

Filed March 8, 1961

APPARATUS FOR COVERING GOLF BALLS

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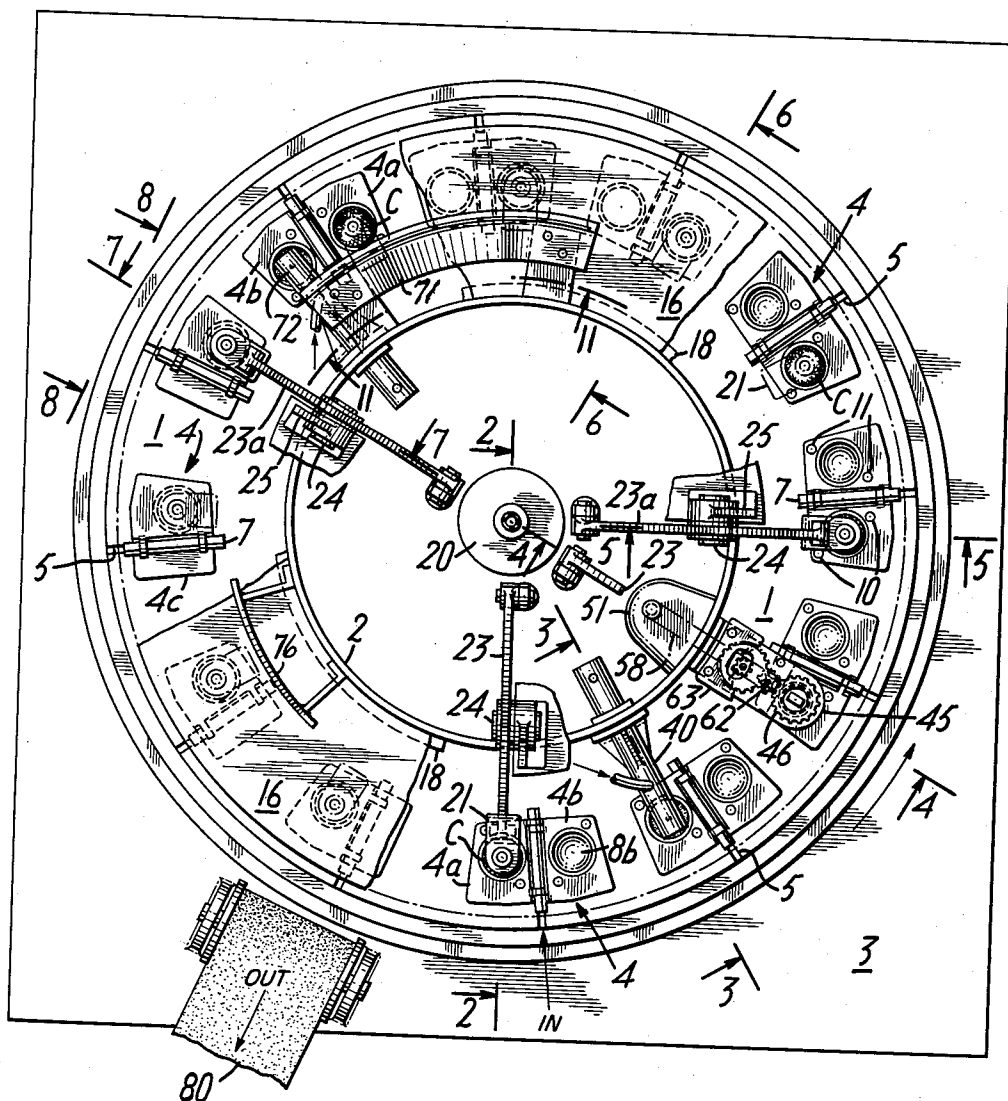


FIG. 1

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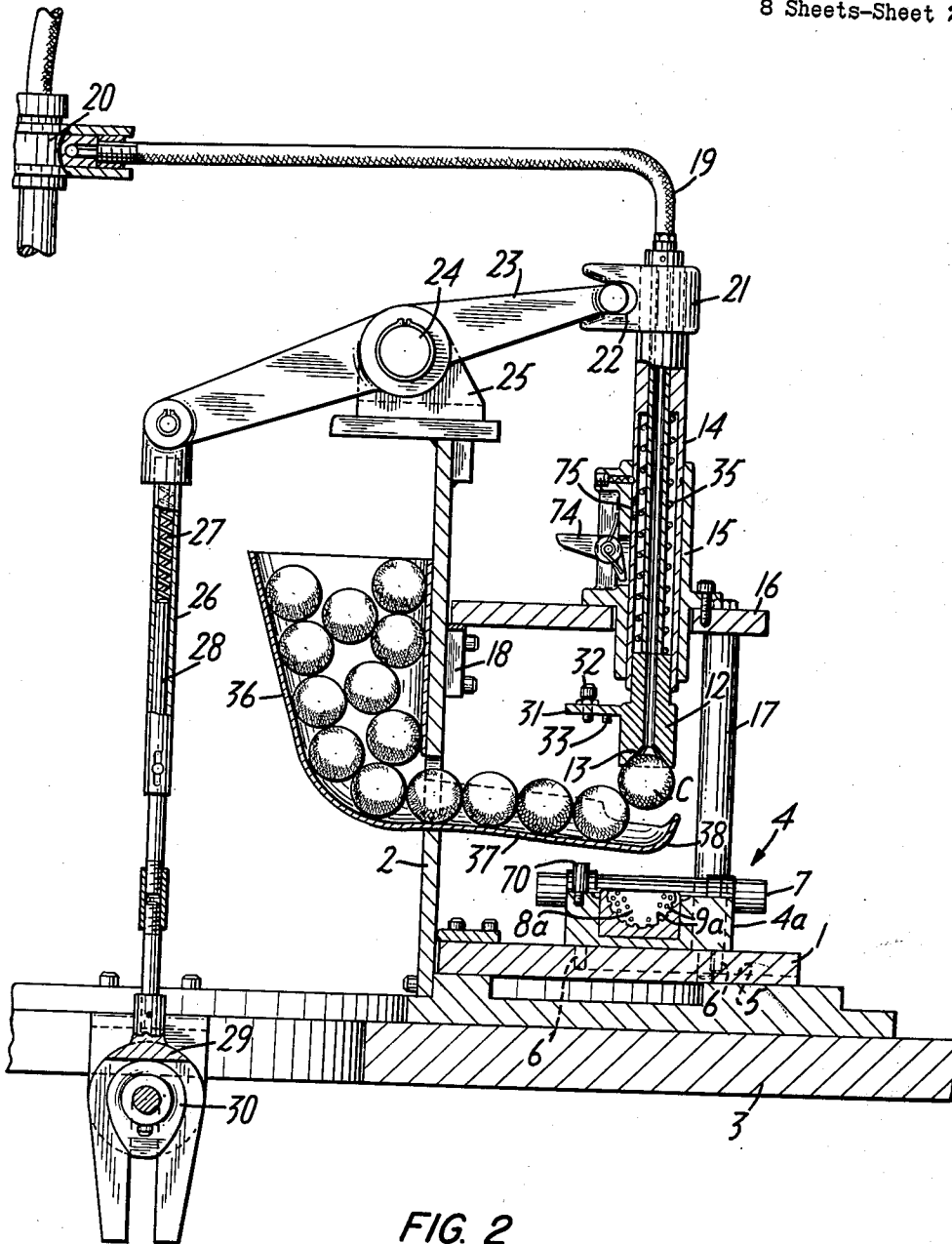
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APPARATUS FOR COVERING GOLF BALLS

