United States Patent [19]

Koch

[11] **3,897,058**

[45] **July 29, 1975**

[54] **ATHLETIC TESTING DEVICE**

[76] Inventor: **Alvin F. Koch,** 109 Oak Cir., Monroe, La. 71201

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[21] Appl. No.: **453,791**

[52] **U.S. Cl.** ..... **273/26 B;** 73/379; 273/81 R; 273/81.2; 273/183 D

[51] **Int. Cl.²A63B 69/36;** A63B 69/38; A63B 69/00

[58] **Field of Search** ..... 73/379; 35/29 A; 273/81 R, 273/81 D, 81.2, 26 B, 26 R, 183 D, 183 R, 186 A, 194 R

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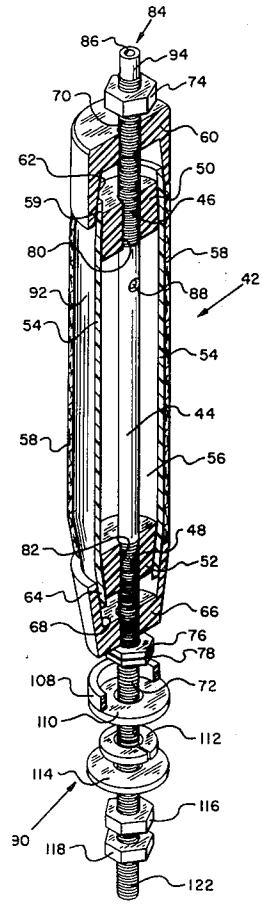
Primary Examiner—James J. Gill
Attorney, Agent, or Firm—Norvell E. Von Behren, Esq.

[57] **ABSTRACT**

An athletic testing device for use by athletes in a game where an athletic club is utilized for playing the game and where a controlled force application on the club handle by the user's hand or hands is desirous as the club is swung. The testing device is adapted to be used with a golf club, a tennis racket or a baseball bat and other sporting implements and comprises a pressure-responsive grip which surrounds the shaft of the club with a fluid reservoir being formed between the shaft and the grip. A passageway is formed from the reservoir to the exterior of the club handle and the reservoir and the passageway are connected by means of flexible tubing to a remote pressure indicating and/or recording device.

By use of the new and novel testing device and the new and novel athletic club handle, the athlete is able to freely swing the athletic club while a remotely located supervisor or professional can observe the amount of pressure exerted on the pressure-responsive grip and furthermore observe variations in pressure occurring throughout the swing. By the use of the subject invention, firmness and/or looseness of the grip during various portions of the swing of the athlete can be more readily defined and understood so that the athlete may make necessary corrections in his grip as a result of the information obtained from the testing device.

