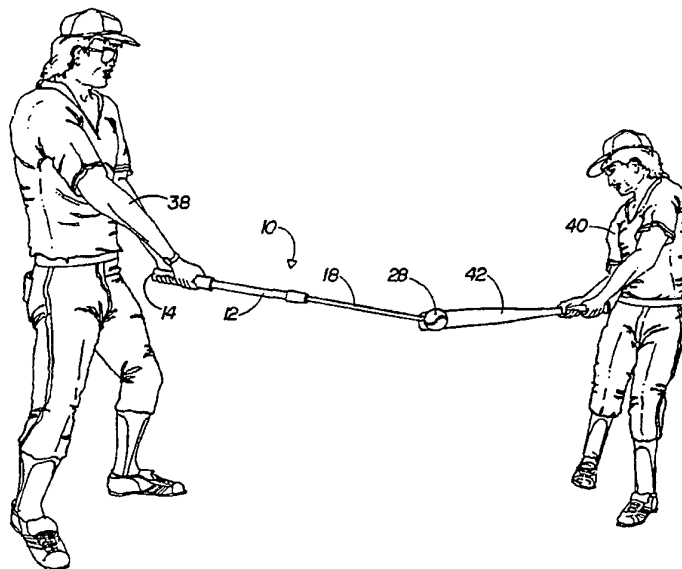




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(54) Title: IMPROVED BATTING PRACTICE DEVICE USING EXTENSIBLE MEMBER



## (57) Abstract

A batting practice device comprising a relatively stiff, elongate tubular member (12) with a handle (14) located on one end and the other end being open and containing in its interior an elongate ball supporting member (18) slidably disposed in a telescopic manner in the interior of the tubular member (12), a ball (28) tightly disposed on the outer end of the ball supporting member (18). The ball supporting member (18) is readily movable between a compacted position in which most of its length is contained in the interior of the tubular member (12), and an extended position in which a relatively small amount of the length remains inside the tubular member (12), and an extended position in which a relatively small amount of the length remains inside the tubular member. To assure the ball supporting member remaining in the extended position during use, a locking collar (44) is used, which can also be used to retain the ball supporting member in the compacted position. To prevent the ball supporting member from becoming separated during use, a rigid member (60) is extended through the length of the ball supporting member.

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IMPROVED BATTING PRACTICE  
DEVICE USING EXTENSIBLE MEMBER

Relationship to Previous Invention

This is a Continuation-in-Part of my patent application entitled "IMPROVED BATTING PRACTICE DEVICE," Serial No. 07/844,557, which was filed March 2, 1992, and which now pends in allowable condition in the U.S. Patent and Trademark Office.

Background of the Invention

1. Field of the Invention

The present invention relates to sporting equipment and more particularly to an improved batting practice device.

2. Description of the Prior Art

The prior art exhibits a number of training devices for improved batting performance. One example is that of batting-tee-type devices. The batting-tee devices exhibit a vertical support member upon which a ball is placed. A batter can then swing at the stationary ball on top of the support member thereby removing the need for a pitcher. Some designs have exhibited an elastic support member which is integral with a ball-shaped region at the top of the support member. One such device which teaches an integral support and ball-shaped region is disclosed in U.S. Patent No. 4,846,472. Such an integral batting tee device removes the need for retrieving batted balls. However, one problem with batting tees is that they do not lend themselves to the practice of hitting a moving object. Furthermore, in that it is desirable to gain proficiency in hitting balls at various locations of the strike zone, time is wasted in adjusting the batting tee to a desired height and position.

An answer to the problems inherent in stationary batting tees has been addressed by the introduction of hand-held batting practice devices. These devices are typically characterized by exhibiting a gripping portion, a connecting portion, and an impact portion. In operation, the hand-held batting practice devices require a holder and a batter. One individual holds the gripping portion of the device and extends the device so that the impact portion of the device is in a desired location for the batter to practice his or her swing. By the holder moving and accelerating the device, a batter can practice hitting different types of pitches at various locations of the strike zone.

One hand-held batting practice device is disclosed in U.S. Patent No. 2,765,170. The device has a helical spring which is connected to a gripping region located at one end of the helical spring, the other end of the helical spring being connected to a ball. However, one drawback of the device taught in U.S. Patent No. 2,765,170 is that the device is held such that it descends, as opposed to extending laterally, from the holder's hands. In that the device disclosed in U.S. Patent No. 2,765,140 descends from the holder's hand, the holder is placed in closer proximity to the batter which increases the probability of a holder being accidentally struck by a bat.

Other hand-held batting practice devices are disclosed in U.S. Patent Nos. 3,921,976, 4,513,965 and 4,846,472. These devices are intended to be held such that the ball or impact regions of the devices extend laterally away from the holder and toward the batter. However, one problem with these devices is that the holder's hand, elbow and shoulder can be subjected to significant stress and strain as a result of impact-produced torque.

U.S. Patent No. 4,846,472 does seek to reduce the impact-produced shock experienced by a holder's hands. However, the device taught in U.S. Patent No. 4,846,472 teaches a singular tubular extension which is connected at one end to a grip region.

At the end opposite to the grip region is located an opening to the tubular extension and it is upon this opening that a ball is positioned in a rest position. The ball is secured to the device by means of an elastic cord or string. A screw connects the one end of the string to the grip at a location inside of the tubular extension. A second screw connects the other end of the string to the ball. In that a bat will most often impact both the ball and that part of the tubular extension proximate the ball, significant torque will still be experienced at the grip region. Furthermore, string and screw connections have a history and propensity of becoming disengaged when exposed to significant stresses over time.

