May 20, 1969 S. M. SHOBERT 3,444,729

GOLF CLUB SWINGING APPARATUS

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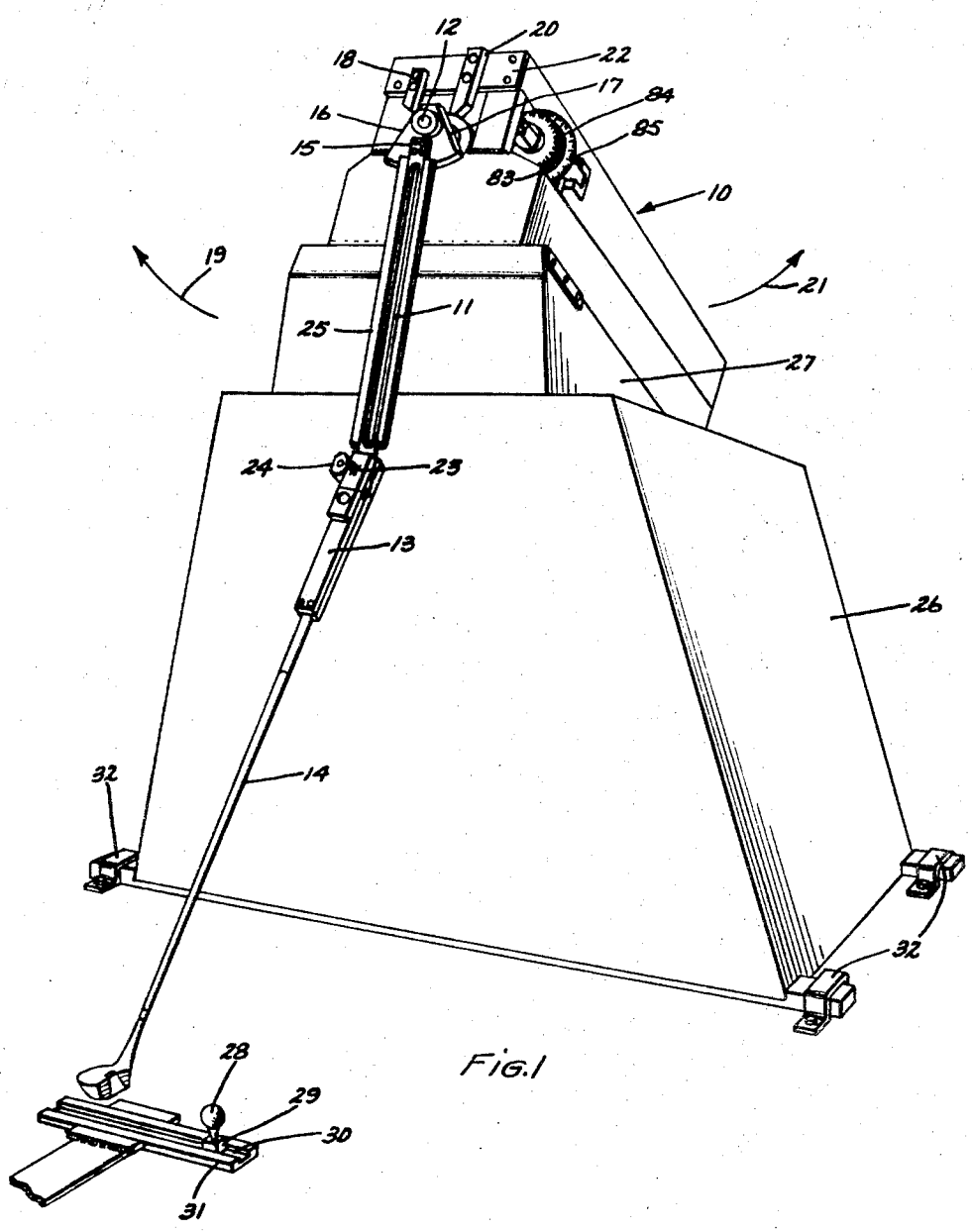