25 Claims, 20 Drawing Figures



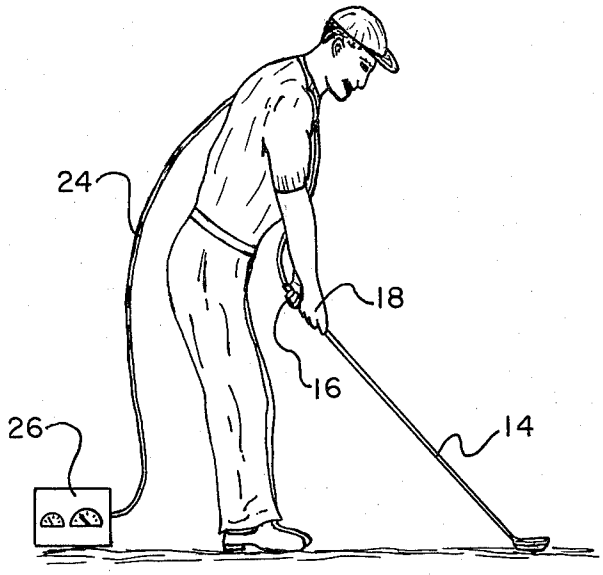


FIG. 2

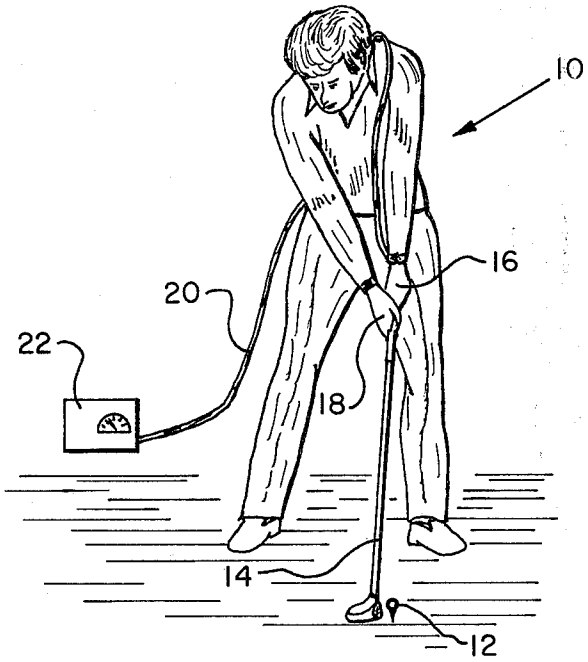


FIG. 1

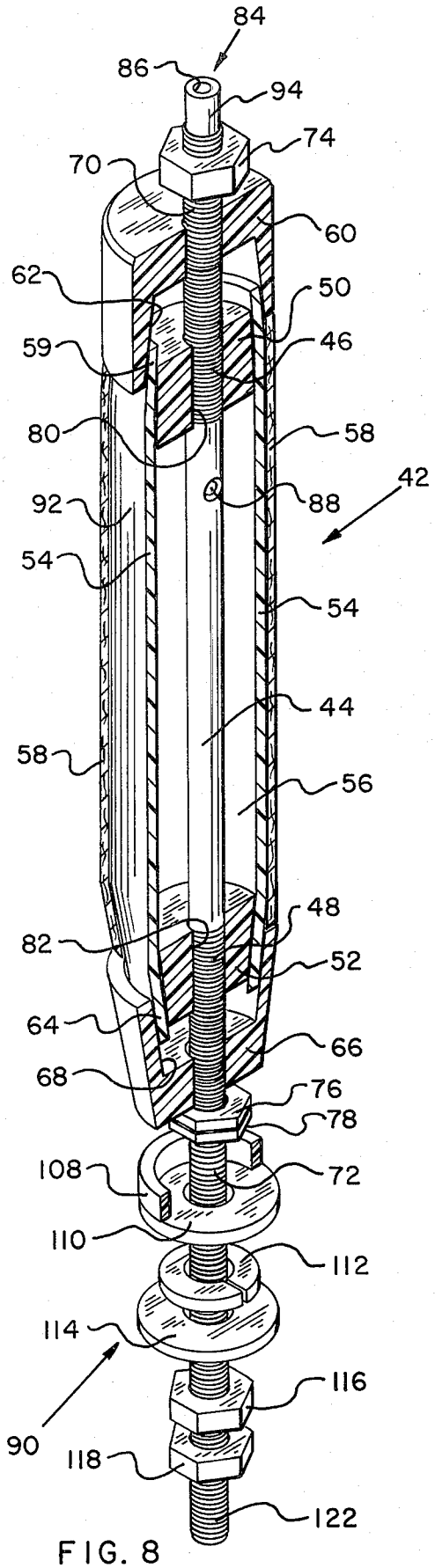


FIG. 8

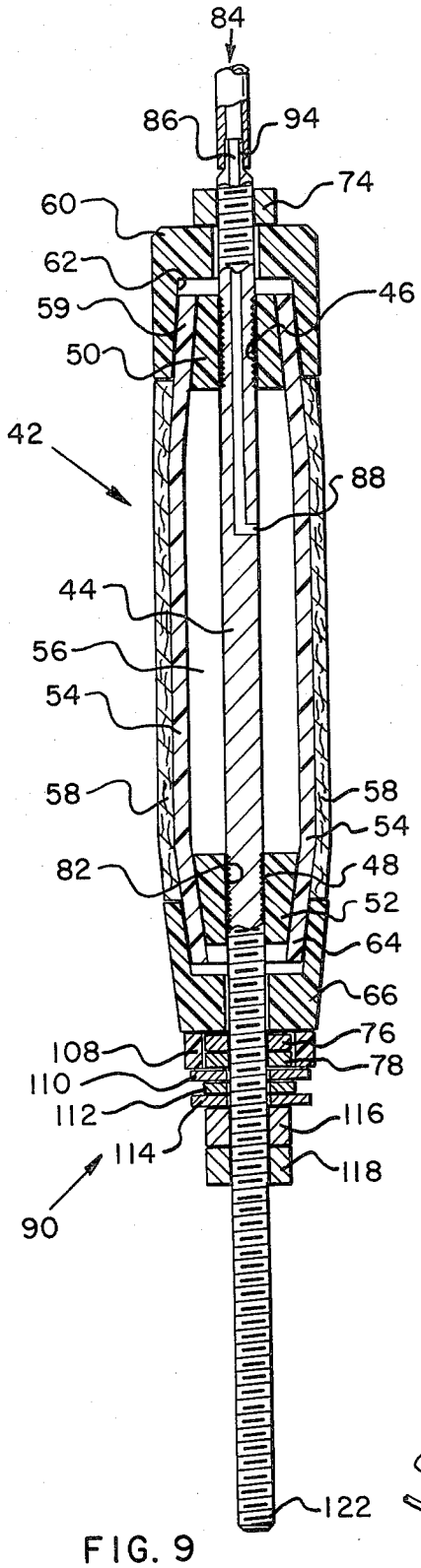


FIG. 9

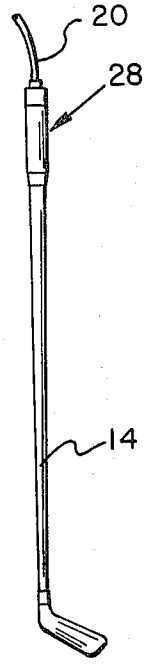


FIG. 3

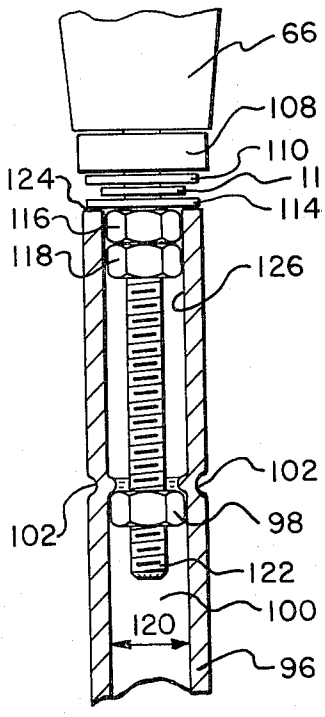


FIG. 10

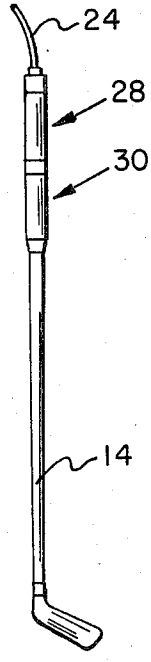


FIG. 4

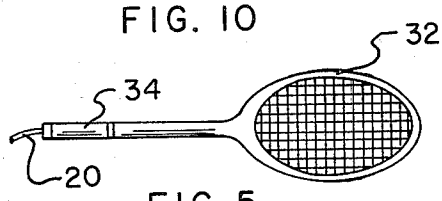


FIG. 5

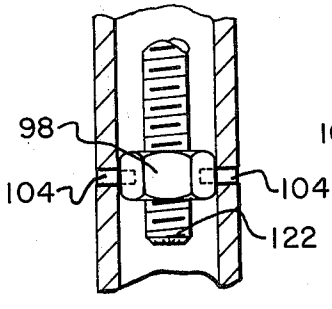


FIG. 11

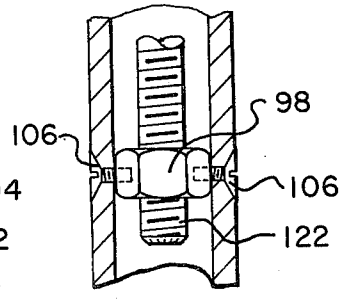


FIG. 12

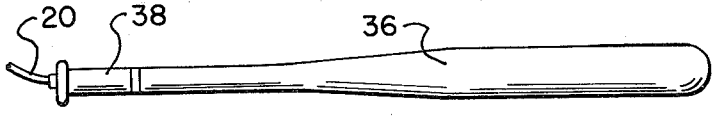


FIG. 6

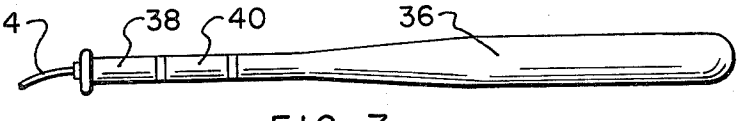


FIG. 7

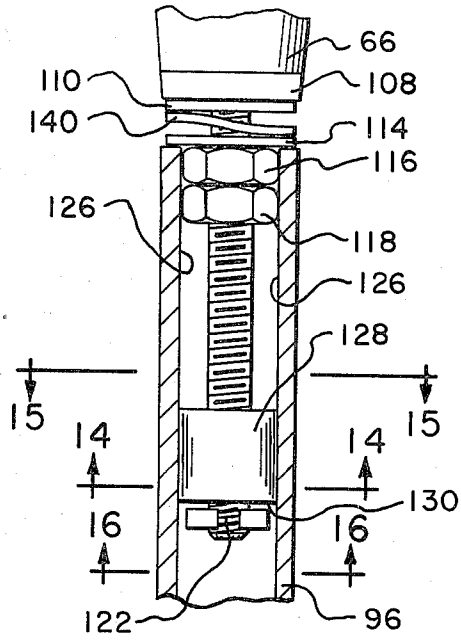


FIG. 13

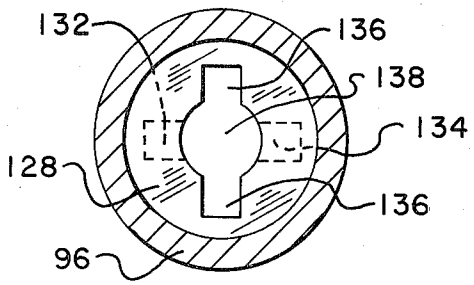


FIG. 15

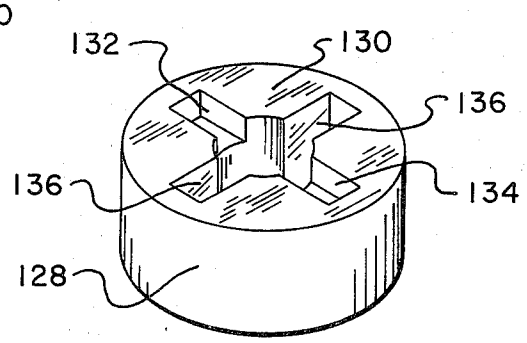


FIG. 14

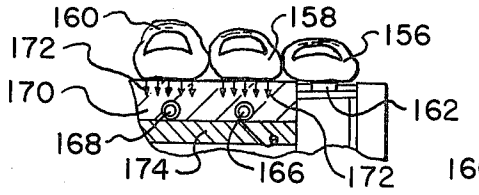


FIG. 19
(PRIOR ART)