Thus, a need exists for a simple, easily used and durable hand-held batting practice device which will tend to minimize the reaction forces imparted to the holder of the device, and such a device is set forth herein.

#### Summary of the Invention

A practice device in accordance with this invention for enabling a batter to practice his batting skills as well as eye and hand coordination comprises a relatively stiff, elongate tubular member having first and second ends, with a handle located on the first end, and the second end being open. An elongate, flexible, ball-supporting member is utilized in telescopic relation with the tubular member, with a ball being tightly secured on one end of the ball-supporting member. The other end of the ball-supporting member is slidably disposed in the interior of the relatively stiff tubular member, with the ball-supporting member being readily movable between a compacted position in which most of its length is contained in the interior of the tubular member, and an extended position in which only a relatively small amount of the length of the ball-supporting member remains inside the tubular member. The

ball is preferably made of urethane foam, foam rubber or similar material which will absorb a degree of the impact shock.

I advantageously utilize a locking means on the end of the tubular shaped, relatively rigid member, which locking means preferably takes the form of a rotatable collar. This arrangement enables the user to secure the flexible member, on occasion, in the extended position, such that the ball will be appropriately positioned for being struck by an implement swung by a batter. When not in use, the resilient, flexible ball-supporting member can be compacted for storage by returning it to the interior of the tubular shaped, relatively rigid member.

In the interests of safety, I anchor a nylon cord or the like in the interior of the relatively stiff outer member, which cord is attached to the end of the flexible member disposed in a telescopic relation with the outer member. The nylon cord is of a carefully selected length, such that it prevents the flexible member from entirely coming out of the outer member.

To prevent the resilient, flexible ball-supporting member from taking a permanent bend or being crushed, I utilize on its interior an elongate member having a controlled amount of flexibility.

Accordingly, a first object of the present invention is to provide a durable, lightweight batting practice device for helping a batter improve his hand/eye coordination.

Another object of the present invention is to provide a hand-held batting practice device which is constructed to minimize the occurrence of injury to the holder of the device, and which is extensible from a compacted condition to enable a ball utilized on the end of the device to be placed at a considerable distance from the holder, for the holder's safety.

Still another object of the present invention is to provide a highly effective, durable, easily affordable batting practice device which is of simple construction, and which can be readily compacted for the purposes of shipping or storage.

Yet another object of my invention is to provide a batting practice device that is safe to use, and which effectively resists deformation that would impair its ability to be compacted.

It is yet still another object of the present invention to provide a flexible, resilient member operatively disposed in a relatively rigid tubular member, with the arrangement being such that the tubular member, the flexible member and the connecting means comprise a torque reduction means for reducing the torque experienced by an individual holding the handle of my device when the target is struck by an implement or striking member swung by a second individual.

These and other objects, features and advantages will be more apparent from a study of the appended drawings.

#### Brief Description of Drawings

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 is an illustration of a typical use of my device, wherein one person holds the target member, and the other person swings a bat at the target member;

Figure 2 is a schematic illustration of a typical device in accordance with the present invention, revealing a condition in which the flexible, ball-supporting member has been moved into its compacted position inside the relatively stiff outer member;

Figure 3 is a schematic illustration revealing the flexible, resilient ball-supporting member of Figure 2 when it has been moved outward into its extended position;

Figure 4 is a fragmentary view, revealing my novel collar member in the tightened condition;

Figure 5 is a view resembling Figure 4 but showing the collar having been removed from the collet;

Figure 6 is a view, partly in section and illustrating a preferred form of a device utilized to assure that the flexible ball-supporting member has resilience, and for preventing it from taking on a permanent bend, with this figure also revealing a stout cord utilized as a safety means inside the relatively rigid tubular member, for preventing the flexible member from becoming separated from the tubular member to which the handle is attached; and

Figure 6a is a fragmentary view of a preferred way of affixing the end of the stout cord utilized as a safety measure, to a location inside the handle end of the relatively stiff outer member, in this instance a rivet being utilized for this purpose.

When referring to the drawings, it should be understood that like reference numerals designate identical or corresponding parts throughout the respective figures.

#### Detailed Description of the Invention

With initial reference to Figure 1, it will be seen from this figure that I have shown a batting practice device 10 in accordance with this invention, involving a tubular shaft 12 of generally rigid material, upon the end of which is utilized a handle 14. Contained inside the shaft 12 is a flexible member 18, upon the outer end of which is a target member 28, typically in the configuration of a baseball, although I am not to be limited to this. The tubular shaft 12, which may hereinafter be referred to as the first member, the handle 14 and the target member 28 are shown in greater detail in Figure 2. The relationship of these members to the extensible member 18 is shown in Figure 3, and I may hereinafter refer to the flexible member 18 as the second member.

In Figure 1 it is to be seen that the batting practice device 10 is being held by a person 38, with the device 10 being held in



approximately a horizontal attitude for the convenience of the batter 40. As visible in this figure, the batter 40 is holding a bat 42, which he swings with the intent of striking the target 28, which is spherical in shape, and in the preferred instance, closely resembles a baseball. The target member 28 is typically made of urethane foam, foam rubber or similar material.

