means for grinding the outer surface of a bowling ball to remove irregularities therefrom, a first polishing means to remove grinding marks and provide a clean polished surface, and a second polishing means for providing a lustrous exterior on the ball.

Another object of the invention is to provide a ball reconditioning machine as set forth in the preceding paragraph wherein the ball is rotatably supported at a working position, and the grinding means, and first and second



polishing means are sequentially moved into operative engagement with the bowling ball.

A further object of the invention is to provide timing means for a ball reconditioner as set forth above, wherein the timing means automatically controls the length of the grinding and first and second polishing cycles, and wherein the grinding cycle may be bypassed, if desired.

Still another object is to provide a ball reconditioner, as described above, with means for automatically dressing the grinding wheel so that a consistent amount of stock will be continuously removed from the balls being ground.

A still further object of the invention is to provide a ball reconditioner, as described above, with means for applying polishing compound to both the first and second polishing means so that the desired polishing of the balls will be effected.

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

FIG. 1 is a front perspective view taken from one side of a preferred embodiment of the invention;

FIG. 2 is a front perspective view similar to FIG. 1 but taken from the opposite side of the machine;

FIG. 3 is a fragmentary front perspective view taken from the same side as FIG. 1, but at a different angle, and showing certain elements of the invention in greater detail;

FIG. 4 is a side elevational view on an enlarged scale showing the turret assembly and the means for indexing the turret;

FIG. 5 is a sectional view taken generally along line 5—5 of FIG. 4, with certain parts broken away for clarity;

FIG. 6 is a side elevational view on an enlarged scale of the ball holding means of the present invention;

FIG. 7 is a front elevational view of the apparatus illustrated in FIG. 6;

FIG. 8 is a plan view of the drive and timing apparatus of the present invention;

FIG. 9 is an enlarged side elevational view of the apparatus illustrated in FIG. 8 with certain parts broken away for clarity;

FIG. 10 is a sectional view taken generally along line 10—10 of FIG. 9;

FIG. 11 is a side elevational view of the dressing device of the present invention, shown in somewhat diagrammatic form, and with certain parts broken away for clarity;

FIG. 12 is a front elevational view of the apparatus set forth in FIG. 11;

FIG. 13 is a plan view of the structure illustrated in FIG. 11 and FIG. 12; and

FIG. 14 is a side elevational view of the buffing compound applicator of the present invention.

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.

*General organization*

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, the illustrated embodiment of the ball reconditioning machine includes a frame having a pair of spaced side members **20** and **30**. Frame member **20** includes a generally horizontally disposed lower frame element **21**, generally vertically extending frame elements **22** and **23** positioned at the rear and at the central por-

tion of element 21 respectively, and a rearwardly inclined front element 24 positioned at the forward end of element 21. Front element 24 is connected to vertical element 23 by a generally horizontally disposed central portion 25 which includes a portion 26 extending generally vertically upwardly from the rearward end of portion 25. A generally horizontally disposed element 27 connects the upper ends of elements 22 and 23, and a generally forwardly inclined element 28 extends from the upper portion of element 22 and is secured to the upper part of portion 26. Frame member 30 includes a generally horizontally disposed lower element 31 having a generally vertically extending element 32 positioned at the rearward end thereof, and a generally rearwardly inclined element 33 positioned at the forward end thereof. Front frame element 33 includes a generally horizontally disposed central portion 34 that is positioned generally opposite frame portion 25, and a generally vertically extending portion 35 extending upwardly from the rearward end of portion 34. A forwardly inclined element 36 is connected between the central portion of element 32 and the rearward end of portion 34, and element 32 includes a forwardly inclined upper portion 37 that is connected to the upper portion of element 35. A transverse element 29 connects the upper portion of elements 26, 28, 35, and 37, while transverse elements 38 and 39 connect elements 22 and 32, and 24 and 33, respectively. Suitable casters 40 support the aforedescribed frame structure, so that the ball reconditioner may be moved as desired.

A ball holding cradle 50 is pivotally mounted on the main frame of the ball reconditioner by a pair of suitable supports 41 and 42 that are provided on frame element 39. Ball cradle 50 includes a pair of spaced, generally identically shaped side frame members 52 and 53, each having upwardly diverging sides 54 and 55 connected together at their bottom portions, connected at their midportions by horizontal member 56, and connected at their upper portions by horizontal member 57. The lower portion of members 52 and 53 are journalled in supports 41 and 42 as at 58, and suitable bearings may be provided as at 59 (FIG. 6 and FIG. 7) if desired.

A transverse member 60 spans the upper ends of forward cradle elements 55, and is provided with a pair of spaced upwardly extending lugs 61 and 62 which rotatably support a roller 63 therebetween. A pair of spaced upstanding lugs 64 and 65 are provided on the upper surface of the transverse member 57 of each cradle frame member 52 and 53, with rollers 66 being rotatably supported between lugs 64 and 65. A suitable ball rotating member 67 extends transversely between ball cradle frame members 52 and 53, and is secured to a shaft 67*a* that is rotatably supported in a hub 68, and which is driven through pulley 69 (see FIG. 7). Rollers 63 and 66, and ball rotating member 67 together collectively define a ball working station. The outer surface of ball rotating member 67 may be provided with an elastomeric material to enhance the gripping ability with the ball being reconditioned so that relative motion between the ball and work wheel is obtained.

