



US 20170056743A1

(19) **United States**

(12) **Patent Application Publication**
KROKEN et al.

(10) **Pub. No.: US 2017/0056743 A1**

(43) **Pub. Date: Mar. 2, 2017**

(54) **BALL TRAINING EQUIPMENT
COMPRISING FLEXIBLE STRING**

A63B 67/10 (2006.01)

A63B 63/00 (2006.01)

(71) Applicants: **Geir KROKEN**, Vollen (NO); **Paal Stoltenberg MYHRE**, Asker (NO)

(52) **U.S. Cl.**
CPC *A63B 69/0091* (2013.01); *A63B 63/004* (2013.01); *A63B 43/007* (2013.01); *A63B 67/10* (2013.01); *A63B 69/002* (2013.01); *A63B 69/0053* (2013.01); *A63B 2220/30* (2013.01); *A63B 2220/833* (2013.01); *A63B 2210/58* (2013.01); *A63B 2220/803* (2013.01); *A63B 2220/805* (2013.01); *A63B 2220/808* (2013.01); *A63B 2225/50* (2013.01); *A63B 2220/801* (2013.01); *A63B 2225/093* (2013.01); *A63B 2243/0033* (2013.01)

(72) Inventors: **Geir KROKEN**, Vollen (NO); **Paal Stoltenberg MYHRE**, Asker (NO)

(21) Appl. No.: **15/308,420**

(22) PCT Filed: **May 11, 2015**

(86) PCT No.: **PCT/NO2015/000010**

§ 371 (c)(1),

(2) Date: **Nov. 2, 2016**

(57) **ABSTRACT**

Training equipment for training with ball (13) comprising an elastic line (12) attached between the ball (13) and a fixed anchoring point, wherein the fixed anchoring point is an extendable rod (11) adapted to be secured to an existing structure at a distance above ground level, such as the crossbar of a goal. The rod (11) and the elastic line (12) contribute to intermediate storage of energy when the ball's movement changes direction. The equipment can be combined with sensors and electronic communication equipment for objective assessment of the quality of performed exercises and with the possibility of keeping track of scores in games/competitions.

(30) **Foreign Application Priority Data**

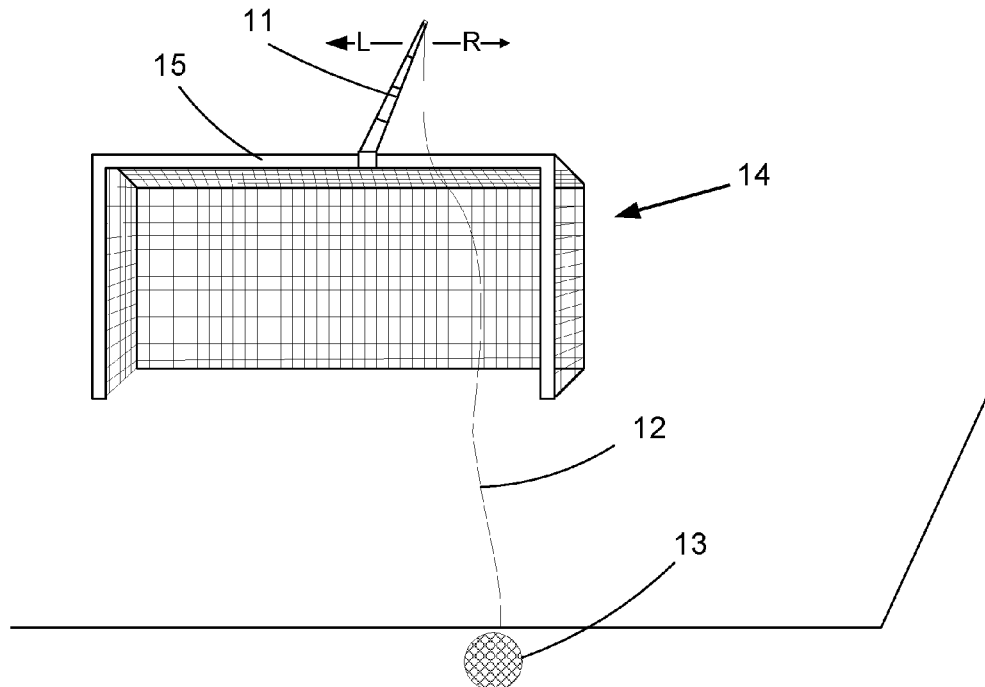
May 13, 2014 (NO) 20140602
Dec. 11, 2014 (NO) 20141499