FIG. 1

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Fig. 2

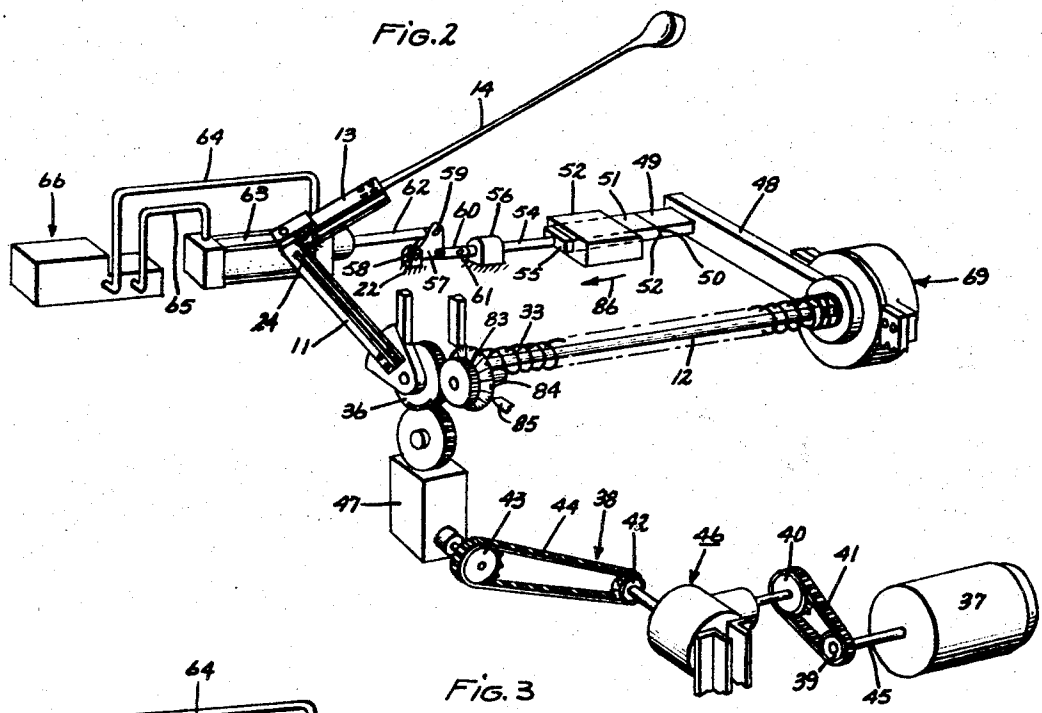
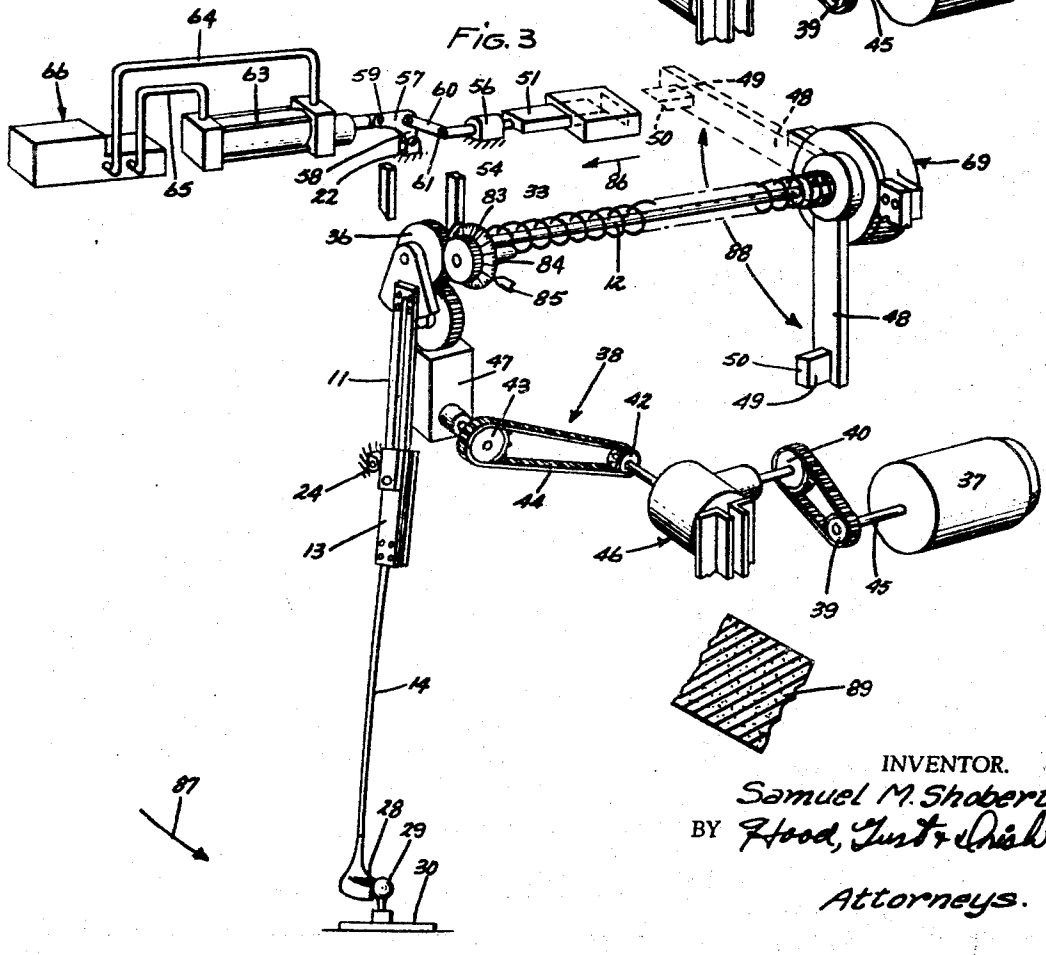