Means are provided for periodically twisting the ball, so that the exterior of the ball will be uniformly worked. The ball twisting means includes a sector 70 (best seen in FIG. 7) that is secured to an arm 71 which is rotatably supported in a hub 72 carried by a transversely extending frame member 73. Arm 71 is rotated by pulley 74 which is driven by belt 75. Belt 75 is trained over a driving pulley 76 and engages an idler pulley 77 that is carried by a depending arm 78 biased toward belt 75 by spring 78*a*. A strip of elastomeric material 80 is provided on sector 70 so that as sector 70 rotates, strip 80 will engage the undersurface of the ball B and twist it a predetermined amount to insure that its outer surface will be uniformly worked.

Means are provided for lifting the ball B out of the working position at the end of the reconditioning cycle, and comprise a pair of generally horizontal, rearwardly extending arms 81 and 82 spanned at their rearward end by a transverse member 83 (best seen in FIGS. 6 and 7). The forward ends of arms 81 and 82 are secured to a transverse shaft 84 that is rotatably mounted in cradle frame members 55 to pivot arms 81 and 82 upwardly to lift the ball B from the working station. Shaft 84 is pivoted by a link 85 fixed thereto which is actuated by a rod 86 responsive to appropriate movement in the turret assembly to be hereafter described.

A turret assembly, indicated generally at 90 in FIG. 4, is indexably mounted on the main frame of the ball reconditioning machine for sequential movement of each of the ball working members into a position adjacent the ball working station defined at the upper portion of the ball carrying cradle. Turret assembly 90 includes a grinding wheel 91, a first buffing wheel 92 (for cut buffing), and a second buffing wheel 93 (for finish buffing). It will be understood that in the illustrated embodiment, grinding wheel 91 will remove a predetermined amount of stock from the outer periphery of the ball being reconditioned, and first buffing wheel 92 will perform a rough buffing operation, while second buffing wheel 93 will perform a polishing operation. It should be further understood, of course, that more than one grinding wheel may be provided, if desired, and also more or less buffing wheels may be provided. In any event, timing means to be hereafter described, are provided to regulate the length of the grinding and polishing cycles, and also to bypass the grinding cycle, if desired.

A turret assembly 90 is fixed to a shaft 95 that extends transversely across the main frame, and which has its end portions rotatably mounted in aligned bearings in brackets 96 and 97, which are provided on frame portions 25 and 34, respectively. Turret assembly 90 includes a body 98 fixed to shaft 95, as by key 99. Body 98 is provided with pairs of transversely aligned, radially outwardly extending arms 100 between which the ball working wheels are mounted. The mounting for each of the ball working wheels is substantially identical, so that only one is shown in detail (FIG. 5). A stationary shaft 101 extends transversely between the end portions of arms 100, and is secured thereto by end caps 102 that are bolted to the ends of arms 100 (FIG. 4). A spool 103, upon which the ball working wheel is fixed, is rotatably mounted on shaft 101 as by bearings 104. A pulley 105 is keyed to spool 103 for rotation thereof by a belt drive means to be hereafter described.

The means for indexing the turret assembly 90 (portions of which can be seen in FIGS. 2, 4, 5, 6, and 8) includes a sprocket 110 driving a second sprocket 112 by a chain 111. Sprocket 112 is rotatably mounted on a support member 113 carried by a flange depending from frame portion 34. A cam 115 is secured to sprocket 112 for rotation therewith, and engages a suitable roller 116*a* carried on an arm 116 which extends outwardly and rearwardly from the rearward end of ball cradle member 57. It will be readily understood that as the enlarged portion of cam 115 rotates into engagement with the roller 116*a*, the ball cradle 50 will be pivoted forwardly away from the main frame of the ball reconditioner. A spring 117 (FIG. 2), or its equivalent, such as shock absorber 117*a* (FIG. 6 and FIG. 7) is connected between the end portion of shaft 84 and a bracket 118 mounted on frame element 33 to return the ball cradle 50 to a position adjacent the main frame after the enlarged portion of cam 115 has rotated past the roller 116*a*. Cam 115 carries a crank pin 119 which is adapted to drive a Geneva mechanism 120 that is used to index the turret assembly 90. As is best seen in FIG. 4, Geneva mechanism 120 includes six steps defined by radially extending slots 121. The Geneva mechanism of the illustrated embodiment is provided with six steps in order to provide an intermediate step or position between each pair of ball working wheels.

As is best seen in FIG. 4 and FIG. 5, a cam **122** is fixed to Geneva mechanism **120**, and both are keyed to shaft **95** by the aforementioned key **99**. An arm **123** is secured at its upper end to a transverse pin **124** carried by a bracket **125** that depends from frame element **29** (FIG. 2). Arm **123** is pivotally secured at its lower end to the rearward end of rod **86**. A roller **126** is provided at the intermediate portion of arm **123**, and is engageable with the enlarged portion of cam **122**, as is best seen in FIG. 4, to actuate the ball lift arms **81** and **82**.

Each of the radial arms **100** of the turret assembly include a stop **100***a* that is engageable with a roller **130***a* carried by an upwardly and rearwardly extending arm **130** mounted on the rearward portion of the ball cradle **50** (see FIG. 6) when the turret is indexed to one of the steps intermediate the working wheels. Thus, in any of the intermediate positions of the turret assembly, the ball cradle **50** will be held in a forward position by the engagement of roller **130***a* with stop **100***a*, and cam **115** will rotate without engaging roller **116***a*.

The means for rotatably driving the single working wheel in the ball working position includes a driven pulley **135** which is fixed to the output shaft of a drive motor M (FIG. 2). A belt **136** is trained over the large diameter of pulley **135** and extends upwardly to an idler pulley **137** that is rotatably supported in the frame member **29**. Belt **136** then extends forwardly where it is trained over the pulley **105** on the ball working member in the ball working position. The location of pulleys **135** and **137** is such that only the pulley of the ball working wheel adjacent the ball cradle **50** comes in contact with and is driven by belt **136**. As each ball working wheel is indexed into the ball working position, its pulley **105** engages belt **136**, while the pulley **105** connected to the ball working member leaving the ball working position moves out of contact with belt **136**.

