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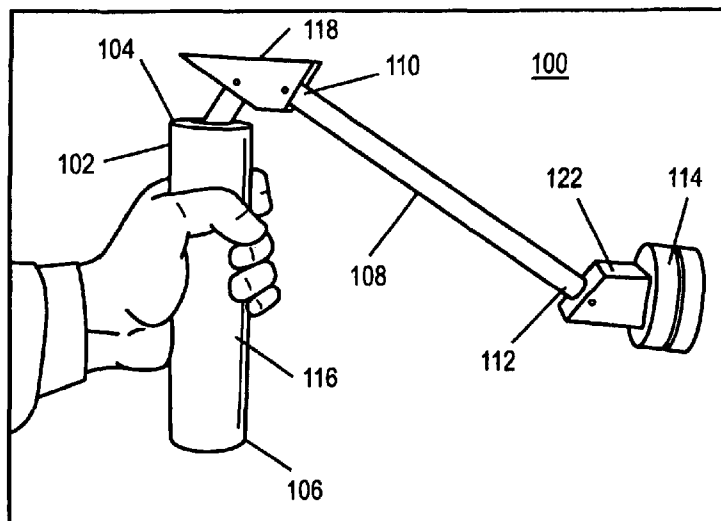
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(54) **Title:** OFFSET WEIGHT EXERCISE DEVICE AND METHODS OF USE THEREOF



(57) **Abstract:** Offset weight devices and methods of use. Some devices including a handle having a beveled end, an arm attached to the handle and at least one weight attached to the arm. Other devices include a central handle, a frame circumscribing at least part of the outer edge of the central handle, a rope or cable affixed to the frame, and at least one weight affixed to the rope or cable. The methods include holding an exercise device having a handle and at least one offset weight in a hand, and performing a fundamental upper extremity exercise. Other methods include determining an exercise protocol by evaluating a physical skill to determine fundamental motions associated with the skill and specifying an exercise using an offset weight device. Also included is a system for exercising with an offset weight device having a measuring device to measuring the results of using the offset device.

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## OFFSET WEIGHT EXERCISE DEVICE AND METHODS OF USE THEREOF

## BACKGROUND

## FIELD OF THE INVENTION

5           The invention is generally directed to the field of exercise devices and particularly to exercise devices having an offset weight and methods of using the exercise devices.

## DESCRIPTION OF THE RELATED ART

          In the following discussion certain articles and methods will be described for background and introductory purposes. Nothing contained herein is to be construed as an  
10   “admission” of prior art. Applicant expressly reserves the right to demonstrate, where appropriate, that the articles and methods referenced herein do not constitute prior art under the applicable statutory provisions.

          In the field of upper extremity rehabilitation, delivering the highest quality of care possible to an injured person is very important to help the person regain as much functional  
15   strength as possible, as soon as possible. It is important that a therapist be able to rehabilitate the injured person with equipment that exercises the relevant musculoskeletal groups in very specific ways that are known to induce faster recovery. In particular, it is beneficial to exercise with a consistent resistance throughout the full functional range of motion and apply good torque at key points in the range of motion for developing functional strength. Working  
20   a patient against resistance through the full functional range of motion is an important component of proper form. Exercises should be taken through the complete range of joint movement in a slow controlled manner, with emphasis placed on the completely contracted position. If the rehabilitation device does not provide forces throughout the full functional range, form is compromised. Full range of motion exercises contract and strengthen the  
25   muscle being worked (the prime mover) and stretch the opposing (antagonist) muscle. This contributes to both muscle strength and joint flexibility.

          The fundamental exercises of upper extremity rehabilitation from the elbow joint up to the fingers are: eccentric and concentric (1) flexion, (2) extension, (3) supination, (4) pronation, (5) ulnar deviation and (6) radial deviation. Flexion is bending the hand forwards  
30   towards the palm. Extension is the opposite of flexion, that is, bending the hand backwards towards the back of the hand. Supination is opening the fist (turning it up towards the sky). Pronation is the opposite of supination, that is, closing the fist (turning it down towards the

ground). Ulnar deviation is bending the fist outwards towards the ulna, the outside bone of the forearm (when looking at the back of the hand). Radial deviation is the opposite of ulnar deviation, that is, bending the fist inwards towards the radius, the inside bone of the forearm. Eccentric means lowering weight while concentric means lifting weight (i.e. concentric  
5 supination would be lifting weight while supinating).

High quality equipment for performing these exercises has been developed with a characteristic of providing forces throughout full range of motion. These high quality devices often utilize some variation of a handle coupled to an external pulley resistance mechanism. This is the characteristic mechanism of high-end Nautilus machines, for example. Another  
10 example of such an apparatus, called the Multi Wrist™, is shown in Figure 1. Figure 2 illustrates each fundamental exercise being performed on the Multi Wrist™ device.

Rehabilitation with high-end equipment promotes faster recovery of injured muscles. This type of rehabilitation equipment is, however, difficult and expensive for use outside of clinic. This is especially true for military use abroad in theaters of conflict such as Iraq and  
15 Afghanistan. Due to the large size, high-end equipment is difficult and cumbersome to deploy. Further, because high-end equipment has so many moving parts, it requires regular maintenance, special handling, and is easily damaged with rough handling and without proper care. Additionally, due to high cost and size, high-end equipment is impractical for widespread distribution.

Moreover, rehabilitation with this type of equipment requires bringing the injured person in to a rehab clinic, a geographic constraint requiring presence in and transportation to and from the clinic site. This is often very difficult and cumbersome, because many people with minor conditions such as moderate elbow, wrist, or hand tendonitis often do not feel their conditions are severe enough to keep them from working for a trip to a rehab clinic.  
25 Many soldiers with apparently minor injuries do not feel their conditions are severe enough to keep them from deploying on a mission for a trip to a rehab clinic. For soldiers, it is important they be in optimal condition - a soldier's activity can be very physically demanding, and a condition that prevents them from seamlessly performing the fundamental motions of the wrist would impair their ability in the heat of battle. It is currently, however,  
30 difficult for physical and occupational therapists to address this problem with high-quality rehab equipment being so bulky and difficult to deploy. Additionally, because such equipment is designed only for in-clinic use, many people are unable to enjoy the benefits of

high quality rehab when they are away from the clinic, and cannot enjoy the benefits of high-quality exercise between visits.

Due to these constraints, therapists often cannot use high-quality therapeutic devices to rehabilitate soldiers, and have no choice but to use practical alternatives that are less effective, such as, for example, a hammer as shown in Figure 3. A patient can grasp the handle of a hammer and rotate his or her wrist to perform the fundamental exercises utilizing the hammerhead as a weight/resistance source. Some clinics also use a vertical shaft with a handle on one end and adjustable weights positioned distal to the fist. This at least gives a therapist the option of adjusting the level of resistance.

Although much less expensive and more convenient, there is a significant gap in terms of quality and consistency of the forces provided between high-quality machinery such as the Multi Wrist™ and the hammer or vertical shaft with adjustable weights. With a vertical shaft there are several significant problems. Injury of the upper extremity is often followed by atrophy of the relevant muscle groups, typically as a result of a period of immobilization that can result from casting, bracing, or general inactivity. Atrophied muscles need to be worked throughout their full range of motion to gain strength throughout the full range of motion. This is particularly important for the ranges of motion where the muscles spend most of their time. Soldiers, as well as civilians, typically spend most of their day with their forearms/wrists in neutral and near-neutral position, such as, for example, between the positions illustrated in Figures 4a (supination), 4b (neutral) and 4c (pronation).

It is advantageous that injured workers and soldiers regain strength within the range of motion illustrated in Figure 4. It is a known that to gain strength within a particular functional range, one must work against resistance in that particular functional range. For example, for a patient to regain functional strength throughout a broad range of motion, the patient has to strength train against a force *throughout* that broad range of motion. If they do not, they will be functionally weaker at the ranges where they did not strength train. For example, if after an injury, the patient only works his biceps by doing bicep curls starting with the arm straight down and then stopping at 90° rather than curling through a complete 180°, the patient will not enjoy the benefit of stronger muscles for much of the remaining 90° because the muscle fibers have not been strengthened for that region. The patient is functionally weak in this region compared to their strength in the region in which they performed resistance training. In areas where the patient has not been strength trained, the

patient will be weak. This leads to the very serious issue of improper recovery that can lead to long-lasting pain and a higher chance of re-injury. The same is true for any range of motion that is not performed. For best results, the patient should preferably work against resistance within the full range of motion. A vertical weight does not provide this.

5           Figures 5a-5c and 6a-c illustrate why vertical weights do not yield the high-quality therapeutic results provided by high-quality in-clinic equipment. Although this is much cheaper, there is an enormous gap in terms of quality and consistency of the forces provided between high-quality machinery and the hammer or vertical shaft with adjustable weights. In the neutral position (Figure 5b, 6a), the gravity vector does not induce rotation at all. In fact,  
10 the vertical weight device only provides an adequate torque at positions, unluckily, outside the most desired range of motion (beyond the limits illustrated in Figure 5A and 5C). Thus within the range of motion illustrated in Figures 5a-5c, the patient is getting very little in terms of strength training.

          When an individual grasps the handle of an exercise apparatus with configuration as  
15 shown in Figure 6a in preparation of, for example, eccentric pronation, the weight is initially positioned above the fulcrum, the wrist joint. In this position, rotation of the fulcrum is not induced. Rather, the exercise apparatus is predisposed towards falling through one's fist directly downwards. The inability to induce rotation is illustrated with the arrow showing the force  $F$  in Figure 6a, which is the force created by the interaction of gravity and the mass of  
20 the weight and the lack of a moment arm. This can be a problem, because during the course of rotation, there is initially no significant induction of rotation. Then, as the position of the exercising system reaches a configuration as depicted in Figure 6b, induction of rotation exists, as evidenced by the development of a moment arm  $L$ . The torque, however, is still very little.

25           When the position of the exercise system reaches a configuration as depicted in Figure 6c, further into the motion of the exercise, significantly more induction of rotation is felt. At this position, there is a significant moment arm  $L$ , and therefore appreciable torque. This is in stark contrast to the tiny induction of rotation felt with the configuration as shown in Figure 6a. This extreme variation does not provide a consistent exercise. Consistent  
30 induction of pronation in the initial position as shown in Figure 1 is critical for a thorough and consistent exercise that properly induces pronation of the wrist throughout the exercise of eccentric pronation (as well as concentric supination). Similarly, consistent induction of

supination throughout the eccentric supination exercise and the concentric pronation exercise is critical for a thorough and consistent exercise that properly works out an individual. In particular, consistent exercises are preferable for an individual in need of wrist rehabilitation therapy.

5           The inability of a vertical weight device to provide meaningful strength building exercise in the desired range has severe implications for the typical person, that is, a person who spends most of their time with their wrists and hands in the neutral to near-neutral range (such as, for example, 45° into supination or pronation with neutral being 0°). A hammer does, however, have the advantage of being rapidly deployable, durable, and portable. Thus  
10 it is a very common feature in most rehab clinics despite its lack of effectiveness.

          For many sports, there are a number of skills for which strong wrist and hand muscles are advantageous. As discussed above, the simple vertical exercise device cannot efficaciously strengthen these muscles. Further, unless the athlete has unfettered access to high-end machines such as the Multi Wrist™, the athlete faces several problems. First,  
15 without the ability to regularly exercise throughout the full range of motion, it is difficult for the athlete to enhance performance. Second, weakness in these muscle groups leave an athlete more prone to injury than if they had a practical method to strength train these muscles.

          For a soldier in the infantry, operating virtually any type of military equipment is  
20 rendered extremely difficult without the ability to perform pronation, supination, ulnar deviation and radial deviation with one's hands and wrists. In the heat of battle, it is important that these movements with the wrists to carry out basic activities (such as holding and operating a gun and loading ammunition) can be performed seamlessly and without pain. The effect of an inability to move the hands and wrists freely and without pain is seen clearly  
25 after analyzing how much a soldier has to pronate, supinate, ulnar and radial deviate his/her hand to operate a firearm. Additionally, it is important military personnel have and maintain proper hand and wrist function so that they can utilize keyboard and mouse interfaces seamlessly and without pain. The keyboard and mouse interfaces common in the majority of most computers are also rendered extremely difficult to use with injuries that limit these  
30 movements. In addition, wrist pain is notorious for being so pervasive in that it affects such a significant portion of the activities one has to perform that it may reduce the mental clarity of the patient. The patient may even refrain from performing motions that cause pain. This can

vastly diminish the patient's quality of work. Further, this can be frustrating and lead to a vicious cycle of diminished image of self-worth because the soldier understands that without full function of their hands, they are physically capable of far less.

5 Presently, there is a need for an exercise product that provides resistance over a full range of motion yet is mechanically simpler, smaller and cheaper than the high-quality in-clinic rehabilitation equipment currently available. Preferably, the product is highly portable and can be used outside a clinic.

#### SUMMARY OF THE INVENTION

10 An embodiment of the present invention provides an exercise device comprising a handle having a first end and a second end, wherein the first end is beveled; an arm having a first end and a second end, wherein the first end of the arm is attached to the first end of the handle; and at least one weight attached to the second end of the arm.

15 An embodiment of the present invention also provides a method of exercising comprising holding an exercise device in a hand, the exercise device comprising a handle and at least one offset weight; and performing a fundamental upper extremity exercise.

An embodiment of the present invention also provides an exercise device comprising a central handle; a frame circumscribing at least part of the outer edge of the central handle; a rope or cable having a first end affixed to the frame; at least one weight affixed to a second end of the rope or cable, wherein the at least one weight is offset from the handle.

20 An embodiment of the present invention also provides a method of determining an exercise protocol comprising evaluating a physical skill to determine fundamental motions associated with the skill; and specifying an exercise using an offset weight device, wherein the exercise comprises a specific combination of yaw, pitch, and roll of the offset weight device.

25 An embodiment of the present invention also provides a system for exercising comprising an offset weight device; and a measuring device to measuring the results of using the offset device.

An embodiment of the present invention also provides an exercise device comprising a means for holding; a means for providing an offset weight; and an offset weight.

Additional features, advantages, and embodiments of the invention may be set forth or apparent from consideration of the following detailed description, drawings, and claims. Moreover, it is to be understood that both the foregoing summary of the invention and the following detailed description are exemplary and intended to provide further explanation  
5 without limiting the scope of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate preferred embodiments of the invention and together with the detailed description serve to  
10 explain the principles of the invention. In the drawings:

Fig. 1 is a photograph of a prior art device.

Fig. 2 is a series of photographs illustrating the use of the device of Fig. 1.

Fig. 3 is a photograph of another prior art device

Fig. 4 is a series of photographs illustrating a desired range of motion.

15 Fig. 5 is a series of photographs illustrating defects in use of a prior art device.

Fig. 6 is a series of schematic diagrams illustrating defects in use of the prior art device of Fig. 5.

Fig. 7 is a photograph of an embodiment of the invention.

Fig. 8 is a photograph of an embodiment of the invention

20 Fig. 9 is a schematic diagram of an embodiment of the invention.

Fig. 10 is a schematic diagram of an embodiment of the invention.

Fig. 11 is a schematic diagram of an embodiment of the invention.

Fig. 12 is a pair of photographs illustrating a pronation exercises through a significant portion of the range of full functional range, including extremes to quickly bringing a racket  
25 back.

Fig. 13 is pair of photographs illustrating an exercise specifically suited for extreme ranges for quickly bringing a racket back.

Fig. 14 is pair of photographs illustrating another exercise specifically suited for extreme ranges for quickly bringing a racket back.

5 Fig. 15 is pair of photographs illustrating an offset weight for half the range for quickly bringing a racket back.

Fig. 16 is pair of photographs illustrating an offset weight for other half of the range for quickly bringing a racket back.

10 Fig. 17 is pair of photographs illustrating a slightly more offset weight for half the range for quickly bringing a racket back.

Fig. 18 is pair of photographs illustrating a slightly more offset weight for other half of the range for quickly bringing a racket back.

15 Fig. 19 is pair of photographs illustrating ulnar deviation exercises through a significant portion of the range of the full range, including extremes for quickly bringing a racket back.

Fig. 20 is pair of photographs illustrating ulnar deviation exercises through a range of the full range, including extremes for quickly bringing a racket back.

Fig. 21 is pair of photographs illustrating ulnar deviation exercises through a range of the full range, including extremes for quickly bringing a racket back.

20 Fig. 22 is pair of photographs illustrating an exercise with a perpendicular weight for majority of full range for a powerful snap throughout the range of motion.

Fig. 23 is pair of photographs illustrating an exercise with a slightly angled weight for extreme ranges for a powerful snap throughout the range of motion.