Fig. 3



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FIG. 4

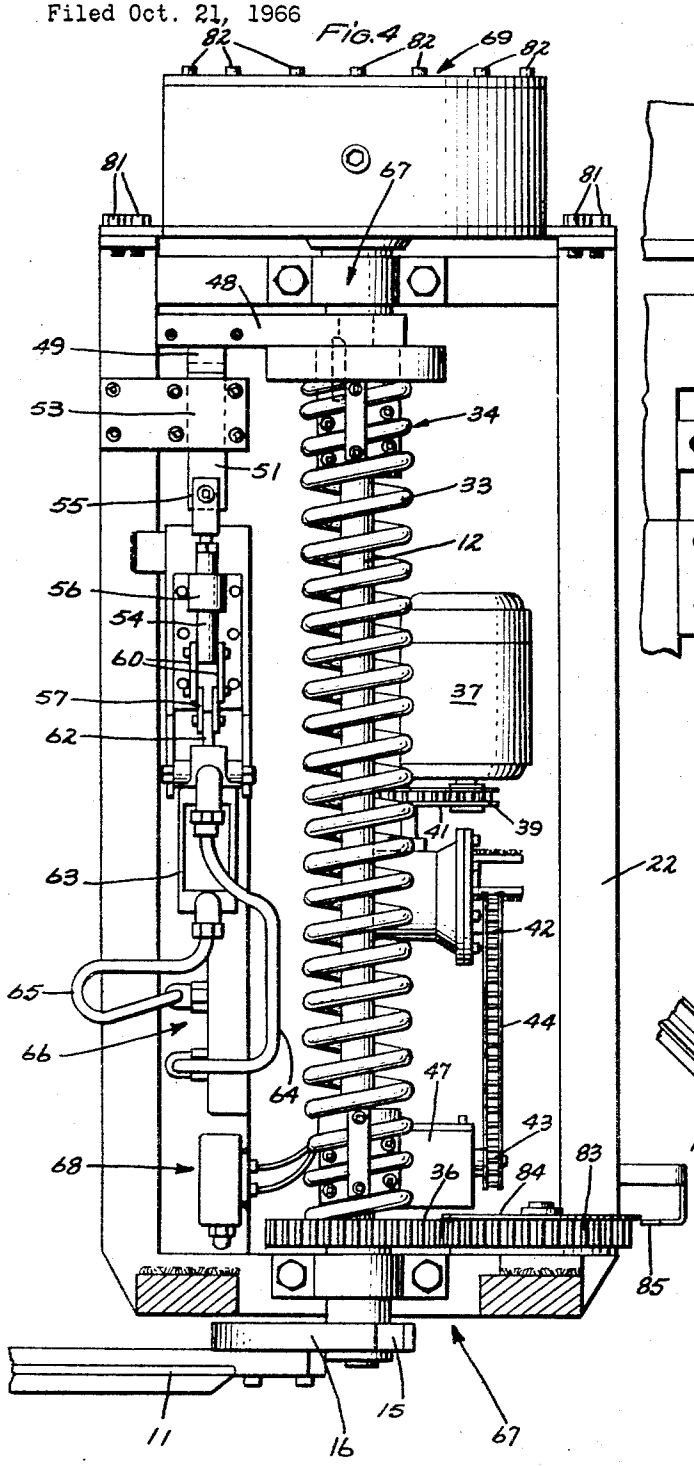


FIG. 5

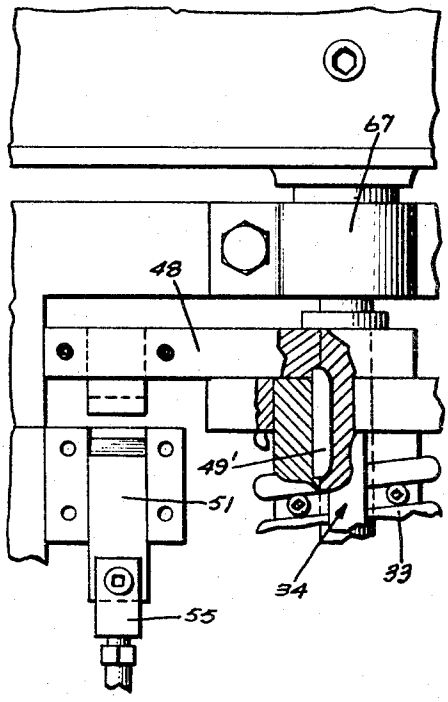
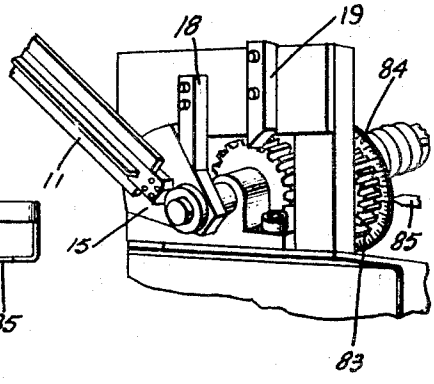