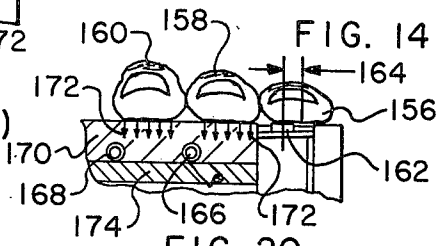
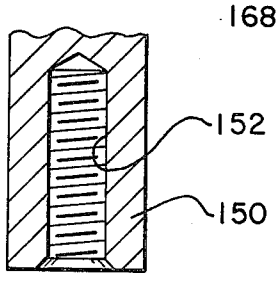


FIG. 20
(PRIOR ART)



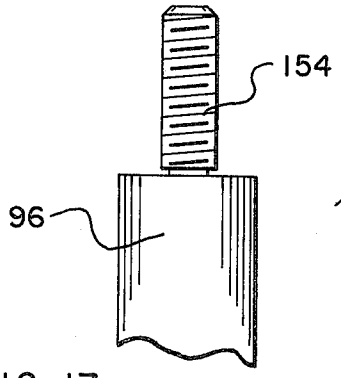


FIG. 17

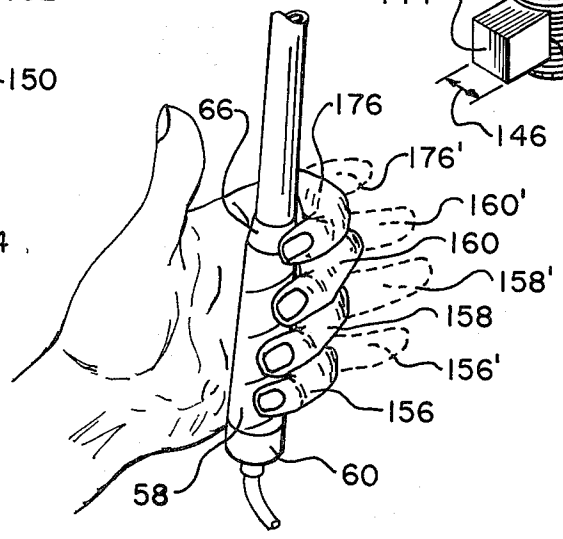


FIG. 18

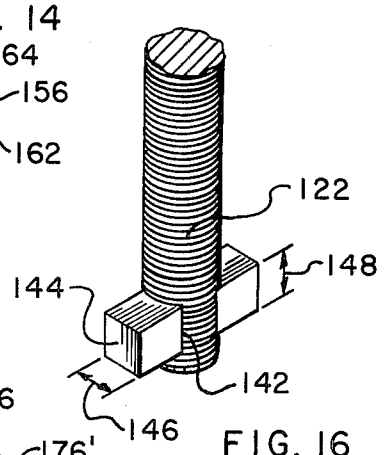


FIG. 16

ATHLETIC TESTING DEVICE

BACKGROUND OF THE INVENTION

This invention relates generally to athletic testing devices and more particularly to a new and novel athletic club handle and athletic club device which may be used in conjunction with an athlete swinging a club which requires a controlled force application on the club handle by the athlete's hand or hands as the club is swung.

There are various sports prevalent in this country which require an athlete to utilize a club or some similar implement for swinging at a ball which is rapidly advancing towards the athlete or else is fixed on a stationary tee or some other device in front of the athlete. One such example is the sport of golf wherein the golfer athlete utilizes a golf club to drive a stationary golf ball positioned on either a golf tee or on the ground in front of him. Other examples come to mind such as the sport of tennis and the sport of baseball which utilize either a tennis racket or a baseball bat for swinging at the rapidly approaching ball. After the above sports were introduced into this country, the more dedicated players soon came to the conclusion that the grip of their hand or hands on the athletic club played an extremely important part in the final direction and control of the ball.

Devices have been invented for measuring the strength of an athlete's grip and also for exercising the muscles in his hands as typified by the U.S. Pat. No. 1,623,869, issued Apr. 5, 1927 to A. Giraldi; the U.S. Pat. No. 2,501,919, issued Mar. 28, 1950 to F. Saam; the U.S. Pat. No. 2,634,976, issued Apr. 14, 1953 to J. E. Mock; the U.S. Pat. No. 2,708,367, issued May 17, 1955 to H. F. Lusk and the U.S. Pat. No. 3,374,762, issued Mar. 26, 1968 to A. W. Baldwin. These devices, while satisfactory for the purpose intended, structurally were not adaptable to an athletic club for use by the athlete in understanding the nature and extent of his grip on that club.

Other devices evolved for controlling the swing of the club, for example in the game of golf as typified by the U.S. Pat. No. 1,712,537, issued May 14, 1929 to W. P. White which teaches a speed indicating device for golf clubs. And also the U.S. Pat. No. 2,626,151, issued Jan. 20, 1953 to G. M. T. Jenks which teaches a golf practice apparatus for controlling the golf swing and arm and wrist movement.

Golf club pressure-responsive grips are also known in the prior art as typified by the U.S. Pat. No. 2,954,697, issued Oct. 4, 1960 to P. M. Geist; the U.S. Pat. No. 3,111,322, issued Nov. 19, 1963 to J. A. English and the U.S. Pat. No. 3,323,367, issued June 6, 1967 to R. W. Searle. The patent to Geist teaches a pressure-responsive grip that utilizes a spirally wound length of tubing in juxtaposition to the golf club shaft in an attempt to measure the pressure exerted by the user's fingers with a mechanical pressure indicator being positioned on the external portion of the club shaft. The patent to English is primarily a grip training device which is utilized to teach the student acceptable positioning of the fingers and the hands on the athletic club and cannot be utilized as a means for determining the extent of the pressure on the athletic club. The patent to Searle is directed to an athletic club which utilizes electric sensors on the gripping portion of the club with the sensors transmitting the grip pressure to a club-mounted indicator formed in the central portion of the club.

While the before-mentioned Geist patent and the Searle patent teach pressure-responsive grips, they do not teach a pressure-responsive grip which measures the total force applied by the athlete's hand or hands on the golf club and they do not provide means for allowing that force to be transmitted to an instructor located nearby who can readily visualize and/or record the various changes in the grip pressure so that he can convert the pressure indications to communicative language which he can transmit to the student thereby enabling the student to adjust his grip pressure as desired in order to improve his swing.