The timing means for controlling the operation of the ball reconditioning machine are mounted in a gear box **142** that is suitably secured to the front transverse element **39** of the main ball reconditioner frame and will be best understood from a consideration of FIG. 8–FIG. 10. This timing device is driven by motor M by means of belt **133** which is trained over pulley **132** on the timer and hub **134** of the motor M pulley **135**. A worm gear, not shown, is provided at the inner end of a shaft **143** to which pulley **132** is affixed, with the worm gear driving a gear **144** on a transverse shaft **145**. The rearward end of shaft **145** is provided with a worm gear, not shown, that drives another gear **146** carried by a shaft **147** extending transversely with respect to shaft **145**. A sprocket **148** is secured to shaft **147**, and drives the buffing compound applicator and the grinding wheel dresser to be hereafter described. Pulley **76**, which drives the ball twisting device, described above, is secured to the forwardly extending end of shaft **145**. The right hand end of shaft **147**, as viewed in FIG. 8, carries the sprocket **110** which drives the above described turret assembly indexing means.

As is best seen in FIG. 10, shaft **147** is rotatably supported in a transversely extending gear box member **148***a* as by bearings **149**. An adapter **150** is secured to transverse member **148***a* by bolts **151**, only one of which is shown, with the bore and adapter **150** being spaced from shaft **147** so that the shaft is free to rotate relative thereto. A stationary gear **152**, comprising part of a planetary type gear reducer, is positioned in spaced relation with respect to shaft **147**, and is fixed to adapter **150** as by set screws **153**, only one of which is shown. An arm **154** is fixed to shaft **147** for rotation therewith by a key **155**, and a pair of gears **157** and **158** are provided on opposite sides at the outer end of arm **154**. A gear support member



**159** is rotatably mounted in the end of arm **154** by a bushing **160** with gears **157** and **158** fixedly secured to the support member by screws **161** and **162** for rotation together. Another gear **163** is mounted on a bushing **164** for rotation relative to shaft **147**, and is driven by gear **158**. Each of gears **152**, **157**, **158** and **163** have the same pitch diameter, with gears **152**, **157** and **158** each having the same number of teeth, and with gear **163** specially designed to properly interact with gear **158** while having a lesser number of teeth, preferably one less tooth than gear **158**. Each of gears **152**, **157**, **158** and **163** preferably have a large number of teeth, so that a predetermined slow rotational movement will be imparted to gear **163** relative to shaft **147** as a result of the planetary gear reducer interposed therebetween. A cam **165** is fixed to gear **163** for rotation therewith, and is adapted to trigger a one revolution clutch to be hereafter described to rotate shaft **166**, to which the turret index drive pulley **110** is fixed.

As is best seen in FIG. 9, cam **165** is divided into two substantially identical 180° portions, each of which is provided with a plurality of notches. Each of notches **167**, **168**, **169**, and **170** correspond to indexing positions, while land areas **171** and **172** correspond to the first and second buffing positions, as will hereinafter become more fully apparent.

A cam follower **175** is pivotally mounted on a cam follower arm **177** at **176**, and is adapted to ride along the outer periphery of cam **165**. Arm **177** is pivotally mounted on a transverse shaft **180**, with a link **181** being fixed to arm **177** for pivotal movement therewith. A spring **178** is connected between the upper end portion of follower **175** and link **181** to urge the follower **175** against a suitable stop **179** carried by arm **177**. A spring **182** is connected between the frame **142** and the upper end portion of link **181** to bias the follower arm **177** toward cam **165**. A second arm **184** is pivotally mounted on shaft **180**, and extends in substantially an opposite direction from arm **177**. Arm **184** includes a latching surface **185** which is engageable with the latching surface of a clutch pawl to be hereafter described. A transverse pin **186** is carried by the lower portion of link **181** for movement of the arm **184** into and out of latching engagement with the clutch pawl. A suitable spring **183** is biased between the frame **142** and a socket formed in the upper surface of arm **184** to urge arm **184** toward the clutch pawl.

A latch **187** is pivotally mounted on frame **142** as at **188**, and is provided with a notched portion **189** that is engageable with an extension **177***a* on arm **177** to hold the cam follower **175** out of engagement with the outer periphery of cam **165**. Pivotal movement of latch **187** may be effected by solenoid means, not shown, that are secured to the end of latch **187** as at **190**.

A toothed clutch input member **192** is fixed to shaft **147** for rotation therewith by a key **193**. A plate **194** (best seen in FIG. 10) is seated within a recess in clutch input member **192**, and is fixed to shaft **147** by a bolt **195** to retain input member **192** against axial movement relative to shaft **147**. A clutch pawl **196** is pivotally secured, as at **197**, to a clutch output member **198**, with which shaft **166** is integrally formed. Pawl **196** includes a latching surface **199** that is engageable with the latching surface **185** of arm **184**, and a tooth **200** that is engageable with the teeth on input member **192**. Pawl **196** is urged toward engagement with clutch member **192** by means of spring **196***a*.

Means are provided for releasing latch **187** from engagement with arm **177**, and comprises a pair of levers **202** pivotally secured to cam **165** at 180° opposed positions, as at **203**. The end portion **187***a* of lever **187** is positioned in the path of travel of the end portions **204** of levers **202**, so that as cam **165** rotates, the end portions **204** will engage the portion **187***a* and pivot lever **187** to free arm **177** for movement relative to cam **165**.