FIG. 6



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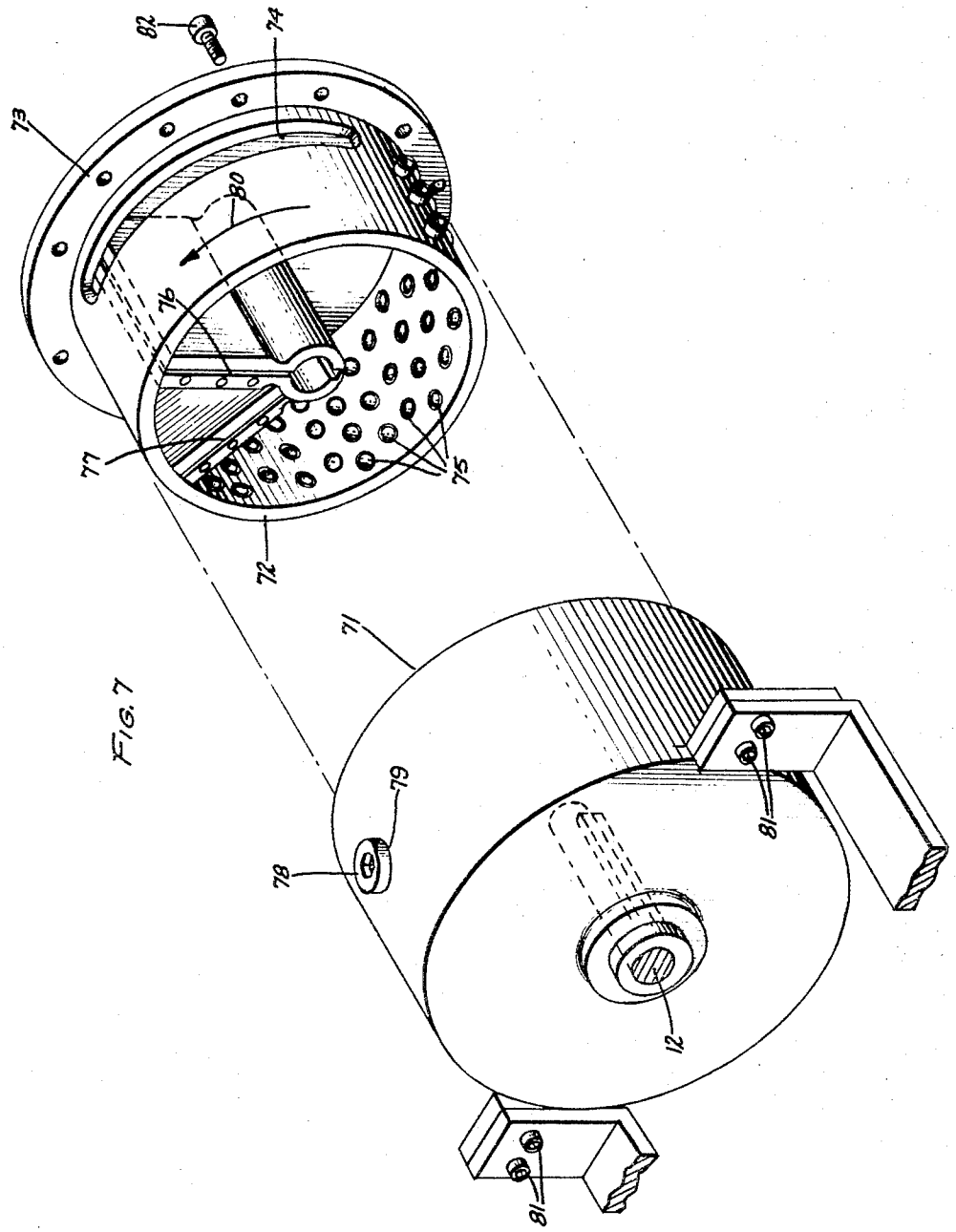


FIG. 7

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GOLF CLUB SWINGING APPARATUS

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U.S. Cl. 73—100 9 Claims

ABSTRACT OF THE DISCLOSURE

A golf-club swinging apparatus comprising a frame, a shaft journaled in the frame, a helical spring coaxially coiled about the shaft, one end of the spring being connected to the shaft. A motor is connected to the spring in such a way as to turn it in a winding direction so as to store energy therein. Means are provided for releasably latching the shaft against rotation by the force of the spring when it is wound. An arm is connected to the shaft and is provided with means for securing the grip end of a golf club. A braking device is attached to the shaft in such a way as to retard the movement thereof during the follow-through portion of the golf swing in a manner which simulates the retarding motion by a golfer through the same portion of his swing.