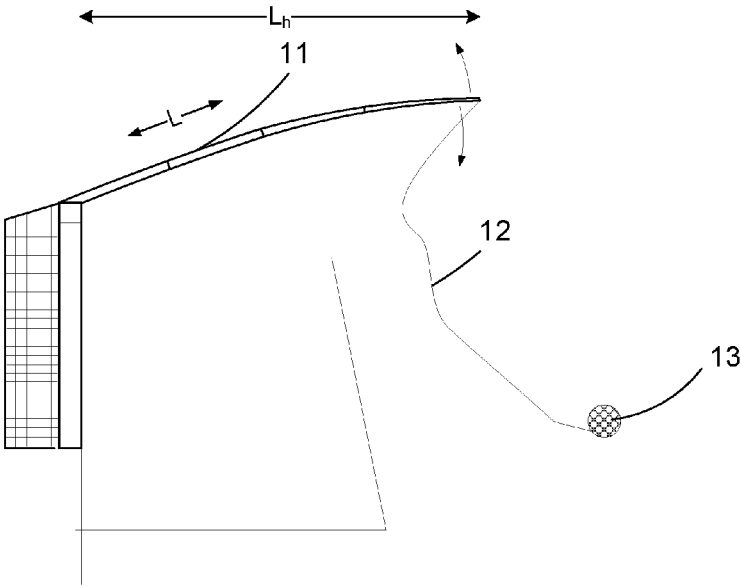
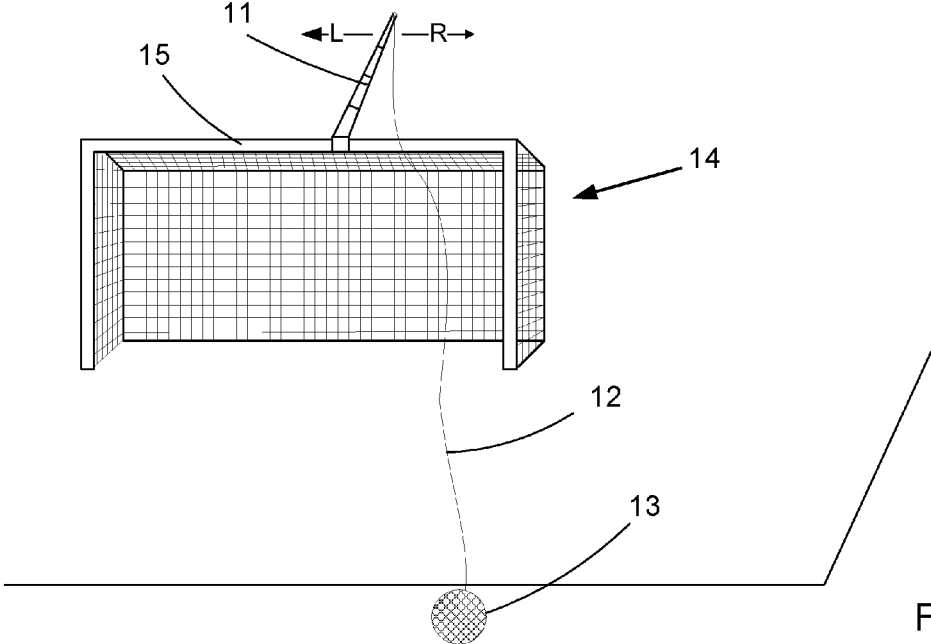
Publication Classification

(51) **Int. Cl.**

A63B 69/00 (2006.01)

A63B 43/00 (2006.01)