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8 Sheets-Sheet 2



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APPARATUS FOR COVERING GOLF BALLS

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FIG. 6

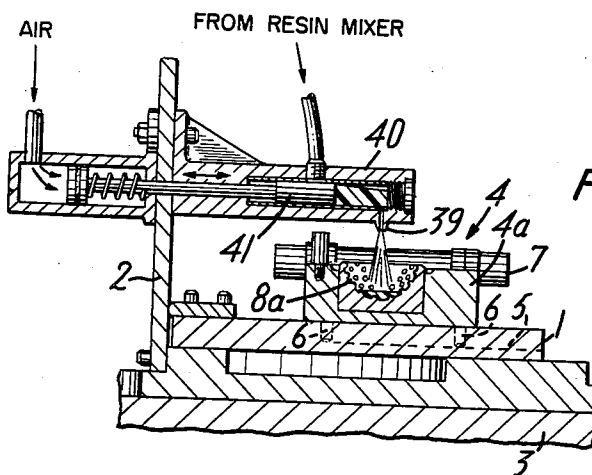
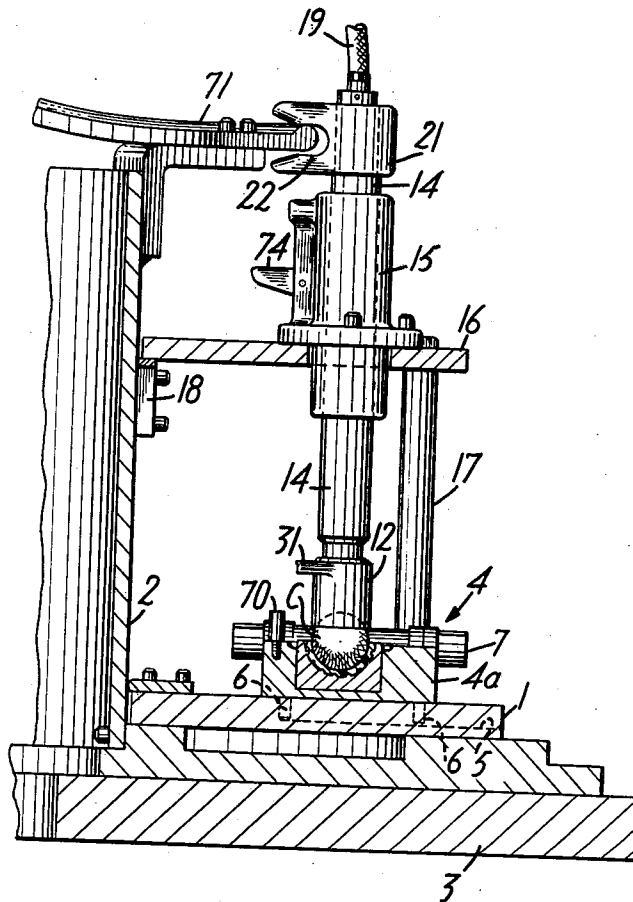


FIG. 3

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APPARATUS FOR COVERING GOLF BALLS

