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[56]

References Cited

UNITED STATES PATENTS

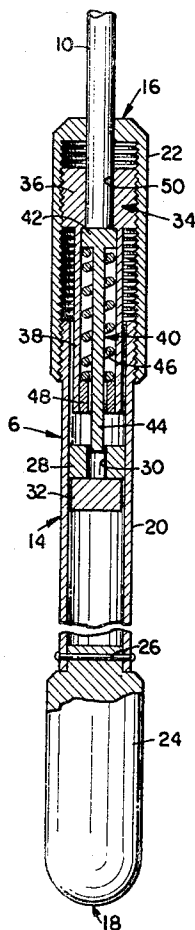
2,135,648	11/1938	Stumpf	273/186(A)
2,772,887	12/1956	Blake	273/186(A)
3,113,781	12/1963	Guier	273/186(A)
3,113,782	12/1963	Guier	273/186(A)
3,172,668	3/1965	Blake	273/186(A)

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[54] **SWING FORCE INDICATOR INCLUDING AN ACTUATOR FOR DISENGAGING A MAGNETICALLY ATTRACTED MOVABLE MEMBER**
 9 Claims, 3 Drawing Figs.

[52] U.S. Cl. 273/26,
 273/186, 273/73, 73/379
 [51] Int. Cl. A63b 69/36,
 A63b 49/00
 [50] Field of Search 273/186,
 193, 194, 26, 73; 73/379, 380, 381

ABSTRACT: A swing force indicator for use with sporting implements such as golf clubs, baseball bats and the like having a shaft and a closed tubular housing at an end of the shaft. A magnetic sleeve is disposed midway between ends of the housing and an axially movable member is magnetically attracted to the sleeve. An axially movable plunger is disposed on the other side of the sleeve, is biased away from the sleeve and is axially movable past the sleeve into engagement with the member to dislodge the member when the implement is swung with a predetermined force.