It is to be understood that the flexible second member 18 forms the support for the ball-shaped member 28, which is firmly affixed to the free end thereof. As will be obvious, the person 38 assisting the batter can hold the device 10 by the handle 14, and support the ball-shaped member 28 in a position for being swung at with an implement held by the batter 40. In the instance depicted in Figure 1, the implement being swung by the person 40 is a baseball bat 42, although the implement utilized in other sports could be used as well in conjunction with this invention.

As should be quite apparent, the holder 38 can move and swing the device 10 in such a manner that batter 40 can effectively practice hitting various types of pitches at various speeds and locations in the strike zone. As an option, I can utilize a cord 33 at the end of handle member 14, as shown in Figures 2 and 3, to be secured around the wrist of the holder 38 to the device 10. Such a cord can also be used as a means to hang the device 10 up on a rack or hanger when the device is not in use or is in storage.

It is to be understood that the device 10 of the present invention eliminates the need to chase balls and pitch balls, and increases the amount of time to practice and concentrate on improving batting technique. The device is ideal for younger players such as little leaguers in that a player can be instantly corrected as to how to better hit a pitch and thereby improve stance, swing, and hand/eye coordination. Because the device 10 is in accordance with this invention extensible, the ball or target 28 can be disposed at a safe distance from the holder 38, to prevent him from being struck by the bat 42 during batting practice.

With reference now to related Figures 2 and 3, it will be seen now in further detail that the present novel batting practice device 10 is largely constituted by the relatively rigid first member 12 and the flexible second member 18. A handle 14 may be secured to the end of the member 12. Although I am not to be limited to any particular material, I prefer the use of PVC material in the construction of the member 12, because of its rigidity, lightness, durability and inexpensiveness. In Figure 2 the device 10 is shown in its compacted position, in which the flexible member is entirely contained within the rigid member 12, which of course is the position suitable for shipping as well as storage.

From Figure 3 it can be readily seen that the device 10 is of an extensible nature, with the flexible, resilient second member 18 being of a length such that it can be entirely contained within the relatively rigid, tubular-shaped first member 12. By appropriate means, the target member or ball 28 is tightly secured at the outer end of the flexible member 18. As should now be entirely clear, when the member 18 is in the extended position shown in Figures 1 and 3, the target member or ball 28 is readily employable for helping a batter improve his hand and eye coordination. Because of the relatively great length of the extended device, it can be safely held for the convenience of the batter, without jeopardizing the safety of the person holding the device 10.

In the prototype of the present invention, shaft 12 was twenty-seven inches long, but obviously I am not to be limited to this dimension.

With continuing reference to Figures 2 and 3, it is to be understood that the handle 14 is preferably of one-piece construction, being for example molded foam rubber or other easily grippable and shock absorbing material. The handle 14 is preferably inserted over the holding end of the elongate tubular member or shaft 12, and secured in place by the use of a suitable

glue or cement. I may optionally provide a plug on the outer end of the handle, utilized for a purpose to be described at greater length hereinafter.

In the prototype of the present invention the handle 14 was approximately 4 3/4 inches long, but obviously I am not to be limited to this dimension. As previously mentioned, I may utilize an exterior cord attached to the handle 14.

The flexible member 18, also referred to as the second member, is operatively associated with tubular shaft 12, with the free end of the member 18 being easily accommodated in the interior of the first member 12, as is apparent from the several figures. The flexible member 18, which may also be referred to as the ball-supporting member, has an external diameter which is less than the internal diameter of the hollow region of shaft 12, in order that it may be readily accommodated within the interior of shaft 12.

The member 18 is resilient, meaning that it will return to its original straight condition after bending as a result of being struck. This member is preferably made of flexible plastic tubing or a material having similar physical properties. For reasons of structural integrity, a portion of the flexible member 18 remains inside shaft 12 when the flexible member has been moved to the extended position, and in this region I prefer to utilize a suitable plug or elongate spacer, such as of vinyl or wood, that is approximately five inches long. This detail will be discussed at greater length hereinafter.

As visible in Figures 4 and 5, I prefer to use a locking means in the form of a rotatable collar 44, which is internally threaded, with Figure 5 revealing internal threads 46, which are intended to threadedly engage the threads 48 forming a part of collet 50 that is firmly attached to the end of the shaft 12. Although any of a number of different threads could be used, I prefer to use an Acme thread, with approximately five threads per inch. In this way, after the collar 44 has been tightened, it may be loosened either

by a lady or a child, for the coarse thread I prefer to use is relatively easy to loosen.

To permit the collar 44 to effectively tighten the end of the collet 50 around the flexible member 18, I prefer to utilize a plurality of slots 52 in the nature of saw cuts at spaced locations around the periphery of the end of the collet, with the curved interior of the upper end of the collar 44 serving to cause the portions of the collet between the slots 52 to move into a very tight relationship with the sidewall of the flexible member 18. To provide additional gripping power, I prefer to utilize a rubber grommet 54 between the shaft of member 18, and the slotted end of the collet 50. In this way, when the collar 44 has been sufficiently rotated in the tightening direction, the grommet 54 is caused to grip the member 18 very tightly.

As by now should be obvious, the versatility of this arrangement is such that the collar 44 can be tightened so as to lock the flexible member 18 in the fully extended position, a partially extended position, or the compacted position, whichever is appropriate in a given instance.