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8 Sheets-Sheet 4

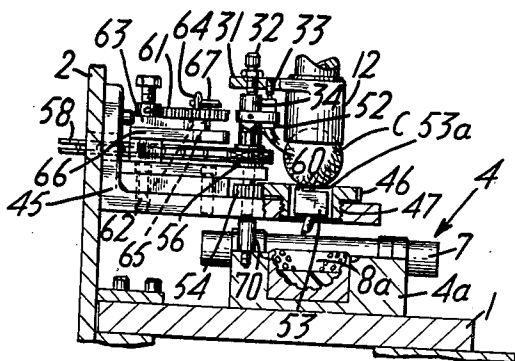
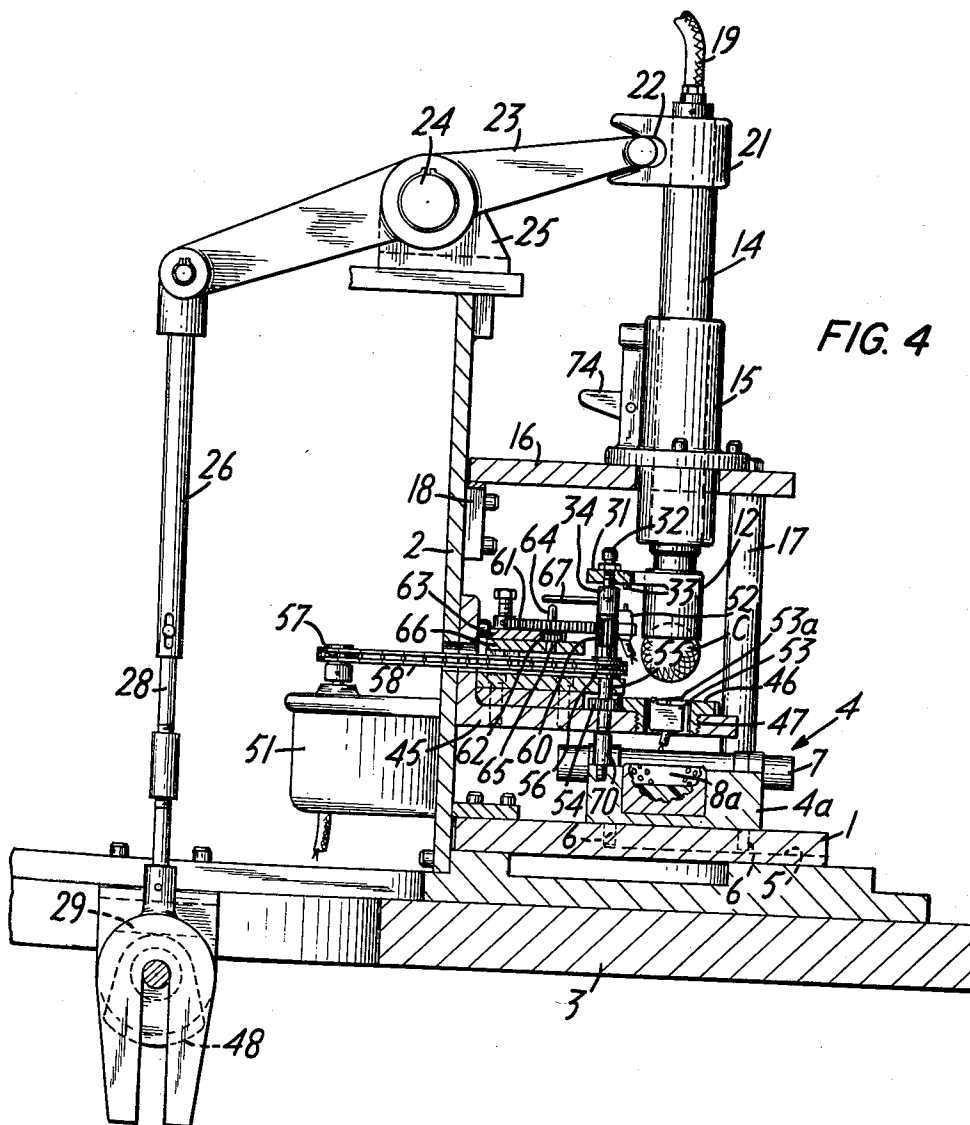


FIG. 4A

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APPARATUS FOR COVERING GOLF BALLS

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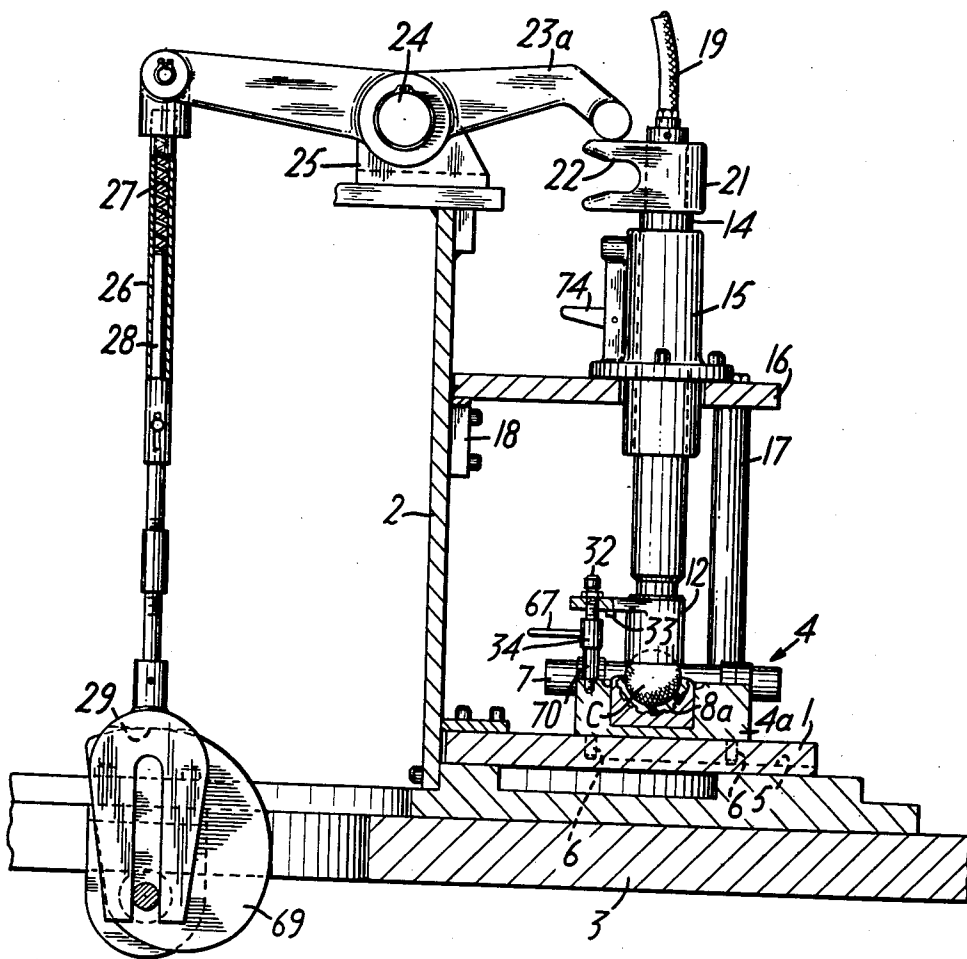