The present invention relates generally to golf club swinging apparatus, and more particularly to the means and methods for providing a golf club swinging apparatus which substantially simulates the body actions of a golfer. The apparatus of the present invention is ideally suited for testing golf clubs and the like.

The apparatus of the present invention can be used as a standard for testing and comparing golf clubs of various designs and which are fabricated from different materials. Specifically, the apparatus of the present invention can be arranged repeatedly to swing various golf clubs through a predetermined arc and to expend predetermined amounts of energy. Thus, by use of the apparatus, the flexibility, strength and resilience of the shaft of a golf club can be determined. Very simple methods are applicable for determining the characteristics of a golf club which is swung by the apparatus of the present invention. For instance, the flight of a golf ball driven by a golf club swung by the apparatus can be measured. Also, it is possible to measure the impact of a golf ball driven by a golf club swung by the apparatus, thereby measuring the driving characteristics of the golf club.

It is an object of the present invention, therefore, to provide a golf club swinging apparatus which simulates the body action of a golfer and which can be used as a standard for testing golf clubs and the like.

Another object of the present invention is to provide such an apparatus which will swing a golf club through a predetermined arc and which will expend predetermined amounts of energy in swinging the golf club through said arc.

Other objects will become apparent as the description proceeds.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of one embodiment of the present invention showing a golf club operatively connected thereto;

FIG. 2 is a diagrammatic, perspective view of a part of the embodiment of FIG. 1 showing a golf club being held in a drive-beginning position;

FIG. 3 is a view similar to FIG. 2 showing the position of the elements of the mechanism and the golf club just before the golf club strikes a golf ball;

FIG. 4 is a fragmentary top view of a portion of the apparatus of the present invention with the top cover removed to show the relationship between certain of the functioning elements thereof;

FIG. 5 is a fragmentary, enlarged view of a portion of FIG. 4 illustrating a means for releasably latching a shaft against rotation by energy stored in a spring and connected to said shaft;

FIG. 6 is a fragmentary, perspective view of the golf club swinging apparatus illustrating a pair of stops for determining the maximum arc through which a golf club may be swung; and

FIG. 7 is an exploded perspective view illustrating a fluid-actuated brake means which is operatively connected to the afore-mentioned shaft.

Referring now to the drawings, an illustrative embodiment of the present invention can be visualized in conjunction with the following description.

The golf club swinging apparatus of the present invention, indicated generally by the reference number **10** in FIG. 1, comprises an arm **11** having one end drivingly connected to a shaft **12** and its other end pivotally connected to a wrist device **13** for securely holding the grip end of a golf club, indicated by the reference number **14**. The arm **11** is rigidly fastened to a member **15** which is, in turn, rigidly fastened to the shaft **12**. The member **15** has a shape corresponding to a segment of a disc and has stop-engaging sides **16** and **17**, as shown clearly in FIG. 1. A stationary stop **18** which is engageable with the side **16** limits the travel of the arm **11** in the direction of the arrow **19** and a stationary stop **20** like stop **18** is engageable with the side **17** to limit the travel of the arm **11** in the direction of the arrow **21**. The stops **18** and **20** are securely mounted on a rigid, stationary frame, indicated by the reference number **22**, which serves as the frame for the apparatus **10**.

The wrist device **13**, hereinafter referred to as the gripper **13**, is pivotally connected to the arm **11** by means of a wrist pin **23**. There is a stop **24** carried by the gripper **13** and arranged to limit the movement of the gripper **13** against the arm **11**. Specifically, the stop **24** abuts the side **25** of the arm **11** to position the golf club **14** as shown in FIG. 2.

The arm **11** is movable in a plane radial to the axis of the shaft **12**. In FIG. 1, it can be seen that the shaft **12** is journaled in the frame **22** and that the axis of the shaft is inclined at a predetermined angle with respect to a horizontal plane. Thus, the arm **11** moves in a plane which is inclined by the complement of the aforementioned predetermined angle with respect to the horizontal plane. The inclination of the arm **11** with respect to the horizontal plane is provided to simulate actual use of the golf club. The frame **22** of the apparatus **10** is supported on stands indicated by the reference numbers **26** and **27**.

In FIGS. 1 and 3, it can be seen that the apparatus **10** and golf club **14** are operatively arranged to drive a golf ball **28** which is supported on an adjustably movable tee **29**. The tee **29** is movable in a longitudinal slot **30** in a member **31** which extends in the direction of movement of the club end of the golf club **14**.