Levers 202 are held against stops 206 that are carried by cam 165 by springs 207 that are connected between posts carried by the levers 202 and by the cam 165.

*Operation*

As mentioned above, the ball reconditioning machine of the present invention is adapted to be used in commercial bowling establishments. Often it will be desirable to bypass the grinding operation of the reconditioning machine, and merely utilize the two buffing stages as for example when a ball is merely soiled. To this end, a selector switch, not shown, on a coin mechanism, not shown, which is utilized to actuate the machine, may be energized upon the depositing of an appropriate coin to select either a "short" cycle or a "long" cycle. The "short" cycle, which excludes the grinding operation, will be firstly described.

The machine will initially be in the load-unload position, that is, with the turret positioned so that the intermediate step between the grinding wheel and the second buffing wheel is positioned adjacent the ball working station. It will be understood, that in this position the motor is not actuated so that none of the movable parts are moving. A ball is then placed in the ball working station on top of the ball cradle 50 so as to rest against guide rollers 63 and 66, and drive member 67. A suitable enclosure, not shown, is then placed over the exposed machine parts, and the motor is actuated by inserting an appropriate coin. The motor M drives the input pulley 132 to the timing device through the belt 133, and cam 165 is rotated by the interaction of shafts 143, 145, and 147, and through gears 144, 146, 152, 157, 158, and 163. The motor speed, pulley sizes, and number of gear teeth are selected so that the cam 165 rotates at a relatively slow speed, as for example, once in every five minutes. Notches 167 correspond to the load-unload position, so that as cam 165 begins to rotate in the counterclockwise direction, as viewed in FIG. 9, the follower 175 will ride up to and along the outer periphery of cam 165, and move from notch 167 to notch 168. When follower 175 drops into notch 168, arm 177 will pivot relative to shaft 180, and the transverse pin 186 on link 181 will contact the undersurface of arm 184 to pivot latching surface 185 out of engagement with the latching surface 199 of the clutch pawl 196. Spring 196*a* will then pivot clutch pawl 196 around pin 197 so that the tooth 200 will engage the adjacent tooth on the clutch input member 192 causing it to rotate therewith. The clutch output member 198 will travel one revolution with the clutch pawl 196 to impart one revolution to the input sprocket 110 of the turret indexing drive, to be more fully explained later. Rotation of sprocket 110 will drive chain 111 to rotate the sprocket 112 and the cam 115 affixed thereto. The enlarged portion of cam 115 will engage the roller 116*a* on arm 116 and pivot the ball cradle relative to the main frame of the machine, so that the turret assembly has sufficient clearance to index. Crank pin 119 will then enter the appropriate slot 121 in the Geneva mechanism 120, and the turret will be indexed 60° to position the grinding wheel adjacent the ball. Simultaneously with the indexing of the turret, springs 117 will return the ball cradle to working position adjacent the main frame.

Immediately after the aforedescribed sequence has taken place, follower 175 will drop into notch 169, it being understood that cam 165 rotates considerably more slowly than input member 192. It will be noted that notches 169 are substantially larger than notches 168, and in fact, notches 169 are sized so that the clutch pawl 196 will make two revolutions with the clutch input member 192. This will cause the turret assembly to index twice, first from the grinding wheel to the position intermediate the grinding wheel and the first buffing wheel, and second to the first buffing. When the turrent is in the intermediate position, the roller 130*a* will be resting on stop 100*a* to hold the ball cradle in a forward position. As the turret indexes the grinding wheel into its working position, the spring 117 returns the cradle 50 to the ball working station. When the cam follower 175 reaches the end of notch 169, and rides up on the land area 171, the latching surface 185 will engage the clutch pawl latching surface 199 and the clutch pawl will be disengaged from the clutch input member 192. The cam follower 175 will then ride up on the land area 171 during the first buffing cycle during which time the belt 135, that is driven by the pulley 135 fixed to the motor output shaft, drives the pulley 165 associated with the first buffing wheel 92. During each of the ball working cycles, the ball is continuously rotated by member 67, and periodically twisted by member 80, so that the outer periphery of the ball will be uniformly worked. When the follower 175 reaches the end of the land area 171, it drops into the notch 170, which corresponds in length to notch 169, and the turret will again be indexed twice to bring the second or finishing buffing wheel into working position. Prior to the indexing of the first buffing wheel away from the working position, cam 115 engages roller 116*a* to pivot the cradle 50 to a forward position, so that the turret is free to index. After the second buffing wheel is in working position, the cam follower 175 will ride up on the land area 172 until the second buffing operation is completed, when it will then drop into notch 167 and index the turret to the position intermediate the second buffing wheel and the grinding wheel. As the turret indexes to the position intermediate the second buffing wheel and the grinding wheel, the enlarged portion of cam 122 engages the roller 126 on arm 123 to actuate the ball lifting arms 81 and 82 through rod 86 and link 85. A selector switch, not shown, will then deenergize the motor, and the movable parts will then come to rest so that the ball may be removed from the ball holding cradle. Thus, it will be understood that in the "short" cycle, one-half of cam 165 is used, and that if the cam 165 rotates once in 5 minutes, the duration of the first and second buffing operations will be 2½ minutes.