FIG. 5

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APPARATUS FOR COVERING GOLF BALLS

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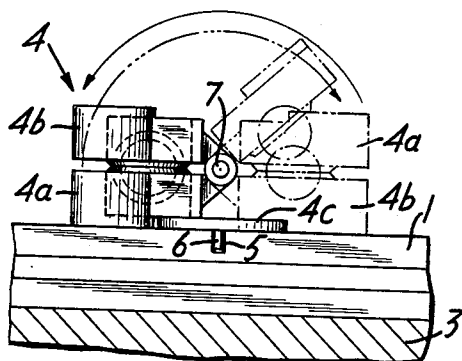
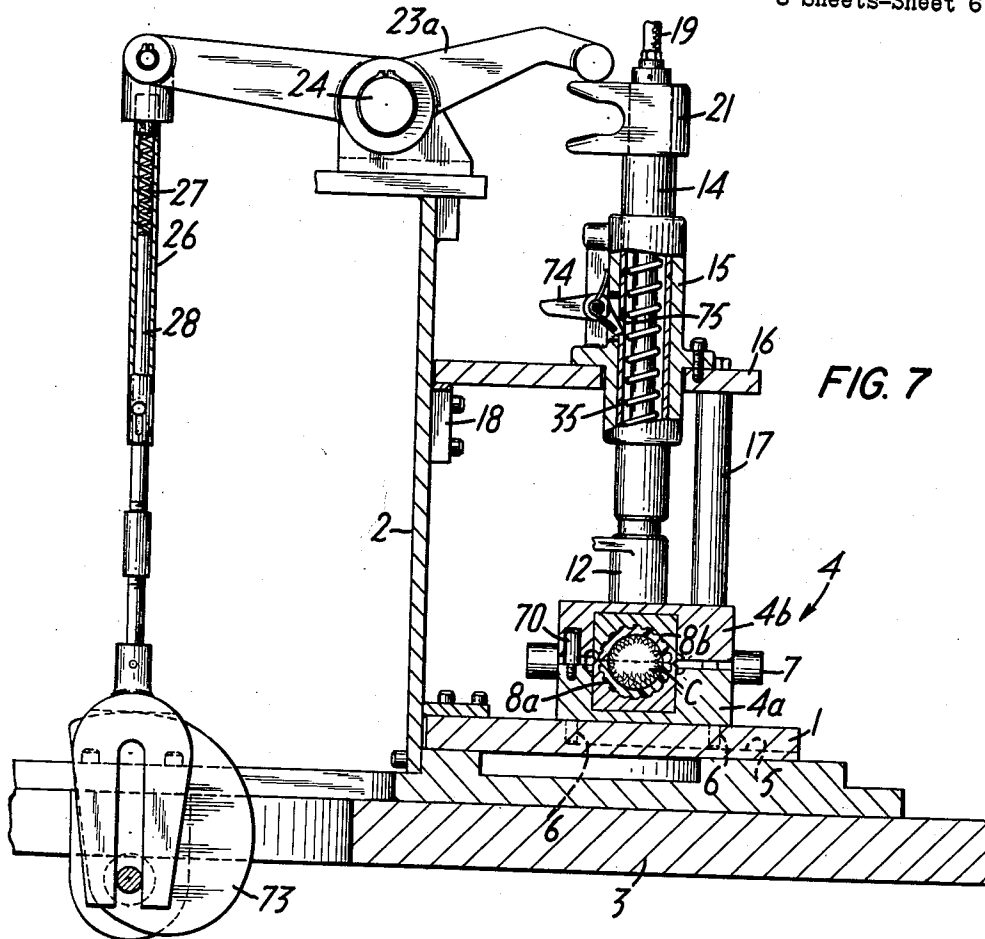


FIG. 8

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APPARATUS FOR COVERING GOLF BALLS

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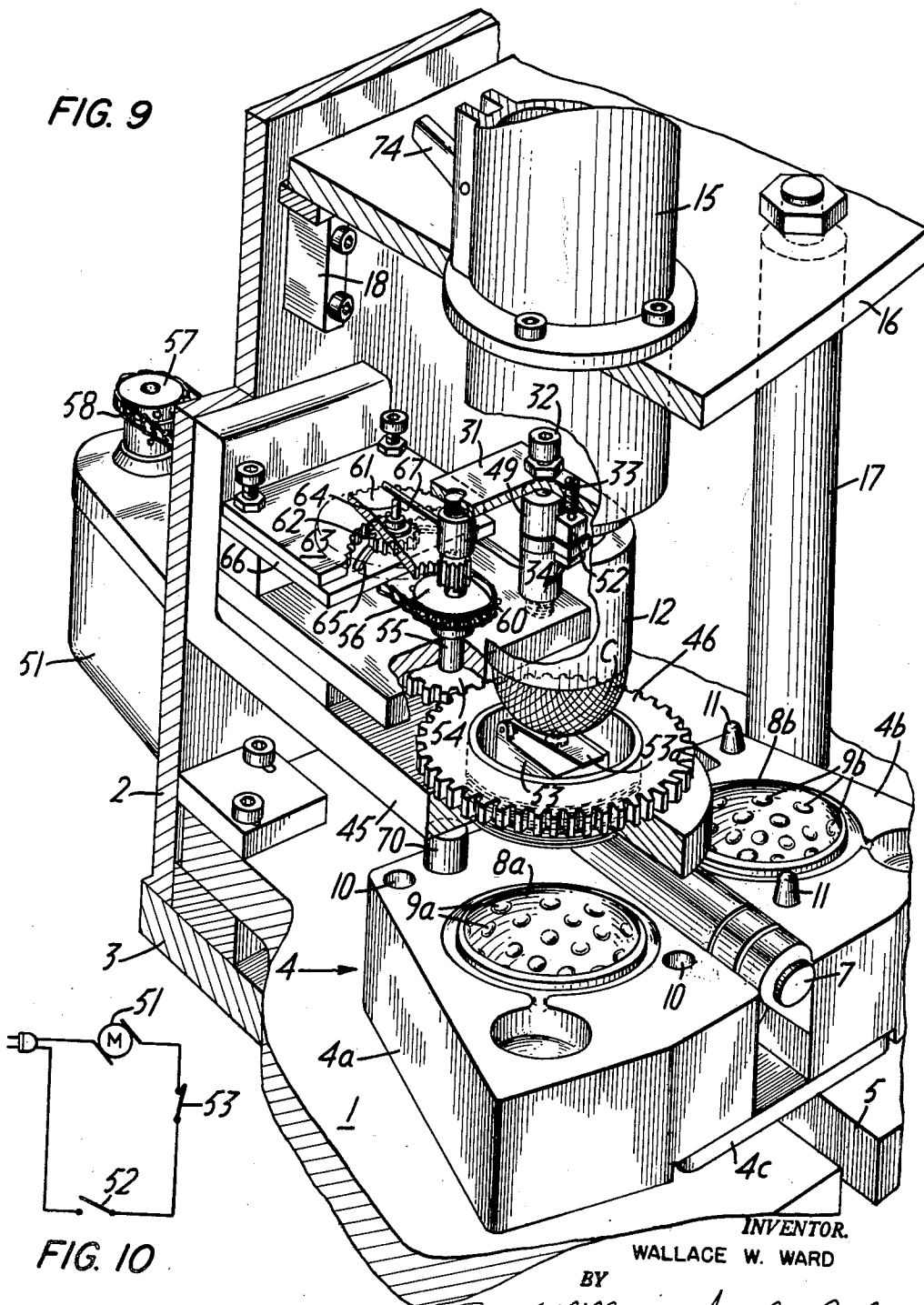


