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SIMPSON

(54) **TRAINING APPARATUS FOR A PROPER THROWING MOTION**

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(57) **ABSTRACT**

A training apparatus to assist users in building hand and arm strength while executing proper throwing motions, the apparatus comprises a generally non-linear gripping member and a generally non-linear weighted member tethered to the gripping member, the apparatus further comprising a loop for securing the training apparatus to the user's arm during use to preclude inadvertent release of the apparatus during use, wherein the length of the tether is mathematically derived from ratios of the user's body so that the tether causes the weighted member to be downwardly pulled a set amount of time after the user's hand has been downwardly directed when the user is using the apparatus in a throwing cycle.

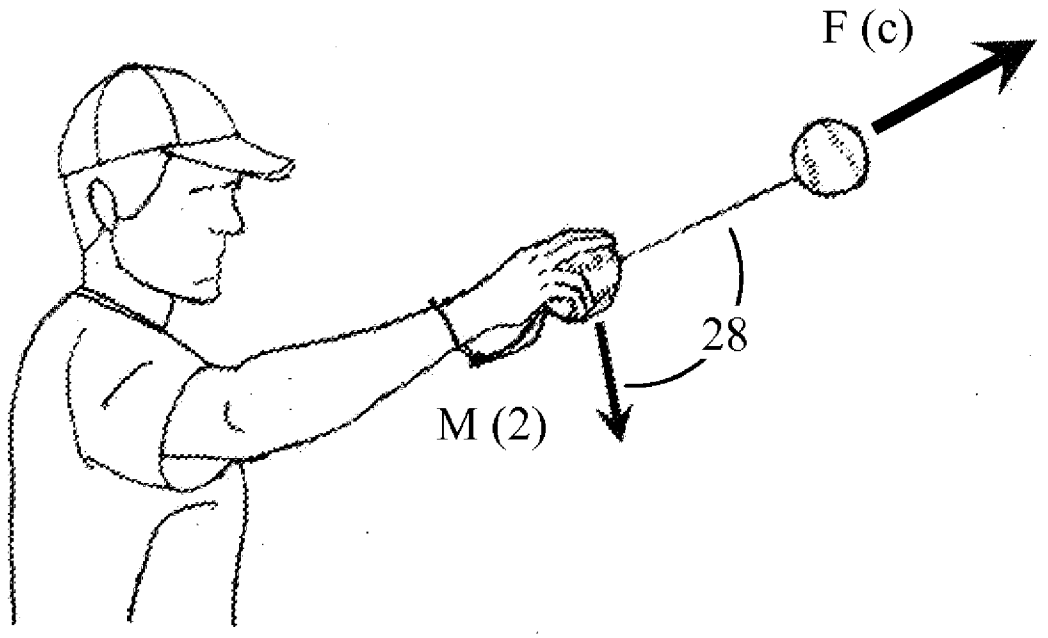


Fig 1 (A)