25 Fig. 24 is pair of photographs illustrating an exercise with a slightly angled weight for half the range for a powerful snap throughout the range of motion.

Fig. 25 is pair of photographs illustrating an exercise with a slightly angled weight for other half of the range for a powerful snap throughout the range of motion.

Fig. 26 is pair of photographs illustrating an exercise with a slightly more angled weight for half the range for a powerful snap throughout the range of motion.

Fig. 27 is pair of photographs illustrating an exercise with a slightly more angled weight for other half of the range for a powerful snap throughout the range of motion.

5 Fig. 28 is pair of photographs illustrating an exercise with a slightly more angled weight for other half of the range for full range for a powerful snap throughout the range of motion.

Fig. 29 is pair of photographs illustrating an exercise with a perpendicular weight for full range for a powerful snap throughout the range of motion.

10 Fig. 30 is pair of photographs illustrating an exercise with a slightly angled weight for full range for a powerful snap throughout the range of motion.

Fig. 31 is pair of photographs illustrating an exercise with a slightly more angled weight for full range for a powerful snap throughout the range of motion.

15 Fig. 32 is pair of photographs illustrating an exercise with a perpendicular weight through range 1 for generating momentum to meet the ball.

Fig. 33 is pair of photographs illustrating an exercise with a slightly angled weight through range 1 for generating momentum to meet the ball.

Fig. 34 is pair of photographs illustrating an exercise with a slightly more angled weight through range 1 for generating momentum to meet the ball.

20 Fig. 35 is pair of photographs illustrating an exercise with a perpendicular weight through range 1 for generating momentum to meet the ball.

Fig. 36 is pair of photographs illustrating an exercise with a slightly angled weight through range 1 for generating momentum to meet the ball.

25 Fig. 37 is pair of photographs illustrating an exercise with a slightly more angled weight through range 1 for generating momentum to meet the ball.

Fig. 38 is pair of photographs illustrating an exercise with a perpendicular weight through range 2 for powerful follow through.

Fig. 39 is pair of photographs illustrating an exercise with a slightly angled weight through range 2 for powerful follow through.

Fig. 40 is pair of photographs illustrating an exercise with a slightly more angled weight through range 2 for powerful follow through.

5 Fig. 41 is pair of photographs illustrating an exercise with a perpendicular weight through range 2 for powerful follow through.

Fig. 42 is pair of photographs illustrating an exercise with a slightly angled weight through range 2 for powerful follow through.

10 Fig. 43 is pair of photographs illustrating an exercise with a slightly more angled weight through range 2 for powerful follow through.

Fig. 44 is pair of photographs illustrating an exercise with a perpendicular weight for range to get back into the ready position for training for powerful snap back to ready position after follow-through.

15 Fig. 45 is pair of photographs illustrating an exercise with a slightly angled weight for range for back into ready position for training for powerful snap back to ready position after follow-through.

Fig. 46 is pair of photographs illustrating an exercise with a slightly more angled weight for range for back into ready position for training for powerful snap back to ready position after follow-through.

20 Fig. 47 is pair of photographs illustrating an exercise with a slightly angled weight for range for back into ready position for training for powerful snap back to ready position after follow-through.

25 Fig. 48 is pair of photographs illustrating an exercise with a slightly more angled weight for back into ready position for training for powerful snap back to ready position after follow-through.

Fig. 49 is pair of photographs illustrating an exercise for training for strong relationships between the muscle groups one needs to have a strong working relationship between to perform any given key skill.

Fig. 50 is pair of photographs illustrating the ready position for a single-handed tennis forehand with topspin.

Fig. 51 is pair of photographs illustrating the ready position to starting position for a single-handed tennis forehand with topspin.

5 Fig. 52 is pair of photographs illustrating the starting position to point of contact with ball for a single-handed tennis forehand with topspin.

Fig. 53 is pair of photographs illustrating the point of contact with ball to follow through to the end for a single-handed tennis forehand with topspin.

10 Fig. 54 is pair of photographs illustrating the point to stop motion with agility and stability to reorient oneself for next skill for a single-handed tennis forehand with topspin.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

The present inventors have discovered that the problems associated with conventional exercise devices can be advantageously overcome with an offset weight exercise device, especially in conjunction with strategic protocols with which to utilize an offset weight  
15 exercise device. The inventors have developed inexpensive and portable, yet highly effective tools and methods for working upper extremity muscles such as those in the hands, wrists and arms. The invention can be used to rehabilitate injured muscles or strengthening healthy muscles. The invention is particularly advantageous for soldiers and athletes, however anyone desiring requiring physical rehabilitation or muscle strengthening can benefit from  
20 the devices and methods of the present invention.

The same exercises enabled by the device for rehabilitation can be utilized by a healthy individual to enhance athletic performance in sports involving the swing of a racket, club, bat, stick, etc. The muscles efficaciously exercised by devices of the present invention in the respective motions a practitioner can strength train through supination, pronation, ulnar  
25 deviation, radial deviation, flexion, and extension are outlined in Table I. These are also fundamental motions in the swing of an athletic instrument in a number of actions in several sports, an example of which is shown in Table II. By efficaciously exercising these muscles throughout their functional range, preferably with strategically designed exercise protocols specific to skills one wishes to enhance, one can reinforce their ability to perform these  
30 motions powerfully, thereby enhancing performance.

TABLE 1

<b>Exercise</b>	<b>Muscle</b>
Pronation	Pronator Quadratus Pronator Teres
Supination	Biceps Brachii Supinator
Ulnar Deviation/Adduction	Extensor Carpi Ulnaris Flexor Carpi Ulnaris
Radial Deviation/Abduction	Extensor Carpi Radialis Brevis Extensor Carpi Radialis Longus Flexor Carpi Radialis
Flexion	Brachialis Brachioradialis Flexor Carpi Radialis Flexor Carpi Ulnaris Flexor Digitorum Profundus Palmaris Longus Pronator Teres
Extension	Extensor Carpi Radialis Brevis Extensor Carpi Radialis Longus Extensor Digitorum Extensor Indices

5

TABLE 2

<b>Sport</b>	<b>Action</b>	<b>Movements Involved (For a right-handed person)</b>
Tennis	Serve	Flexion + Ulnar Deviation
	Baseline forehand	Radial Deviation + Pronation
	Baseline backhand	Extension and Radial Deviation + Supination (right hand)
		Flexion and Radial Deviation + Pronation (left hand)
	Forehand volley	Flexion and Radial Deviation + Pronation
	Backhand volley	Extension and Radial Deviation + Supination (right hand)
		Flexion and Radial Deviation + Pronation (left hand)
	Note	Strong pronation + radial deviation enables powerful top-spin in forehands
		Strong supination + radial deviation enables powerful top-spin in backhands (for right hand)
		Strong pronation + Radial deviation enables powerful top-spin in backhands (for left hand)
Golf	Swing/Drive	Right hand: Neutral -> Radial Deviation + Extension -> Ulnar Deviation + Flexion (into Neutral) -> Pronation + Radial Deviation + Extension
		Left hand Neutral -> Radial Deviation+ Extension -> Ulnar Deviation + Flexion (into Neutral) -> Supination + Radial Deviation + Extension

Baseball	Swing	Right hand: Neutral -> Supination + Ulnar deviation + Pronation while ulnar deviated -> Radial Deviation
		Left hand: Neutral -> Pronation + Ulnar Deviation -> Extension + Supination while ulnar deviated ->Radial Deviation .
Hockey	Swing	Left hand: Extension while ulnar deviated
		Right hand: Flexion while ulnar deviated

FIG. 7 illustrates a first embodiment of the invention. In this embodiment, the offset weight exercise device 100 includes a handle 102 with a beveled end 104 opposite a second end 106 without a bevel. In an alternative embodiment of the invention, both ends 102, 104 of the handle have beveled ends. The exact angle of the bevel is not important. The angle of the bevel is but one factor in determining the size of the resultant offset. The other factors are discussed in more detail below.

The offset weight exercise device 100 also includes an arm 108 attached to the handle 102. Preferably, a first end 110 of the arm 108 is attached to the beveled end 104 of the handle 102. The arm 108 is preferably attached to the handle 102 via an attachment mechanism 118. In one aspect of the invention, the attachment mechanism 118 includes a screw mechanism. Attachment mechanism 118 can optionally include an angle adjustment mechanism. The male portion of the screw mechanism may be associated with either the handle 102 or the arm 108, the female portion being associated with the other component.

Attached to the second end 112 of the arm 108 are weights 114. The weights 114 are preferably attached to the arm 108 via an attachment mechanism 122, which can optionally include an angle adjustment mechanism. In one aspect of the invention, the attachment mechanism 122 includes a screw mechanism. The male portion of the screw mechanism may be associated with either the arm 108 or the weights 114, the female portion being associated with the other component. The weights 114 can come in several different quantities. Additionally, the weights 114 can also come in several different shapes to simulate desired objects, such as, for example, a hammerhead. In one aspect of the invention, each individual weight 114 includes at least two attachment mechanisms 122. In this manner, several weights 114 may be attached to each other and, therefore, to the arm 108.

Additionally, the offset weight exercise device 100 may include a removable grip 116 surrounding the handle 102. Preferably, the handle is made of a resilient material that is comfortable to grip, yet provides a good grip. Contemplated grip 116 materials include, for

example, rubber and foam. Preferable, the grips 116 come in several different sizes. In this manner, patients who have suffered significant injury to their hand and have difficulty closing their fingers or making a fist can select thick grip 116 for the offset weight exercise device 100. As their rehabilitation improves their ability to close their hands, a smaller grip 116 can be substituted for the larger grip 116. Further, the grips 116 may come in different shapes to accommodate different user taste or to simulate different objects (e.g., tennis racket, golf club, baseball bat, hockey stick etc.) Additionally, the grip 116 may optionally include a strap (not shown). Preferably, the strap more uniformly distributes forces throughout the hand of the user. Preferably, the strap aids the ability of a user to hold the offset weight exercise device 100. This is advantageous for a user that has a poor ability to grasp, such as a stroke patient.

In one embodiment of the invention, the offset weight exercise device 100 is provided with several removable arms 108 having different lengths. As discussed previously, the amount of torque provided by a rotating weight is a function of both the weight and the length of the moment arm. Thus, for example, a healthy athlete exercising to further increase his or her strength can insert an arm 108 that is longer than one typically used for rehabilitating an injured patient. In another embodiment of the invention, the arm 108 of the offset weight exercise device 100 is telescoping. In this way, the length of the arm 108 can be varied without the need of removing one arm 108 and inserting another of a different length.

Figure 8 illustrates another embodiment of the invention. In this embodiment, offset weight exercise device 200 includes a handle 102 with a beveled end 104 opposite a second end 106 without a bevel, and an arm 108 attached to the beveled end 104 of handle 102. A first end 110 of the arm 108 is preferably attached to the handle 102 via an attachment mechanism 118. Attached to the second end 112 of the arm 108 are weights 114. The weights 114 are preferably attached to the arm 108 via an attachment mechanism 122. The primary difference between this embodiment and the previous embodiments is the angle of arm 108 makes relative the axis of handle 102. The inventors have found this particular configuration is advantageous for performing several specific exercises, such as, for example, extreme ranges of supination, extreme ranges of pronation, protocols to exercise the relationship between a multiplicity of musculoskeletal groups, and ulnar and radial deviation exercises (discussed in more detail below).

Figure 9 illustrates another embodiment of the invention. In this embodiment, the offset weight exercise device 300 includes a circular frame 301 with a central handle 302. The offset weights 304 are attached to the outside of the circular frame 301 with a rope or cable 306. Preferably, this configuration is advantageous because torque is determined by the point at which rope or cable 306 bends, which can be kept at a constant distance relevant to the location of the wrist. Preferably, this provides a consistent quantity of torque throughout the range of motion.

Figure 10 illustrates still another embodiment of the invention. In this embodiment, the offset weight exercise device 400 includes an oval frame 401 with a central handle 302. As in the last embodiment, the offset weights 304 are attached to the outside of the oval frame 401 with a rope or cable 306. In an alternate aspect of this embodiment, the central handle 302 is mounted in the oval frame 401 with a rotation mechanism 405. The rotation mechanism 405 can be used to change the angular position of the central handle 302 within the oval frame 401. In this manner, because the oval frame 401 does not have a constant radius, the torque for a given exercise at any position of rotation can be varied. Thus, for example, the central handle 302 could be set aligned with the short axis of the oval frame 401 so that the offset weights 304 are initially close for an initial application of light torque followed by increasing torque with rotation. Alternatively, the central handle 302 could be set aligned with the long axis of the oval frame 401 so that the offset weights 304 are initially far for an initial application of high torque followed by decreasing torque with rotation. The handle, of course, could be set anywhere between, depending on the desired exercise protocol.

Figure 11 illustrates still another embodiment of the invention. In this embodiment, the offset weight exercise device 500 includes a cam shaped frame 501 with a central handle 302. As in the last embodiment, the offset weights 304 are attached to the outside of the cam shaped frame 501 with a rope or cable 306. In this embodiment, the cam shape can be designed so that the offset weight exercise device 500 essentially provides a consistent torque throughout the full range of motion. In an alternate aspect of this embodiment, similarly to the last embodiment, the central handle 302 is mounted in the cam shaped frame 501 with a rotation mechanism 405. The rotation mechanism 405 can be used to change the angular position of the central handle 302 within the cam shaped frame 501. In this manner, because

the cam shaped frame 401 does not have a constant radius, the torque at any position of rotation can be varied.

Methods according to embodiments of the invention include, for example, use of an offset weight exercise device to (1) exercise through full range of motion, (2) exercise to train to be able to quickly set up for implementation of a skill, (3) exercise to increase momentum to meet an object, for example, a ball, puck, etc., (4) exercise to create a powerful follow-through, (5) exercise to train one's ability to be able to stop momentum of a powerful stroke with agility and stability to quickly reorient oneself for implementation of another skill, and (6) use a strategically positioned weight system to provide weight training to reinforce relationships between different muscle groups. These are described in more detail below.

(1) Exercise through full range of motion

Additional preferred embodiments of the invention are directed to devices and methods that can allow a user to exercise particular musculoskeletal groups of interest, such as the musculoskeletal groups associated with the motions of pronation and radial deviation, for purposes of performance enhancement in several particular skills associated with several types of sports, such as the skill of powerful forehand with top-spin in the game of tennis. This can be accomplished via utilization of an offset weight resistance/induction system used with a protocol, such as the one shown in Figures 12-21, for utilizing the offset weight resistance/induction mechanism. Preferably, this protocol is designed for purposes of exercising specific musculoskeletal groups of interest throughout their full functional ranges.

(2) Exercise to train to be able to quickly set up for implementation of a skill:

Additional preferred embodiments of the invention are directed to devices and methods that can allow a user to exercise particular musculoskeletal groups of interest, such as the musculoskeletal groups associated with the motions of pronation and radial deviation, for purposes of performance enhancement in several particular skills associated with several types of sports, such as the skill of powerful forehand with top-spin in the game of tennis. This can be accomplished via utilization of an offset weight resistance/induction system used with a protocol such as the one shown in Figures 22-31, for utilizing the offset weight resistance/induction mechanism. Preferably, this protocol is designed for purposes of exercising specific musculoskeletal groups of interest for the specific skill throughout the ranges in which they are heavily utilized to perform the step of setting oneself up for implementation of a skill, such as, for example, tennis forehand with top-spin.

(3) Exercise to increase momentum to meet the ball

Additional preferred embodiments of the invention are directed to devices and methods that can allow a user to exercise particular musculoskeletal groups of interest, such as the musculoskeletal groups associated with the motions of pronation and radial deviation, for purposes of performance enhancement in several particular skills associated with several types of sports, such as the skill of powerful forehand with top-spin in the game of tennis. This can be accomplished via utilization of an offset weight resistance/induction system used with a protocol, such as the one shown in Figures 32-37, for utilizing the offset weight resistance/induction mechanism. Preferably, this protocol is designed for purposes of exercising specific musculoskeletal groups of interest for the specific skill throughout the ranges in which they are heavily utilized to generate the necessary momentum in the swing component of the specific skill, such as the swing component of a tennis forehand with top-spin, to meet a ball (or the equivalent in a given sport, such as, for example, a hockey puck.)

(4) Exercise to create a powerful follow-through:

Additional preferred embodiments of the invention are directed to devices and methods that can allow a user to exercise particular musculoskeletal groups of interest, such as the musculoskeletal groups associated with the motions of pronation and radial deviation, for purposes of performance enhancement in several particular skills associated with several types of sports, such as the skill of powerful forehand with top-spin in the game of tennis. This can be accomplished via utilization of an offset weight resistance/induction system used with a protocol, such as the one shown in Figures 38-43, for utilizing the offset weight resistance/induction mechanism. Preferably, this protocol is designed for purposes of exercising specific musculoskeletal groups of interest for the specific skill throughout the ranges in which they are heavily utilized to perform the important step of follow through, such as the follow through component of a tennis forehand with top-spin.