The collar 44 is shown in the removed position in Figure 5 only for reasons of clarity, for in normal use, it is only necessary to loosen the collar in order to be able to move the flexible member 18 into or out of the shaft 12. As is entirely obvious, after the member 18 has been moved to the desired position, it is then necessary to tighten the collar, to prevent the flexible member from moving away from that position.

I have found with extensive use, an ordinary flexible member 18 tended to take on a degree of permanent set, adversely affecting its appearance and utility, and in some instances impairing its ability to be received in the hollow shaft 12. Therefore, in accordance with a preferred embodiment of this invention, I utilize suitable internal means for minimizing deflection and assuring resilience, or in other words, preventing the member 18 from tending to take on, or to remain in, a bent condition.

In the preferred embodiment of this invention depicted in Figure 6, I reveal that the sidewall of the member 18 is relatively thin, with a relatively stiff, resilient rod 60 extending down the central interior portion of the member 18. The rod 60 can, for example, be of acetal delrin and be .312 inches in diameter, which of course is considerably smaller than the dimension of the interior of the member 18. The interior dimension of the member 18 is typically on the order of 1/2 inches. The resilient rod 60 could also be made of steel.

In order for the relative rigidity of the rod 60 to be passed along to the member 18, I utilize a number of spacer members 62, such as of vinyl, although I am not to be limited to this material. The spacer members 62 should have an outer diameter relatively closely approximating the interior dimension of the member 18, and be disposed at intervals of approximately six inches along the rod 60, although I am not to be limited to this.

With reference to Figure 6, it is to be seen that I utilize a comparatively long plug or spacer 64 at a location adjacent the inner end of the member 18. The reason for the long spacer 64 at this location is two-fold, with one being to provide a firm surface against which the collar 44 may be tightened. An additional reason is to prevent bending of the member 18 at the location where the member 18 emerges from the collar 44. Without the long spacer 64 in the interior of the member 18 at this location, there is a tendency for the member 18 to take on a permanent deformation, which is of course to be avoided.

It is to be understood that a batter may strike the ball 28 with a considerable amount of force, thus requiring the ball to be firmly attached to the end of the flexible member 18 if dislodgment is to be prevented. I may prefer to drill holes in the end of the member 18, so that at the time of manufacture, when the end of the member 18 is glued or cemented inside the interior of the ball 28, there will be a considerable amount of contact surface and holding power.

In the preferred instance, I mold the ball 28 in place at the end of the flexible member 18 by the use of a water blown urethane foam, in conjunction with which a two-part mold (not shown) is utilized. Each half of the internal portion of the mold is configured to resemble a baseball, so that when the end of the member 18 is inserted into the mold, and the urethane material is poured into the mold, the result is a baseball-shaped component tightly molded to the end of the flexible member. As is obvious, the material out of which the ball 28 is molded tends to enter the several holes that were formed in the end of the member 18, causing the ball 28 to grip the end of the member 18 very tightly.

In order to provide a tough covering or hide around the ball so formed, I typically spray a flexible vinyl coating onto both interior surfaces of the mold halves before the urethane is poured. In this way, when the mold halves are opened approximately one minute after the urethane is poured, it will be seen that a baseball-shaped component has been molded in a highly satisfactory manner to the end of the flexible shaft member 18.

Another consequence of the batter striking the ball 28 with great ferocity is the possibility of the flexible member 18 coming entirely out of the shaft portion 12, despite the collar member 44 having been securely tightened. To this end, I utilize a strong nylon cord 70 of limited length on the inside of the member 12, with one end of this cord being attached to the end of the handle 14, such as by a rivet 72 fastened to the end of the member 12, as shown in Figures 6 and 6a. As an alternative, the one end of the cord 70 could be affixed to the handle end of the device by means of a plug driven into the end of member 12. A loop 74 is formed on the other end of the cord 70, to permit it to be readily attached to the end of the flexible member 18, thus to form a positive means for preventing member 18 from entirely separating from the rigid member 12.

The sturdy nylon cord 70 is of a carefully chosen length, and is loosely contained in the end of the member 12 when the device is in the compacted condition. However, it is to be clearly understood that at such time as the user pulls out the inner member 18 to its functional length, the nylon cord 70 effectively prevents the member 18 from entirely coming out of the member 12.

Because the member 18 is of resilient, flexible material, this represents a torque reducing means in that most of the load resulting from the target or ball 28 being impacted by the implement 42 is absorbed, and not transmitted to the handle 14 located at the holding end of the tubular member 12. Further, the target 28 being made of urethane foam, rubber or other shock absorbing material, the initial shock experienced by the device 10 is considerably reduced. As previously mentioned, the handle 14 is made of a shock absorbing material (e.g. rubber) to reduce the amount of vibration experienced by an individual holding the device 10 when the target 28 is impacted by a striking object, such as the implement 42.

Inasmuch as my device is readily movable from a compacted position into an extended position, it provides a maximum amount of safety to the holder of the device, in that the holder of the device may be far removed from the arc through which the batter 40 swings the implement 42.

As should now be readily apparent, my novel device is designed to minimize the amount of shock and torque experienced by a holder when the target 28 of the device 10 is impacted by a bat 42 or other striking object.

The foregoing detailed description is intended to be illustrative and non-limiting. Many changes and modifications are possible in light of the above teachings. Thus, it is understood that the invention may be practiced otherwise than as specifically described herein and still be within the scope of the appended claims.