The stand **26**, which supports the apparatus **10**, is rigidly fastened to the floor by means of clamps **32**.

There is a torsion spring **33** coiled about the shaft **12** as shown clearly in FIGS. 2, 3 and 4. In FIG. 4, it can be seen that a first end of the spring **33** is connected to the shaft **12** by a screw-clamp arrangement, indicated generally by the reference number **34**. The second and opposite end of the spring **33** is connected by a similar screw-clamp arrangement, indicated generally by the reference num-

ber 35, to a gear 36 which is rotatably mounted about the shaft 12.

As most clearly seen in FIGS. 2 and 3, the gear 36 is drivingly connected to an electric motor 37 by means of a transmission, indicated generally by the reference number 38. In the illustrative embodiment of FIGS. 2 and 3, the transmission 38 comprises a pair of sprockets 39 and 40 and a chain 41 for drivingly connecting said sprockets. There is a second pair of sprockets 42 and 43 and a chain 44 for drivingly connecting the sprockets 42 and 43. The sprocket 39 is mounted on the output shaft 45 of the motor 37. The sprockets 40 and 42 are drivingly connected by a differential gear box, indicated generally by the reference number 46. The sprocket 43 is drivingly connected to the gear 36 by a gear box, indicated by the reference number 47. The gear box 47 contains a gear, not shown, which is drivingly engaged with the gear 36.

There is an arm 48 rigidly connected to the shaft 12 by a key 49, shown in FIG. 5, and arranged to extend radially outwardly therefrom. A tongue 49 having a chamfered face 50 is rigidly fastened to the outermost end of the arm 48 as shown in FIGS. 2, 3, 4 and 5. A latch bar 51 having a chamfered face 52 engages the face 50 of the tongue 49 as best shown in FIG. 2, thereby latching the shaft 12 against rotation by the energy stored in the spring 33. The latch bar 51 extends through a support member 53 and is reciprocably supported thereby.

A rod 54 is connected at one end to the rear end of the latch bar 51, as shown at 55. This rod 54 is reciprocably supported in a bearing block 56. A bell-crank 57 is pivotally connected to a bracket 58 on the frame 22, one arm pivotally connected to one end of a link 60, and the other arm 59 pivotally connected to the end of a hydraulic piston 62. The other end of the link 60 is connected to the rod 54, as shown at 61. The piston 62 is reciprocably received in a hydraulic power cylinder 63. A fluid transmission line 64 is connected to one end of the cylinder 63 and another fluid transmission line 65 is connected to the opposite end of the cylinder 63. The transmission lines 64 and 65 are connected to an electrically operated valve means, indicated generally by the reference number 66. The piston 62 is retracted when fluid is admitted to the cylinder through the transmission line 64. In a similar manner, the piston 62 is protracted when fluid is admitted to the cylinder through the transmission line 65.

The connecting means comprising the bell crank 57 and link 60 functions as a toggle mechanism which holds the latch bar 51 in engagement with the tongue 49 without force being applied by the piston 62.

The structure of the electrically operated valve means 66 and cylinder 63 are well known and need not be further described in this specification.

Referring now to FIG. 4, it can be seen that the shaft 12 is journaled in the frame 22 by means of bearings 67.

An electrical switch means 68 is used for controlling the operation of the motor 37.

A brake, indicated generally by the reference number 69, is operatively connected to the shaft 12 and is arranged to retard the rotational motion of the shaft through a predetermined portion of the travel of the arm 11. The details of the brake 69 are shown in FIG. 7.

The brake 69 comprises an outer, drum-shaped housing 70 which is securely fastened to the frame 22 and which is concentrically mounted with respect to the shaft 12. The housing 70 has an open end 71 which receives an inner, drum-shaped housing 72, which is preferably concentrically mounted on a circular plate 73 which closes the open end 71 of the housing 70. The outer diameter of the housing 72 is substantially less than the inner diameter of the housing 70, thereby providing a concentric, annular spacing between the housing 72 and the housing 70. The housing 72 is provided with an elongated, arcuate slot 74 extending peripherally about a predetermined portion of its side wall. The slot 74 is of sufficient width to permit the free flow of oil from the inner housing 72 to the space between the inner housing and the outer housing 70. In FIG. 7, it will be seen that the portion of the side wall of the inner housing 72 not provided with the slot 74 is provided with a plurality of orifices or ports 75 which permit a constricted flow of oil from the inner housing 72 to the space between the inner housing 72 and the outer housing 70. A rotatably mounted, radial vane 76 is arranged to move about the interior of the housing 72, thereby forcing the oil in the housing 72 out through the slot 74 and the orifices 75. The vane 76, which vaguely resembles pistons in a hydraulic cylinder, is arranged to be drivingly connected to the shaft 12 when the plate 73 is assembled to the housing 70. There is a stationary vane 77 or radial partition disposed as shown in FIG. 7, arranged to oppose the movement of the oil by the vane 76, thereby forcing the oil through the slot 74 and the orifices 75. A plug 78 is provided for closing an opening 79 through which oil is admitted to the housing 70.