(5) Exercise to train one's ability to be able to stop momentum of a powerful stroke with agility and stability to quickly reorient oneself for implementation of another skill.

Additional preferred embodiments of the invention are directed to devices and methods that can allow a user to exercise particular musculoskeletal groups of interest, such as the musculoskeletal groups associated with the motions of supination and ulnar deviation, for purposes of performance enhancement in several particular skills associated with several types of sports, such as the skill of a powerful forehand with top-spin in the game of tennis. This can be accomplished via utilization of an offset weight resistance/induction system used

with a protocol, such as the one shown in Figures 44-48, for utilizing the offset weight resistance/induction mechanism. Preferably, this protocol is designed to exercise the specific musculoskeletal groups of interest for the specific skill throughout the ranges in which the specific musculoskeletal groups are heavily utilized to perform the step of stopping the momentum of a powerful stroke. Preferably, the step of stopping the momentum of the power stroke is performed with agility and stability so that an athlete can quickly reorient himself or herself for implementation of another skill. For example, during fast-paced tennis play, upon hitting/returning/driving the ball with a very powerful stroke, the practitioner needs to “apply brakes” to the momentum and bring the racket back into ready position.

5  
10 (6) Using a strategically positioned weight system to provide weight training to reinforce relationships between different muscle groups

Some embodiments of the invention are directed to devices and methods that allow a practitioner to utilize an offset weight resistance system to efficaciously exercise specific musculoskeletal groups of interest while simultaneously providing forces that can exercise other musculoskeletal groups of interest. This can be accomplished via utilization of an offset weight resistance/induction system used with a protocol, such as the one shown in Figure 49, for utilizing the offset weight resistance/induction mechanism. For example the musculoskeletal group associated with pronation may be efficaciously exercised via a resisted pronation exercise, while simultaneously providing forces that can exercise other musculoskeletal groups of interest, such as the musculoskeletal group associated with radial deviation. This is advantageous for providing exercises that can reinforce the relationships between these musculoskeletal groups. A strong relationship between these musculoskeletal groups is advantageous to several skills in sports that require a good relationship between different, yet connected musculoskeletal groups. For example, the relationship between the musculoskeletal groups associated with pronation and radial deviation is advantageous for a strong forehand with topspin in tennis. The devices and methods of the present embodiment allow the user to strengthen these relationships, enhancing athletic performance in a representative skill, such as strong forehand with topspin.

20  
25  
30 Determining the device/method of figuring out where to place the offset weight, and the accompanying motion to produce the design of exercises for a specific end.

Some embodiments of the invention are directed to devices and methods that allow a practitioner skilled in the relevant art to design exercises that utilize an offset weight resistance/induction system to efficaciously exercise specific musculoskeletal groups of

interest while simultaneously providing forces that can exercise other musculoskeletal groups of interest. Specifically, this can be accomplished by utilizing a system wherein the fractioned:

- 1 – evaluates a specific skill to elucidate and determine the motions associated (e.g. pronation + radial deviation) (thereby elucidating the musculoskeletal groups that are associated with these motions) and with this knowledge
- 2 – designs a protocol, such as the protocols shown in Figures 12-48 that combines the use of an apparatus with a strategically positioned weight connected to a handle with which a practitioner can hold to manipulate the apparatus and a form with which to manipulate the apparatus. The form can be comprised of a sequence and/or combination of specific yaw, pitch, and rolls of the apparatus. Preferably, this protocol will work the related and desired musculoskeletal groups through the relevant and desired ranges needed to be strength-trained to meet a specific end. For example, enhanced ability to produce a forehand with topspin in tennis. Indeed, this end can be any number of skills in any number of sports, such as a golf drive in the sport of golf, a pass in the sport of hockey, etc. Indeed, this end can also include performance enhancement in skills that do not require the action of swinging an apparatus, but do involve a movement of the wrist, such as the skill of throwing a curveball in the sport of baseball, shooting a basket in the sport of basketball, etc. Indeed, this end can also include enlargement of a specific musculoskeletal group, something that may be of particular interest to bodybuilders. Indeed, this end can also include the rehabilitation of specific musculoskeletal groups for injured and/or underdeveloped patients that require treatment. Figures 12-54 depict an example for illustrative purposes how one can utilize the above-described devices and methods for purposes of reaching the end of performance enhancement in the skill of tennis forehand with topspin.

25 Example of a skill-specific performance enhancing exercise protocol - Tennis Forehand with Topspin (Single-handed)

A powerful tennis forehand with topspin involves a powerful snap in pronation and a powerful snap in radial deviation. There exist two important ranges, one to generate momentum to meet the ball, one to follow through with the forehand with topspin. After these two important ranges, there is a third significant step in which one must apply “brakes” to the motion of the forehand with top-spin to stop and reverse one’s motion and reorient one’s self for another skill. For example, one might reorient to return one’s opponent’s return with a backhand stroke, substantially utilizing the muscles of supination and ulnar deviation.

Before one can perform a powerful tennis forehand with topspin, one must perform the initial step of setting oneself up for implementation of the skill. In a fast-paced tennis play, from ready position with the racket in neutral position, this requires a powerful snap in pronation and ulnar deviation.

5 The tennis forehand with topspin skill may break into six phases. A protocol to improve the tennis forehand with top-spin may be designed to efficaciously target specific muscle groups in the arm in specific ways via utilization of an offset weight system that make possible six elements of a powerful tennis forehand with top-spin:

- 10 1. A powerful snap throughout the range of motion associated with cocking one's tennis racket back and setting oneself up for implementation of a forehand with topspin. (Shown in Figure 51)
2. A powerful snap throughout the range of motion associated with the forehand with topspin. (Shown in Figure 50-54)
3. Generating a substantial amount of momentum to meet the ball. (Shown in Figure 52)
- 15 4. Following through with power. (Shown in Figure 53)
5. Stopping one's motion (and the associated momentum) with agility and stability to reorient oneself for another skill. (Shown in Figure 54)
6. Strong relationships between the muscle groups one needs to have a strong working relationship between to perform any given key skill.

20 By dividing the tennis forehand with topspin skill into the above six basic elements, a protocol may be designed specifically to improve each individual basic element. That is, a combination of exercises using a strategically positioned weight with a form having a specific yaw, pitch and roll may be designed for each of the six basic elements. With such a protocol, improvement in the overall skill may be efficaciously produced. Indeed, in such a protocol a practitioner could

25 perform exercises at varying speeds. Preferably, this can simulate what occurs during play. For example, a practitioner could train for a powerful snap with exercises wherein the practitioner transitions from start to finish positions rapidly.

Some embodiments of the invention are directed to devices and methods in which an offset weight resistance device and protocol is utilized for purposes as a promotional item.

30 Some embodiments of the invention are directed to devices and methods in which an offset weight resistance device and protocol is placed within a clinic or a gym at no or minimal cost to the clinic, with coupons given to the clinic for purposes of generating patient or individual athlete sales. Preferably, this enables a healthcare professional to teach a patient how to correctly use the device, and preferably also provides a channel with which to

35 distribute the device to the patient or individual athlete.

Some embodiments of the invention are directed to devices and methods that couple one or a multiplicity of measuring systems with an offset weight resistance/induction system to measure a multiplicity of factors associated with a practitioner's ability, strength, and capacity to produce specific types of movements. Types of measurement may include a recording of one's range of motion, preferably but not necessarily with a specified amount of resistance/induction of a specified force. Another type of measurement may include a recording of one's capacity to lift/lower a weight during an eccentric or concentric contraction of a specific musculoskeletal group during a specified motion. Such a device may be used to easily and conveniently track a patient's rehabilitation progress. This may include several features to allow for a multiplicity of tests available on expensive in-clinic devices such as the BTE Simulator II. These tests may include, for example, maximum strength testing, maximum and repetitive lift capacity, endurance, consistency of effort, or an athlete's strength training progress. Preferably, an apparatus with a shape as depicted in Figures 9-11 readily incorporates the measurement and tracking mechanisms available in the expensive in-clinic machines due to the fact that it allows for a constant quantity of torque. Indeed, through the use of the Internet or other communication device, a patient could transmit his results to the care provider.

Other embodiments of the present invention are directed to devices and methods that can allow one to exercise in a way that can be very beneficial in increasing nerve function and hand/eye coordination. This can be achieved by, for example, a mechanism in that allows the offset weight exercise device to move about in a random or pre-programmed route. This can enable exercises including, for example, an exercise wherein the user keeps the weight at the top of the apparatus above the wrist at all times. In this example, because the weight constantly moves, to keep the weight above the wrist one would have to constantly adjust the position of one's wrist. If the route of the movement of the weight were programmed to be random, this could increase one's reaction time and be very beneficial to train nerve function. Further, through the use of the Internet or other communication device, a patient could transmit his results to the care provider.

Some exemplary embodiments of the present invention are directed to devices and methods that can incorporate a diagnostic mechanism such as a gyroscope connected to a computing device. With such, one can accurately detect in, for example, frames and/or real time, one's range of motion/the position of the weight/the position of the device. Such a

device could be used to easily track a patient's rehabilitation progress. Indeed, through the use of the Internet or other communication device, a patient could transmit his results to the care provider.

While this invention is satisfied by embodiments in many different forms, as  
5 described in detail in connection with preferred embodiments of the invention, it is understood that the present disclosure is to be considered as exemplary of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated and described herein. Numerous variations may be made by persons skilled in the art without departure from the spirit of the invention. The scope of the invention will be measured by the  
10 appended claims and their equivalents. The abstract and the title are not to be construed as limiting the scope of the present invention, as their purpose is to enable the appropriate authorities, as well as the general public, to quickly determine the general nature of the invention. In the claims that follow, unless the term "means" is used, none of the features or elements recited therein should be construed as means-plus-function limitations pursuant to  
15 35 U.S.C. §112, ¶6. However, this invention includes not only the disclosed means for accomplishing the functions disclosed, but also those equivalents that would be embraced by means plus function claims, which are also contemplated.

## I CLAIM:

1. An exercise device comprising:  
a handle having a first end and a second end, wherein the first end is beveled;  
an arm having a first end and a second end, wherein the first end of the arm is  
5 attached to the first end of the handle; and  
at least one weight attached to the second end of the arm.
2. The device of claim 1, further comprising a grip surrounding the handle.
3. The device of claim 2, wherein the grip is shaped to simulate different types of  
sporting equipment.
- 10 4. The device of claim 2, wherein the grip further comprises a strap.
5. The device of claim 2, wherein the grip is removable.
6. The device of claim 1, wherein the arm is removably attached to the handle.
7. The device of claim 6, wherein the arm is removably attached with screw threads.
8. The device of claim 1, further comprising a lengthening mechanism for the arm.
- 15 9. The device of claim 8, wherein the lengthening mechanism comprises a telescoping  
mechanism or the addition of arm extensions.
10. The device of claim 1, wherein the at least one weight is removably attached to  
the arm.
11. The device of claim 10, wherein the at least one weight is removably attached  
20 with screw threads.
12. The device of claim 1, wherein the at least one weight includes a second  
attachment mechanism for additional weights.
13. The device of claim 12, wherein a second weight is attached to the at least one  
weight using the second attachment mechanism.
- 25 14. The device of claim 1, wherein the exercise device provides a patient resistance  
through the full functional range of motion.
15. The device of claim 1, wherein the exercise device is portable.

16. The device of claim 1, wherein the exercise device is adapted to be used in non-clinical environments.

17. The device of claim 1, further comprising an angle selecting mechanism between the handle and the arm.

5 18. A method of exercising comprising:

holding an exercise device in a hand, the exercise device comprising a handle and at least one offset weight; and

performing a fundamental upper extremity exercise.

10 19. The method of claim 18, wherein fundamental upper extremity exercise is one or more of eccentric and concentric flexion, extension, supination, pronation, ulnar deviation or radial deviation.

20. The method of claim 18, wherein performing the exercise provides resistance through the full functional range of motion

15 21. The method of claim 18, wherein the exercise rehabilitates an injured muscle or strengthens a healthy muscle.

22. The method of claim 18, further comprising adding additional weight to the at least one offset weight.

23. The method of claim 18, further comprising adding a grip to handle.

20 24. The method of claim 19, wherein the grip is selected based on the strength and/or ability of a user.

25 25. The method of claim 18, further comprising consulting a chart of exercises for particular muscles.

26. The method of claim 18, further comprising swinging the device like a hammer and striking an object.

27. The method of claim 18, further comprising adjusting the length of the offset.

28. The method of claim 18, wherein the exercise device comprises improving an athletic skill.

29. The method of claim 24, wherein the athletic skill is decomposed into basic elements and the exercise comprises improving at least one basic element.

30. The method of claim 18, wherein the exercise comprises, an exercise to train to be able to quickly set up for an implementation of a skill, an exercise to increase momentum to meet a ball, an exercise to create a powerful follow-through, an exercise to stop momentum of a powerful stroke to quickly reorient for implementation of another skill, and an exercise  
5 to reinforce relationships between different muscle groups.

31. The method of claim 18, further comprising measuring a user's strength and ability to perform the exercise.

32. The method of claim 18, wherein the exercise improves nerve function and/or hand/eye coordination.

10 33. The method of claim 18 further comprising using a mechanism producing a pre-programmed route.

34. An exercise device comprising:

a central handle;

a frame circumscribing at least part of the outer edge of the central handle;

15 a rope or cable having a first end affixed to the frame;

at least one weight affixed to a second end of the rope or cable,

wherein the at least one weight is offset from the handle.

35. The exercise device of claim 34, wherein the frame circumscribes the entire edge of the central handle.

20 36. The exercise device of claim 34, wherein the shape of the frame is circular, oval or cam shaped.

37. The exercise device of claim 36, wherein the cam shape provides constant torque when rotated.

25 38. The exercise device of claim 34, further comprising a handle rotation mechanism, wherein the handle rotation mechanism is adapted to change the angular position of the central handle within the frame.

39. A method of determining an exercise protocol comprising:

evaluating a physical skill to determine fundamental motions associated with the skill;

and

30 specifying an exercise using an offset weight device,

wherein the exercise comprises a specific combination of yaw, pitch, and roll of the offset weight device.

40. The method of claim 39, wherein the fundamental motions comprise eccentric and concentric flexion, extension, supination, pronation, ulnar deviation or radial deviation.

41. A protocol developed by the method of claim 39.

42. A system for exercising comprising:

an offset weight device; and

a measuring device to measuring the results of using the offset device.

5

43. The system of claim 42, wherein the measuring device comprises sensors to measure strength and/or degree of rotation.