I Claim:

1. A practice device for enabling a batter to practice his batting skills as well as eye and hand coordination, comprising a relatively stiff, elongate tubular member with a handle located on one end, with the other end of said member being open and containing in its interior, an elongate, ball-supporting member, said ball-supporting member being slidably disposed in a telescopic manner in the interior of said tubular member, with a ball being tightly disposed on the outer end of the ball-supporting member, said ball-supporting member being readily movable between a compacted position in which most of its length is contained in the interior of said tubular member, and an extended position in which only a relatively small amount of the length of said ball-supporting member remains inside said tubular member.
2. The practice device as recited in Claim 1 in which locking means are utilized on said elongate tubular member for enabling a user to selectively secure said ball-supporting member in the extended position, such that said device can be held in an appropriate position for a batter to practice hitting the ball.
3. The practice device as recited in Claim 2 wherein said locking means is a rotatable collar.
4. The practice device as recited in Claim 1 in which said ball-supporting member is relatively flexible.
5. The practice device as recited in Claim 1 in which said ball-supporting member is a flexible tubular member, and means utilized inside said ball-supporting member to prevent the crushing of its sidewall upon said ball being struck by an implement swung by a batter.



6. The practice device as recited in Claim 5 wherein an elongate, relatively rigid member extends substantially the entire length of the interior of said flexible tubular member.

7. The practice device as recited in Claim 1 in which means disposed in the interior of said tubular member prevents said ball-supporting member from being entirely withdrawn from said elongate tubular member.

8. An extensible target-supporting device employable for helping a batter improve his hand and eye coordination, said device comprising first and second members disposed in telescopic relation, with each of said members having a free end, said first member being an elongate, relatively stiff tubular member, inside which said second member is slidably disposed, said second member being relatively flexible, and having a ball-shaped member tightly affixed to its free end, said first member having a handle on its free end, whereby a person assisting the batter can extend the second member and then hold the device by the handle, thus supporting said device in a position of relative safety as said ball-shaped member is being swung at with an implement held by the batter.

9. The target-supporting device recited in Claim 8 in which locking means are provided on said first member, said locking means enabling said second member to be locked in the extended position, with said ball-shaped member thus disposed a relatively great distance away from said handle.

10. The target-supporting device as recited in Claim 9 wherein said locking means is a rotatable collar.

11. The target-supporting device as recited in Claim 8 in which means are utilized in the interior of said second member, to prevent the crushing of its sidewall upon said ball being struck by an implement swung by a batter.

o 12. The target-supporting device as recited in Claim 11 in which an elongate, relatively rigid member extends substantially the entire length of said second member.

13. A practice device for enabling a batter to practice his batting skills as well as eye and hand coordination, comprising a relatively stiff, elongate tubular member having first and second ends, a handle located on said first end, and said second end having an opening leading into the interior of said tubular member, and an elongate, ball-supporting member utilized in operative relation with said tubular member, a ball tightly secured on one end of said ball-supporting member, with the other end of said ball-supporting member slidably disposed in a telescopic manner in the interior of said tubular member, said ball-supporting member being readily movable between a compacted position in which most of its length is contained in the interior of said tubular member, and an extended position in which only a relatively small amount of the length of said ball-supporting member remains inside said tubular member, and means for preventing said ball-supporting member from being separated from said tubular member upon said ball being struck by a batter.

14. The practice device as recited in Claim 13 in which locking means are utilized for enabling a user to selectively secure said ball-supporting member in the extended position, such that said device can be held in an appropriate position for the batter to practice hitting the ball without jeopardy to the person holding said device.

15. The practice device as recited in Claim 14 wherein said locking means is a rotatable collar.

16. The practice device as recited in Claim 13 in which said ball-supporting member is flexible.

17. The practice device as recited in Claim 13 in which said ball-supporting member is a flexible tubular member, and means utilized inside said ball-supporting member to prevent the crushing of its sidewall upon said ball being struck by an implement swung by a batter.

18. The practice device as recited in Claim 17 in which an elongate, relatively rigid member extends substantially the entire length of said second member.