When it is desired to use the "long" cycle, including the grinding operation, a coin (larger in domination than that used in connection with the "short" cycle) is inserted in the coin mechanism, and a solenoid, not shown, is actuated to urge latch 187 in a counterclockwise direction. Thus, when follower 175 drops into notch 168 to index the grinding wheel into the ball working position, and immediately thereafter when it rides up the higher land area 171*a* between notches 168 and 169, the follower arm 177 will be lifted high enough so that the groove 189 of the latch 187 will grip the extension 177*a* of follower arm 177 to prevent it from dropping into the notch 169. The solenoid which pivoted latch 187 is now deenergized but the follower arm 177 will be held up by notch 189 until lever 187 is disengaged by lever 202. The follower 175 will be prevented from dropping into any of the notches in the cam periphery by the lever 187 for approximately 180° revolution of cam 165, when the end portion 187*a* of latch 187 will engage the end portion 204 of release lever 202. When latch 187 engages release member 202, latch 187 will be pivoted about pivot 188 away from the follower arm 177 to free the follower 175 for movement into the cam notch 169. When the cam follower 175 drops into the notch 169, the buffing operation described above in connection with the "short" cycle is then carried out in its entirety. Thus, it will be apparent that in the "long" cycle, when cam 165 rotates once in 5 minutes, the duration of the "long" cycle will be 5 minutes.

*Grinding wheel dresser*

During the grinding operation, the grinding wheel will have a tendency to become "loaded" with some of the material it has removed from the ball. To keep this ma-

terial or these grindings from building up upon the grinding wheel, and to maintain a true arcuate grinding surface, the present invention provides the dressing device to be presently described.

Referring now to FIG. 11–FIG. 13, the dressing device includes an actuating lever **210** pivotally secured adjacent its mid-point as at **211**, to the arm **100** of the turret assembly which leads to the first buffing wheel **92**. The lever **210** includes a first cam follower **212** at the left hand end thereof, as viewed in FIG. 11, that is adapted to engage the outer periphery of a stationary cam **213** that is secured to the radially outwardly extending arms **96***a* of bracket **96**. Lever **210** includes a second cam follower **214** positioned between follower **212** and pivot **211**, which is adapted to ride upon the outer periphery of a constantly rotating cam **215**. Cam **215** is mounted for rotation about pivot **216**, and is rotated by a sprocket **217** that is driven by sprocket **148** and chain **218** (FIG. 1). The sizes of sprockets **217** and **148** are selected so that the cam **215** has a relatively slow rotational speed, as for example three revolutions per minute. As will hereinafter become more fully apparent, this enables the dressing device to make the desired number of passes across the grinding wheel during the dressing operation.

A flange **220** of generally L-shaped cross section is secured to the right hand end of lever **210**, as viewed in FIG. 13, and defines spaced apart walls **221** and **222** between which the lower end of a link **223** is mounted for generally universal movement. The upper end of link **223** is connected for generally universal movement to one corner of a generally triangularly shaped bell-crank or lever **224**, which is formed by spaced plates **226** and **227**. As viewed in FIG. 12, the lower corner of triangular lever **224** is pivotally secured to a bracket **240** to be hereafter described by a bolt **230**. Thus, when follower **214** rides over the rise portion of cam **215**, lever **210** will be pivoted clockwise, as viewed in FIG. 11, and link **223** will swing outwardly to the left, as viewed in FIG. 12, to the position indicated at **223***a*, since the lower portions of link **223** move downwardly in that figure with lever **224** pivoting around bolt **230**. Movement of the link **223** to the position shown at **223***a* will swing the dressing tool, to be hereafter described, across the surface of the grinding wheel **91**.

The above mentioned bracket **240** includes a generally rearwardly and upwardly inclined portion **241** to which lever **224** is pivotally secured, and a generally outwardly extending lower portion **242**. A generally transversely extending member **243** is secured adjacent the lower portion of bracket portion **241**, and extends outwardly above the grinding wheel **91**. Transverse member **243** includes a side portion **244** terminating at its rearward end in a bifurcated lug **245** (see FIG. 13) that is pivotally mounted on transverse pin **211**. A grinding wheel dressing tool **246** is mounted for pivotal movement on a sector shaped member **247** as at **248**. The sector shaped member **247** consists of two generally identically shaped plates held in spaced relation by spaced bolts **249** which are secured to bracket portion **243**. Pivotal movement of tool **246** is effected by a link **250** which is connected at one end to the upper right hand corner of lever **224**, as viewed in FIG. 12, and at the other end to the central portion of tool **246**. It will be understood, of course, that tool **246** is provided with a suitable slot to accommodate link **250**. A dressing member **251**, such as a diamond or the like, is fixed in the end portion of tool **246**, and is adapted to engage the radial surface of grinding wheel **91** as tool **246** sweeps thereacross. A spring **253** is connected between an extension **245** of bracket **240**, and the end cap **102** on the radial arm of grinding wheel **91**, to bias the dressing tool **246** toward the grinding wheel. Another spring **254** is connected at one end to lever **210** between followers **212** and **214**, and at the other end to the end cap **102** on the radial arm leading to second muffing wheel **93**, to urge the followers **212** and **214** toward engagement with cams **213** and **215**, respectively.

Means are provided for feeding the dressing tool **246** toward the grinding wheel **93** to compensate for wear of the grinding wheel during the grinding operation. To this end, an internally threaded socket **260** is fixedly mounted on the arm **100** that leads to the grinding wheel **91**. The lower end of a feed screw **261** is threadably received in socket **260**, and as the feed screw is threaded into the socket, the bracket **240** will be pulled downwardly therewith, as viewed in FIG. 11, and the dressing tool **246** will be advanced into the grinding wheel.