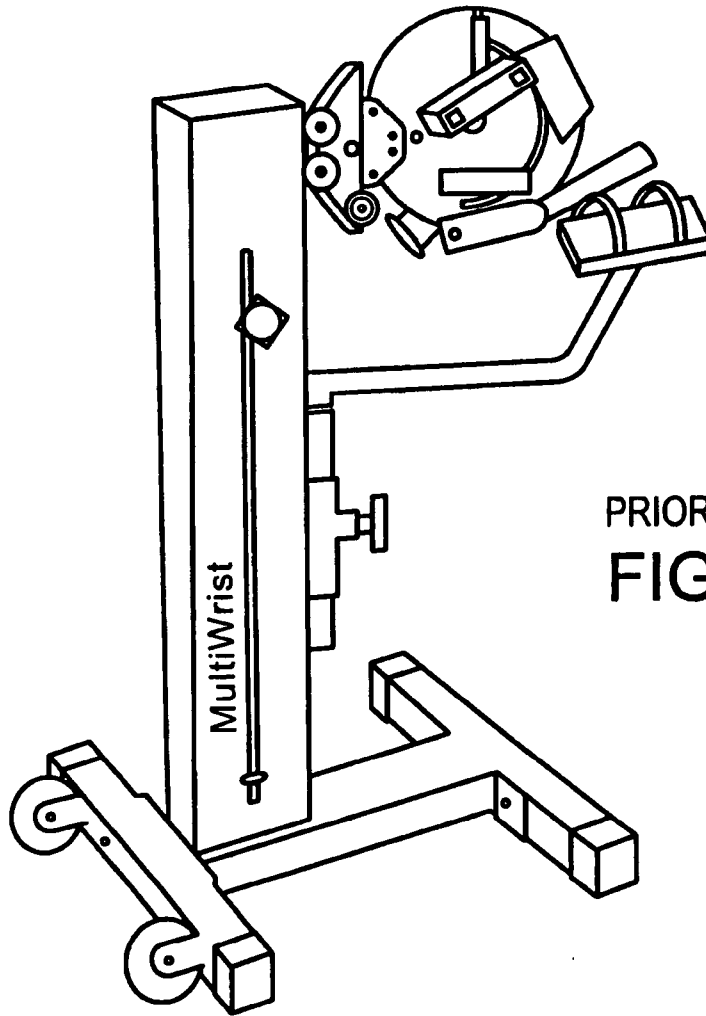
44. An exercise device comprising:

a means for holding;

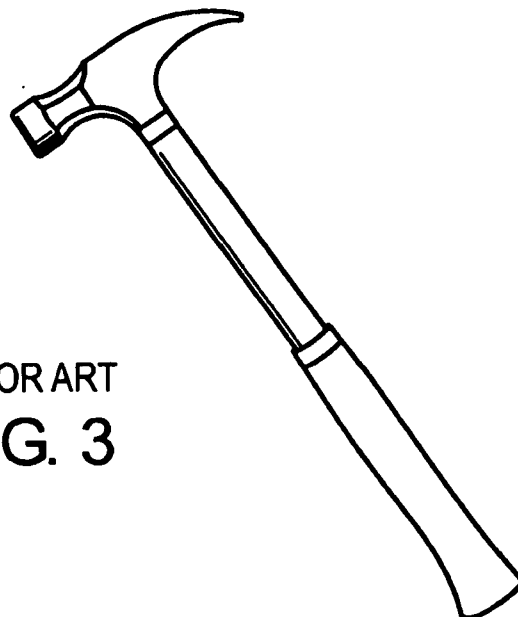
a means for providing an offset weight; and

10

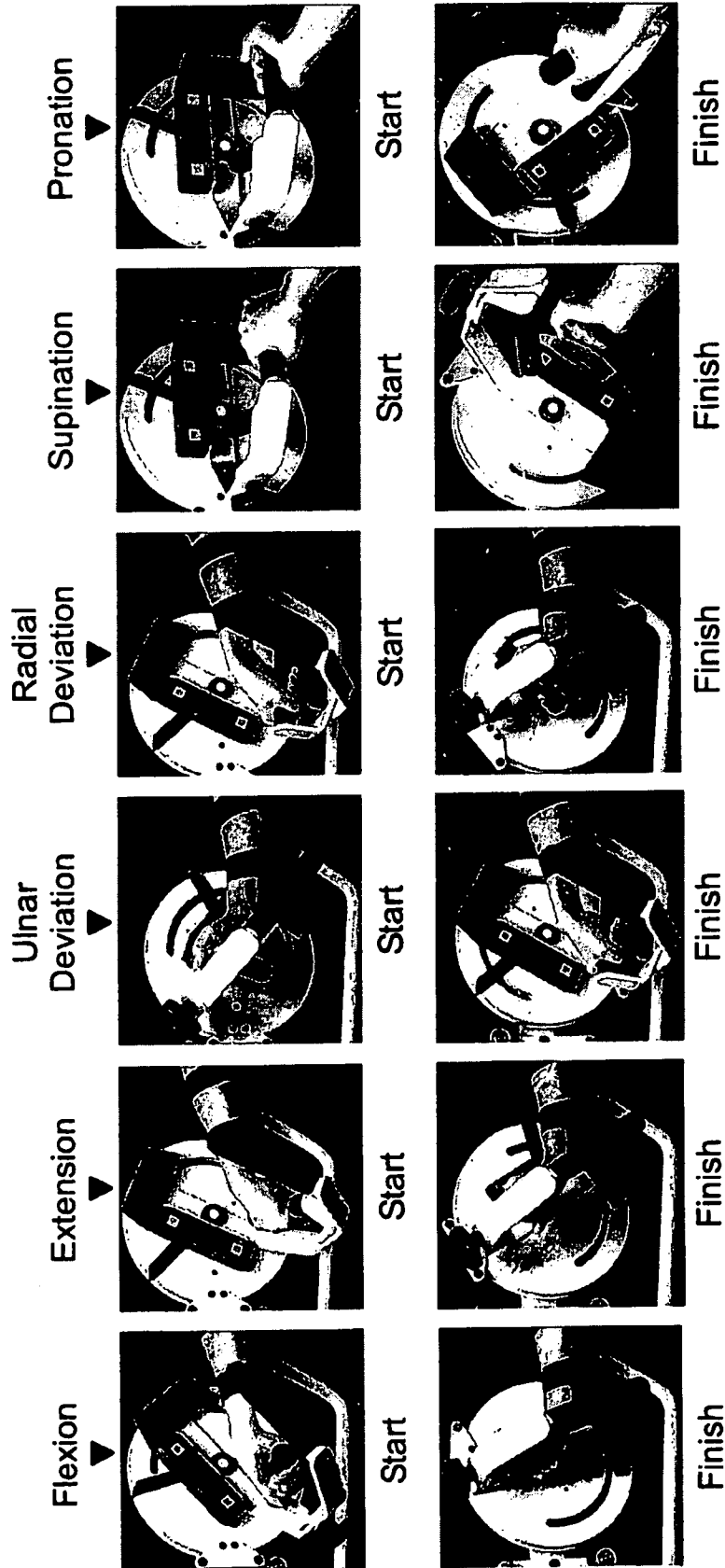
an offset weight.



PRIOR ART  
FIG. 1

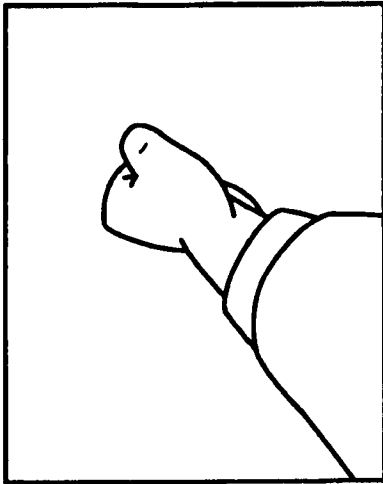


PRIOR ART  
FIG. 3



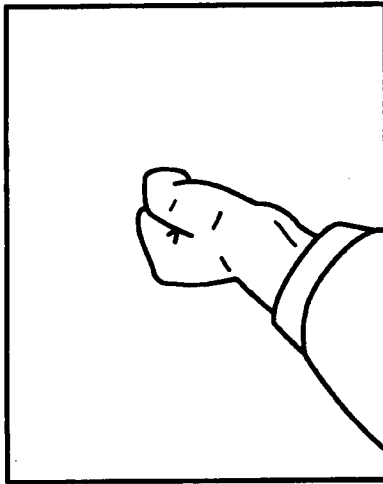
PRIOR ART

FIG. 2



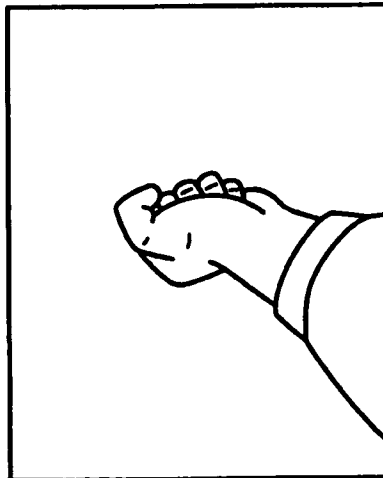
(pronation)

FIG. 4C



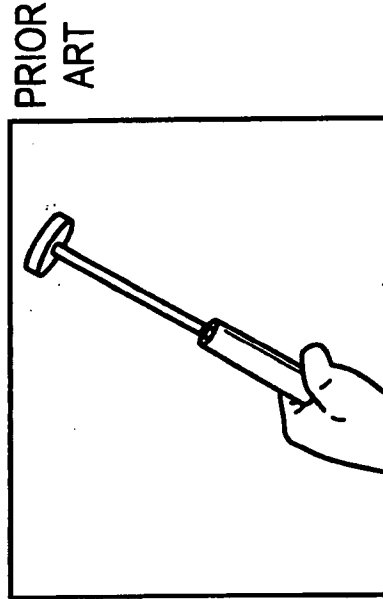
(neutral)

FIG. 4B



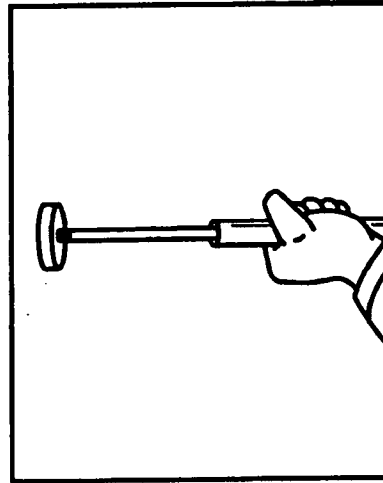
(supination)

FIG. 4A



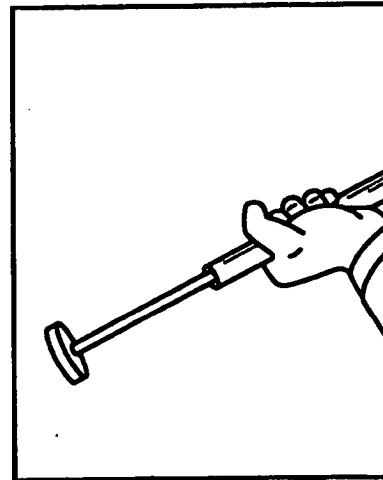
(pronation)

FIG. 5C



(neutral)

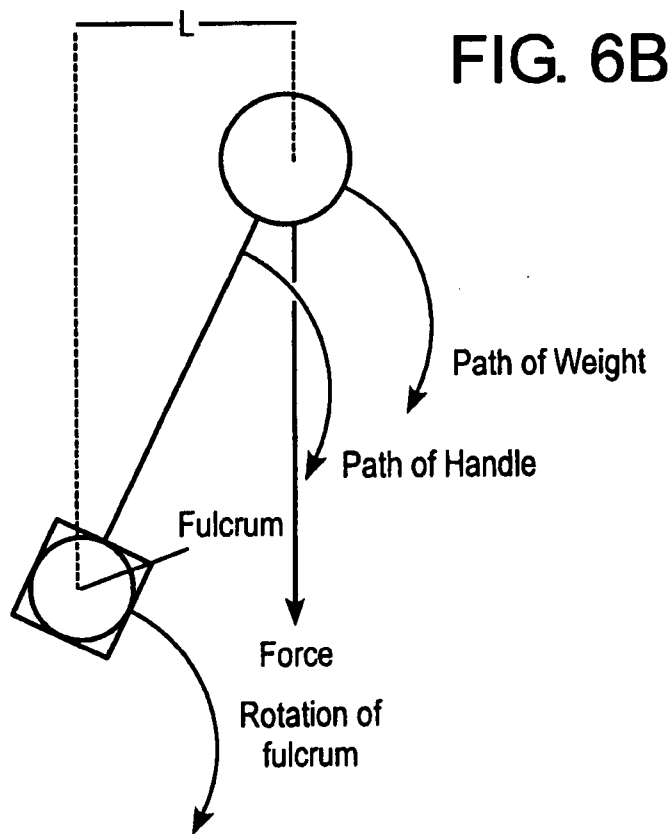
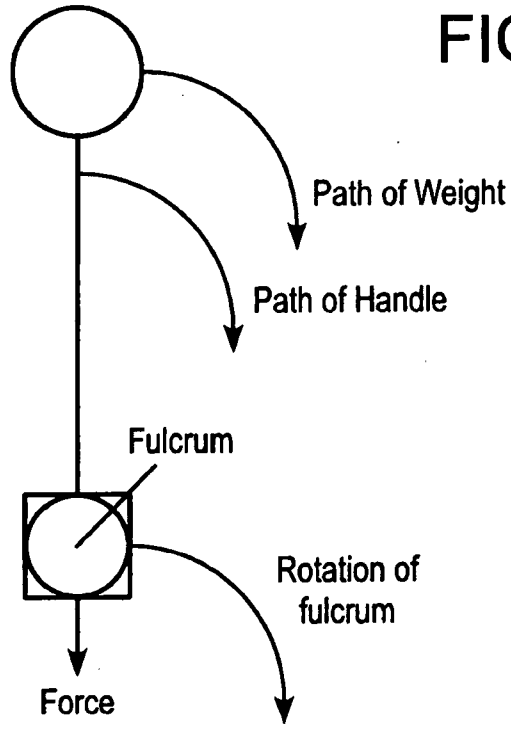
FIG. 5B



(supination)

FIG. 5A

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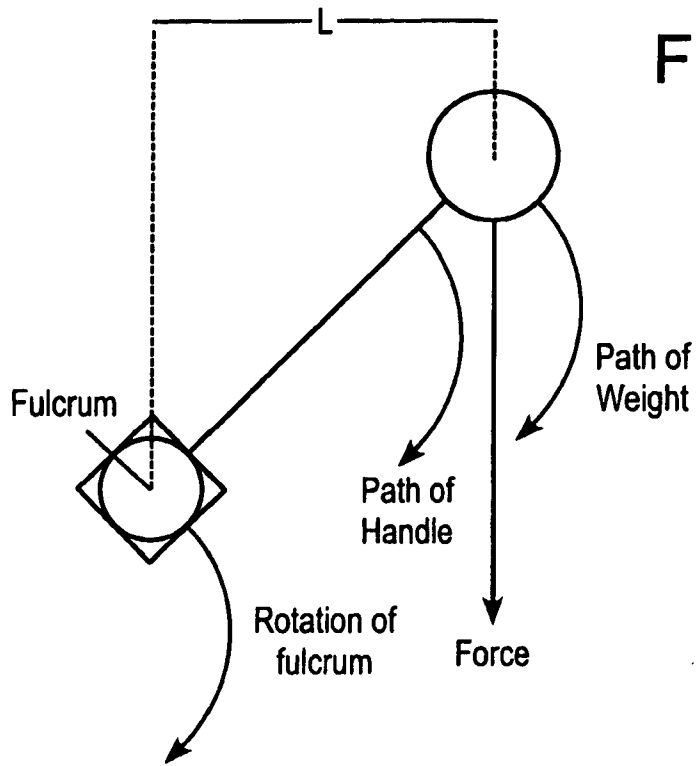


FIG. 6C

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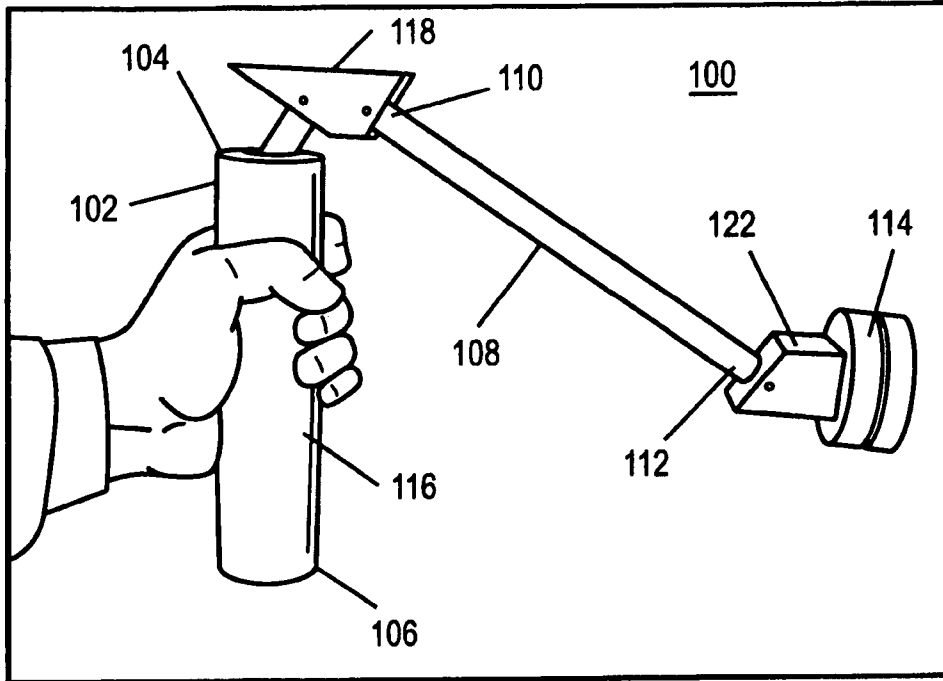