The movement of the vane 76 through the arc circumscribed by the slot 74 is virtually unopposed because the oil can move freely through the slot; however, movement of the vane 76 through the balance of its travel in the direction of the arrow 80 is retarded, because the oil ahead of the vane must move through the constrictive orifices 75.

Referring again to FIG. 4, it can be seen that the housing 70 is rigidly fastened to the frame 22 by means of screws 81 and that the plate 73 is mounted on the housing 70 by means of screws 82.

There is a gear 83 engaged with and driven by the gear 36. A disc 84 having scaler markings about the periphery thereof is concentrically mounted on the gear 83 which is rotatably mounted on the frame 22. A pointer 85 is mounted on the frame 22 and arranged to indicate the rotational position of the disc 84. Thus, the disc 84 and pointer 85 comprise means for indicating the amount of energy stored in the spring 33 by rotation of the gear 36.

With the above structural description in mind, and by making reference to the drawings, the following operational analysis will serve to convey the functional details of the present invention.

The motor 37 and transmission 38 comprise drive means for storing predetermined amounts of energy in the spring 33. The exact amount of energy stored in the spring 33 is indicated by the position of the disc 84. Specifically, when the arm 48 is latched in the position shown in FIG. 2, rotation of the gear 36 about the shaft 12 will store torsional energy in the spring 33. The speed reduction characteristics of the transmission 38 are preferably such that the energy stored in the spring 33 will not drive the elements of the transmission when the motor 37 is deenergized. In a preferred embodiment of the present invention, the gear box 47 includes a worm-gear arrangement for drivingly connecting the sprocket 43 to the gear 36. Such arrangements, which are well known in the transmission art and need not be illustrated nor discussed in this specification, will only permit unidirectional rotation of the driven gear.

After a predetermined amount of energy is stored in the spring 33, the gripper 13 and golf club 14 can be manually positioned as shown in FIG. 2 in simulation of a golfer's wrist action at the limit of his backstroke. At that point, the cylinder 63 can be operated to move the latch bar 51 in the direction of the arrow 86, thereby permitting the arm 11, golf club 14 and the arm 48 to be swung in the direction of the arrow 87 as shown in FIG. 3. The relative movement of the arm 48 after it is released by the latch bar 51 and just before the golf club 14 strikes the ball 28, is suggested by the angle 88 between the broken line and solid line drawing of the arm 48 in FIG. 3. The travel represented by the angle 88 corresponds to the position and length of the slot 74 in the inner housing 72 of the brake 69 and is the foreswing portion of the golf club motion. Thus, the brake 69 does not retard the motion of the arm 11 until the golf ball 28 is struck by the

golf club **14**. After the golf ball **28** is struck by the golf club **14**, the rotating vane **76** in the brake **69** must force oil through the constricting orifices **75** and, therefore, the brake retards the motion of the arm **11** throughout the balance of its travel. The retarding motion of the brake **69** is provided to simulate the follow through portion of the golf-swing or in other words the braking motion of a golfer after he has driven a golf ball. Since the gripper **13** is pivotally connected to the arm **11**, some means must be provided for retarding the motion of the golf club **14** after the golf ball **28** is driven and the brake **69** begins to retard the motion of the shaft **12** and, consequently, the arm **11**. It has been found that a rubber-like cushion **89** (FIG. 3) placed in an elevated position in the path of the club head stops the movement thereof. This position should correspond to that of the club head at the end of a normal stroke by a golfer. This cushion **89** may be fastened to a part of the stand **26** or some other stationary frame.

The maximum travel of the arm **11** is limited by the stops **18** and **20**. The starting point of the gripper **13** and golf club **14** on the backswing is determined by the thickness and position of the stop **24** as shown in FIG. 2. When the arm **48** is released by the latch bar **51** and the arm **11** begins to rotate, the gripper **13** and golf club **14** will begin to pivot on the arm **11** to the position shown in FIG. 2. In effect, the arm **11** simulates the left arm of a right handed golfer which is preferably maintained stiff during a drive and the gripper **13** simulates the wrist and hand of the golfer during the drive. The length of the arm **11** and the length of the gripper **13** are such as to provide a desired whip action of the club end of the golf club **14** when the golf ball **28** is struck.

While there have been described above the principles of this invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of the invention.