A link **262** is mounted for pivotal movement on feed screw **261** beneath shelf portion **242**, and is urged to a set position against a stop **263** carried by shelf portion **242** by a spring **264**. A pawl **265** is pivotally mounted on the upper surface of link **262**, and is engageable with the teeth of a ratchet section **266** which is integrally formed with feed screw **261**. Thus, as link **262** pivots relative to the feed screw **261**, pawl **265** will engage the teeth upon ratchet section **266** to feed screw **261** downwardly into socket **260**, and under the urging of spring **253**, the dressing tool **246** will be advanced into the grinding wheel **91**. An outwardly extending pin **267** is carried by the downwardly bent outer end of link **262**, and is periodically engageable with the inclined portion **271** of lever **270** to effect the pivotal movement of link **262**.

Lever **270** is mounted adjacent its mid-point as at **272** for pivotal movement into and out of the position indicated in broken lines at **270***a*. Pivotal movement of lever **270** is effected by a solenoid **273** connected to lever **270** through a link **274**. A spring **275** is connected to the lower end of lever **270** to urge the lever into the position indicated at **270***a*. When the lever is in the position shown at **270***a*, the inclined portion **271** is positioned in the path of travel of pin **267**, so that the feeding of the grinding wheel dressing tool will be effected as the turrent indexes.

It will be understood, of course, that when the "short" cycle described above is used, which consists of the first and second buffing operations, it will not be necessary, and in fact, it will be undesirable to dress the grinding wheel. To this end, the solenoid **273** is retracted to the solid line position shown in FIG. 11 upon the depositing of the appropriate coin in the coin mechanism for the "short" cycle. The retraction of solenoid **273** causes the inclined portion **271** to be moved into the solid line position shown in FIG. 11, and thus out of the path of pin **267** so that no feeding of the grinding wheel dressing tool **246** will take place during the indexing of the turret. Lever **270** is provided with a catch portion **276** that is engageable with the follower **212** on lever **210** when the solenoid **273** is actuated, as is shown at **212***a* in FIG. 11, and thus the swinging of the wheel dressing tool **246** is also effectively prevented during the "short" reconditioning cycle.

When the "long" cycle is used, including the grinding operation, it is necessary to dress the grinding wheel. However, it is desirable that the number of passes which the tool **246** makes across the wheel **91** be kept to a minimum, so as not to needlessly wear out the grinding wheel. Thus, as the turret indexes, follower **212** will ride up upon the rise portion of cam **213**, and follower **214** will be held out of engagement with cam **215** to prevent the pivoting of tool **246**. When the turret is indexed to the position shown in FIG. 11, the follower **212** rides into the depression in cam **213**, and follower **214** is in position for engagement with cam **215**.

A vacuum device A is mounted on the main machine frame, and includes a hose H which extends upwardly to a position adjacent the ball working station, and is adapted to collect the particles ground from the ball.

*Buffing compound applicator*

In connection with the rough buffing operation which is utilized to remove the grinding marks from the outer

surface of the ball, and in connection with the finished buffing operation which is used to provide a highly polished surface on the ball, it is desirable to periodically apply a small amount of appropriate polishing compound to the buffing wheel during the buffing operation. Since the buffing wheels are rotating at a high rate of speed, and since only a very small amount of compound is needed, the mechanism for applying the buffing compound to the buffing wheels is so constructed and arranged that the buffing compound will contact the buffing wheels for only an instant. While from FIG. 3, it is apparent that a buffing compound applicator is provided for each of the buffing wheels, for clarity of illustration, only one buffing compound applicator is shown in detail in FIG. 14. Since each of the buffing compound applicators are substantially identical, common reference numerals will be used to indicate corresponding elements on each device.

Referring now to FIG. 14, a wedge of buffing compound **280** is clasped between a laterally extending plate **281**, and a laterally extending front plate **282** as by bolt **283**. Rear plate **281** has been bent to form side portion **281***a* which is pivotally secured as at **284** to a bracket **285**. The furthermost rearward ends of portion **281***a* are bent upwardly as at **281***b*, and a latch member **287** is secured thereto as by set screws, not shown. The upper left hand side **287***a* of latch member **287** provides a latching surface for engagement with other latch means to be described later. Rotation of side portion **281***a* relative to bracket **285** is restricted both in a clockwise and counterclockwise direction by means of a generally U-shaped member **288** fixedly attached to bracket **285**, having outwardly extending legs **289** and **290**. Bracket **285** is rotatably mounted on a pin **291** which is secured in arm **100**, and is biased in a counterclockwise direction by tension spring **292** attached to portion **285***a*. The other end of spring **292** is attached to an outwardly extending arm **293** of a bracket **294** rigidly secured to the turret as at **295**.

Also attached to pin **291** is a lever **297** which carries on its lower end, as viewed in FIG. 14, a roller follower **298** in contact with the periphery of cam **215**. This contact is maintained by means of tension spring **299** which is connected between the upper portions of lever **297** and an extension **300** of the bearing cap **102**.

Lever **297** has attached thereto, as by welding, a transversely extending member **302** adjacent its upper end, and a latch **303** is secured to member **302** by bolt **304**. The lower right hand portion **303***a* of latch **303** is held in contact with portions **287***a* of the latch member **287** by the weight of the buffing compound **280** when the device is "cocked" preparatory to the application of buffing compound, as will be seen hereafter.