FIG. 10

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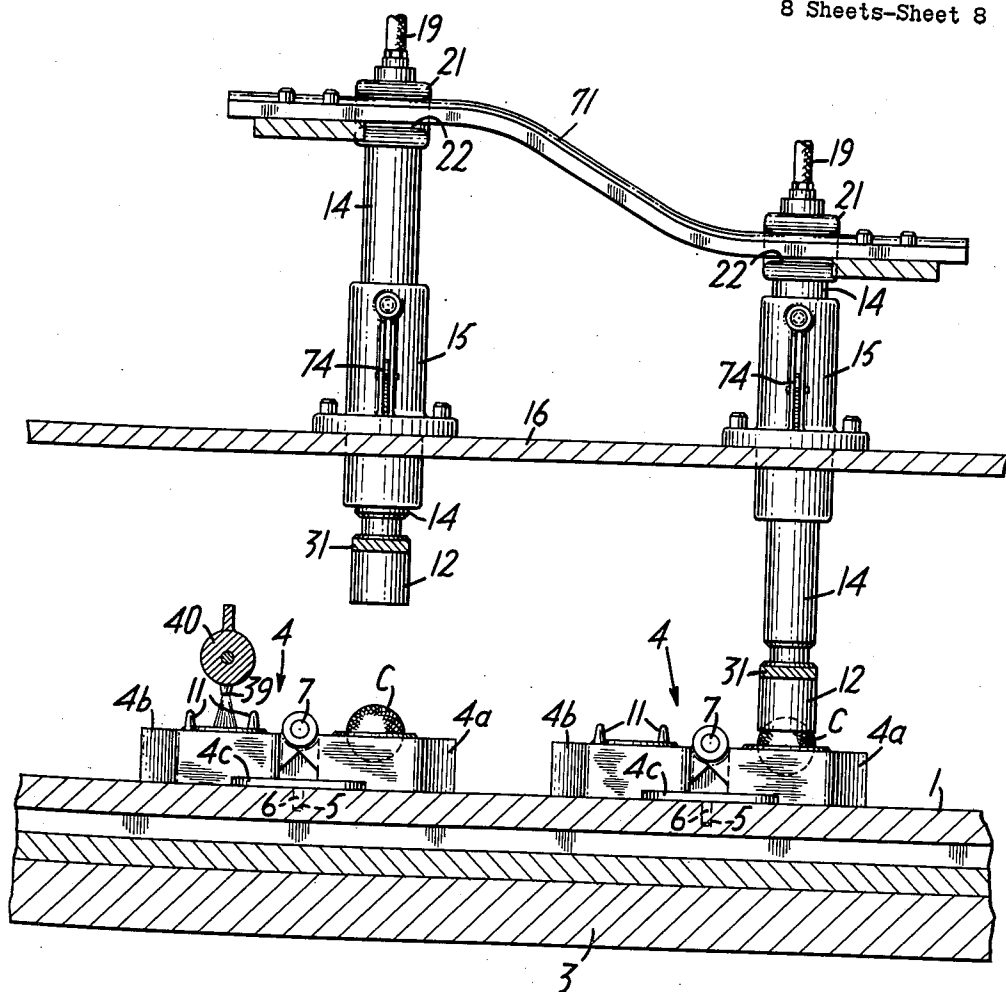
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8 Sheets-Sheet 8



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APPARATUS FOR COVERING GOLF BALLS

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10 Claims. (Cl. 18-5)

This invention relates to apparatus for covering golf balls.

Golf balls, as currently manufactured, sold and used usually comprise a central, spherical core on which a layer of rubber strand, either thread or tape, is wound under tension. The resulting wound core is usually referred to as a "center" and is also spherical in shape. The ball is completed by applying a cover to the center.

For many years balata and gutta percha have been the preferred materials for use in golf ball covers. Such materials are thermoplastic and are easily molded by application of heat and pressure. Suitable methods of applying such covers are well known in the art, but all such methods have required the use of heat at temperatures known to have a deleterious effect on the tensioned rubber windings of the center.