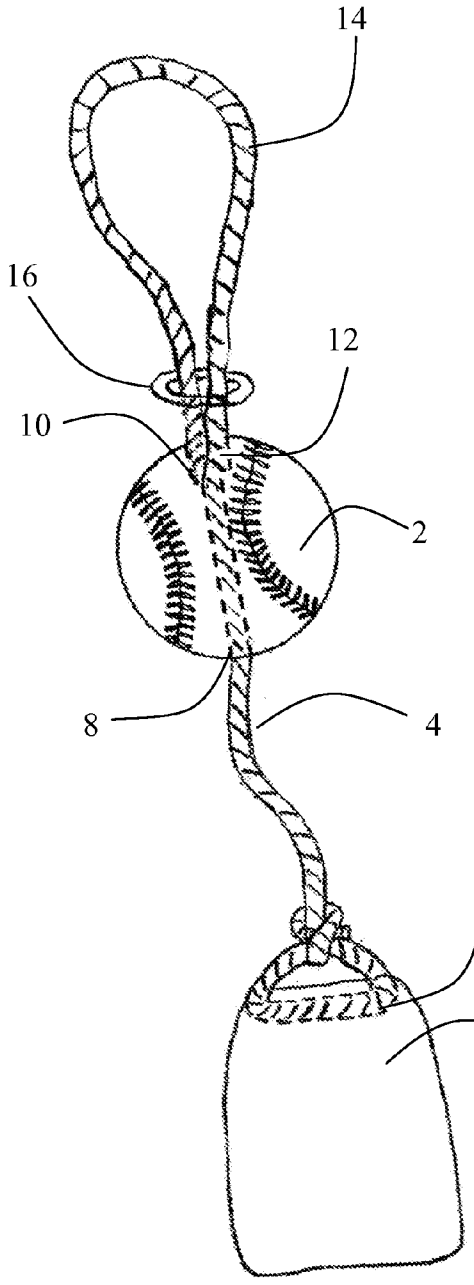


Fig 1 (B)

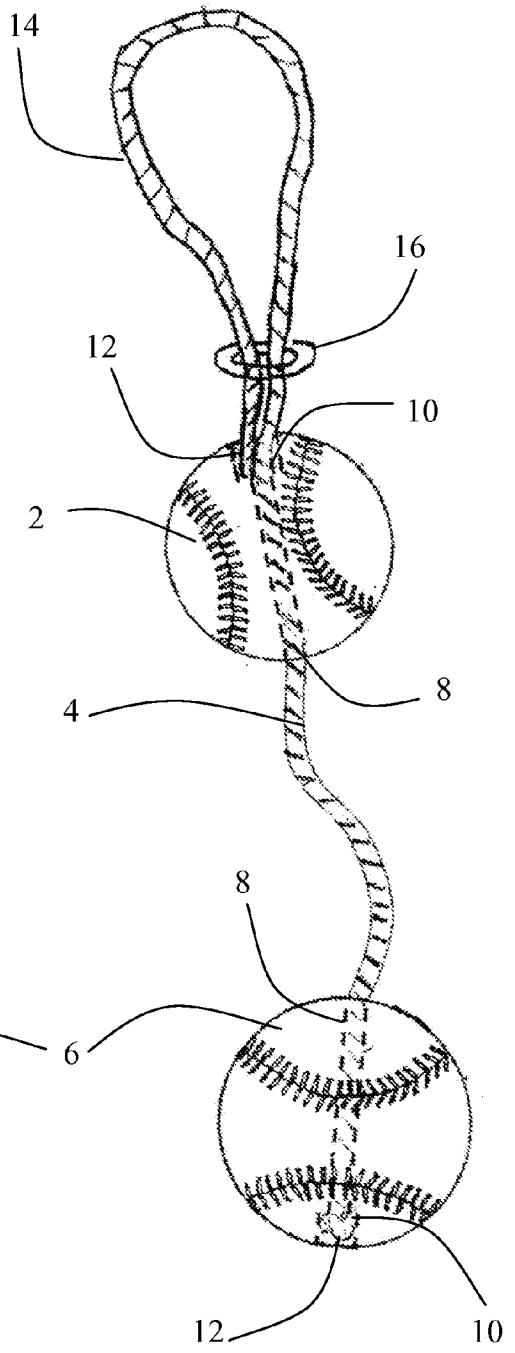


Fig 2 (A)