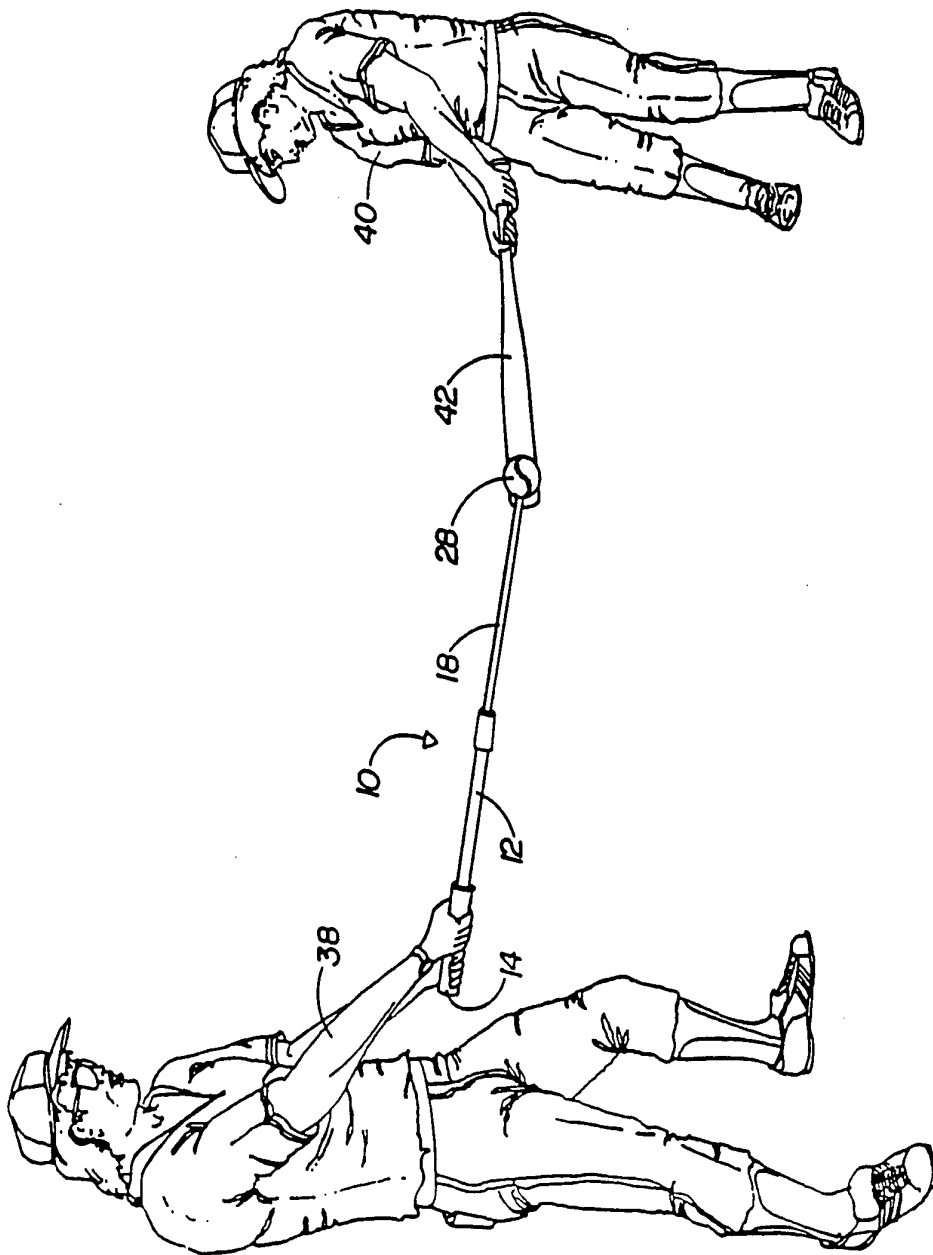
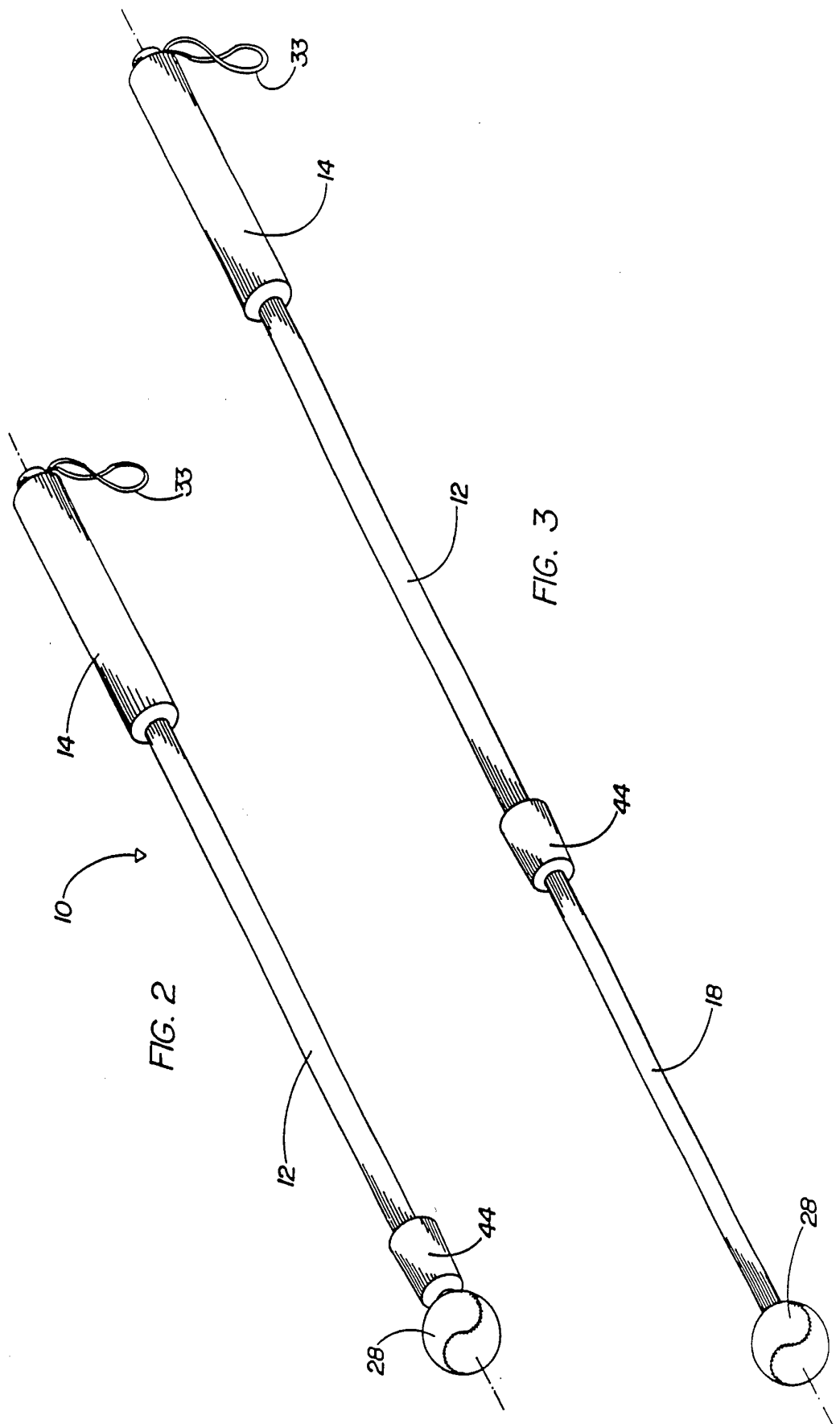