SUMMARY OF THE INVENTION

In order to overcome the inherent deficiencies in the prior art testing devices and the prior art athletic grips there is provided by the subject invention a new and novel athletic testing device and a new and novel pressure-responsive grip which may be utilized with the subject testing device in a way heretofore unknown to athletic devices. The subject pressure-responsive grip comprises a fluid reservoir which is positioned between the athletic club shaft and the outer grip surface of the athletic club and which is utilized to be responsive to the total pressure exerted on the reservoir by the user's hands. The pressure-responsive grip is connected by means of an internal passageway to an external flexible tubing which is connected to a remotely placed pressure indicator and/or recording means thereby enabling the professional instructor to actually visualize and study the grip pressures exerted by the athlete during an actual swing of the athletic club.

The subject new and novel invention may be adapted for use with a golf club, a tennis racket, a basebal bat or other similar types of athletic clubs and may also be utilized to detect and indicate and/or record grip pressures with one or both hands of the athlete on the club.

Accordingly an object of the invention is to provide a new and novel athletic club handle for an athletic club of the type which is normally used for playing a game requiring a controlled force application on the club handle.

Another object of the invention is to provide a new and novel athletic club which has formed thereon a new and novel pressure-responsive grip which is responsive to the total pressure exerted by the hand or hands of the athlete on the club handle.

Yet another object of the invention is to provide a new and novel athletic club handle which may be utilized with a golf club, a tennis racket, a baseball bat or other types of athletic clubs requiring a controlled force and grip pressure on the club handle.

Still yet another object of the invention is to provide a new and novel two-piece athletic club which has a handle portion and a remaining portion forming the club structure with the handle portion comprising the new and novel pressure-responsive grip of the invention.

Still yet another object of the invention is to provide a new and novel two-piece athletic club which has a removable pressure-responsive grip handle section which allows a series of clubs to be utilized with a single grip portion.

Yet another object of the invention is to provide a new and novel testing device for use by an athlete and

the athlete's instructor which comprises an athletic club having a handle portion attached to the remaining portion of the club with the handle portion having formed thereon a pressure-responsive grip which is connected by means of a predetermined length of special flexible tubing to a remote pressure indicator with the flexible tubing being sized and formed from a material sufficient to transmit the grip pressures to the remote fluid pressure indicator and/or recorder.

Another object of the invention is to provide a new and novel three-piece athletic club which has provisions for measuring the grip pressures exerted by the right and the left hand of the athlete utilizing the club.

Still yet another object and advantage of the invention is to provide a new and novel athletic club which may be utilized by the athlete and by the athlete's professional instructor to visualize and analyze the athlete's grip pressure throughout the athlete's swing so that the professional instructor can translate the pressures indicated and/or recorded to a more readily understood terminology to enable the athlete to adjust and vary his grip during predetermined portions of the swing of the athletic club.

Still yet another object and advantage of the invention is to provide a new and novel athletic club which permits an instructor to easily define the misunderstood and relative terms such as lighter, firmer, lightly, tight, loose or the like and to convert these terms into more easily understood language which can be quickly utilized by the athlete in improving his swing.

A further object of the invention is to provide a new and novel athletic club which allows the athletic instructor to analyze in greater detail the factors that influence the firmness or amount of pressure exerted by the athlete on the club handle in relation to the club length, the club head weight, the speed of the athlete's backswing, the position of the club in the athlete's hand and the position of the fingers or thumbs on the athletic club and the muscular tension of the athlete.

Other objects and advantages of the invention will become apparent from a study of the drawings showing the preferred embodiment and various modifications of the basic invention and from a study of the following description of the preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front view of an athlete using the subject new and novel invention in the improvement of his golf swing;

FIG. **2** is a similar athlete using a modification of the subject invention for the improvement of his golf swing with the subject invention indicating and/or recording the grip pressure on both hands of the subject golfer;

FIG. **3** is a side view of the new and novel pressure-responsive grip as utilized on a golf club to be responsive to the grip pressure of one hand of the golfer utilizing the club;

FIG. **4** is a side view of the new and novel athletic grip utilized on a golf club to be responsive to the grip exerted by both hands of the golfer utilizing the club;

FIG. **5** is a top view of a tennis racket showing the new and novel pressure-responsive grip being utilized to be responsive to the hand of the tennis-playing athlete using the club;

FIG. **6** is a view of a baseball bat utilizing the new and novel pressure-responsive grip for responding to the pressure exerted by one hand of the baseball player using the baseball bat;

FIG. **7** is a view of a baseball bat utilizing two new and novel pressure-responsive grips for responding to the pressure exerted by both hands of the baseball player using the baseball bat;

FIG. **8** is a partially exploded isometric view of the new and novel pressure-responsive grip as applied to a golf club in the preferred embodiment;

FIG. **9** is a sectional view taken along the mid-section of the pressure-responsive grip shown in FIG. **8** of the drawing after the grip has been assembled prior to attachment to the golf club remaining portion;

FIG. **10** is a sectional view taken through the lower portion of the pressure-responsive grip showing it inserted in the remaining portion of the golf club and locked in place on the golf club;

FIGS. **11** through **13** show modifications of the means for locking the pressure-responsive grip to the remaining portion of the golf club;

FIG. **14** is a perspective view taken along line **14—14** of FIG. **13** showing a portion of the locking means;

FIG. **15** is a sectional view taken along lines **15—15** of FIG. **13** showing a further view of the locking means of the modification;

FIG. **16** is a perspective view of the locking key utilized in the embodiment shown in FIGS. **13** through **15**;

FIG. **17** is a partial sectional view showing another modication of the means for attaching the pressure-responsive grip to the athletic club;

FIG. **18** is a perspective view showing the new and novel invention as applied to a golf club which utilizes one pressure-responsive grip for responding to the pressure exerted by the left hand of a right-handed golfer and further showing how the little finger and the next two fingers of the golfer's hands are generally positioned on the pressure-responsive grip with the index finger of the golfer's hands being positioned off of the pressure-responsive grip;

FIG. **19** is a partial sectional view of a prior art device; and

FIG. **20** is another partial sectional view of the prior art device shown in FIG. **19**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in general to the drawings and in particular to FIGS. **1** and **2** of the drawings, there is shown the subject invention as being utilized by a golfer shown generally by the numeral **10** who is attempting to hit a golf ball **12** with a golf club **14** while holding the golf club with his left hand at the uppermost portion of the club and his right hand directly below with one of the well-known golf grips. In the embodiment shown in FIG. **1**, the golfer's left hand is positioned around the new and novel pressure-responsive grip which will be described more fully hereinafter.

Attached to the upper portion of the golf club **14** and partially hidden in the FIG. **1** view by the golfer's left hand **16** is a flexible tubing **20** which is draped over the golfer's left shoulder and terminates at a remotely positioned pressure indicator and/or recorder. By draping the flexible tubing **20** over the golfer's left shoulder it becomes apparent that the golfer is able to swing the golf club virtually unimpaired by the flexible tubing which is being carried by his left shoulder and accordingly a remotely located athletic instructor or profes-

sional golfer would also be able to visualize the pressures indicated and/or recorded on the pressure indicator device **22.**

Referring now to FIG. **2** of the drawing there is shown a similar athlete using a modification of the subject invention for the improvement of his golf swing with the modification comprising the golf club **14** having formed on the upper portion thereof two pressure-responsive grips, one for the left hand **16** and the other for the right hand **18** with a dual flexible tube **24** initiating at the upper end of the golf club in the vicinity of the left hand **16** and terminating at a remotely positioned pressure indicator and/or recorder **26** which has circuitry incorporated therein for indicating and/or recording the pressures of both the right and left-hand pressure-responsive grips which will be described more fully hereinafter.