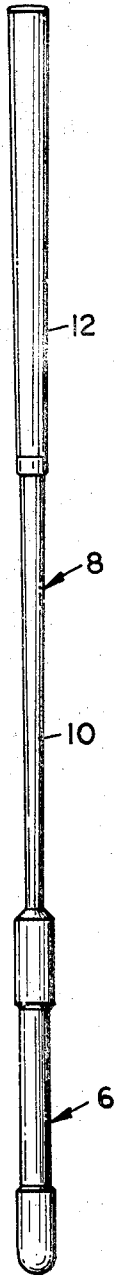


FIG_1

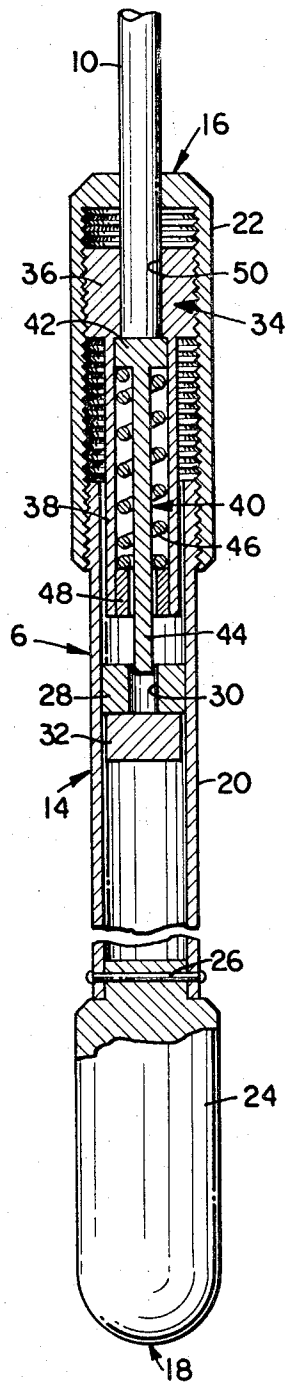


FIG_2

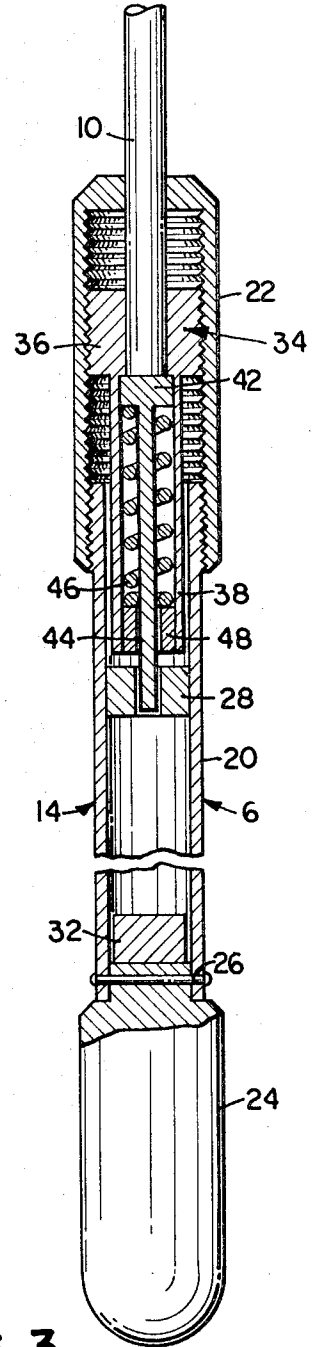


FIG_3

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SWING FORCE INDICATOR INCLUDING AN ACTUATOR FOR DISENGAGING A MAGNETICALLY ATTRACTED MOVABLE MEMBER

BACKGROUND OF THE INVENTION

This invention relates to stroke force indicators for use on sporting articles such as golf clubs, baseball bats, tennis rackets and the like.

Many sports require that an object, usually a ball, be struck with a certain force, not infrequently the highest obtainable force. This requires a great amount of training and practice of the player which is facilitated when he has some indication of the magnitude of his stroke force. Since the player swings the article, say the golf club, about a relatively fixed point the club is subjected to centrifugal forces the magnitude of which is directly related to the force which the golf club head applies to the golf club. Measurement of such force then indicates to the player the magnitude of the force his stroke transmits to the ball.

Various stroke force indicators are known. Typical examples can be found in U.S. Pat. Nos. 2,135,648; 3,113,781 and 3,113,782. A common characteristic of such indicators is that they employ a stationary and a movable member which are magnetized and which separate when the centrifugal force to which the movable member is subjected exceeds a predetermined value to create an audible click.

Prior art stroke force indicators usually also provide for adjustment of the stroke force required for separating the immovable and movable members. They employ various means, such as variations in an airgap maintained between the members, variations in moment arms, where the movable member is pivotable about an axis, or variation of the position of the immovable member on the golf club shaft to take advantage of variations of the centrifugal force on the movable member at various positions along the golf club shaft. In many instances it is very difficult to obtain an accurate control of the required release force. Small variation in the relative positioning between the two members usually changes the required stroke force a great deal. Such minute variations are difficult to control and it is, therefore, quite difficult to repeat any given setting.

If the movable and immovable members are disposed on the exterior of the golf club shaft, the operation and the setting of the device is clumsy, and its proper functioning is dependent on maintaining a virtually perfect surface on the golf club shaft. Scratches, nicks and the like, which almost invariably occur during the handling of the club, can adversely effect the functioning of the indicator and can even prevent it from operating.

SUMMARY OF THE INVENTION

The present invention provides a stroke force indicator for sporting articles such as golf clubs, baseball bats and the like, and provides a tubular housing connected to an elongate shaft defining a grip for the club. A barrier is fixedly positioned within the housing, and limits movements of a member that is axially slidably disposed within the housing. The barrier and the member are constructed so that they are magnetically attracted to each other. Actuating means are positioned adjacent the barrier for disengaging the magnetically attracted member and barrier in response to a centrifugal force (or swing velocity) of a predetermined magnitude. This causes the member to strike a portion of the housing to emit an audible click.

In the preferred embodiment the actuating means comprises a plunger axially movable disposed within the housing on the side of the barrier opposite the member. The barrier defines a passageway through which the plunger can extend to dislodge the member. The plunger is biased away from the barrier, and means are provided for adjusting the relative positions of the barrier and the plunger so that an increased spacing between the two requires a greater centrifugal force to

move the plunger sufficiently to dislodge the member from its magnetic engagement with the barrier.