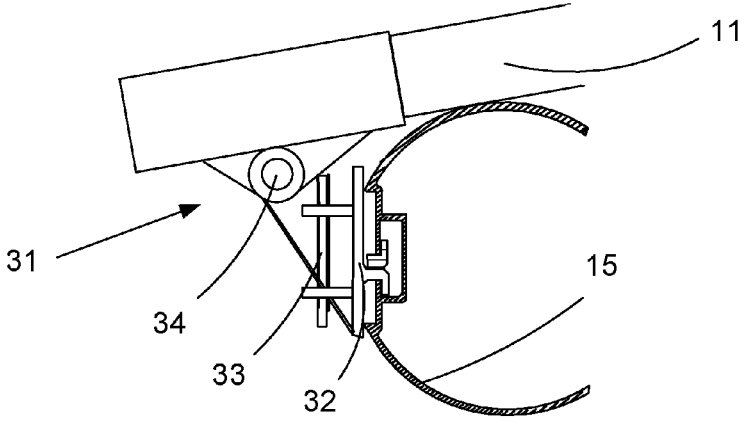


Fig. Fig. 3

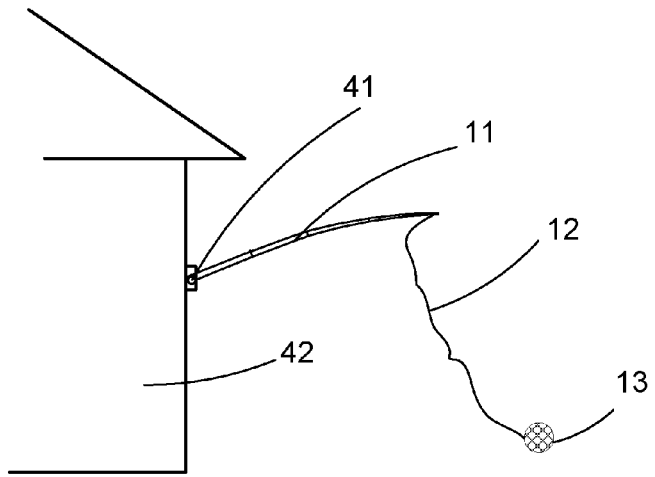


Fig. 4

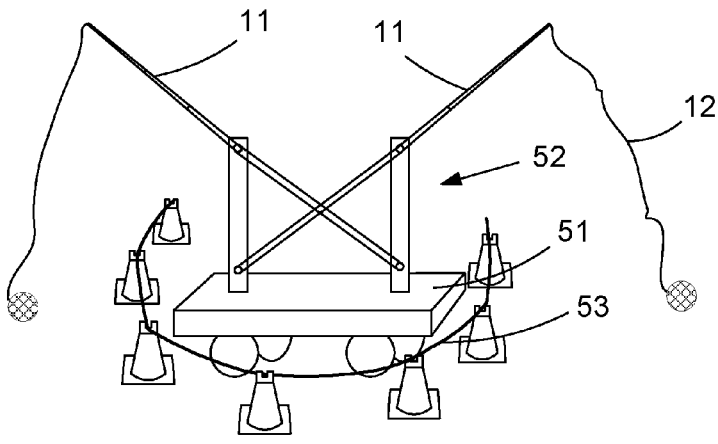


Fig. 5

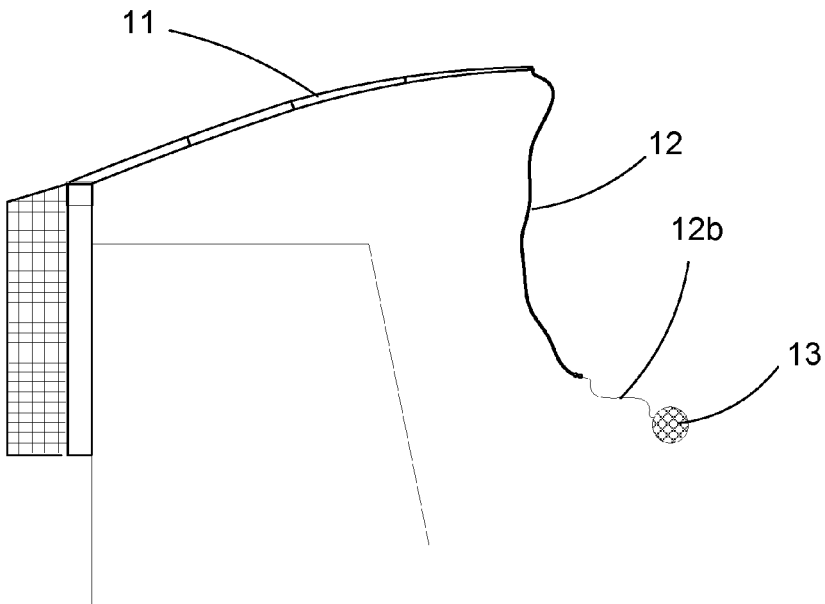


Fig. 6

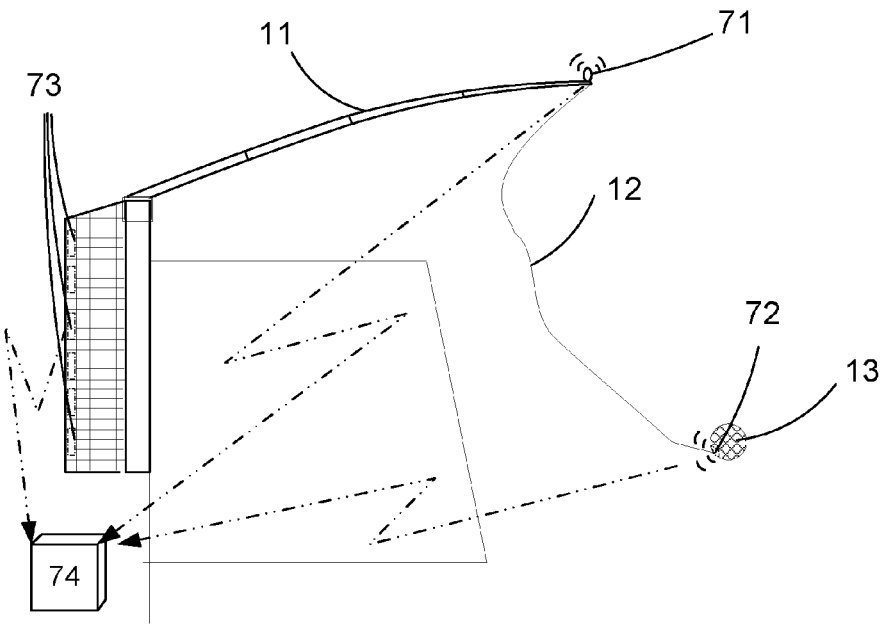