Referring now to FIGS. **3** and **4** there is shown in somewhat more detail the golf clubs **14** shown in FIG. **1** and **2** with the golf club in FIG. **3** having one pressure-responsive grip **28** formed on the upper portion of the club for use by the left-hand of a right-handed golfer or by the right hand of a left-handed golfer. In addition the golf club shown in FIG. **4** has formed on the upper portion thereof, shown generally by the numeral **28,** a pressure-responsive grip and in addition has formed therebelow a second pressure-responsive grip **30** for use by the other hand of the golfer.

Referring now to FIGS. **5** through **7** of the drawings there is shown how the new and novel pressure-responsive grip may be adapted as a modification of the preferred embodiment for use on a tennis racket **32** with its pressure-responsive grip **34** or to a baseball bat **36** with its pressure-responsive grip **38.** It will be understood that in both the tennis racket adaptation **32** and the baseball bat adaptation **36** there is attached to the pressure grips **34** and **38** the flexible tubing **20** which is ultimately connected to the pressure indicator and/or recorder **22** as shown in FIG. **1** of the drawing. If it is desirous to determine the pressures of both of the hands of the baseball player using the bat **36,** as shown in FIG. **7** the baseball bat **36** would have formed on the handle end thereof a pressure-responsive grip **38** as well as a second pressure-responsive grip **40,** both of which would be connected internally to the dual flexible tubing **24** and ultimately to the dual pressure indicators and/or recorder **26** as shown in FIG. **2** of the drawing. Should it also be desirous to utilize the subject invention to record both hand pressures on the tennis racket of the FIG. **5** modification, it becomes readily apparent that a second pressure-responsive grip can be added directly below the pressure-responsive grip **34** without departing from the spirit and scope of the invention.

PRESSURE-RESPONSIVE GRIP

Referring now to FIG. **8** of the drawing there is shown a partially exploded isometric view of the new and novel pressure-responsive grip of the subject invention as applied to a golf club and which may be modified within the spirit and scope of the invention to be applied to a tennis racket, a baseball bat and/or other athletic club devices. The basic pressure-responsive grip is shown generally by the numeral **42** in FIG. **8** and comprises a shaft **44** having a threaded portion **46** formed on the upper end thereof and a threaded portion **48** formed on the lower end thereof and also having threadably mounted on the threaded portions a plug **50** as well as a plug **52.** Positioned around the outside of the plugs **50** and **52** is a pressure-responsive grip **54** which surrounds and is sealably mounted on the shaft **44** as will be described hereinafter. The pressure-responsive grip **54** in combination with the plugs **50** and **52** and the shaft **44** form a fluid receiving reservoir **56** whose purpose and function will be more fully described hereinafter. Surrounding the pressure-responsive grip **54** is a leather wrap **58** which is spirally wound around the golf club handle in a manner well known in the art and forms no part of the basic invention.

Surrounding the tapered plug **50** and positioned over the upper edge **59** of the pressure-responsive grip **54** is a receptacle **60** having a tapered inner surface **62** sized dimensionally to provide a tight fluid retaining fit when the receptacle **60** is positioned over the plug **50** with the upper portion **59** of the pressure-responsive grip being positioned therebetween.

Formed on the lower portion **64** of the grip is a second receptacle **66** which has a tapered inner surface **68** sized in a similar manner to assure a fluid-tight fit when the receptacle **66** is positioned over the plug **52** with the lower portion **64** positioned therebetween.

The shaft **44** also contains a threaded portion **70** on its upper end thereof as well as a threaded portion **72** on its lower end thereof which are utilized in combination with a nut **74** and a pair of nuts **76** and **78** to draw the receptacles **60** and **66** together tightly over their repective plugs **50** and **52** thereby assuring a tight leak-proof fluid retaining reservoir **56** within the pressure grip.

The plugs **50** and **52** may be formed generally of a plastic material and are designed with an internal hole **80** and **82** which is sized somewhat smaller than the diameter of the shaft **44** so that whenever the plugs are threaded on the shaft **44** at the threaded portions **46** and **48,** they will form a tight seal at the shaft. In order to connect the fluid receiving reservoir **56** to the exterior of the club handle there is formed within the shaft **44** a passageway means, shown generally by the numeral **84** which comprises a drilled hole **86** connecting with a drilled hole **88** within the reservoir **56.**

Formed on the lower portion of the handle is a means for attaching the handle grip to the remaining portion of the golf club whenever it is desirous to have the handle portion removable from the golf club proper. The attaching means is shown generally by the numeral **90** and comprises a generally protruding portion or extension of the shaft **44** and a plurality of other parts which will be described more fully hereinafter.

The cylindrical shaped pressure chamber or reservoir **56** is designed to be sensitive to compressive pressures applied over any portion of its external surface **92** on the pressure-responsive grip **54.** This concept of an entire pressure-responsive surface being sensitive to pressures from the golfer's hand or hands is heretofore unknown over the prior art and enables the measurement of a total force by the hand or hands which can be expressed in standard units of force measurements such as pounds per square inch. The pressure-responsive grip **54** forming the exterior of the reservoir **56** is preferably made of a high density polyethylene plastic which has sufficient flexibility to compress easily under external hand pressures while having a low elasticity factor which allows for a low dissipation of force ex-

erted. It is anticipated that in the preferred embodiment a special design of the material in the pressure-responsive grip 54 would allow even less dissipation so that the wall could only have inward give and no outward give in some other area of the wall.

As before mentioned the plugs 50 and 52 are formed generally of a plastic material and are preferably formed from a high density polyethylene plastic rod and are designed to form a pressure seal when fitted to the reservoir wall. It is within the spirit and scope of the invention that the entire pressure chamber or reservoir 56 could be formed in a one-piece molded construction using current plastic molding techniques.

In assembling the basic reservoir of the subject invention, the threaded steel shaft 44 is positioned through the plugs 50 and 52 and the receptacles 60 and 62 are positioned over the upper edge 59 and the lower edge 64 of the pressure-responsive grip 54 and the respective tightening nuts 74 and 76 and 78 are tightened to draw the entire chamber tight. It is within the spirit and scope of the invention that the stability of the reservoir 56 could be enhanced by various known techniques such as making a wedged section of the cylinder extend from the axis of the shaft to an arc of the outer wall.

FLEXIBLE TUBING

As before mentioned the flexible tubing 20 or the dual flexible tubing 24 fluidly connects the reservoir 56, by means of the passageway 84 to the remotely located pressure recorder and/or indicators 22 or 26. The flexible tubing 20 or 24 is positioned over the exterior 94 of the shaft as shown in FIG. 9 of the drawing and is held in place by means of a clamp or by other well known fastening means. In a similar manner the other end of the flexible tubing 20 or 24 is connected to the remotely located pressure indicators and/or recorders 22 or 26.