Thus, the present invention assures a positive separation of the movable member from the barrier. Difficult and minute adjustment in the relative positioning between the movable and the stationary members, as was frequently necessary in the past, has been eliminated by directly engaging the two in the same relative position, and providing an additional element causing the separation between the two members. This has the further advantage that the separating element can be given any desired mass while its movements can be virtually exactly controlled by accurately adjusting the biasing forces of helical springs which bias the element away from the barrier and which biasing force must be overcome by the centrifugal force before the movable member can be dislodged from its magnetic retention to the barrier. Additionally, the mechanism is enclosed within the housing to protect it from damage and to give the device an appealing appearance.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a golf club provided with a stroke indicator constructed according to the present invention;

FIG. 2 is a fragmentary, enlarged view, partially in section, of the stroke force indicator shown in FIG. 1; and

FIG. 3 is a view similar to FIG. 2, but shows the stroke force indicator adjusted to require a lesser stroke or centrifugal force to operate it.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a stroke force indicator 6 constructed according to the present invention is shown mounted on a golf club 8 comprising an elongate shaft 10 and a grip or handle 12. The stroke force indicator is positioned at that part of the golf club normally carrying the golf club head (not shown). The force indicator can also be mounted at the free end of other supporting articles requiring a stroke force such as a baseball bat, a tennis racket or the like.

Referring to FIGS. 2 and 3, the force indicators 6 generally comprise a housing 14 having closed ends 16 and 18. The housing is defined by a tubular intermediary portion 20 which, at its one end, includes an external thread in engagement with the internal thread of an end cap 22. In the presently preferred embodiment of the invention the other end of the tubular portion mounts a weighted head 24 which is secured to the tubular portion by a cross-pin 26 and which has a mass approximating that of a golf club head to better simulate the conditions of a standard golf club used during play.

Mounted about midway between ends of tubular portions 20 is a barrier 28 having a sleeve-like configuration to define a concentric aperture 30. The barrier is immovably secured to the tubular portion as by bonding, bracing, welding or mechanically pinning it thereto. An axially movable member 32 is disposed in the portion of tube 22 between barrier 28 and head 24. The member can have any desired configuration but preferably it has a cylindrical cross section of diameter slightly less than the inside diameter of tube 20 so that it is freely movable between the barrier and the head.

In the presently preferred embodiment of the invention the barrier is constructed of a magnetized material, such as steel, while the member 32 is constructed of magnetic material, such as steel or iron, attracted to the barrier magnet. To prevent any magnetic attraction between the axially movable member, tube 20 and head 24, the latter two are constructed of a nonmagnetic material such as aluminum, brass or bronze.

The internal thread on end cap 22 extends from the open end of the cap to the closed end thereon. A plug 34 threadably engages the end cap and comprises an externally threaded cylindrical base 36 from which a tubular, reduced diameter cross section housing 38 extends. An axially movable plunger 40 defined by head 42 and a reduced diameter shaft 44 is

disposed interiorly of housing 38 and biased towards base 36 by a helical compression spring 46 resting on a bushing 48 pressed into or otherwise secured to the free end of housing 38 after the plunger and the springs have been inserted therein. It will be noted that the plunger shaft 44 protrudes slightly past the end of the bushing, and is maintained in alignment with aperture 30 in barrier 28 by bushing 48.

Golf club shaft 10 is disposed in a bore 50 in plug base 36 and is rigidly secured thereto in any convenient manner. If shaft 10 is firmly gripped, end cap 22 can be rotated to move plug 34 together with plunger 40 in an axial direction towards or away from barrier 28.

Turning now to the operation of the stroke force indicator 6, and assuming it to be mounted at the end of golf club 8, the golf club is gripped at handle 12 and raised in an upright position so that member 32 slides gravitationally from adjacent head 24 towards barrier 38 whereby the member is magnetically retained to the barrier and overlies aperture 30. End cap 22 is now rotated relative to shaft 10 to move plug 34 closer to barrier 38 and the golf club is swung through an arc as if a golf ball were to be struck. As a result of the swinging motion of the stroke force indicator, a centrifugal force acts on plunger 40 in opposition to the force exerted by spring 46 whereby the spring is compressed and the plunger moves towards barrier 28 and member 32. When the plunger contacts member 32 and disengages it from barrier 28, the member, under the centrifugal force, slides in housing 20 until it engages head 24 and causes an audible signal or click to indicate that it has been separated from the barrier. To assure a pronounced, audible click, and also give the player a feeling that the movable member struck head 24, it is preferred to construct housing 14 so that the spacing between the head and barrier 28 is two or more times the inside diameter of the housing. This enables member 32, assuming its length does not exceed its diameter, to reach a sufficient speed so that its impact with head 24 can be felt by the player.

Golf players usually desire to perfect their wrist action just prior to striking the golf ball which adds to the centrifugal force acting on the plunger. To that end, force indicator 6 is initially adjusted so that the plunger fails to disengage member 32 from barrier 28 if the club is merely swung with the arms. However, it is so set that the plunger does disengage member 32 from the barrier if, in addition to the swinging arm, the player applies a wrist action to the club.