FIG. 7

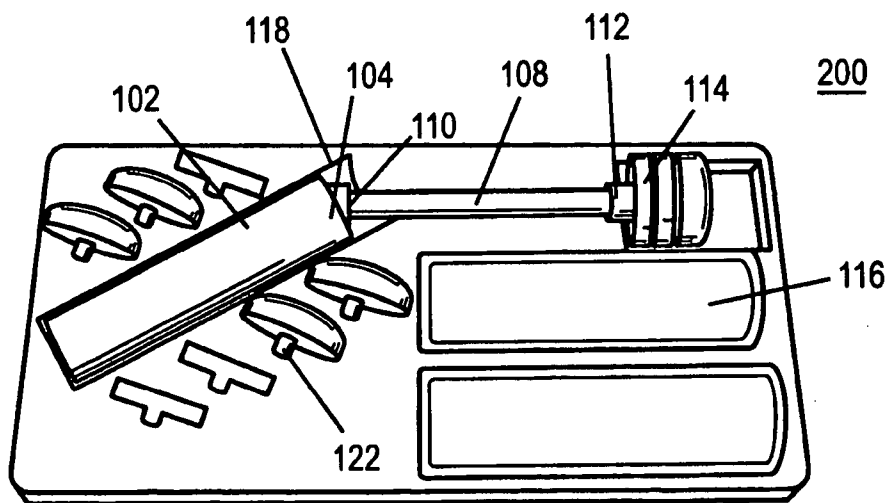


FIG. 8

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FIG. 9

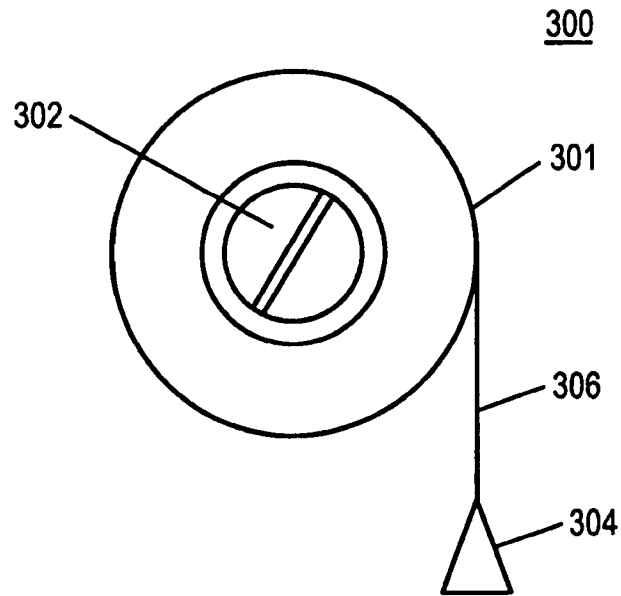


FIG. 10

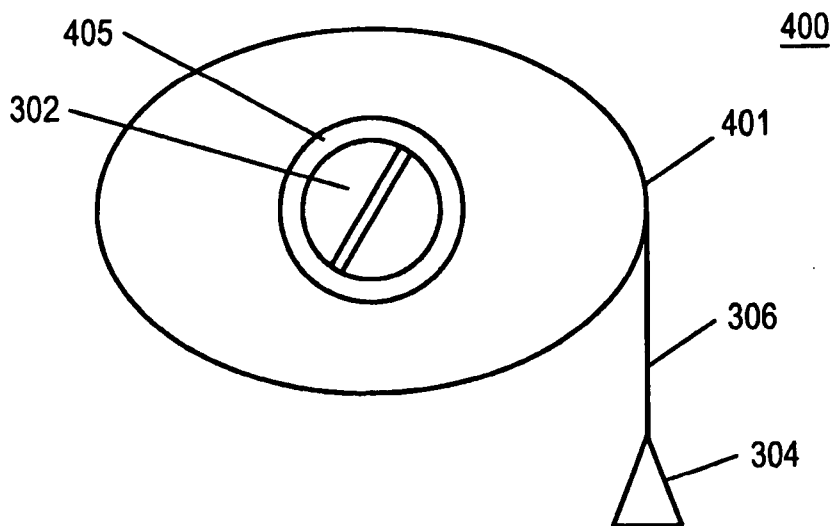
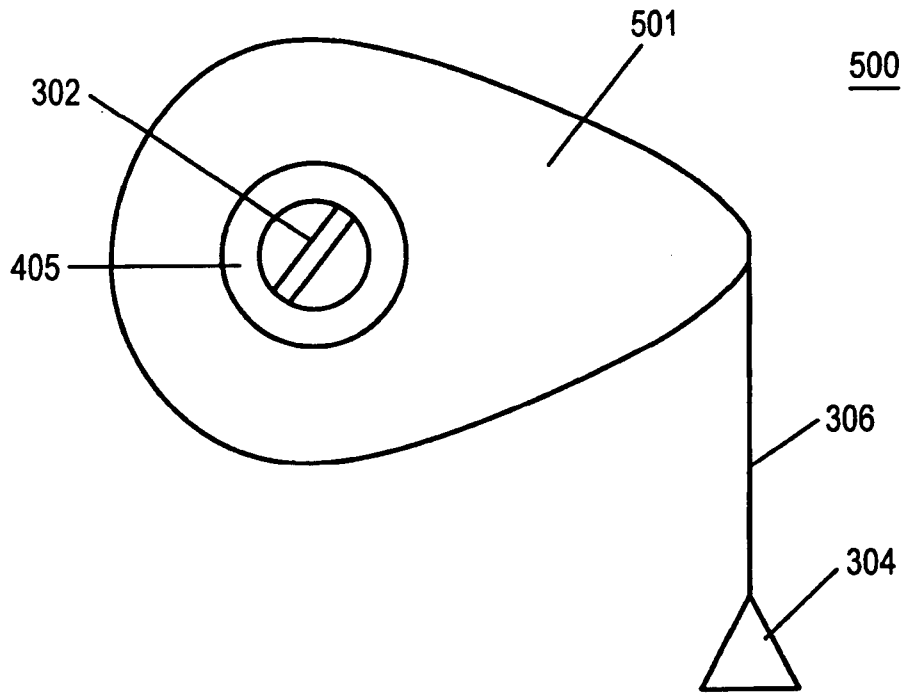


FIG. 11



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PHASE I (Quickly bringing one's racket back)

Part 1: (Pronation exercises through full functional range, including extremes)

Exercise 1.1

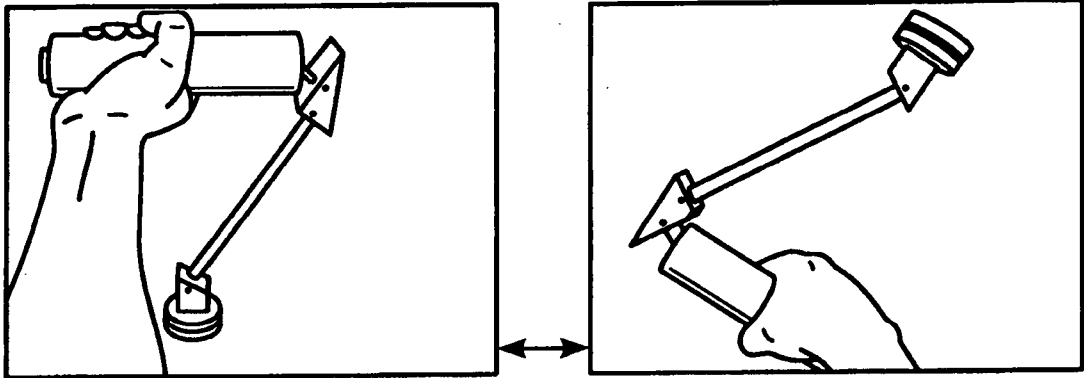


FIG. 12

Exercise 1.2 and Exercise 1.3 - (specifically suited for extreme ranges)

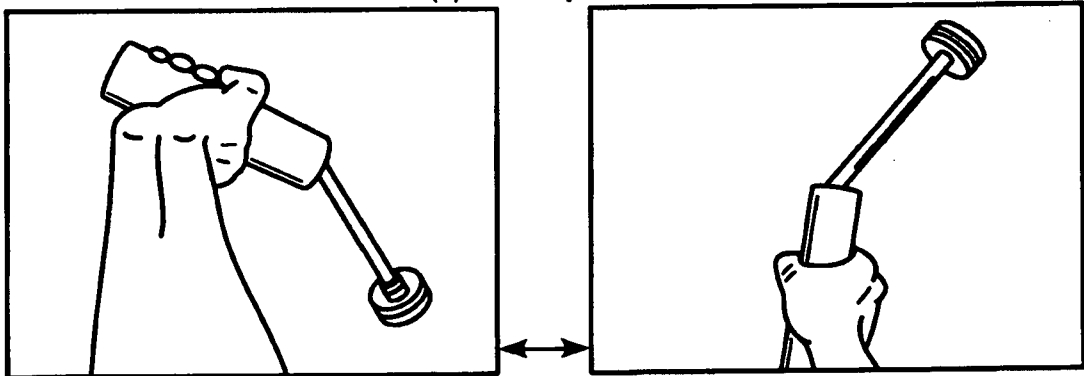


FIG. 13

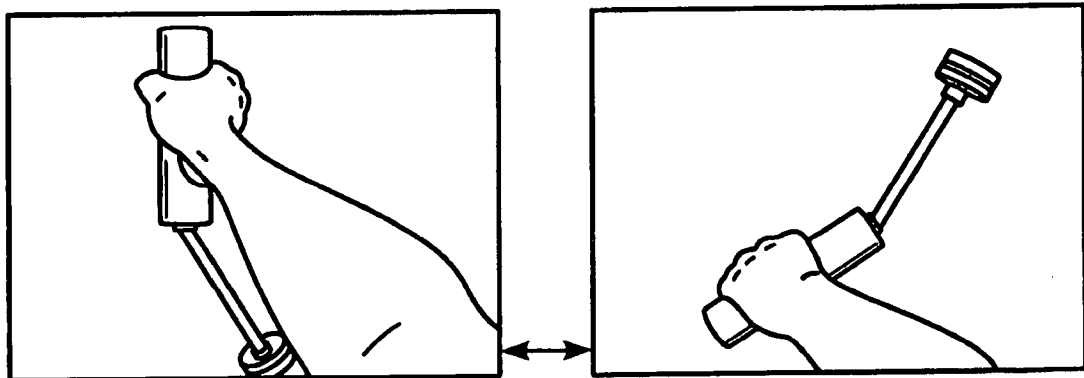


FIG. 14

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Exercise 1.4 - offset for half the range

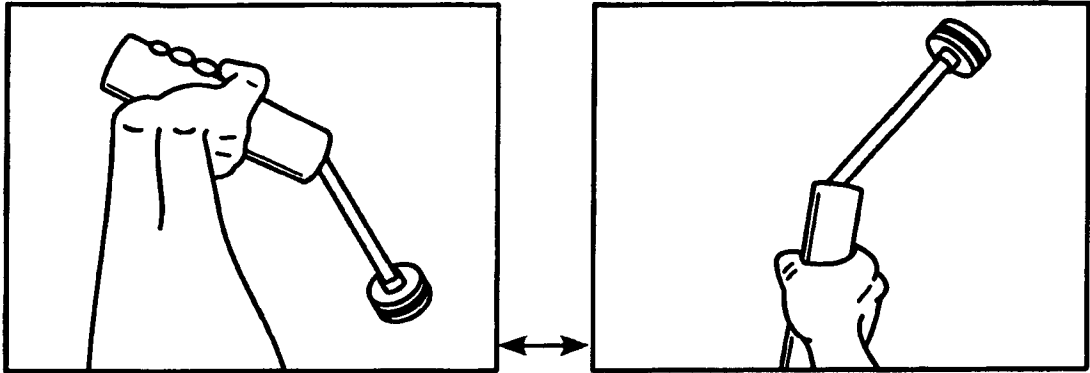


FIG. 15

Exercise 1.5 - offset for other half of the range

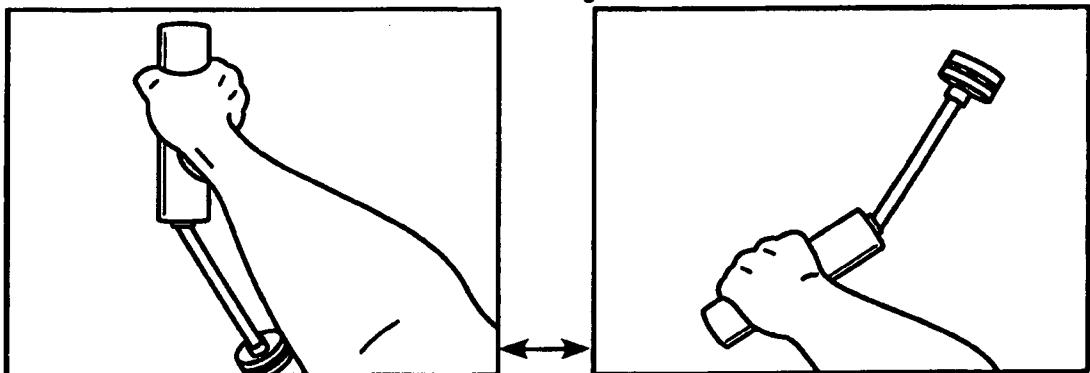


FIG. 16

Exercise 1.6 - Slightly more offset for half the range

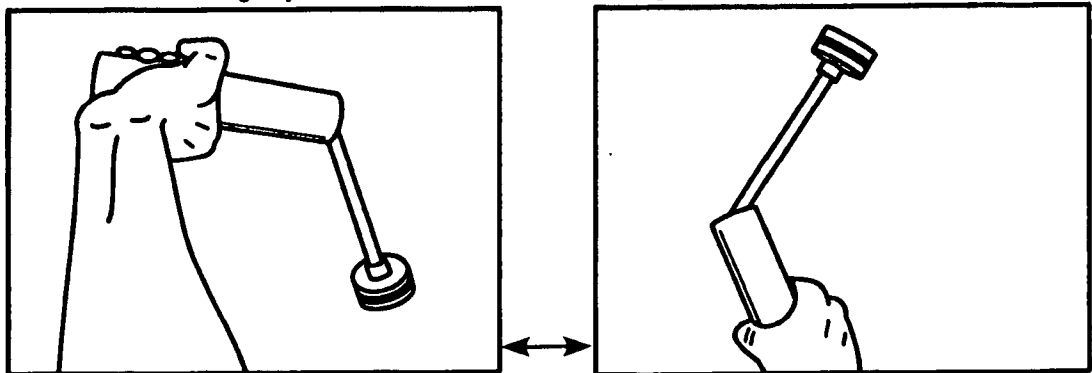


FIG. 17

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Exercise 1.7 - Slightly more offset for other half of the range

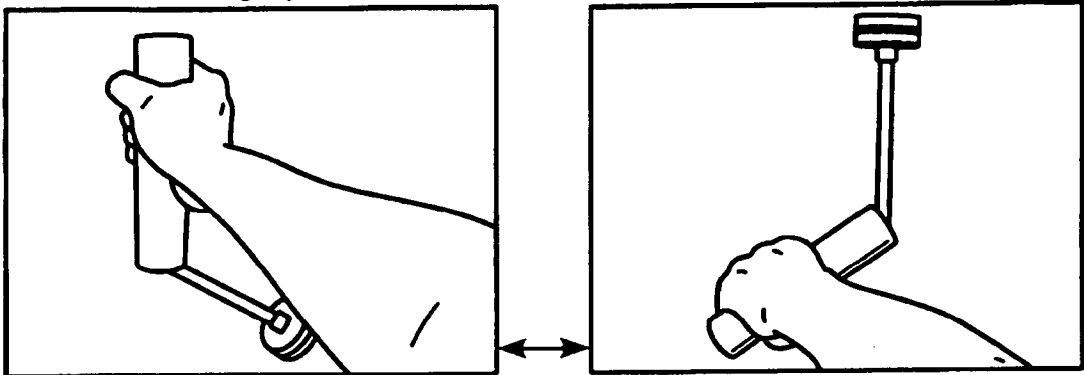


FIG. 18

Part 2: (Ulnar deviation exercises through full range, including extremes)