What is claimed is:

1. A golf club swinging apparaus comprising a frame, a shaft journaled in said frame, spring means, drive means operatively connected to said spring means and effective to store predetermined amounts of energy therein, means connecting said spring means to said shaft means, means for releaseably latching said shaft against rotation by said spring means, means for securely holding the grip end of a golf club, an arm having one end connected to said shaft and its other end connected to said holding means, said arm being arranged to move in a plane generally perpendicular to said shaft when said shaft is driven by said spring, and brake means operatively connected to said shaft; said brake means including a member operatively connected to said shaft and movable in response to rotation thereof, and means for retarding progressively the movement of said member and correspondingly the rotation of said shaft for a distance corresponding to a golf-swing followthrough.

2. A golf club swinging apparatus as in claim **1** wherein said spring means comprises a torsion spring coiled about said shaft, said spring means having one end connected to said shaft and its other end connected to said drive means.

3. A golf club swinging apparatus as in claim **1** wherein said drive means includes an electric motor, transmission means for drivingly connecting said electric motor to said spring means, said transmission having speed reducing elements for preventing driving of said transmission means by the energy stored in said spring when said motor is de-energized.

4. A golf club swinging apparatus as in claim **1** wherein said brake means comprises a fluid reservoir provided with a wall defining first and second compartments, said wall having flow-restricting orifices therein, said member including a rotary vane drivingly connected to said shaft and movable within said first compartment to force fluid from said first compartment into said second compartment via said orifices thereby retarding motion of said vane when said arm moves through a predetermined portion of its path.

5. A golf club swinging apparatus as in claim **1** wherein said brake means includes a fluid reservoir having said member movable therein, means operatively connecting said shaft to said member whereby the latter moves in said reservoir in response to rotation of said shaft, and means including said reservoir and member for permitting substantially unhibited movement of said member in said reservoir for a first predetermined portion of the rotation of said shaft but progressively retarding such movement through a second predetermined portion of said movement.

6. A golf club swinging apparatus as in claim **1** wherein said brake means further includes a fluid-containing reservoir which receives said member for movement therein, said member defining with said reservoir a compartment which varies in volume as said member moves, and means communicating with said compartment for restricting progressively the flow of fluid therefrom as said member moves in a direction to reduce the volume thereof.

7. A golf club swinging apparatus comprising a frame, a shaft journaled in said frame, spring means, drive means operatively connected to said spring means and effective to store predetermined amounts of energy therein, means connecting said spring means to said shaft means, means for releaseably latching said shaft against rotation by said spring means, means for securely holding the grip end of a golf club, an arm having one end connected to said shaft and its other end connected to said holding means, said arm being arranged to move in a plane generally perpendicular to said shaft when said shaft is driven by said spring, and brake means operatively connected to said shaft; said brake means including a member operatively connected to said shaft and movable in response to rotation thereof, and means for retarding progressively the movement of said member and correspondingly the rotation of said shaft for a distance corresponding to a golf-swing followthrough, said means for releaseably latching said shaft comprising a latch bar, a radially disposed arm having one end rigidly fastened to said shaft and its other end proportioned and arranged to engage said latch bar, and reciprocation means operatively connected to said latch bar, said reciprocation means being effective to move said latch bar into and out of engagement with said other end of said arm.

8. A golf clug swinging apparatus as in claim **7** including a toggle mechanism connecting said reciprocation means to said latch bar, said toggle mechanism being effective to hold said latch bar in engagement with said other end of said arm without force being applied by said reciprocation means.

9. A golf club swinging apparatus comprising a frame, a shaft journaled in said frame, the axis of said shaft being inclined a predetermined angle with respect to a horizontal plane, a helical spring coaxially coiled about said shaft, means for connecting one end of said spring to the first end of said shaft, drive means, means for connecting said drive means to the other end of said spring, said drive means being effective to store predetermined amounts of energy in said spring, means for releaseably latching said shaft against rotation by energy stored in said spring, means for securely holding the grip end of a golf club, an arm having one end drivingly connected to said shaft and its other end pivotally connected to said holding means, said arm being arranged for movement in a plane generally perpendicular to said shaft, fluid operated brake means for retarding the motion of said shaft through a predetermined portion of the travel of said arm, said brake means being operatively connected to said shaft, said fluid operated brake means comprising a drum-shaped inner housing concentrically mounted about the axis of said shaft, said inner housing having

an elongated opening extending peripherally about a portion of its side wall and a plurality of orifices disposed in a portion of the balance of its side wall, a drum-shaped outer housing disposed about said inner housing, said outer housing having an inner diameter greater than the external diameter of said inner housing, thereby providing a space between said inner and outer housings, a radially extending rotary vane in said inner housing drivingly connected to said shaft, a stationary, radially extending partition in said inner housing, said rotary vane and partition being proportioned and arranged to force fluid from said inner housing through said elongated opening and said orifices to said space between said inner and outer housings when said shaft is rotated, said elongated opening having sufficient width to permit substantially unrestricted flow of fluid therethrough, said orifices having a diameter which permits restricted flow of fluid therethrough.

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U.S. Cl. X.R.

73—13; 273—77