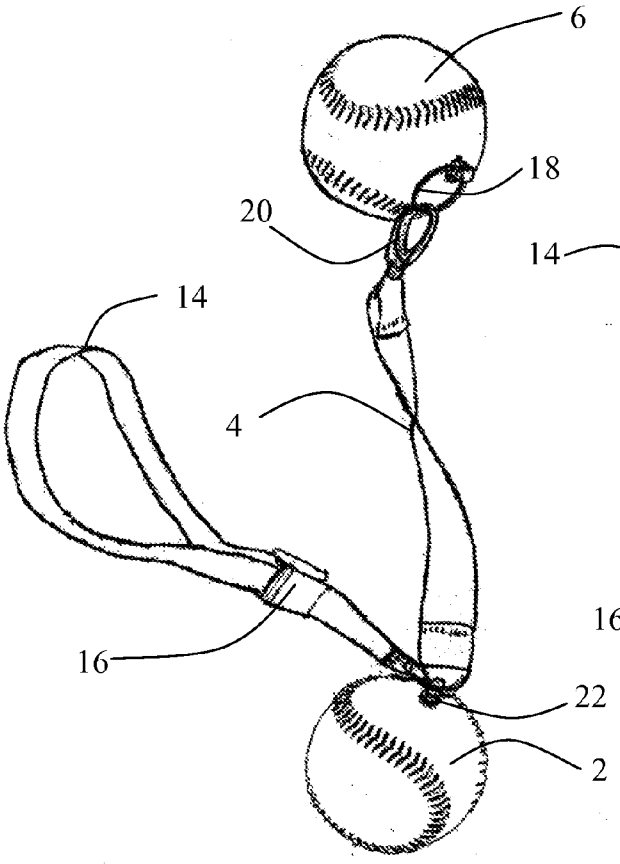
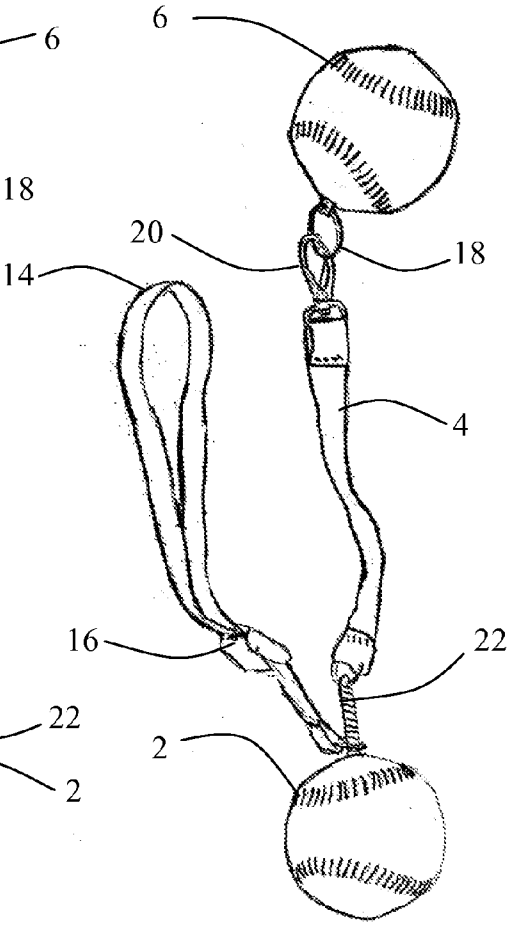


Fig 2 (B)