It has recently been proposed to use urethane polymers as materials for covering golf balls. Such materials have substantial advantages in that they provide a cover which is extremely tough and highly resistant to cutting or other damage in use. In addition, liquid urethane polymers offer manufacturing advantages because such polymers may be applied, set and cured at normal room temperatures or at temperatures less than sufficient to damage the tensioned windings of the center.

In a copending application of Louis F. Muccino and the present applicant filed December 1, 1959, Serial No. 856,465, and in applicant's copending application filed October 20, 1960, Serial No. 63,764, methods of covering golf balls have been disclosed in which a metered quantity of liquid urethane polymer is deposited in a mold half having a hemispherical cavity therein, and in which a golf ball center is pressed into the polymer until the center is concentric with the cavity. In carrying out these methods, it will be understood that it is important that the golf ball center be exactly concentric with the mold cavity in order to insure that the cover will be uniform in thickness over the entire surface of the golf ball center.

In the winding of golf ball centers, it is not always convenient to wind to exact dimensions. As a consequence, golf ball centers as delivered from the usual winding machines vary slightly in their outside diameters.

It is an object of the present invention to provide an apparatus for covering golf balls in which the outside diameter of each golf ball center is sensed or measured before it is introduced into the mold, and in which the travel of the holder which advances the golf ball center into the mold is automatically adjusted to stop when the golf ball center is concentric with the mold cavity.

Other objects and advantages of the invention will appear hereinafter.

A preferred embodiment of the invention selected for purposes of illustration is shown in the accompanying drawings, in which,

FIG. 1 is a top plan view of the apparatus, partly broken away.

FIG. 2 is a section on the line 2-2 of FIG. 1.

FIG. 3 is a section on the line 3-3 of FIG. 1.

FIG. 4 is a section on the line 4-4 of FIG. 1, showing the parts in the initial position.

FIG. 4A is a similar section showing the parts in sensing position.

FIG. 5 is a section on the line 5-5 of FIG. 1.

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FIG. 6 is a section on the line 6-6 of FIG. 1.

FIG. 7 is a section on the line 7-7 of FIG. 1.

FIG. 8 is a section on the line 8-8 of FIG. 1.

FIG. 9 is an enlarged perspective view of the sensing mechanism shown in section in FIGS. 4 and 4A.

FIG. 10 is a circuit diagram.

FIG. 11 is a section on the line 11-11 of FIG. 1.

The complete machine, of which the apparatus constituting the present invention forms a part, includes a rotatable annular platform 1 mounted to turn around a fixed cylindrical shell 2 which is mounted on a base 3 which also supports the platform 1. The machine has a plurality of stations, and the platform is rotated intermittently, step by step, to advance the work from one station to the next. The platform may be advanced intermittently by conventional means known in the art and which form no part of the present invention. Between each successive advancing movement of the platform, there is a dwell period during which the platform is held in stationary position while operations are performed at the operating stations. At the first operating station, as illustrated in FIG. 2, a mold 4 is placed on the platform and is supported thereon in fixed position. Guide slots 5 are formed in the platform 1 to receive and engage pins 6 on the mold base to accurately position the molds on the platform. The molds may be placed on the platform by hand or by mechanical means known in the art which form no part of the present invention.

Each mold 4 comprises two mold halves 4a and 4b and a mold base 4c which are hinged together by a hinge pin 7. Each mold half has a hemispherical cavity 8a, 8b formed therein, and the surface of each cavity is preferably provided with a plurality of projections 9a, 9b adapted to form the customary dimples in the outside surface of the cover. Each mold half 4a is provided with recesses 10 to receive pins 11 on mold half 4b in order to insure proper registration when the mold is closed.

Means are provided for holding a spherical golf ball center during the performance of the operations performed at the successive operating stations. A plurality of such holding means are provided, preferably one for each station of the apparatus, and such means are supported on and move with the platform. As exemplified in FIG. 2, each such holding means comprises a vacuum cup 12 having a conical cavity 13 in its bottom end. A golf ball center C is adapted to seat against the conical wall of the cavity and be accurately centered therein. The cup 12 is mounted on a tubular quill 14 which extends through and slides in a guide member 15. The said guide member is mounted on an annular disk 16, the outer edge of which is supported on platform 1 by posts 17, and the inner edge of which rides on brackets 18 attached to the shell 2. Connected to the upper end of the quill 14 is a tube 19 which is connected to a valve 20, which, in turn, is connected to a suitable vacuum pump (not shown). Also mounted on the upper end of quill 14 is a collar 21 having a notch 22 adapted to receive one end of a lever, such as lever 23, pivoted at 24 in a bracket 25 mounted on the shell 2. The other end of lever 23 is pivotally connected to a lost motion actuating member comprising a tube 26 containing a helical compression spring 27, and a rod 28 having a cam follower 29 on its lower end. At the first operating station, the cam follower engages a cam 30 to reciprocate the quill 14 in the guide member 15 as hereinafter explained. Lever 23 and the lost motion actuating member including parts 26, 27, 28 and 29 and cam 30 do not move with the platform 1, but remain in fixed position. A plurality of such assemblies are provided, however, positioned at the operating stations where required. As the platform 1 rotates, the notch 22 of collar 21 is disengaged from the lever

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23 at one station and then engages the corresponding lever 23 at the next operating station. Also mounted in fixed position on the cup 12 is a stop bar 31 carrying three adjustable stop pins 32, 33 and 34, the purposes of which will be explained hereinafter. The cup 12 is slidable in the quill 14, but is normally held in the position illustrated in FIG. 2 by a very strong helical compression spring 35, the function of which will be explained hereinafter.

At the first operating station, as illustrated in FIG. 2, the holding means receives and holds a golf ball center C. For this purpose, the valve 20 is opened, in any suitable manner, to connect the cup 12 to the vacuum pump. A golf ball center may then be placed in engagement with the conical cavity 13, by hand, if desired, and will be held in position by vacuum. Preferably, however, the golf ball centers are picked up automatically by the holding means as illustrated in FIG. 2. For this purpose a hopper 36 is provided having a chute 37 terminating in a lip 38 adapted to hold a ball in the path of movement of the cup 12. At the first operating station, the cam follower 29 is actuated by the cam 30 which rotates, first to move the quill downward to bring the vacuum cup 12 into engagement with the first golf ball CC in the chute 37, and then to lift the said center out of the chute and hold it, as shown, for advancement to succeeding operating stations.