Thus, in operation, when the follower **298** begins to ride up on the rise portion of cam **215**, lever **297** will begin moving clockwise and the latch **303** affixed thereto will push against latch member **287**. This force is transmitted through latch member **287** to pivotal mounting **284** thereby causing bracket **285** and buffing compound **280** to rotate in fixed relation with lever **297**. Lever **297** and bracket **285** rotate together until buffing compound **280** engages the surface of buffing wheel **93**. When the buffing compound contacts the buffing wheel (which is rotating in the direction shown), the buffing wheel reacts against the buffing compound **280** with a normal force F and a friction or drag force D. The sum of these two forces, or the total resultant force of the buffing wheel on the buffing compound, is indicated at L and sets up a counterclockwise moment around the pivotal mounting **284**. As can be seen by a close examination of FIG. 14, the only resistance to a counterclockwise movement of side **281***a* relative to bracket **285** about pivotal connection **284** is the friction between the contacting latch surfaces **287***a* and **303***a*. This resistive force is overcome by the moment created by force L allowing side **281***b* to rotate counterclockwise with respect to bracket **285** thereby causing latch surfaces **287***a* and **303***a* to slip out of engagement with each other and at the same time lifting the buffing compound away from the buffing wheel. Since these latch surfaces had been responsible for maintaining the fixed angular alignment between lever **297** and bracket **285**, there remains no resistive means to prevent counterclockwise rotation of bracket **285** under the bias of spring **292**. Bracket **285**, therefore, rotates counterclockwise until bumper **306**, rigidly affixed thereto as at **307**, contacts stationary stop **308** on bracket **294**. Upper portions of latch member **287** are now disposed to the left of lower portions of latch **303**, the latch **303** serving to hold side **281***a* near its furthermost counterclockwise position with respect to bracket **285** thereby preventing further contact of the buffing compound with the buffing wheel. It will be understood that buffing compound **280** has been out of engagement with buffing wheel **93** since latch surfaces **287***a* and **303***a* slipped out of engagement, and remains out of contact over the entire dwell portion of the cam **215** while the lever **297** is in its furthermost clockwise position.

When the return portion of cam **215** is engaged by roller follower **298**, lever **297** rotates counterclockwise under the bias of spring **299** and the lower left hand surface of latch **303** rides up and over latch **287** to "cock" the device in preparation for the next application of buffing compound. As follower **298** rides up the rise portion of cam **215**, the buffing compound **280** is again brought in contact with the buffing wheel and the cycle, as described hereinbefore, is repeated. A stationary cam **215***a* (FIG. 5) allows compound application only when the buffing wheel is in the working position.

We claim:

1. A ball reconditioner comprising in combination: means for supporting a ball in work position; a plurality of ball working devices; a single movable carrier supporting said devices; and means including a single timing member for indexing the carrier to move said ball working devices sequentially into a work position for working upon said ball.

2. A ball reconditioner comprising: a frame having means for rotatably supporting a ball; a plurality of ball working devices; means for sequentially moving said working devices into and out of engagement with the ball; and means for selectively bypassing at least one of said working devices.

3. A ball reconditioner comprising: a main frame; a ball holding frame pivotally mounted on said main frame; guide means on said ball holding frame for rotatably supporting a ball and defining a ball working station; a turret indexably mounted on said main frame and rotatably supporting a plurality of ball working members including a grinding wheel, and at least one buffing wheel; means for indexing said turret to sequentially position said grinding wheel and said buffing wheel at said ball working station; means for pivoting said ball holding frame relative to said main frame as said turret indexes; and means for rotating said ball working members.

4. A ball reconditioner as defined in claim 3 wherein means are provided for rotating said ball.

5. A ball reconditioner as defined in claim 4 wherein means are provided for periodically twisting said ball.

6. A ball reconditioner as defined in claim 3 wherein said grinding wheel has an arcuate surface adapted to engage said ball.

7. A ball reconditioner as defined in claim 6 wherein means are provided for periodically dressing said grinding wheel to maintain said arcuate surface.

8. A ball reconditioner as defined in claim 3 wherein means are provided for periodically applying buffing compound to said buffing wheel.

9. A ball reconditioner as defined in claim 3 wherein means are provided for lifting the ball from the ball holding frame at the end of the reconditioning cycle.

10. A ball reconditioner as defined in claim 9 wherein the means for indexing the turret include a Geneva mechanism with a step corresponding to each of the ball working members, and with a intermediate step between each of said first mentioned steps.

11. In a ball reconditioning machine having a plurality of ball working members adapted to be moved sequentially into engagement with a ball, a timing device for controlling the movement of the ball working members comprising: a driven input shaft; a single timing disc continuously rotated by said shaft; a follower adapted to ride upon said disc; means on said disc for periodically moving said follower; and means operable in response to movement of said follower for moving said ball working members.

12. In a ball reconditioning machine having a reconditioning cycle consisting of the steps of grinding, rough buffing, and finish buffing, performed by a grinding wheel, and first and second buffing wheels respectively, a timing device for controlling the sequential operation comprising: a constantly rotating cam having a plurality of spaced actuators; a cam follower adapted to ride along said cam and engage said actuators; an output member adapted to move said grinding wheel, said first buffing wheel and said second buffing wheel sequentially into engagement with said ball; and clutch means operable in response to the engagement of said follower with an actuator to drive said output member.

13. A timing device for controlling the shifting of the ball working members in a ball reconditioning machine having a plurality of ball working members comprising: a housing; a timer disc in said housing and having peripherally spaced actuators; the peripheral space between said actuators corresponding to the ball working operations and said actuators corresponding to a shift between the ball working members; means for rotating said disc at a predetermined speed; a follower movably mounted in said housing and adapted to ride along the periphery of said disc; a clutch having an input member, and an output member adapted to shift said ball working members; means for rotating said input member at a speed substantially in excess of the speed of said disc; latch means associated with said follower for connecting said clutch output member with said clutch input member when said follower engages an actuator to effect a shift in said ball working members; and means for releasing said clutch output member from said clutch input member when said follower is out of engagement with an actuator.