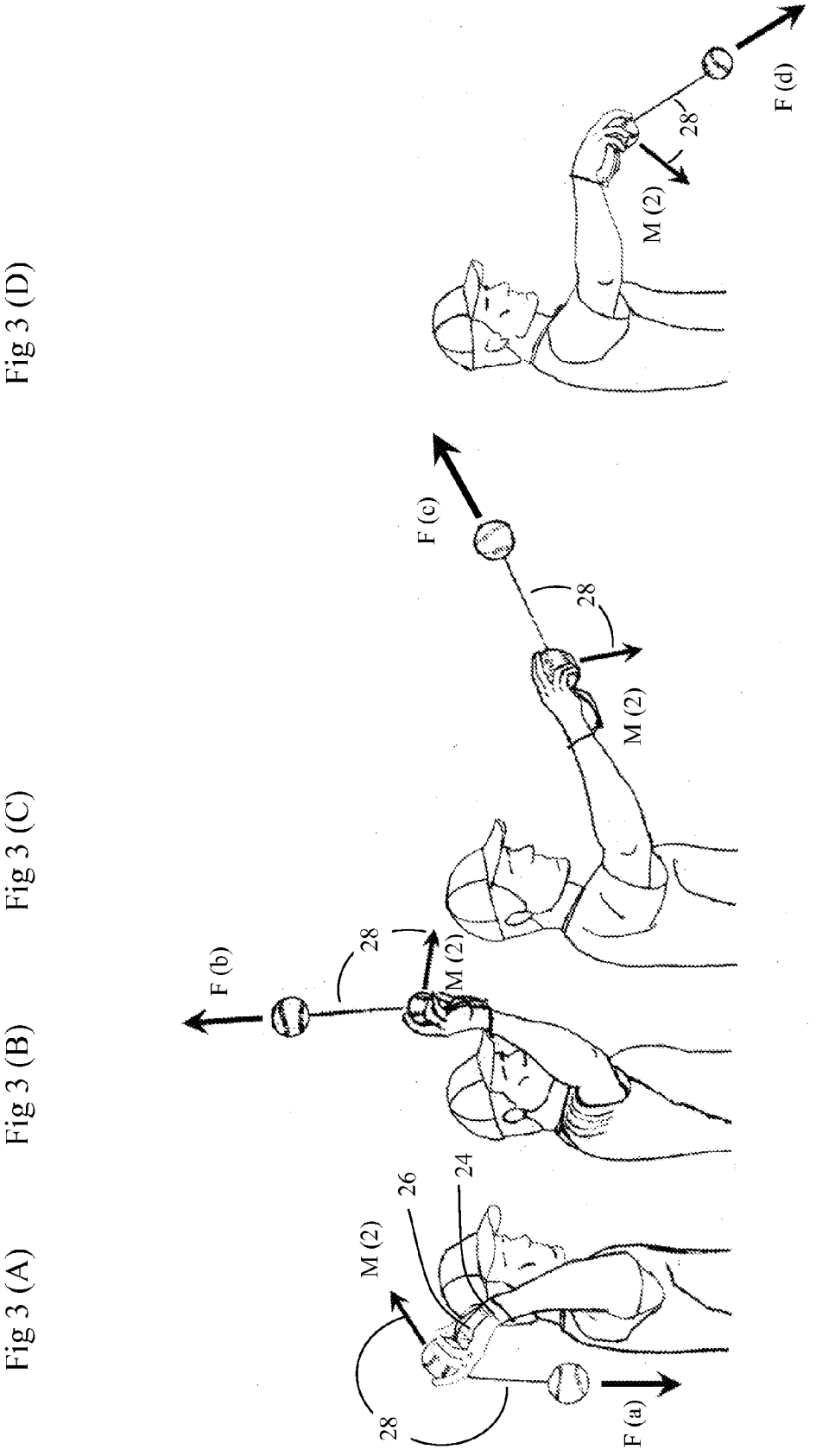


Fig 3 (A)
Fig 3 (B)
Fig 3 (C)
Fig 3 (D)
M (2)
26
24
28
F (a)
F (b)
F (c)
F (d)

TRAINING APPARATUS FOR A PROPER THROWING MOTION

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 61/442704 filed on Feb. 14, 2011.

STATEMENT REGARDING FEDERALLY FUNDED RESEARCH

[0002] Not applicable.

BACKGROUND

[0003] Athletes, regardless of age, who participate in a sport that requires the participant to throw a ball overhand with one hand need a means of refining their technique and strengthening their muscles and tendons required to accomplish the throws. Common arm injuries result from incorrect overhand throwing motions.

[0004] The present invention relates to a training device for baseball, softball or cricket comprised of a gripping member connected to a non-linear object by a short string, rope or cord. The device uses a short cord or tether attached to a non-linear object which is then attached to a gripping member that is used as a handle to perform a variety of exercises with the device.

[0005] This device uses the orbital properties of the tethered weight to provide resistance to the throwing motion. The resisting force has a continuously changing vector that more accurately simulates the stresses on the arm when throwing a ball and forces the user to grip the ball more firmly. Other devices provided no amplification of the centrifugal force that a baseball experiences during the throwing motion.