Exercise 1.8, Exercise 1.9, and Exercise 1.10

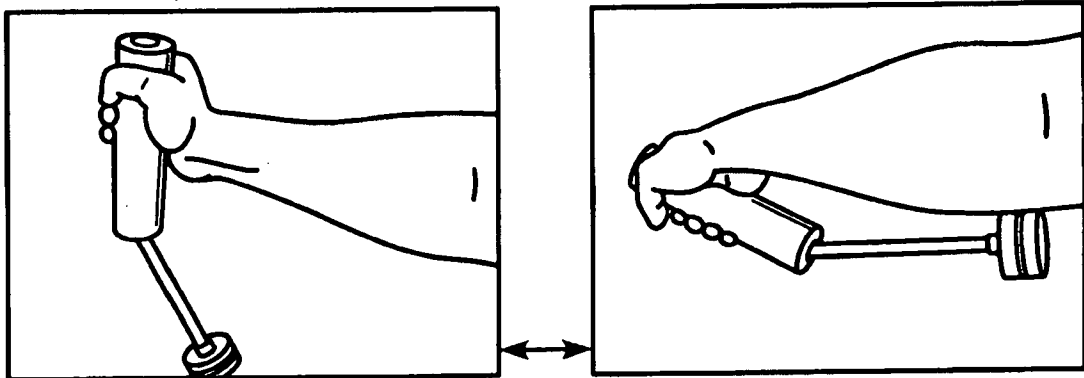


FIG. 19

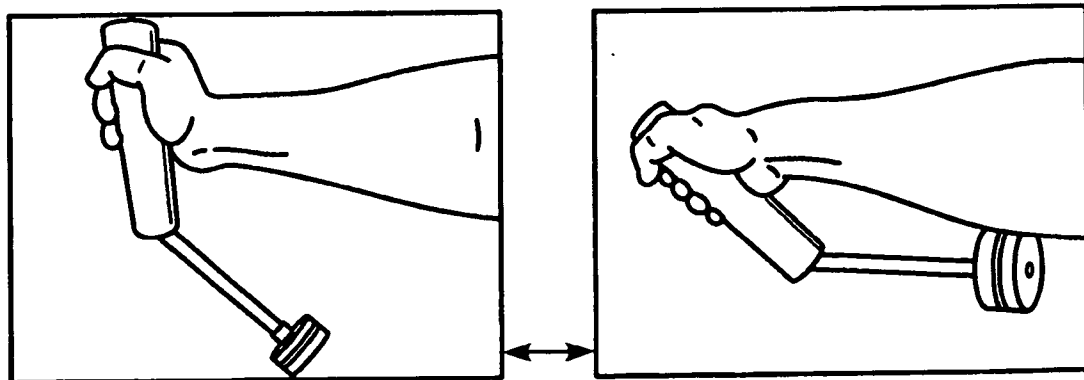


FIG. 20

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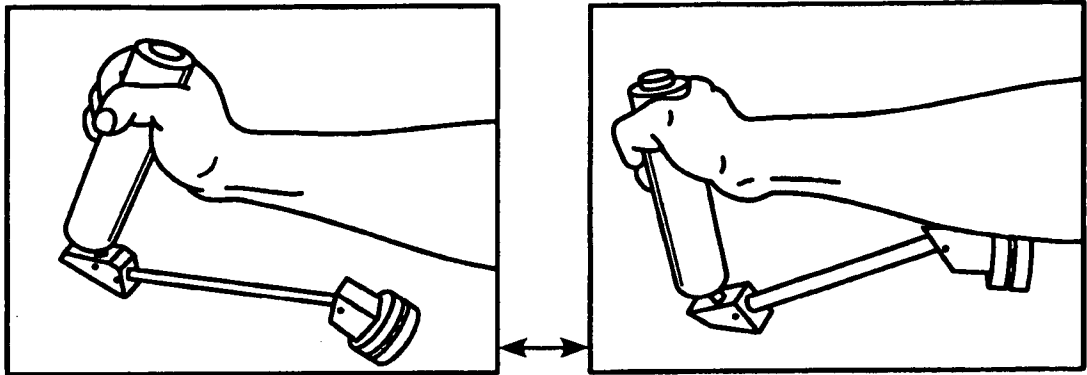


FIG. 21

PHASE II (Powerful snap throughout the range of motion)

Part 1: (Pronation exercises through full functional range, including extremes)

Exercise 2.1: Perpendicular weight for majority of full range

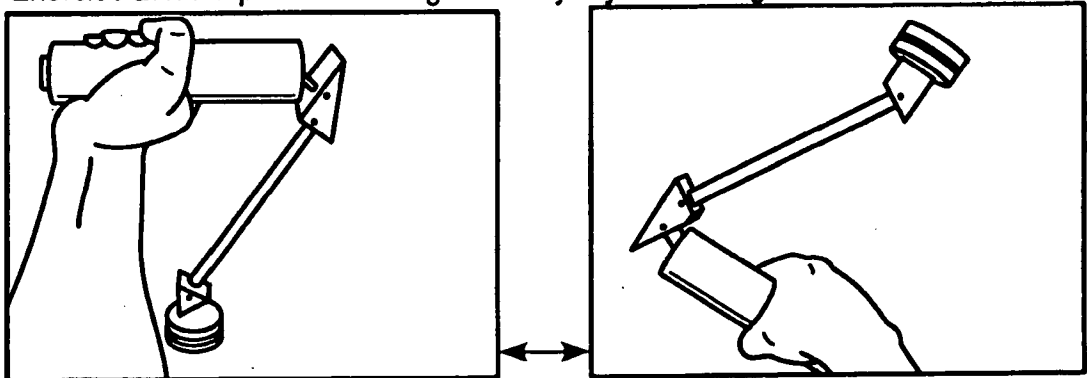


FIG. 22

Exercise 2.2 and Exercise 2.3: Slightly angled weight for extreme ranges.

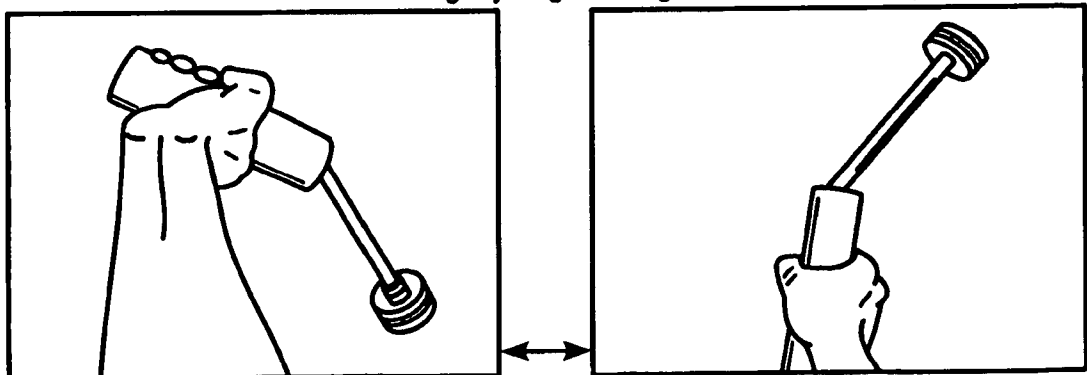


FIG. 23

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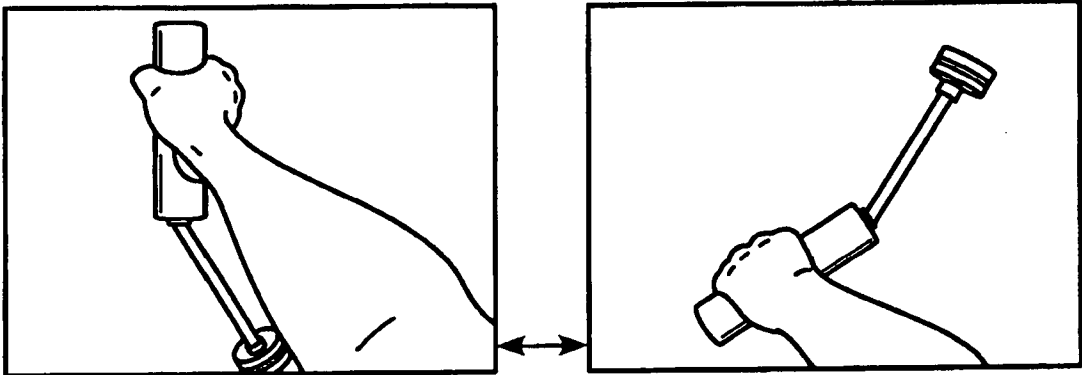


FIG. 24

Exercise 2.4: Slightly angled weight for half the range

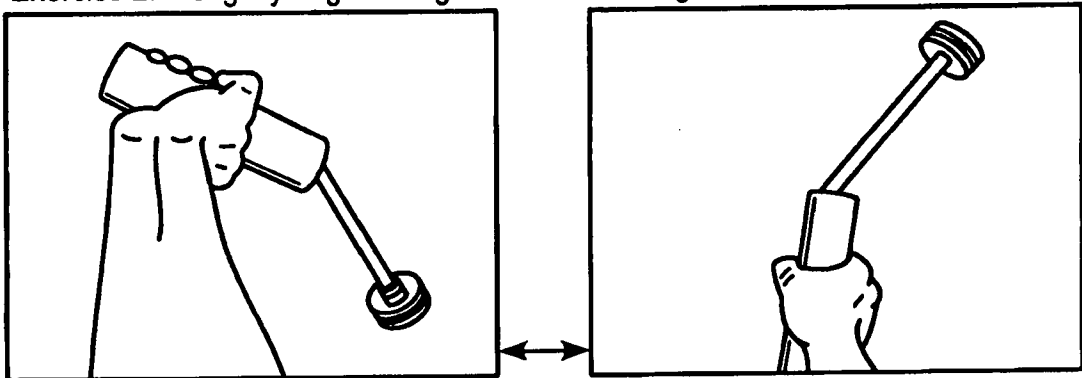


FIG. 25

Exercise 2.5: Slightly angled weight for other half of the range

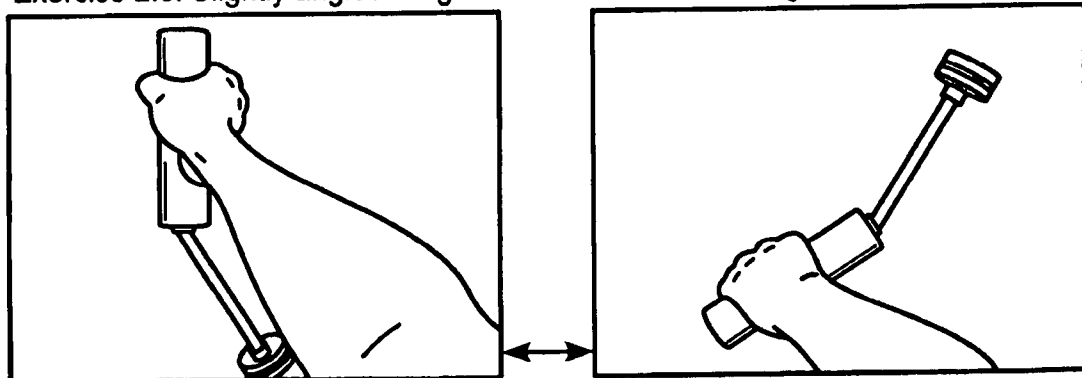


FIG. 26

Exercise 2.6: Slightly more angled weight for half the range

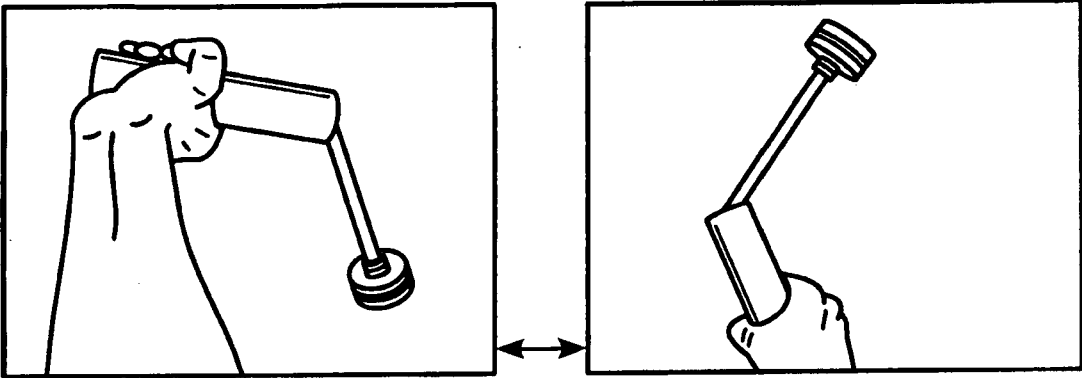


FIG. 27

Exercise 2.7: Slightly more angled weight for other half of the range

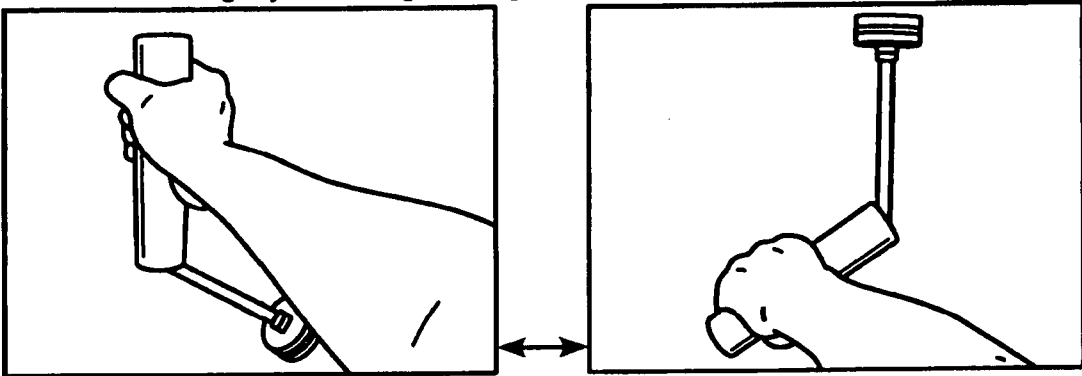


FIG. 28

Part 2: (Radial Deviation exercises through full range, including extremes)

Exercise 2.8: Perpendicular weight for full range

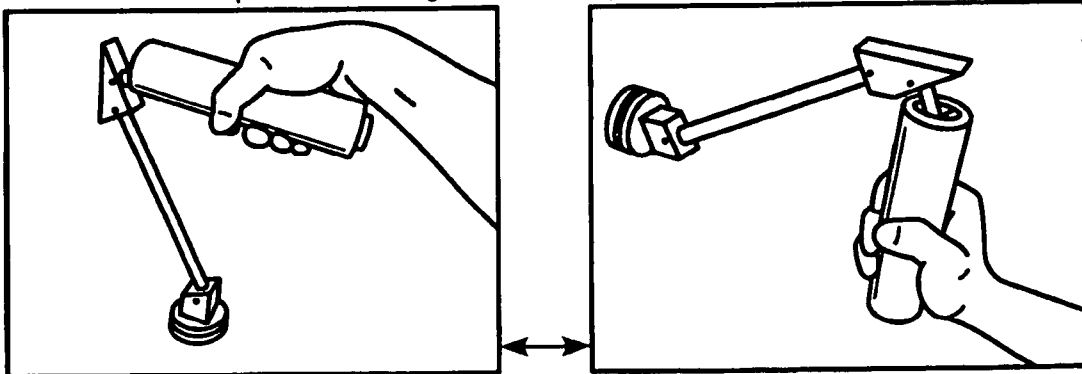


FIG. 29

1 x Exercise 2.9: Slightly angled weight for full range

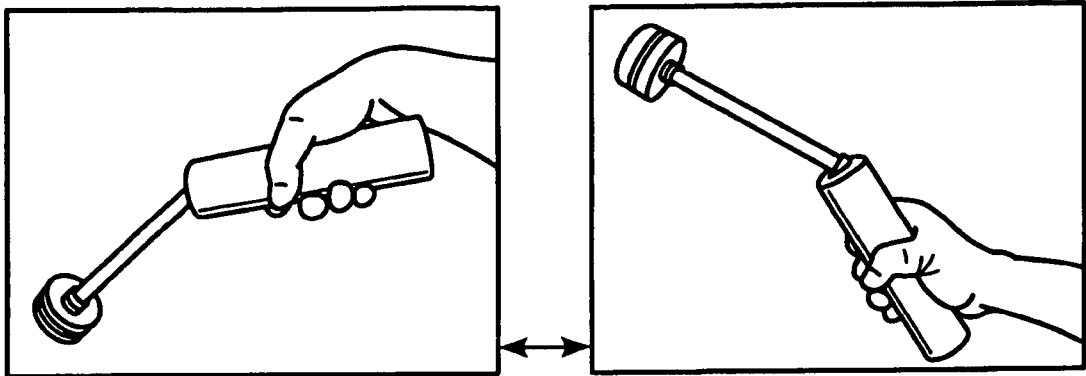


FIG. 30

Exercise 2.10: Slightly more angled weight for full range

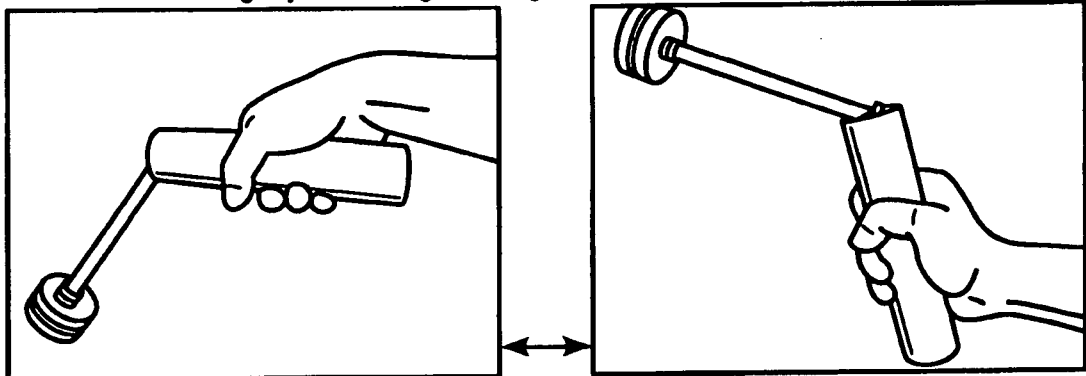


FIG. 31

PHASE III (Generating momentum to meet the ball)  
Part 1: (Pronation exercises through Range 1)  
Exercise 3.1: Perpendicular weight through Range 1