FIG. 1



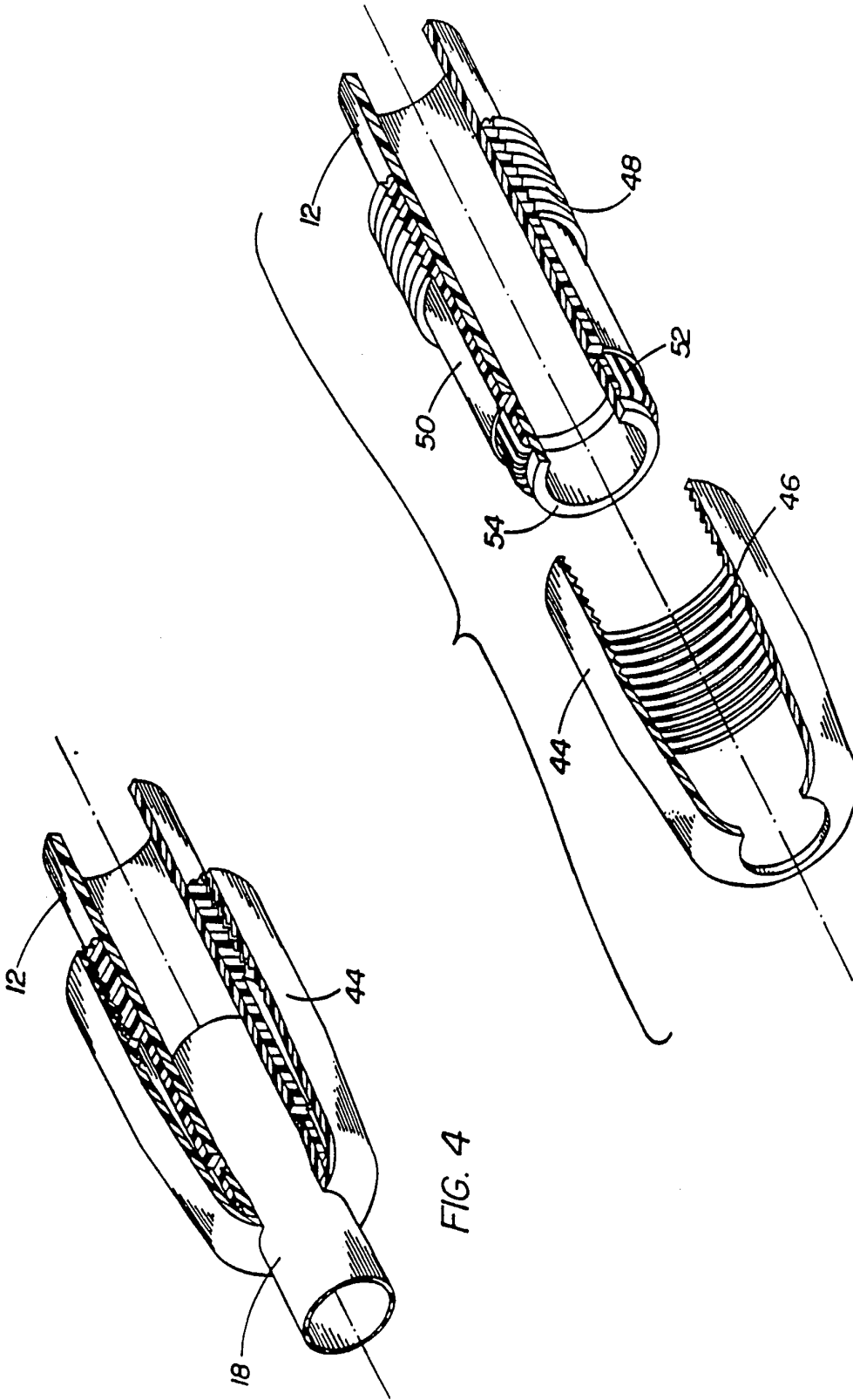


FIG. 4

FIG. 5

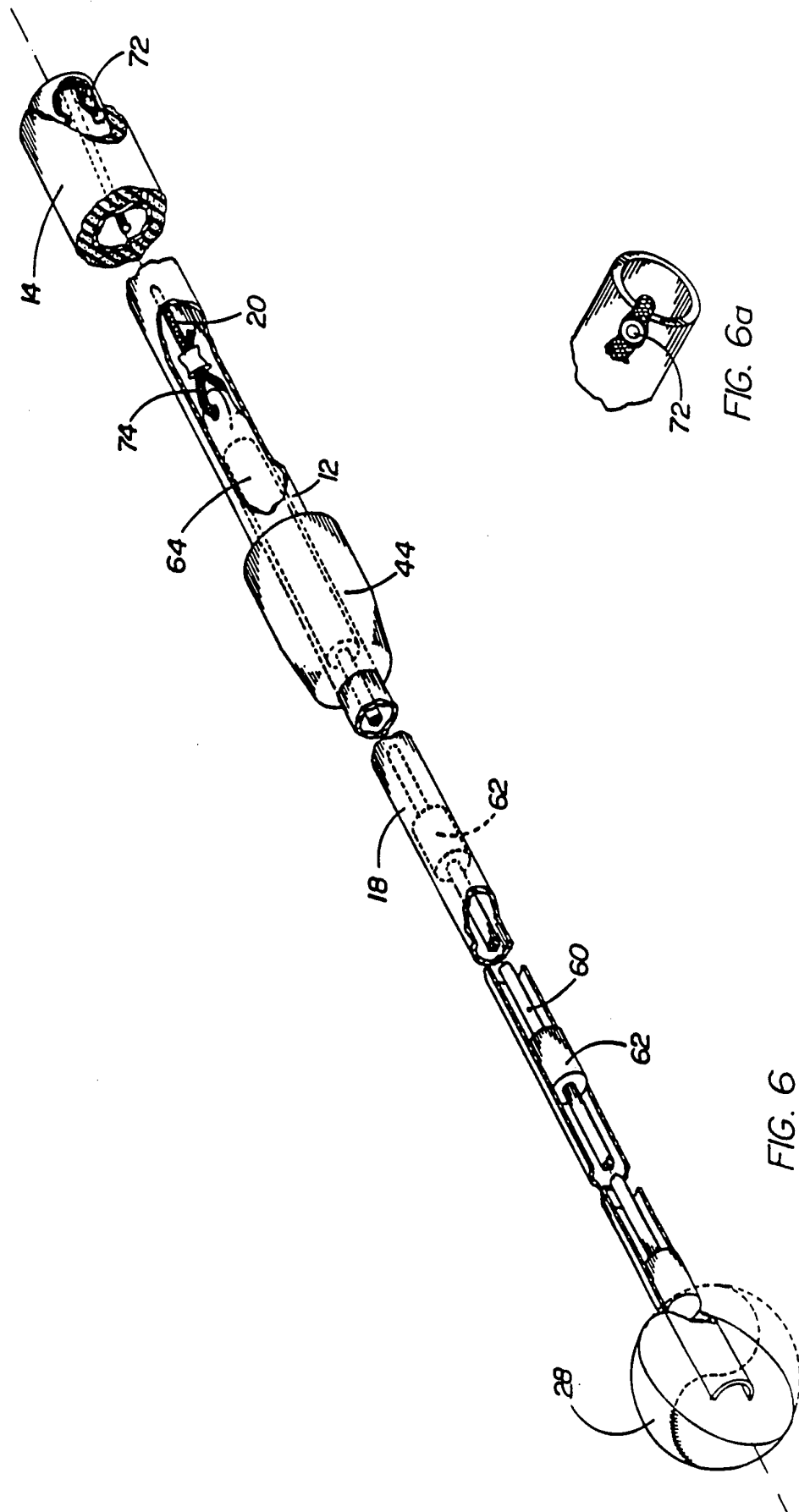


FIG. 6a

FIG. 6

INTERNATIONAL SEARCH REPORT

In tional application No.  
PCT/US94/03088

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) :A63B 69/40

US CL :273/26R

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 43/18.1; 273/26A, 26B, 26E, 26R, 29A, 58C, 80B, 80D, 186.2, 186.5, 200R, 193B, 207, 208

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
APS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| Y         | US, A, 1,621,926, (R. E. DICKINSON, JR.), 07 June 1927. (See entire document).     | 1-18                  |
| Y         | US, A, 2,462,955, (W. J. GLANCEY), 01 March 1949. (See entire document).           | 1-18                  |
| Y         | US, A, 3,461,593, (L. P. MARTUCH ET AL.), 19 August 1969. (See entire document).   | 6                     |
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| Y         | US, A, 1,967,355, (K. P. EDWARDS), 24 July 1934. (See entire document).            | 1-18                  |
| Y         | US, A, 2,396,408, (L. A. BENECKE), 12 March 1946. (See entire document).           | 3, 8-10, 13-15        |

Further documents are listed in the continuation of Box C.  See patent family annex.

|   |  |
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Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US94/03088

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| Y         | US, A, 1,736,583, (U. C. DEIKE), 19 November 1929. (See entire document).          | 8-12                  |
| A         | US, A, 2,765,170, (D. L. BROWN), 02 October 1956. (See entire document).           | 1-18                  |
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| A         | US, A, 4,846,472, (TERZA), 11 July 1989. (See entire document).                    | 1-18                  |
| A         | US, A, 4,555,111, (ALVAREZ), 26 November 1985. (See entire document).              | 1-18                  |
| A         | US, A, 4,513,965, (ASCHERMANN), 30 April 1985. (See entire document).              | 1-18                  |