In the preferred embodiment the flexible tubing is preferably formed of a high density polyethylene plastic material which is sized to have a thickness and rigidity sufficient to resist outward pressures exerted from within the tubing during use of the testing device while still being flexible enough to allow the user of the testing device to swing the athletic club without impairing his normal swing. From experiments it has been found that in the preferred embodiment it is preferable that the flexible tubing have an inner diameter of approximately ⅛ inch and a tubing wall thickness of approximately 3/32 inch. The important characteristics of the flexible tubing are that the tubing wall be sufficiently firm or rigid in texture so as not to be compressible from the inside of the tubing to the outside. That is, the tubing wall thickness should not decrease under pressure exerted from the fluid contained within the tubing. A second important characteristic of the tubing is that the tubing wall be sufficiently strong so that no tubing wall expansion occurs at the pressures encountered during the golfing swing such as pressures up to 75 pounds of pressure per square inch. This means that the internal tubing diameter should not increase greater than the normal internal diameter due to the tubing wall expanding outwardly such as a balloon might expand as air is blown into the center of the balloon. The volume of the fluid contained in a section of the tubing should not increase and there should be no fluid volume displacement up to approximately 75 pounds per square inch.

A final important characteristic of the flexible tubing is that the tubing should be sufficiently flexible to curve or bend from its own weight so that it will naturally drape over the golfer's shoulder and hang to the ground without impairing his natural swing.

DETACHABLE GRIP

In the preferred embodiment there is shown in FIGS. 8 and 9 the means for forming the grip or handle of the golf club so that it is detachable from the golf club shaft with head attached or as referred to hereinafter the remaining portion of the club. In addition there is shown in FIGS. 10 through 17 various means and ways for designing the grip so that the handle section is easily and quickly detachable.

It is felt that the detachable feature is especially desirable since it allows the professional instructor and the golfer athlete to study grip pressure variations that exist from club to club. It has been observed in experiments that a phenomenon exists in most golfers whereby they are unable to execute with equal precision shots made with various golf clubs of the same set. This problem is thought to be of a psychological nature and causes muscular tension which is thought to be brought on by a lack of self-confidence and is observable in the grip pressure.

In designing the detachable handle for use with the remaining portion of the golf club, a hollow steel shaft 96, as shown in FIG. 10 of the drawing, is designed to be fitted with a threaded nut 98 which is imbedded in the hollow center 100 of the shaft 96. After the nut 98 is imbedded in the hollow center 100, a series of crimps 102 are placed around the shaft 96 to permanently retain the nut 98 in place. As a modification of this method of holding the nut 98 in place a series of pins 104 shown in FIG. 11, or a series of screws 106, as shown in FIG. 12, may be used with equal success.

By referring back to FIGS. 8 through 10 there will now be explained the relationship of the shaft 44 of the detachable grip or handle and the before mentioned threaded nut 98. As shown in FIG. 8 and 9 of the drawing the nuts 76 and 78 are surrounded by a plastic ring 108 which is seated on a metallic washer 110 and a pair of washers 112 and 114. The washer is sized so that its outside diameter is approximately equal to the outside diameter of the hollow steel shaft 96. Threadably mounted on the shaft 44 and in juxtaposition to the washer 114 is a pair of nuts 116 and 118 which are sized so that their outer diameter or the outer diameter of their hex head is approximately equal to the inner diameter 120 of the shaft 96.

From this construction, it can be seen that whenever the basic pressure-responsive grip 42, having a shaft 44 with its lower end 122 threaded into the nut 98 until a tight fit is obtained with the washer 114 bearing upon the upper surface 124 of the shaft 96, the nuts 116 and 118 will bear against the inner surface 126 of the shaft 96 thereby insuring that there will be no play or wobble in the golf club at this portion as the golfer swings the club. From experimentation it has been found that in the preferred embodiment it is preferable to have the nut 98 approximately 3 inches below the final location of the nut 118 in order to give added stability against wobble during the golf club swing. Since the swinging torque of a golfer is generally clockwise the threads of the nut 98 would preferably be left-handed for a right-handed hitter and right-handed for a left-handed hitter

in order to insure that the detachable grip 42 did not loosen from the remaining portion of the club after several successive swings by the golfer.

Referring now to FIGS. 13 through 16 there is shown a modification of the means for providing a detachable grip utilizing a cylindrical clip fastener 128 in place of the nut 98 in FIG. 10. The cylindrical fastener 128 may be formed of steel or some other suitable material and has a bottom surface 130 having formed therein a pair of notches 132 and 134 as well as a notch 136 in combination with a drilled hole 138. The fastener 128 may be rigidly positioned within the hollow steel shaft 96 and held in place by means of a series of crimps 102 as shown in FIG. 10 of the drawing or by means of a plurality of pins 104 as shown in FIG. 11 of the drawing and may also be held in place by means of a plurality of screws 106 as shown in FIG. 12 of the drawing. The detachable grip 42, in this embodiment, would also have a spring washer 140 positioned between the washers 110 and 114 in place of the lock washer 112 shown in FIG. 9 of the drawing.

The lower end 122 of the shaft 44, in this embodiment has positioned therein a keyway 142 sized to receive a steel key 144 which is held in place in the keyway by means well known in the art and forming no part of the invention. The hole 138 in the fastener 128 is sized somewhat larger than the diameter of the lower end 122 of the shaft 44 and the elongated notches 136 are sized somewhat larger than the width 146 of the key 144. In a similar manner the notches 132 and 134 are sized somewhat longer than the length of the key 144 and are sized somewhat larger in width and height than the width 146 and the height 148 of the key 144. From this it can be seen that whenever the lower end 122 of the shaft 44, having the key 144 held in place thereon, is inserted in the hole 138 and the notches 136 and is positioned similar to that shown in FIG. 13 of the drawing, the spring washer 140 will exert a bias upwardly to seat the key 144 in the notches 132 and 134. When seated in this manner, the nuts 116 and 118 are tightly positioned against the surface 126 of the shaft 96 thereby insuring against wobble and detachment of the handle from the remaining portion of the club as the club is swung by the golfer.

While in the embodiments hereinbefore described, the detachable grip 42 has been shown with a protruding lower end 122 for insertion into the remaining portion of the golf club, it is within the spirit and scope of the invention that the means for attaching the grip to the golf club could be formed in other ways, as for example in the manner shown in FIG. 17 of the drawing wherein the grip shaft 44 has a somewhat larger lower portion 150 formed thereon and having a drilled and tapped hole 152 sized to receive a mating drilled shaft 154 which has been fixedly attached, by means well known in the art, to the hollow steel shaft 96. In this embodiment the threads on the shaft 154 would be sized for either a right or left-handed golfer so that a twisting motion by the golfer during the golf swing would tend to tighten the detachable grip 42 on the club shaft 96 as before mentioned.

Referring now to FIGS. 18–20 of the drawings, there will be described in detail how the applicant's new and novel grip functions to record the total grip pressure of the user of the device. Reference will be made specifically to the before mentioned Geist U.S. Pat. No. 2,954,697 and a portion of the Geist invention is shown in applicant's FIGS. 19 and 20 as prior art. Reference will be made also to the Geist patent specifically for the purpose of referring to the general state of the art and the applicant's advance thereover and the applicant's remarks are not to be construed as being derogatory in any sense.