Thereafter, the player can readjust the force indicator by rotating end cap 22 on shaft 10 to move plug 34 successfully further away from barrier 28 and member 32. An ever increasing strike force is thus required to separate member 32 from barrier 28. FIG. 2, otherwise identical to FIG. 3, indicates a position of plug 34 in which a substantially greater centrifugal force is required to compress spring 46 sufficiently so that plunger shaft 44 disengages member 32 from barrier 28. To prevent strong strokes resulting in high centrifugal forces from separating the movable member 32 from barrier 28, it is preferred that the magnetic attraction forces between the two substantially exceed the rate of the movable member so that it is retained to the barrier under all commonly encountered swinging conditions. Furthermore, the mass of plunger 40 is maintained relatively high so that upon contact with the movable member, the latter is positively disengaged from the barrier magnetic.

Although one embodiment of the invention has been shown and described, it will be obvious that other modifications and adaptations can be made within the spirit and scope of this invention.

I claim:

1. A stroke force indicator for sporting articles comprising: an elongate shaft defining a grip and a tubular housing connected to an end of the shaft, barrier means positioned within the housing, a member axially slidably disposed within the housing, the barrier means limiting the slidable movement of the member, the barrier means and the housing being constructed of magnetic materials so that they are attracted to each other and the member can be retained to the barrier

means, and actuating means positioned adjacent the barrier means for disengaging the magnetically attracted member and barrier means in response to a centrifugal force of a predetermined magnitude whereby the member strikes a portion of the housing while subject to the centrifugal force and issues a signal indicating that the centrifugal force has reached the predetermined magnitude.

2. A stroke force indicator according to claim 1 wherein the actuating means comprises plunger means axially movably disposed within the housing on a side of the barrier means opposite the member, and wherein the barrier means defines a passageway through which the plunger means can extend into engagement with the member when the member is retained to the barrier means.

3. Apparatus for providing a signal responsive to the centrifugal force to which the apparatus is subjected, the apparatus comprising: a housing adapted to be secured to an elongate shaft subjected to centrifugal forces, a stationary, tubular sleeve mounted to the interior of the housing, a movable member disposed in the housing on a side of the sleeve, opposite a connecting point between the housing and the shaft, the member being magnetically attracted to and retained by the sleeve, a plunger movable disposed in the housing on the other side of the sleeve and having a configuration enabling it to extend through an aperture in the sleeve and into contact with the member, and means biasing the plunger away from the sleeve and the member, whereby a centrifugal force acting on the plunger forces the plunger in opposition to the spring force against and into engagement with the member to thereby dislodge the sleeve and the member at a predetermined magnitude of the centrifugal force.

4. Apparatus according to claim 3 including means for adjusting the relative positions of the plunger and the sleeve to thereby vary the required centrifugal force for dislodging the member from its magnetic engagement with the sleeve.

5. Apparatus for indicating stroke forces in connection with sporting games, the apparatus comprising: an elongate shaft having a grip at one end and an elongate, closed end tubular housing at another end, an end of the shaft being disposed in the housing for connecting the shaft and the housing, an axially movable plunger disposed in the housing, means biasing the plunger toward the shaft, an axially movable member disposed in the housing, barrier means between the member and the plunger, and constructed to permit engagement of the member by the plunger while preventing the member from moving towards the shaft and the plunger past a point determined by the barrier means, the barrier means and the member being magnetically attracted to each other, whereby movement of the shaft through an arc forces the plunger in opposition to the biasing means against the member to dislodge the member from the barrier means so that the member can move in an axial direction under the effects of the centrifugal force to engage the closed end of the housing and produce a signal.

6. Apparatus according to claim 5 including means for moving the barrier means and the plunger towards and away from each other whereby the centrifugal force required to dislodge the member from engagement with the barrier means can be adjusted without adjusting the biasing means.

7. Apparatus according to claim 6 wherein the adjustment means comprises a plug rigidly connected with a portion of the shaft disposed inside the housing, the plug including means for axially movably mounting the plunger, the plug further threadably engaging the housing so that relative rotation between the shaft and the housing causes an axial repositioning of the plug and a corresponding adjustment in the relative position between the plunger and the barrier means.

8. Apparatus according to claim 5 wherein the biasing means comprises a helical spring biasing the plunger with a fixed force away from the barrier means.

9. Apparatus according to claim 5 wherein the axial length of the housing on the side of the barrier means facing the axially movable member exceeds the inside diameter of the tubular housing a plurality of times.