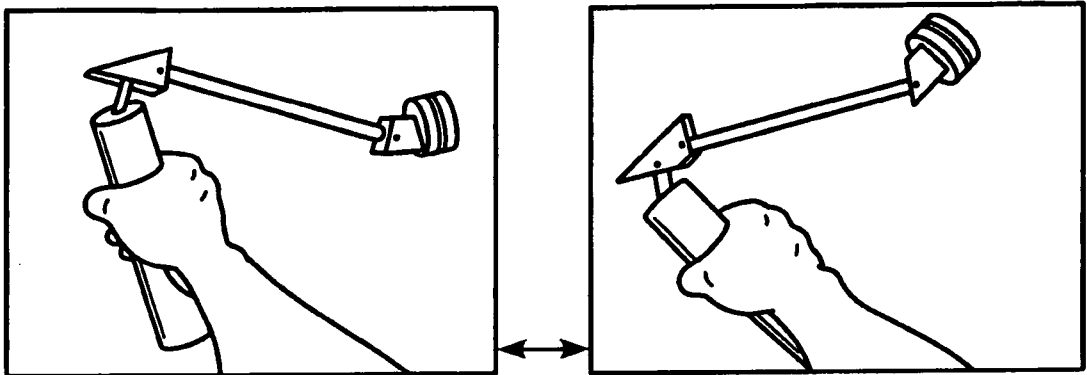


FIG. 32

Exercise 3.2: Slightly angled weight through Range 1

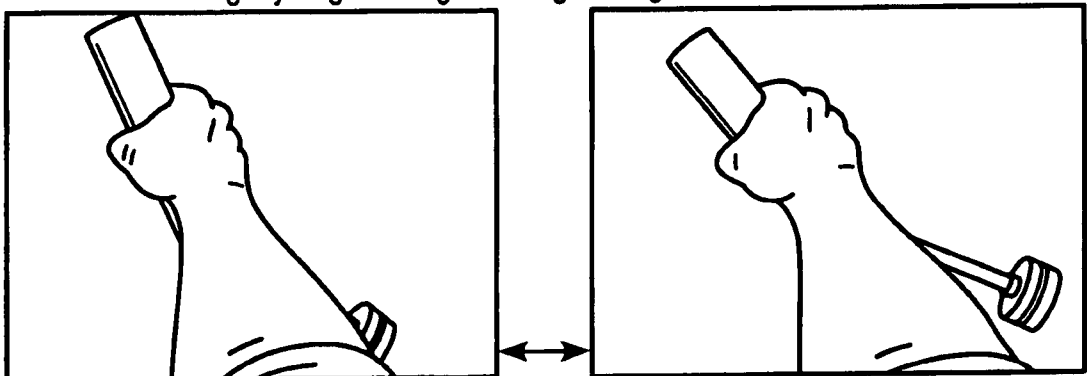


FIG. 33

Exercise 3.3: Slightly more angled weight through Range 1

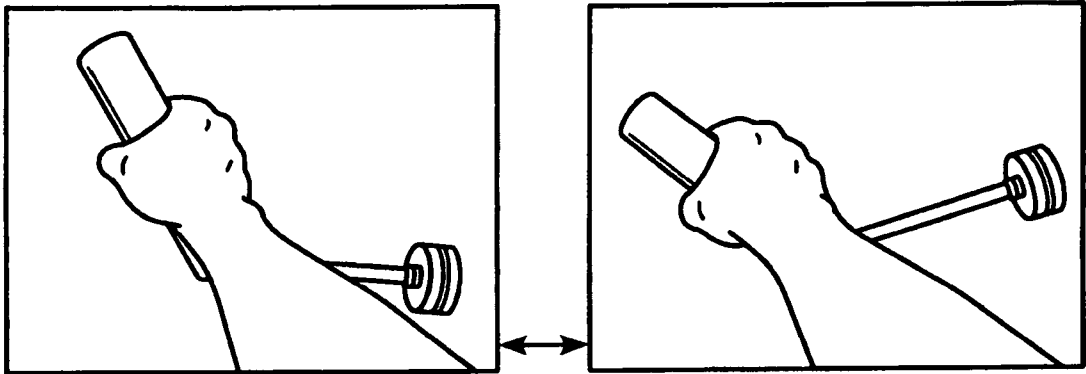


FIG. 34

Part 2: (Radial Deviation exercises through Range 1)

Exercise 3.4: Perpendicular weight through Range 1

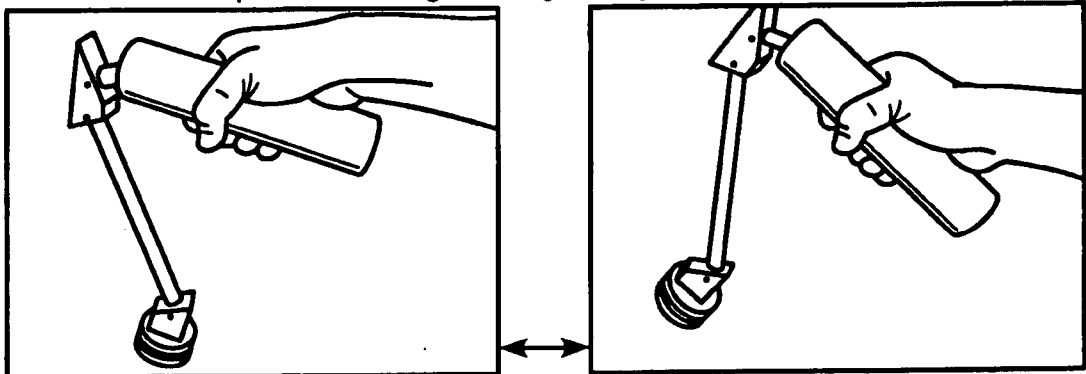


FIG. 35

Exercise 3.5: Slightly more angled weight through Range 1

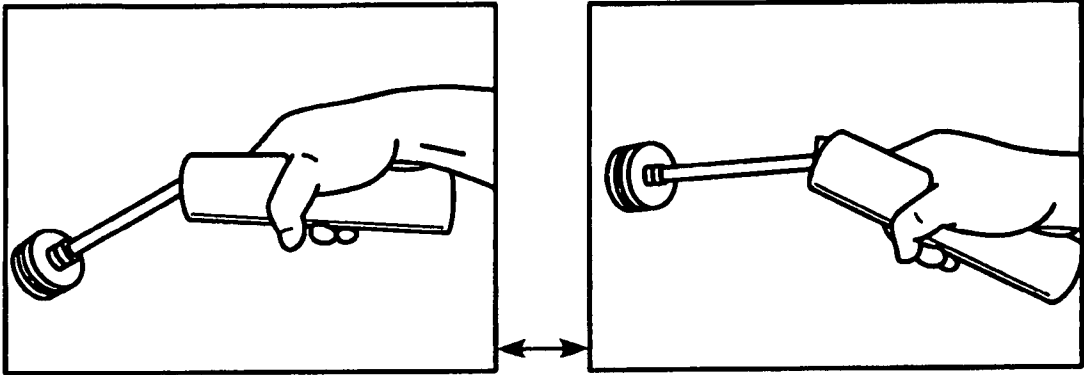


FIG. 36

Exercise 3.6: Slightly more angled weight through Range 1

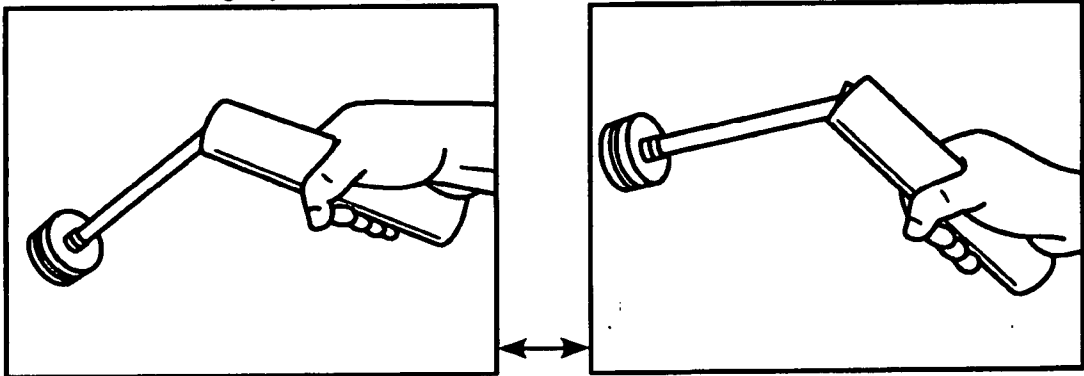


FIG. 37

PHASE IV (Powerful follow through)  
Part 1: (Pronation exercises through Range 2)  
Exercise 4.1: Perpendicular weight through Range 2

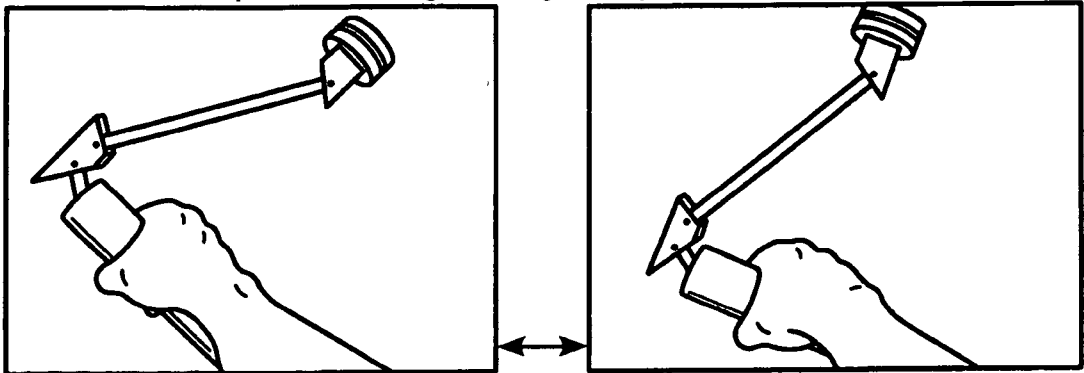


FIG. 38

Exercise 4.2: Slightly angled weight through Range 1

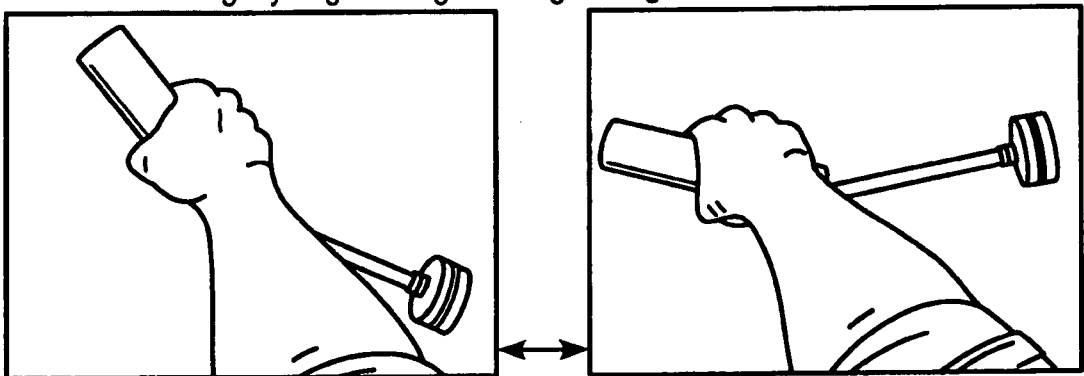


FIG. 39

Exercise 4.3: Slightly more angled weight through Range 1

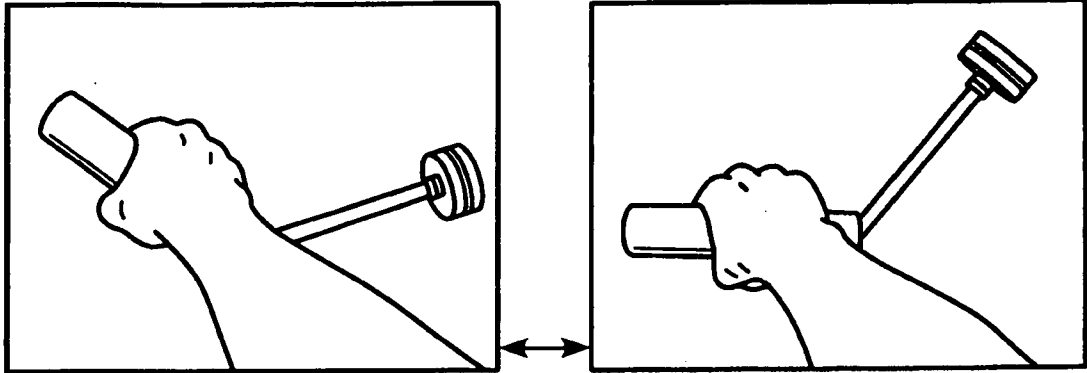


FIG. 40

Part 2: (Radial Deviation exercises through Range 1)  
Exercise 4.4: Perpendicular weight through Range 1

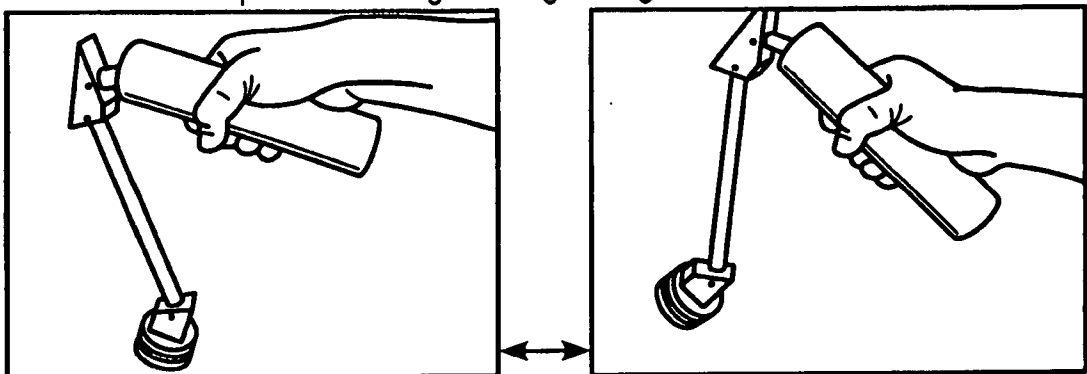


FIG. 41

Exercise 4.5: Slightly angled weight through Range 1

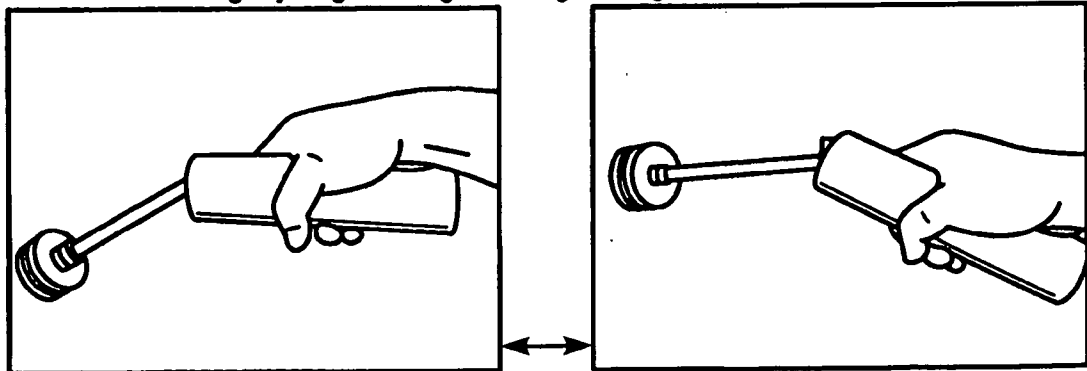


FIG. 42

Exercise 4.6: Slightly more angled weight through Range 1

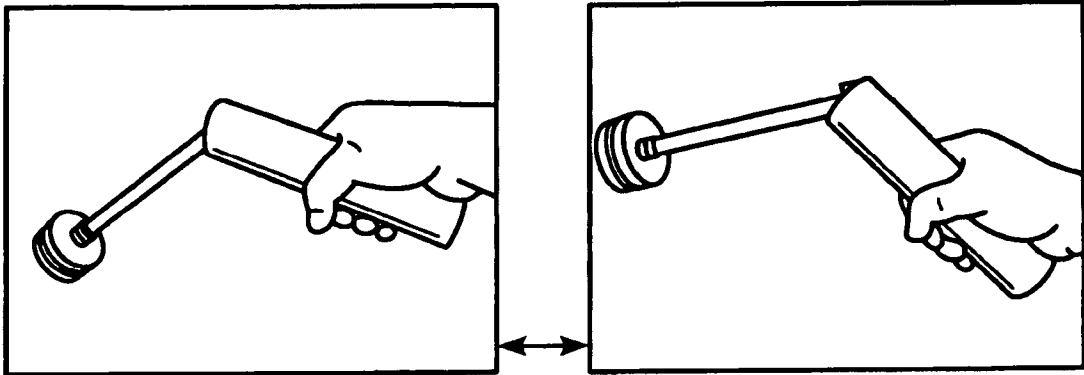


FIG. 43

PHASE V (Training for powerful snap back to ready position after follow-through)  
Part 1: (Supination exercises through range of Figure 50 [back into ready position])  
Exercise 5.1: Perpendicular weight for range of Figure 50