FIG. 19 and FIG. 20 are illustrations of two examples showing how the little finger 156 and the next two fingers 158 and 160 of a golfer's hand could be positioned on the Geist golf club and could affect the pressure readings depending upon the position. By referring to the Geist patent it will be noted that a start button 162 must be depressed by the little finger 156 in order to activate the spring motor device (labeled M in the patent) and in order to record on the graph paper (labeled 41 in the patent) with the stylus (labeled 40 in the patent). In placing the little finger 156 in this manner it will become apparent from a comparison of FIG. 19 with FIG. 20 that the finger 156 could be positioned in different positions on the button 162. That is to say, the finger 156 could be centrally located on the button 162 as typified in FIG. 19 or could be positioned to the right as typified in FIG. 20 with the displacement being illustrated by the numeral 164. This displacement of course would affect the location of the other two fingers 158 and 160 in relation to the tubular element 166 and 168 and would also affect the recording of the grip pressure on the Geist graph paper.

It should also be noted that the distance between the fingers of the average golfer can vary as a result of the thickness of the golfer's fingers. Since the tubular elements 166 and 168 are fixed in the Geist grip 170, it becomes evident from the above that the fingers 158 and 160 can be displaced or located in different positions on the grip depending upon the individual golfer and how he initially places his hands on the golf club grip.

For example, in the location shown in FIG. 19 it will be noted that the finger 160 is directly above the tubular element 168 while the finger 158 is directly above the tubular element 166 resulting in major portion of the gripping force (shown generally by the arrows 172) being transmitted to the tubular elements 168 and 166. However in the location shown in FIG. 20 it should become apparent that a major portion of the gripping force 172 is not transmitted to the tubular elements 168 and 166 but is transmitted to the shaft 174 in the areas shown by the numerals. As a result, the total gripping force of the golfer's hand may not be recorded by the Geist recording mechanism depending upon how the golfer places his hands on the golf club.

By referring to FIG. 18 it will be shown how the golfer usually places his hands on the golf club handle whenever he is gripping the club. Prior to gripping the club the fingers of the golfer are generally extended as shown by the dashed lines in FIG. 18 and labeled by the numerals 156', 158', 160' and 176'. After grasping the club, the fingers are generally wrapped around the golf club grip as shown by the solid lines in FIG. 18 and as indicated by the numerals 156, 158, 160 and 176. When utilizing the applicant's new and novel grip it should become apparent that his grip will record the total grip pressure exerted by the golfer's hand since it is immaterial how the fingers are placed on the grip since a majority of the fingers will always be on the grip and will be able to exert total pressure on the applicant's grip regardless of their location. In addition the golfer can also change the position of the fingers on the

grip without affecting the total grip pressure indicated and/or recorded by the applicant's device.

It should also be noted that from a further study of the Geist patent it would appear that at the relative dimensions indicated in his drawings, in order for his bellows to operate, a sufficient displacement of fluid from the tubular element **15** (as numbered in his FIG. 1) would be required and this displacement would cause the tubular element **15** to collapse under even a slight pressure from the golfer's finger. Upon a collapse of the tubular element **15** in this manner, further pressure indications by his indicating device would be rendered impossible because of the blockage of the fluid flow at the area of the collapsed tubular element.

Should the elements be sized so that the bellows was of sufficiently small diameter so as not to require large displacements of fluid from the tubular element to the bellows, then the problem of friction of the fluid passing through the small passageway into the bellows would become predominent and the response time of the application of pressure to the tubular element and the time that the bellows was moved would offset the change in pressure. This then would reduce the accuracy of the graph produced by the recording device. As before indicated the Geist invention assumes the placement of hands of the golfer will be substantially the same each time and will be substantially the same for all golfers. However, it should be noted that differences of only a small fraction of an inch would mean that the golfer's hand would be situated off of the pressure-sensitive portion of the handle and would thereby render the device ineffective in recording the total grip pressure of the golfer's hand.

It is felt that for proper functioning in a hydraulic system such as the applicant's and such as the Geist reference, there must be substantially no displacement of fluid from the tubing and there must be substantially no tubing wall compression or expansion or collapse which would change the volume of a section of the tubing.

From the foregoing, it has been shown how the applicant's new and novel invention is able to be utilized in the preferred embodiment on a golf club for recording the total grip pressure of one or both hands of the golfer with the subject invention being totally responsive to the grip pressure and not subject to variations in the size or placement of the golfer's hand on the grip. The applicant's new and novel invention also is able to indicate and/or record the grip pressures in amounts and with variations heretofore unobtainable throughout different crucial positions in the golfer's swing. As has been before mentioned, the applicant's basic invention is also adaptable to be used on other athletic clubs such as a tennis racket, a baseball bat, a billiard cue or other clubs wherein it is desirous of recording the grip pressure of the user on the handle of the club.

From the foregoing, it can be seen that the applicant's new and novel invention has accomplished all the objects and advantages of the invention as hereinbefore detailed. Nevertheless, it is apparent that many changes may be made in the details of the invention and of the construction and arrangement of parts of the invention without departing from the spirit and scope thereof as expressed in the accompanying claims and the invention is not to be limited to the exact manner shown and described since only the preferred embodiments have been given by way of illustration only.

Having described the invention, I claim:

1. An athletic club handle for an athletic club which is normally used for playing a game requiring a controlled force application on the club handle by the users fingers and hand or hands as the club is swung, comprising:

a. a shaft positioned in the central portion of the handle;

b. an elongated pressure-responsive grip, surrounding and sealably mounted on said shaft and spaced apart from said shaft for a major portion of its length, said spaced apart grip forming a fluid receiving reservoir between said shaft and said grip, said reservoir being normally responsive to the controlled force exerted by the users fingers and hand pressure on the grip regardless of the position of the fingers along the length of the grip; and

c. means, associated with said reservoir and the exterior of the club handle, for forming a passageway from said reservoir to the exterior of the club handle.

2. The athletic club handle as defined in claim **1** wherein said pressure-responsive grip comprises a flexible tubing member having positioned within said member, on each end thereof, a plug, each plug having formed therein a hole through which is positioned the shaft, and sealably mounted thereon, said grip further comprising means associated with said tubing and said plugs, for tightening the ends of said tubing against said plugs.

3. The athletic club handle as defined in claim **1** wherein said means for forming a passageway comprises said shaft having formed therein a series of drilled holes, initiating at the reservoir and terminating at the exterior of the club handle.

4. The athletic club handle as defined in claim **2** wherein said shaft is threaded in the vicinity of said plugs and said tightening means comprises in part a tapered cap, surrounding each end of said grip and being positioned over said shaft, and around the ends of said tubing, said tightening means further comprising a nut, fixedly attached to the threaded portion of said shaft and tightly positioned on top of each tapered cap to seal the ends of said tubing between said plugs and said tapered caps.

5. The athletic club handle as defined in claim **1** wherein said handle is formed on a golf club.

6. The athletic club handle as defined in claim **1** wherein said handle is formed on a tennis racket.

7. The athletic club handle as defined in claim **1** wherein said handle is formed on a baseball bat.

8. A two-piece athletic club having a handle portion and a remaining portion, the club normally being used for playing an athletic game requiring a controlled force application by an athlete on the club handle by the users fingers and hand or hands as the club is swung, comprising:

a. a shaft;

b. an elongated pressure-responsive grip, surrounding and sealably mounted on said shaft, said grip being spaced apart a pre-determined distance from said shaft for a major portion of its length, said spaced apart grip forming a fluid receiving reservoir between said shaft and said grip, said reservoir being normally responsive to the controlled force exerted by the user's fingers and hand regardless of

the position of the fingers along the length of the grip;

c. means, associated with said handle portion and said remaining portion, for attaching said handle portion to said remaining portion: and

d. means, associated with said reservoir and the exterior of the club handle, for forming a passageway from said reservoir to the exterior of the club handle.