[0006] An object of the present invention is to provide coaches, parents, and athletes a means to show, test and develop proper throwing mechanics in any athlete. A further object of the present invention is to provide a means to strengthen all of the muscles and tendons used in conjunction with a proper overhand throwing motion. A further object of the claimed is invention is to aid in rehabilitation of injured shoulders and elbows as part of physical therapy. The apparatus provides a simple and compact device that can be used in most locations and at virtually any time. This will allow for the maximum flexibility for coaches, parents and athletes in their goal of teaching the athlete to execute a proper throw without causing injury to the athlete's arm.

[0007] Practice time is limited and extremely valuable. This device fits easily into a player's individual equipment bag and requires no set up time. The player is free to take the device virtually anywhere and use it at his/her whim. A large variety of exercises can be performed with the device that help with warm-up, throwing mechanics and the device provides a unique means for increasing the strength, accuracy and execution of most any given throw. There is no other device that provides such ease of use, flexibility and portability.

BRIEF DESCRIPTION OF THE FIGURES

[0008] The detailed description of some embodiments of the invention is set forth below with reference to the accompanying figures, wherein like numerals represent corresponding parts of the figures. Importantly, any gray-scale coloring reflected in the figures is strictly for the reader's ease of visibly distinguishing discrete components, rather than denoting any limiting feature or material.

[0009] FIG. **1**(A) is perspective view of a first embodiment.

[0010] FIG. **1**(B) is a perspective view of a second embodiment.

[0011] FIG. **2**(A) is a perspective view of a third embodiment.

[0012] FIG. **2**(B) is a perspective view of a fourth embodiment.

[0013] FIG. **3** is a depiction of the apparatus in use with the associated forces utilized to strengthen and train the user.

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

[0014] By way of example, and referring to FIG. **1***a* , one embodiment of the present invention comprises a tether **4** with first and second ends. Tether **4** may be fabricated from any appropriate string, cord, strap or rope with non-elastic properties.

[0015] The first end of tether **4** is connected to a non-linear object **6** at one end. Object **6** may be connected to tether **4** by any known means to do so safely and securely in view the forces sustained by the object when placed into actual use. Object **6** can be comprised of virtually any material, object or group of objects of sufficient mass comprising a non linear generally spherical or elliptical shape. It is preferred that the weight of object **6** is within the range of 3 ounces to 2 pounds.

[0016] The non-linear gripping member **2** is connected proximally to the second end which permits the user to grip the gripping member with the hand of his throwing arm to effectuate the exercises designed to build hand and arm strength while executing a proper throwing motion. Object **6** is permitted to orbit around gripping member **2**. The second end of tether **4** is threaded through aperture **8** and aperture **10** of gripping member **2** resulting in the formation of a loop **14**. It is preferred that aperture **10** is enlarged in comparison to aperture **8** to permit the attachment the second end of tether **4** after forming loop **14**. A knot or small anchor may be utilized to attach the second end of tether **4** within the recess of aperture **10**. The size of loop **14** is adjustable via means **12** commonly known in the art. Gripping member **2** can be comprised a generally non-linear spherical shape chosen from the group of a baseball member, softball or cricket ball.

[0017] The length of tether **4** between gripping member **2** and object **6** is within the range between 4 inches and 16 inches, with a preferred range between 6 inches and 10 inches.

[0018] Gripping member **2** may conform to the specifications of a gripping member in given sport in which the participants throw the gripping member with one hand. Non-limiting examples of such sports include baseball member, softball, and cricket ball. Gripping member **2** may be comprised of any material provided that it loosely conforms to the size of the gripping member used in a given sport. For example, if the device is constructed to train for baseball, a rubber or other material may be substituted for a regulation baseball to comprise the gripping member **2**. This process provides for different textures and firmness of the gripping member **2**.