At the second operating station, as illustrated in FIG. 3, the mold half 4a is located beneath a nozzle 39 forming part of a resin metering device 40 adapted to deposit a metered quantity of covering material such as liquid urethane polymer into the cavity 8a, the quantity being slightly in excess of that required to form one half of a complete cover. The said metering device includes a pneumatically operated plunger 41 which discharges the material through the nozzle 39. The device is of conventional construction and forms no part of the present invention.

At the third operating station, as illustrated in FIGS. 4, 4A and 9 the diameter of the golf ball center held in the vacuum cup 12 is sensed or measured. At this station a stationary supporting member 45 mounted on shell 2 extends into the path of movement of the quill 14 and supports a movable member adapted to contact the golf ball center. In the preferred embodiment illustrated, in order to multiply the axial movement of the movable member with respect to the golf ball center, the said movable member comprises a gear wheel 46 having a screw threaded barrel 47 extending downwardly into a threaded socket in the supporting member 45. The supporting member 45 is positioned so that when the platform 1 is indexed in its dwell position, the axis of rotation of the gear 46 will coincide with the axis of the quill 14 and will pass through the center of the golf ball center C. At the third operating station the cam 48 rotates to move the lost motion actuating member to cause the quill 14 to move downward until the stop pin 32 engages the fixed stop post 49 mounted on the support 45. The cam then forces the rod 28 upwardly to compress the spring 27 and holds the said spring under compression to hold the quill in fixed position during the sensing operation.

The gear 46 is operated by an electric motor 51 which, as shown in the circuit diagram FIG. 10, is included in a circuit which also includes a switch 52 which is normally open, and a switch 53 which is normally closed. The switch 52 is mounted on the stop post 49 in position to be closed by the stop pin 33 shortly before stop pin 32 engages the stop post 49. The switch 53 is mounted on the gear 46 in position to be opened when the rotation of the gear 46 advances the gear axially sufficiently to cause the switch to engage the surface of the golf ball center. Preferably, a thin strip 53a of steel is mounted on the switch 53 in position to extend over the switch post so as to be interposed between the switch post and the center. This improves the accuracy of the sensing opera-

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tion. The gear 46 is operatively connected to the motor 51 in any suitable manner, as by the pinion 54 mounted on shaft 55 carried by the support 45. Sprocket 56, mounted on shaft 55, is connected to sprocket 57 on the motor shaft by chain 58.

The closing of normally open switch 52 as above described completes the circuit and starts the motor 51 to cause rotation of the gear 46 to advance the gear and the normally closed switch axially toward the golf ball center. On making contact with the golf ball center, the normally closed switch 53 is opened, the motor stops and the gear 46 stops. Thus, the extent of axial movement of the gear 46 will be determined by the diameter of the golf ball center, being greater for a center of small diameter than for a center of large diameter.

Shaft 55 also carries a pinion 60 which engages a gear 61 forming part of a planetary gear assembly which includes a pinion 62, connected to and rotating with gear 61, and a fixed gear segment 63 mounted on the support 45. The pinion and gear unit 61, 62 has an axial pin 64 extending therethrough, the lower end of which rides in a slot 65 in fixed plate 66, and the upper end of which projects vertically upwardly above the pinion 62 in position to engage a horizontal arm 67 which extends outwardly from the adjustable stop pin 34. The upper end of said stop pin is screw threaded and is mounted in a threaded socket in the stop bar 31.

Thus, when the switch 52 is closed and the shaft 55 is rotated, the gear unit 61, 62 also rotates and the engagement of pinion 62 with fixed segment 63 causes circumferential movement about the axis of shaft 55 to cause the pin 64 to swing the arm 67 to adjust the position of the stop pin 34 in accordance with the diameter of the center C. Thereafter, the quill is retracted to its elevated position by cam 48. However, the stop pin 34 remains in its adjusted position while the platform 1 advances to the next operating station, and there functions to control the advancing movement of the holding means as hereinafter described.

Upon the completion of each sensing operation as performed at the third operating station, the gear 46 and its associated planetary gear assembly 60, 61 and 62 are returned to their original positions in any suitable manner, as by reversing the rotation of the motor 51 by conventional means known in the art.

At the fourth operating station, as illustrated in FIG. 5, the golf ball center is advanced by its holding means toward the center of the cavity 8a in which resin has been previously deposited, and the stop pin 34, the position of which has been previously adjusted by the sensing mechanism at the third operating station, is used to limit the travel of the holding means to stop the advancing movement thereof when the center of the golf ball center reaches the center of the mold cavity. At the fourth operating station, the cam follower 29 is actuated by cam 69 which rotates to move the quill 14 downward until the stop pin 34 engages the fixed pin 70 on the mold 4a to stop further downward movement. At this station, however, a special actuating lever 23a is used which is adapted to engage the upper surface of the collar 21 in order to be able to release from the collar on completion of the downward thrust without retracting the quill. Thus, the quill 14 and the cup 12 hold the center C in proper position after lever 23a is returned to its original position.

After the golf ball center has been accurately centered in the mold cavity as above described, the center is held in this position for a period of time sufficient to permit the resin to partially set. The time required will depend on the nature of the resin formulation and on the nature of the curing agents compounded therewith. This may be accomplished by providing several dwell stations as shown in FIGS. 1 and 6, immediately following the fourth operating station, at which no further operations are performed. In the drawings, FIG. 1, three dwell sta-

tions are shown between the fourth operating station and the fifth operating station, and this will ordinarily provide sufficient time for the resin to set adequately to support the center C. At a convenient time before the mold is moved to the fifth operating station, the vacuum which has been holding the center C in the vacuum cup 12, is released by closing the valve 20 and venting the quill passage in order to release the center C. Thereafter, the quill may be restored to its elevated position by a cam 71 mounted on the cylinder 2 in position to engage the notch 22 of the collar 21.