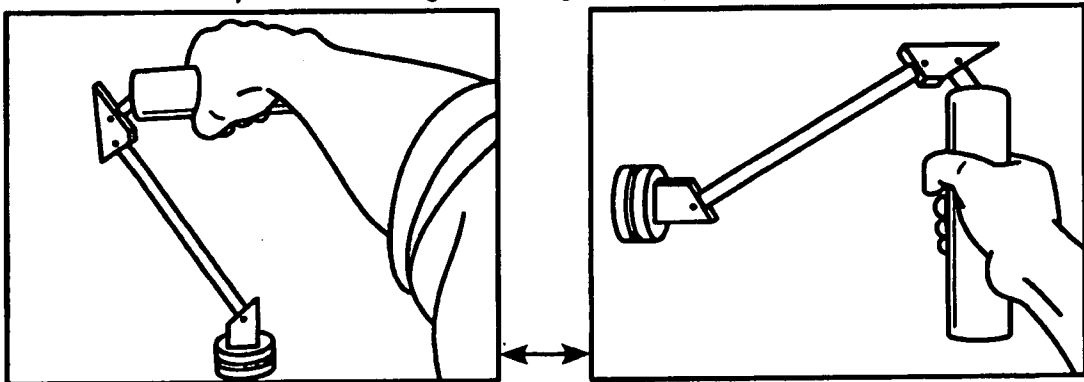


FIG. 44

Exercise 5.2: Slightly angled weight for range of Figure 50

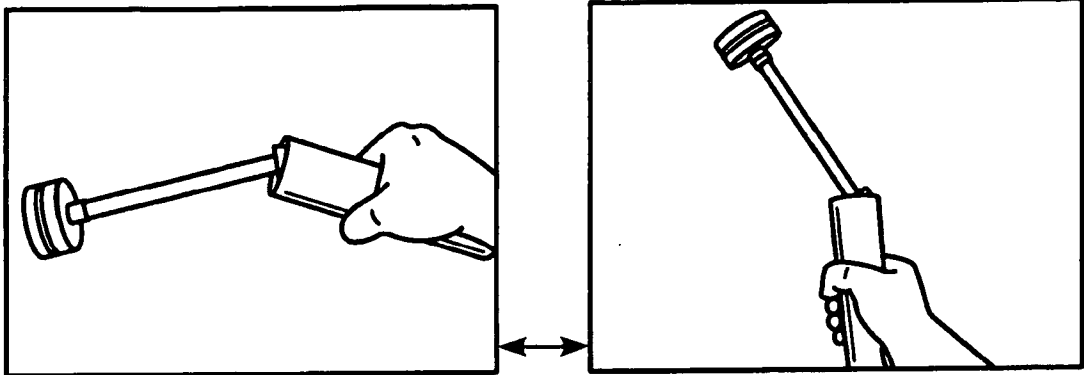


FIG. 45

Exercise 5.3: Slightly more angled weight for range of Figure 50

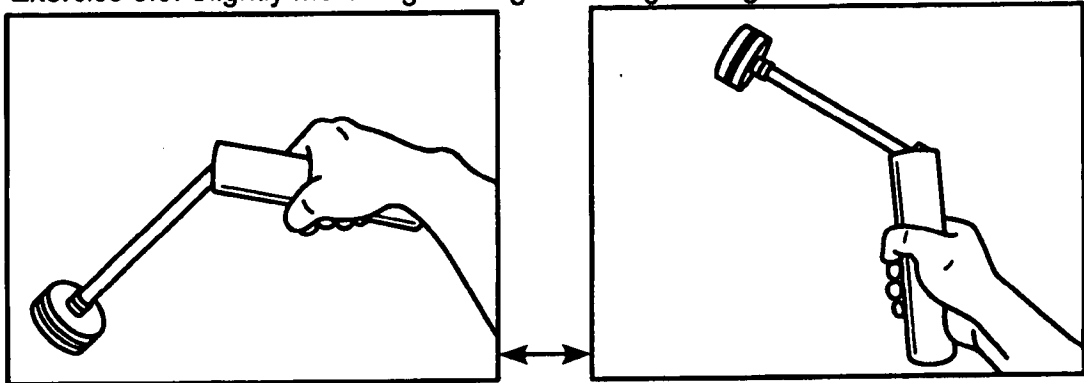


FIG. 46

Part 2: (Ulnar deviation exercises through range of Figure 50)

Exercise 5.4: Slightly angled weight for range of Figure 50

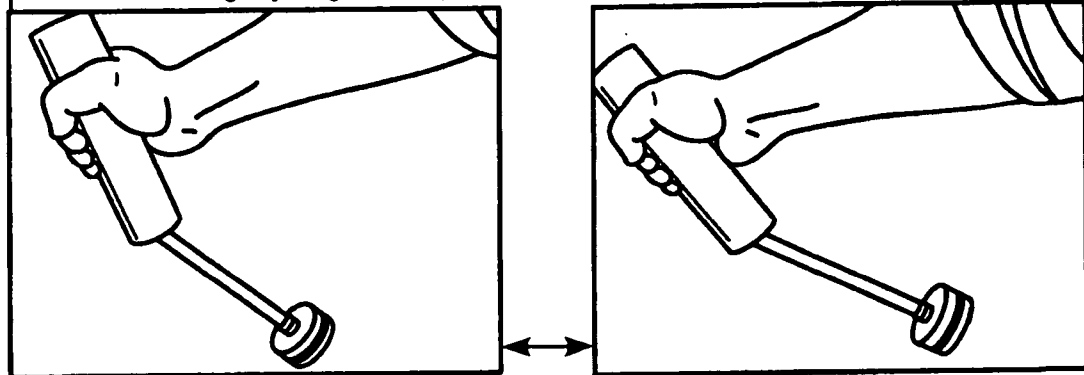


FIG. 47

Exercise 5.5: Slightly more angled weight for range of Figure 50

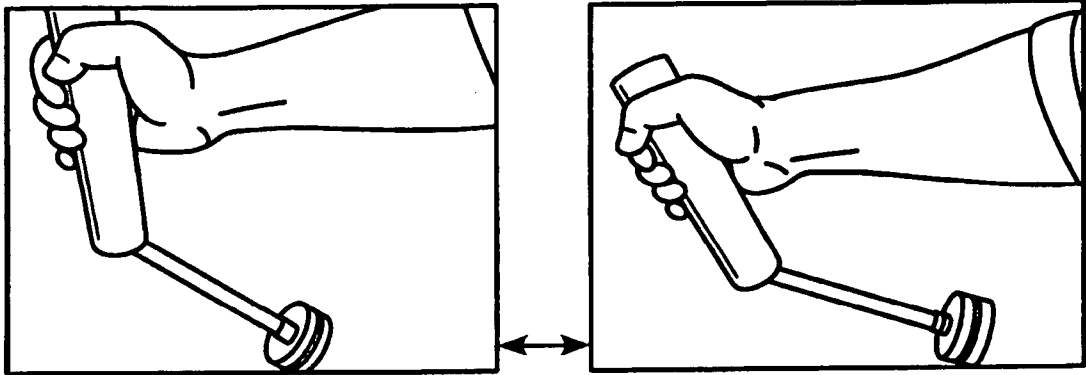


FIG. 48

PHASE VI

(Training for strong relationships between the muscle groups one needs to have a strong working relationship between to perform any given key skill.)

Exercise 6.1:

Efficaciously exercising musculoskeletal groups for both pronation and radial deviation together.

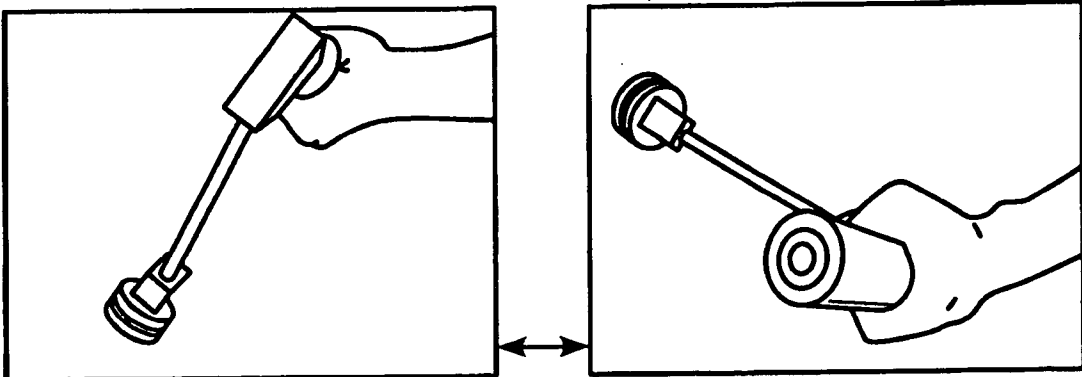


FIG. 49

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(ready position)

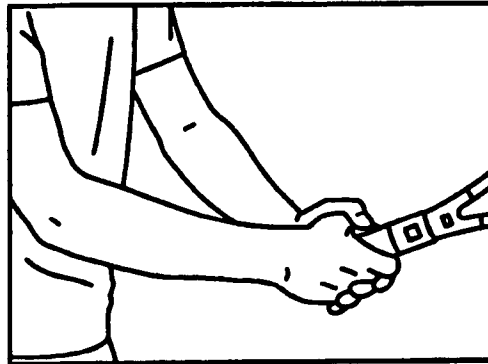


FIG. 50

(ready position → starting position of forehand with top-spin)

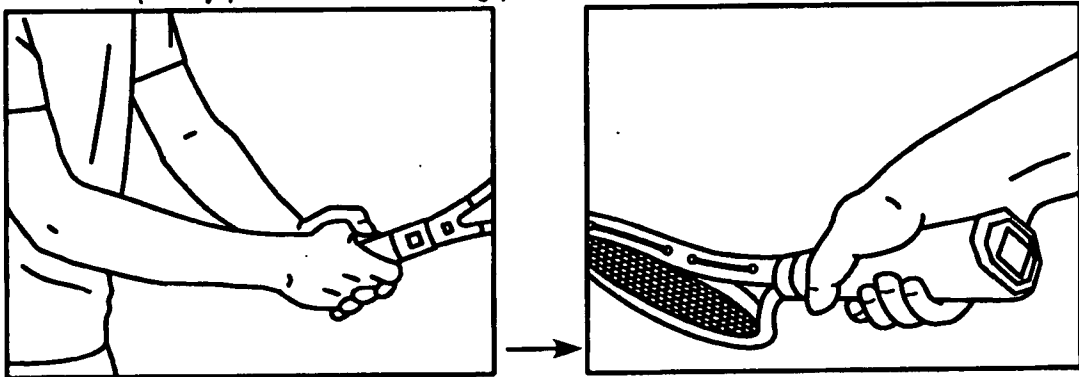


FIG. 51

(starting position of forehand with top-spin → point of contact with ball)

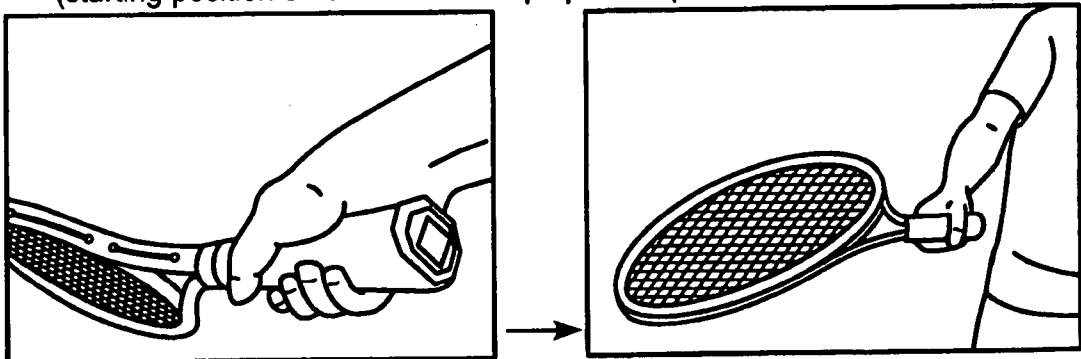


FIG. 52

(point of contact with ball → follow through to the end)

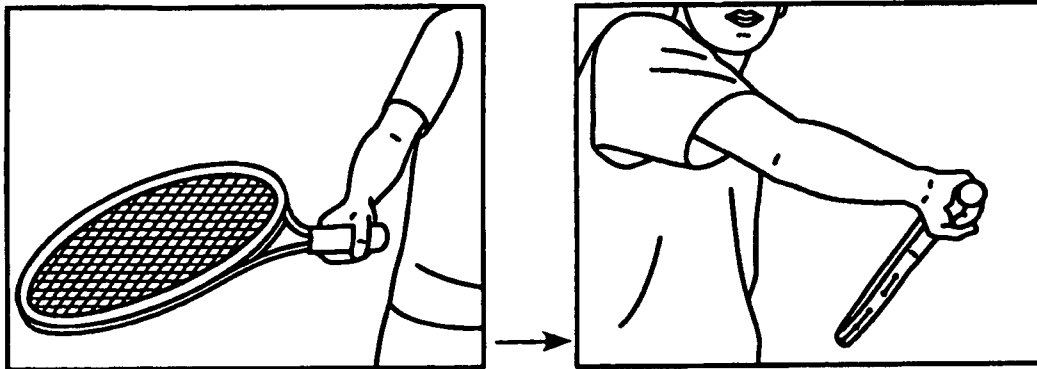


FIG. 53

(Point to stop motion with agility and stability to reorient oneself for next skill)

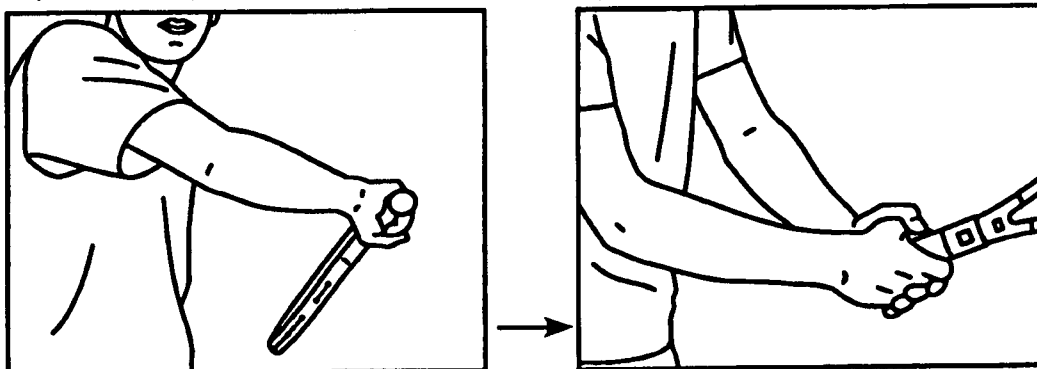


FIG. 54