[0019] Referring to FIG. **1***b*, an alternate embodiment of the present invention substitutes an identical shaped ball in lieu of the generally non-linear object **6**. The substituted nonlinear object in lieu of object **6** is attached to the first end

of tether **4** by is threaded through aperture **8** and aperture **10** of gripping member **6**. It is preferred that aperture **10** is enlarged in comparison to aperture **8** to permit the attachment of the first end of tether **4**. A knot or small anchor may be utilized to attach the first end of tether **4** within the recess aperture **10**.

[0020] Referring to FIGS. **2***a* and **2***b*, tether **4** is mechanically fastened to gripping member **2** and object **6**. Loop **14** is likewise mechanically fastened to gripping member **2** using means commonly known to a person of ordinary skill in the art.

[0021] Referring to FIG. **3** which depicts utilization of the present invention. Gripping member **2** provides the user a means to grip the device. Gripping member **2** is gripped by the fingers and not held in the palm of the hand to strengthen the user's fingers, hand and overall grip. As the user grips gripping member **2** and simulates a throwing motion, the weight **6** is pulled away from the gripping member **2** by centrifugal force thereby providing resistance to the throwing motion.

[0022] The forces provided by the tethered object **6** are outlined in FIGS. **3**(A) though **3**(D). In FIG. **3**(A), the force provided by object **6** is simply the weight of the gripping member itself. F(a) is equal to the mass of object **6** times the gravitational constant (g), or F(a)=M*(g).

[0023] The exercise shown in FIGS. **3**(A) through **3**(D) is the simplest of many that can be performed with the apparatus. The user is instructed to hold his elbow still and rotate his forearm forward about the elbow while flexing his wrist forward. The torque provided by the motion of the wrist and forearm pull gripping member **2** forward and start object **6** in an orbital path around gripping member **2**. The forces exerted on gripping member **2** by object **6** are centrifugal forces as depicted in FIGS. **3**(B), **3**(C), and **3**(D). The forces in FIGS. **3**(B) through **3**(D) are label as F(b), F(c), and F(d) in each respective figure. Gripping member **2** will "orbit" about the elbow and object **6** will orbit about the gripping member **2**. Object **6** will exert a centrifugal force on gripping member **2**. The direction of the centrifugal force is exerted along the attaching tether, through the object **6**. Refer to FIGS. **3**(A) through **3**(D). The exercise shown is continuous. FIG. **3**(A) is the starting point and the user causes the gripping member **2** to travel through the path shown in FIGS. **3**(A) through **3**(D). The user then stops the rotation of the forearm about the elbow at the point shown in FIG. **3**(D) and reverses the motion returning the gripping member **2** to the original position.

[0024] The forces F(a) through F(d) exerted on the gripping member **2** by the object **6** are depicted in FIGS. **3**(A) through **3**(D). In FIG. **3**A, F(a) is defined as the force of gravity on the tethered object. This force, F(a) will have the effect of pulling the user's elbow in the downward direction and causes the user to exert sufficient force on the gripping member **2** to start object **6** into an orbital path about the gripping member **2**. F(a) and the inertia of object **6** provide a resisting force to the motion of the gripping member **2** initiated by the user. In FIGS. **3**B through **3**D, the forces F(b), F(c) and F(d) are centrifugal forces plus or minus the component forces of gravity F(a) . In FIGS. **3**B through **3**D, forces F(b), F(c) and F(d) actually help the user to maintain proper throwing form while exercising with the device. In FIGS. **3**B and **3**C, force F(b) and F(c) help to keep the user's elbow at or about shoulder height while the user has to apply force to keep the gripping member **2** moving in a circular motion about his elbow. In FIG. **3**D, force F(d) stops the user from "short arming" the throw which allows the user to develop a complete arm motion thereby developing greater velocity when a ball is actually thrown. At the end of the forward simulated throwing motion, the user must reverse the direction of travel of gripping member **2** and return gripping member **2** to its original position. The forward simulated throw is conducted at approximately 50% to 90% of actual speed depending on the strength of the user and the exercise being performed. The return stroke is generally performed at a slower pace. Because the forearm is now in the horizontal position, the elbow dip and move slightly backwards. The motion induced in the elbow is small when the weight, or mass of object **6** is appropriate for the strength of the user. The user is instructed to keep his elbow still throughout the exercise. In use, the user's elbow is seen to dip slightly at the start of the forward stroke and move slightly backward at the start of the return stroke. Holding the elbow in the same approximate position while conducting the exercise in resisting forces provide by the motion of the object **6** strengthens the user's shoulder cuff and associated muscle groups at or about the positions show in FIGS. **3**(A) and **3**(D). To some extent the force provided by the motion of object **6** forces the user's wrist though the complete range of motion from FIGS. **3**(A) to **3**(D). The muscle memory gained by the user while using this device is retained at a very high level. A young player who "short arms" the ball when actually throwing a baseball can be quickly trained to use a longer and more ergonomically correct arm motion by using the device