14. In a ball reconditioner with a turret having first, second, and third ball working members, an actuator for use in a timing device that controls the sequential movement of the ball working members comprising: a disc having substantially identically shaped halves; the outer periphery of each half having a first actuator adapted to shift the turret from a position between said third working member and said first working member to said first working member; a second actuator positioned immediately adjacent said first actuator and having a length substantially twice as long as said first actuator and adapted to immediately shift said turret from said first working member to said second working member; a first peripheral surface adjacent said second actuator and having a length substantially longer than either of said actuators and corresponding to the duration of the operation of said second ball working member; a third actuator adjacent the end of said first peripheral surface and having a length corresponding to the length of said second actuator and adapted to shift said turret from said second working member to said third working member; a second peripheral surface adjacent said third actuator and having a length corresponding to the duration of the operation of said third ball working member; and a fourth actuator adjacent the end of said second peripheral surface and having a length substantially corresponding to the length of said first actuator to shift said turret from the third working member to a position intermediate said third working member and said first working member.

15. In a ball reconditioning device including a turret rotatably supporting a grinding wheel and first and second buffing wheels, and having a first reconditioning cycle including first and second buffing operations, and a second reconditioning cycle including a grinding operation, and first and second buffing operations, a timing device for controlling the sequential movement of the ball working wheels into engagement with the ball comprising: a housing; a timing disc mounted in said housing and having substantially identically shaped halves, one of said halves being adapted to control the first cycle, and both of the halves being adapted to control the second cycle; means for rotating said disc, means for selecting said first or second cycle; each of said disc halves including a plurality of spaced actuators; a follower movably mounted in said housing and adapted to ride upon said disc; a clutch having an input member, and an output member adapted to shift said ball working tools; means for rotating said input member at a speed substantially in excess of the speed of said disc; latch means associated with said follower for connecting said clutch output member with said clutch input member when said follower engages an actuator to effect a shift in said ball working tool; means for releasing said clutch output member from said clutch input member when said follower is out of engagement with an actuator; each of said halves having a first actuator adapted to shift the turret from a position intermediate said second buffing wheel and said grinding wheel to said grinding wheel; a second actuator positioned immediately adjacent said first actuator and having a length substantially twice as long as said first actuator and adapted to immediately shift said turret from said grinding wheel to said first buffing wheel; a first peripheral surface adjacent said second actuator and having a length substantially longer than either of said actuators and corresponding to the duration of the first buffing operation; a third actuator adjacent the end of said first peripheral surface and having a length corresponding to the length of said second actuator and adapted to shift said turret from said first buffing wheel to said second buffing wheel; a second peripheral surface adjacent said third actuator and having a length corresponding to the duration of the operation of said second buffing wheel; a fourth actuator adjacent the end of said second peripheral surface and having a length substantially corresponding to the length of said first actuator to shift said turret from said second buffing wheel to a position intermediate said second buffing wheel and said grinding wheel; latch means for holding said follower out of engagement with said disc during the first half revolution of the disc in the second cycle whereby said turret does not index immediately to said buffing wheel; and means for releasing said latch means at the end of said half revolution.

16. A ball reconditioner as defined in claim 15 wherein said follower includes an extension, and wherein said latch means includes a latch body pivotally mounted in said housing and movable into engagement with said follower when said second cycle is selected.

17. A ball reconditioner as defined in claim 16 wherein said means for releasing said latch means includes a pair of release members pivotally mounted on said disc at diametrically opposed positions, and wherein said latch body includes a portion positioned in the path of travel of said release members that is engageable with a release member upon rotation of said disc.

18. A ball reconditioner as defined in claim 15 wherein said means for rotating said disc includes a planetary gear train.

19. In a device for grinding a spherical object, the combination of: a support; a grinding wheel rotatably mounted on said support and having an arcuate grinding surface adapted to engage said object; means for rotating said grinding wheel; a dressing device mounted adjacent said grinding wheel for periodic movement across said surface; an actuating member pivotally mounted on said support; linkage means connecting said actuating member and said dressing device; and means for periodically pivoting said actuating member to move said dressing device across said surface.

20. 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; an actuating member pivotally mounted on said support and engaging said applicator; means for pivoting said actuating member to move said applicator towards said wheel; and means operable in response to the engagement of said applicator with said wheel for moving said applicator away from said wheel.

21. The method of reconditioning a bowling ball comprising the steps of placing a ball at a ball working station, moving a grinding tool into a working position adjacent said ball, grinding a predetermined amount of stock from the outer surface of said ball, simultaneously moving said grinding tool out of the working position and moving a first buffing tool into the working position, buffing the outer surface of said ball with said first buffing tool to remove the marks caused by said grinding tool, simultaneously moving said first buffing tool out of the working position and moving a second buffing tool into the moving position, and buffing the outer surface of the ball with said second buffing tool to polish the outer surface of said ball.

22. In a ball reconditioning machine, the combination of: means including at least two tools for providing two ball reconditioning and treating cycles, the first of said cycles including a grinding operation and the second of said cycles excluding a grinding operation; a grinding wheel having an arcuate grinding surface for performing said grinding operation during said first cycle; means for rotating said grinding wheel; a dressing device for engaging said grinding surface; means for swinging said dressing device in an arc corresponding to the grinding surface to dress said surface during said first cycle; and means for precluding operation of said swinging means during said second cycle.

23. A device for applying buffing compounds to a buffing wheel comprising: a buffing compound holder mounted adjacet a buffing wheel for periodic movement toward and away from said wheel; means for moving said holder toward said wheel; and means responsive to the engagement of said holder with said wheel for moving said holder away from said wheel.

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