At the fifth operating station, as illustrated in FIG. 1, the empty mold half 4b is located beneath a nozzle forming part of a resin metering device 72 similar to the resin metering device 40 previously referred to and shown in FIG. 3. As before, the device 72 deposits a metered quantity of liquid resin into the cavity 8b of mold half 4b, the quantity again being slightly in excess of that required to form one half of a complete cover.

At the sixth operating station, as illustrated in FIG. 8, the mold half 4a is first flipped over onto the mold half 4b, either by hand or by a suitable mechanical device, to initially close the mold as shown in broken lines in FIG. 8. Immediately thereafter, the entire mold is flipped over to the full line position of FIG. 8, thus restoring the mold to a position below and aligned with the quill 14. Then the cam follower 29 is actuated by a cam 73 which rotates to move the quill 14 downward to cause the vacuum cup 12, now acting as a pressure foot, to engage the upper surface of the mold to force the mold halves together to close the mold under compression. At this station, as at the fourth operating station, a special actuating lever 23a is used which is adapted to engage the upper surface of the collar 21 in order to be able to release from the collar on completion of the downward thrust without retracting the quill. FIG. 7 illustrates the position of the parts on completion of the downward thrust, and it will be seen that the amplitude of motion of the quill is sufficient to enable the spring pressed latch 74 to enter the aperture 75 in the quill to lock and hold the quill in this position after the lever arm begins its return movement. The amplitude of the downward movement is also sufficient to compress the spring 33 slightly in order to apply pressure to the closed mold.

As shown in FIG. 1, three dwell stations are provided subsequent to the sixth operating station. At one of these stations, after the resin has reached initial set, a suitable clamp may be placed on the mold and the mold may then be removed and stored for the desired curing and aging period. Prior to removal of the mold, the latch 74 is released by a suitable cam 76 mounted on cylinder 2 which engages the arm of the latch and frees the mold for removal at a station prior to the first operating station. Subsequently, the quill is restored to its elevated position by a suitable cam (not shown) similar to the cam 71 mounted on the cylinder 2. A suitable conveyor 80 may be located adjacent the last dwell station to receive the clamped molds.

It will be understood that the invention may be variously modified and embodied within the scope of the subjoined claims.

I claim as my invention:

1. In an apparatus for covering a spherical golf ball center, a platform for supporting a mold half having a hemispherical cavity therein, means for holding a spherical center in spaced relation to said cavity, means including a sensing member mounted in the path of movement of said spherical center for sensing the diameter of said spherical center, means for advancing said holding means to move the center of said spherical center toward the center of said cavity, and means controlled by said sensing means for limiting the travel of said holding means in accordance with the diameter of the center as sensed by said sensing means to stop movement thereof

when the center of said spherical center reaches the center of said cavity.

2. Apparatus as claimed in claim 1, in which said travel limiting means includes an adjustable stop member mounted on said holding means and controlled by said sensing means.

3. Apparatus as claimed in claim 1, in which said travel limiting means includes a movable member operatively connected with said sensing member which is movable in response to movement of said sensing member.

4. Apparatus as claimed in claim 1, in which said travel limiting means includes a planetary gear assembly operatively connected to said sensing member and a movable member operatively connected to said planetary gear assembly and movable thereby in response to movement of said sensing member.

5. Apparatus as claimed in claim 1, in which said sensing means includes a base, and in which said sensing member is rotatable and has a screw thread engagement with said base, and means to rotate said rotatable member to move said rotatable member axially with respect to said spherical center.

6. Apparatus as claimed in claim 1, in which said sensing means includes a base, and in which said sensing member is rotatable and has a screw thread engagement with said base, means to rotate said rotatable sensing member to move said rotatable sensing member axially with respect to said spherical center, and in which said travel limiting means includes a movable member operatively connected with said sensing member which is movable in response to movement of said sensing member.

7. Apparatus as claimed in claim 1, in which said sensing means includes an electric motor operatively connected to said sensing member, a circuit including said motor, two switches in said circuit, one of said switches being normally closed and one of said switches being normally open, means for closing said normally open switch on advancing movement of said advancing means to cause said sensing member to move toward said spherical center, and means to open said normally closed switch when said sensing member engages the surface of said spherical center.

8. Apparatus as claimed in claim 1, in which said sensing means includes a base, and in which said sensing member is rotatable and has a screw thread engagement with said base, an electric motor operatively connected to said rotatable sensing member to rotate said member to move said rotatable sensing member axially toward said spherical center, a circuit including said motor, two switches in said circuit, one of said switches being normally closed and one of said switches being normally open, means for closing said normally open switch on advancing movement of said advancing means to cause said rotatable sensing member to move toward said spherical center, and means to open said normally closed switch when said rotatable sensing member engages the surface of said spherical center.

9. In an apparatus for covering a spherical golf ball center, a platform for supporting a mold half having a hemispherical cavity therein, said platform being movable intermittently to advance said mold half step by step to a plurality of successive stations, means mounted to move with said platform for holding a spherical center in spaced relation to the cavity of said mold half as said platform moves intermittently from one station to at least the next successive station, means for depositing a metered quantity of liquid covering material into said cavity, and means for thereafter advancing said holding means to advance the center of said spherical center toward the center of said cavity and to embed the said spherical center in the previously deposited covering material, means to stop said advancing movement when the center of said spherical center reaches the center of said cavity, said holding means being disconnected from said advancing

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ing means and remaining in its advanced, stopped position during at least the next intermittent movement of the platform to hold said spherical center in fixed position with respect to the mold cavity during its movement to the next successive station.

10. Apparatus as claimed in claim 9 in which said holding means includes a vacuum cup, means providing a passage connecting said vacuum cup to a source of vacuum, and a valve controlling said passage.

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