[0025] The user must overcome the forces provided by object **6** to complete the simulated throw while using the device and the device will force the user's wrist through its full range of motion. Many players attempt to throw a baseball with a stiff wrist. The combination of a stiff wrist, throwing with a "short arm" and trying to throw the ball hard leads to the vast majority of arm injuries that occur in youth baseball.

[0026] A general range length for a person with a height between **4'4"** to **6'6"** of tether **4** is between 6 inches to 10 inches. An attaching tether shorter than 6 inches will cause object **6** to orbit gripping member **2** quicker than a longer attaching tether. This will change the timing and direction of forces F(b), F(c) and F(d). If the attaching tether **4** is longer than 10 inches the object **6** lags behind the gripping member and does not require the user to flex the wrist as drastically as depicted in FIG. **3**(*c*). During the forward stroke of the simulated throw, when the users reaches the position approximately half way between FIGS. **3**(B) and **3**(C) the user must flex his wrist to pull down on the gripping member. This action is highly coveted by most coaches of the game. It is this action that will cause a thrown gripping member to rotate backwards thereby causing a four seam fastball to rise, and a long throw across the infield to remain relatively flat.

[0027] A preferred length of tether **4** to match a specific body size is calculated using approximately half the length of user's arm measured from the tip of the outstretched fingers to the point of the elbow. A more accurate method to determine the optimal length of the tether for a specific body for players greater than eight years of age, is to measure the length from the users wrist joint to the center of mass of gripping member **2**. In general, two times this measurement equals the distance between the center of mass of gripping member **2** and the center of mass of object **6**. If the radius of gripping member **2** or the tethered object **6** is larger than the radius of a baseball, the length of the tether must be reduced to maintain the integrity of the exercises. Note that it is preferred to keep the

length of tether as long as possible within an individual users measured range because the path of object **6** should be unhindered and free to assume an orbital path about gripping member **2**. The tether length is calculated using the following formula: TL=(2*L)−[R(**1**)+R(**2**)] in which the factors are defined as follows: (L) is the distance measured from the users wrist joint to the center of mass of gripping member **2**; R(**1**) is the radius of gripping member **2**; R(**2**) is the radius of the tethered object **6**, or the distance from the center of mass of the tethered object **6** to the connection point of the tether; and TL is the length of the tether. The length of the attaching tether may be made adjustable within the preferred range by any known means.

[0028] In FIGS. **3**(A) through **3**(D), the angle that exists between the momentary direction of motion of the gripping member **2** (identified as "M(**2**)") and the force vector exerted on the gripping member **2** by the weight **6** will be call the "angle of attack" **28**. When the angle of attack **28** is obtuse, greater than ninety degrees, the net force provided by object **6** F(a), F(b) and F(c) resist the users efforts to move the gripping member through the simulated throw by virtue of creating a drag force. When the angle of attack **28** is acute, as shown in FIG. **3**(*d*), the force F(d) pulls the gripping member **2** forward in the throwing motion. The force F(d) exerted by object **6** causes the user's wrist to travel through its full range of motion and allows the user to decelerate the motion of the object **6**.