9. The athletic club as defined in claim **8** wherein said shaft has formed thereon an exterior protruding portion for positioning and locking within a mating opening on the remaining portion of the club.

10. The athletic club as defined in claim **8** wherein said remaining portion has formed thereon an exterior protruding portion for positioning and locking within a mating opening on said shaft.

11. The athletic club as defined in claim **8** wherein the club is a golf club.

12. The athletic club as defined in claim **8** wherein the club is a tennis racket.

13. The athletic club as defined in claim **8** wherein the club is a baseball bat.

14. The athletic club as defined in claim **11** wherein said shaft has formed thereon an exterior threaded protruding portion and the remaining portion of the golf club comprises in part a hollow tubular member having a locking member positioned and fixedly attached therein at a predetermined distance from the top of the hollow tubular member; said threaded portion having positioned thereon at least one nut, the nut being sized to fit snugly within the hollow tubular member and coacting with the locking member to rigidly connect the handle portion to the remaining portion without impairing the ability of the club to be used in an athletic event.

15. The athletic club as defined in claim **14** wherein said locking member comprises a nut tightly positioned within the hollow tubular member and held therein by crimping the hollow member.

16. The athletic club as defined in claim **14** wherein said locking member comprises a nut tightly positioned within the hollow tubular member and held therein by means of pins.

17. The athletic club as defined in claim **14** wherein said locking member comprises a nut tightly positioned within the hollow tubular member and held therein by means of set screws.

18. The athletic club as defined in claim **14** wherein said locking member comprises a cylindrical clip fastener fixedly attached to the inside of the hollow tubular member.

19. A testing device for use by an athlete in conjunction with an athletic club which is normally swung with a controlled force being applied to the handle of the club, by the user's fingers and hand or hands, said force being converted to a pressure which is transmitted to a pressure indicator, comprising;

a. an athletic club having a handle portion attached to a remaining portion of the club;

1. a shaft positioned in the central portion of the handle portion;

2. an elongated pressure-responsive grip, surrounding and sealably mounted on said shaft and spaced apart from said shaft for a major portion of its length so as to form a fluid receiving reservoir between said shaft and said grip, said reservoir being normally responsive to the controlled force exerted by the user's fingers and hand regardless of the position of the fingers along the length of the grip;

3. means, associated with said reservoir and the exterior of the handle portion, for forming a passageway from said reservoir to the exterior of the club handle;

b. a remote fluid pressure indicator;

c. a predetermined length of flexible tubing connected to said passageway on one end thereof at the exterior of the club handle, and to said pressure indicator at the other end thereof; and

d. a predetermined quantity of fluid filling said reservoir, said passageway and said flexible tubing to said pressure indicator, said tubing being formed of a material being sized to have a thickness and rigidity sufficient to resist outward pressures exerted from within said tubing during use of the testing device while still being flexible enough to allow the user of the testing device to swing the athletic club without impairing his normal swing.

20. The testing device as defined in claim **19** wherein the athletic club is a golf club and the flexible tubing is fixedly attached on one end thereof to the top of the golf club handle and is looped over the shoulder of the user to be fixedly attached at its other end to the pressure indicator which is positioned remote from the athlete golfer.

21. A three piece athletic club having a right and a left-hand handle portion and a remaining portion, the club normally being used for playing an athletic game requiring a controlled force application by an athlete on the right and left-hand handle portion by the user's fingers and hand or hands as the club is swung, comprising:

a. a shaft;

b. two elongated pressure-responsive grips, surrounding and sealably mounted on said shaft and positioned one above the other, said grips each being spaced apart a predetermined distance from said shaft for a major portion of their respective length, said spaced apart grips each forming an independent fluid receiving reservoir between said shaft and said grips, said reservoirs being independently responsive to the controlled force exerted by the user's fingers and hand pressure on the respective grips regardless of the position of the respective fingers along the length of the respective grips;

c. means, associated with one of said handle portions and said remaining portion, for attaching one of said handle portions to the remaining portion; and

d. means, associated with each reservoir and the exterior of the club handle, for forming a passageway from each reservoir to the exterior of the club handle.

22. A testing device for use by an athlete in conjunction with an athletic club which is normally swung with a controlled force of each hand being applied to the handle of the club, each hand force being converted to a pressure which is transmitted to a pressure indicator; comprising:

a. an athletic club having a right and a left-hand handle portion attached to a remaining portion of the club;

1. a shaft positioned in the central portion of each handle portion;

2. two elongated pressure-responsive grips, surrounding and sealably mounted on said shaft so as to form two independent fluid receiving reservoirs spaced apart from said shaft for a major portion of their respective lengths, said reservoirs being independently responsive to the controlled force exerted by the user's fingers and hand pressure on the grips regardless of the position of the fingers along the length of the grips;

3. means, associated with said reservoirs and the exterior of the handle portion, for forming an independent passageway from each reservoir to the exterior of the club handle;

b. a dual indicating remote fluid pressure indicator;

c. a predetermined length of flexible tubing connected to each of said passageways on one end thereof, at the exterior of the club handle and to said dual fluid pressure indicator at the other ends thereof; and

d. a predetermined quantity of fluid filling each reservoir, each passageway and each flexible tubing to said pressure indicator, each said tubing being formed of a material having a thickness and rigidity sufficient to resist outward pressures exerted from within each said tubing during use of the testing device while still being flexible enough to allow the user of the testing device to swing the athletic club without impairing his normal swing.

23. The testing device as defined in claim **19** wherein the flexible tubing is formed from a high density polyethylene plastic having an inner diameter of approximately ⅛ inch and a tubing wall thickness of approximately 3/**32** inch.

24. The testing device as defined in claim **22** wherein each flexible tubing is formed from a high density polyethylene plastic having an inner diameter of approximately ⅛ inch and a tubing wall thickness of approximately 3/**32** inch.

25. A testing device for use by an athlete in conjunction with an athletic club which is normally swung with a controlled force being applied to the handle of the club, the force being converted to a pressure which is transmitted to a pressure indicator, comprising:

a. an athletic club having an elongated handle portion comprising a central shaft and an elongated grip surrounding and spaced apart from the shaft for a greater portion of its length and having formed therebetween at least one pressure responsive, fluid containing, reservoir for accurately sensing the total pressure exerted by at least three fingers of the user's hand regardless of the position of the fingers on the grip;

b. a remotely located fluid pressure indicator; and

c. a predetermined length of flexible tubing connected to the reservoir on one end thereof and to the indicator at the other end thereof; said tubing also containing fluid and being sized so that its wall is sufficiently firm so as to not be compressible when a grip pressure is conveyed by the fluid and also being sized so that its wall is sufficiently strong to prevent tubing wall expansion when a grip pressure is conveyed, said tubing also being flexible enough to allow the user of the testing device to swing the club without impairing his normal swing.

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