[0029] The range of weights for object **6** can be from **2** ounces for initial rehabilitation of injuries to several pounds for strength training of professional athletes. The most common weights will be between **3** ounces and one pound.

[0030] In yet another embodiment depicted in FIGS. **2**A and **2**B, the torque exerted by any given object **6** on the user's wrist **24** may be adjusted by the inclusion of an extendable tether attachment mechanism **22**. In FIG. **2**(A), the extendable attachment **22** is shown in the retracted position. In FIG. **2**(B), the extendable attachment **22** is show in its extended position. In the extended position, the extendable attachment **22** acts as a lever arm and causes the user's wrist to exert a greater torque about the gripping member to execute a simulated throw.

[0031] The gripping member **2** is not released by the user. This allows the user to simulate multiple throws at one half to close to full speed in a short period of time. The tethered path of the object **6** indicates to the user and an outside observer the degree to which the user is performing a proper throwing motion.

[0032] A large number of exercises or drills can be performed with the device. Two of the most useful are outlined below.

[0033] 90-90 Exercise: Referring to FIG. **3**, the user stands in an upright position with his feet at shoulder width and toes pointing forward. The user grips gripping member **2** using finger tips only similar to a four seam fastball. The user raises his elbow to shoulder height with his forearm in a vertical position, generally 90 degrees from the upper arm. The user's wrist should be flexed slightly backward. Object **6** rests approximately one inch behind the user's forearm. The remainder of the user's body should be held as motionless except his wrist and forearm which is performing the exercise. User will rotate his forearm approximately 90 degrees in relation to his elbow while simultaneously flexing his wrist forward causing object **6** to orbit around gripping member **2**. The return orbit of gripping member **2** is accomplished by flexing the wrist in the opposite direction returning forearm and the wrist to the original position. This exercise strengthens the forearm, rotator cuff, wrist and hand, and teaches the proper throwing mechanics.

[0034] Simulated Throw Exercise: The user stands in an upright position with his feet slightly wider than shoulder width and toes pointing forward. The user grips gripping member **2** like a four seam fastball. Gripping member **2** is held in the user's fingers and not in the palm of the hand. The user raises his elbow to shoulder height with his forearm in a vertical position relative to the ground. The user then points his glove hand in the direction of the intended target had the gripping member been actually thrown. The target should be approximately 90 degrees from the relative location of the user's toes. The user then takes a limited step forward in the direction of the intended target. Gripping member **2** start its path of travel from the approximate height of the user's ear and ends to the outside of the user's knee that should now be pointed at the target of the simulated throw. In all of these exercises, the path of the tethered object indicates if the exercise is being preformed correctly.

[0035] Alternative embodiments are contemplated without departing from the spirit of the invention described and claimed herein.

What is claimed is:

1. A training apparatus to assist users in building hand and arm strength while executing proper throwing motions, the apparatus comprising a generally non-linear gripping member and a generally non-linear weighted member tethered to the gripping member, the apparatus further comprising a loop for securing the training apparatus to the user's arm during use to preclude inadvertent release of the apparatus during use, wherein the length of the tether is mathematically derived from ratios of the user's body so that the tether causes the weighted member to be downwardly pulled a set amount of time after the user's hand has been downwardly directed when the user is using the apparatus in a throwing cycle.

2. The apparatus of claim **1**, wherein said weighted member is within the range of 3 ounces to 2 pounds.

3. The apparatus of claim **1**, wherein said loop is adjustable.

4. The apparatus of claim **1**, wherein said gripping member is chosen from the group comprising a baseball, a softball or a cricket ball.

5. The apparatus of claim **1** wherein said tether between said gripping member and said non-linear object is between six inches to twelve inches in circumference.

6. The apparatus of claim **1** further comprising a tether connection mechanism for connecting the tether to the gripping member wherein the connector permits extension of the tether length.

* * * * *