Fig. 7

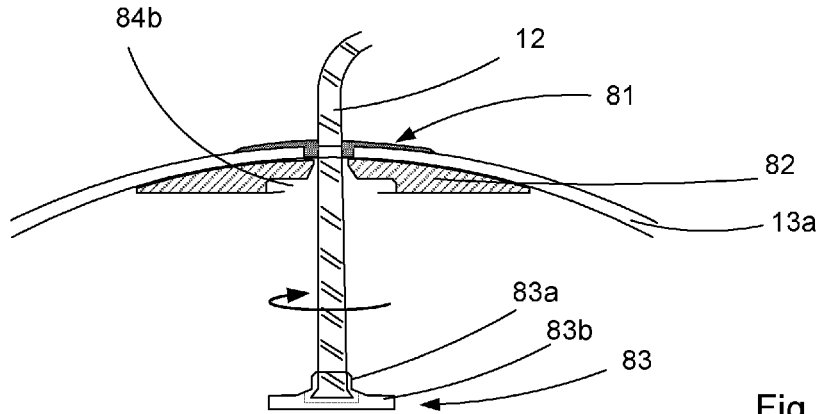


Fig. 8A

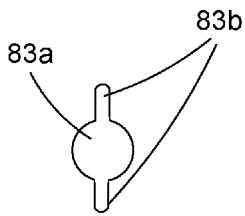


Fig. 8B

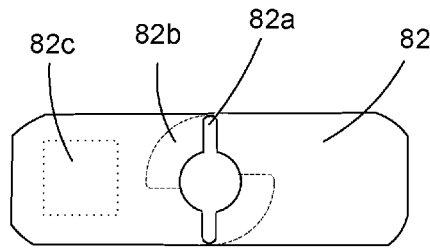


Fig. 8C

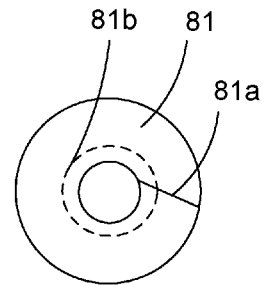


Fig. 8D

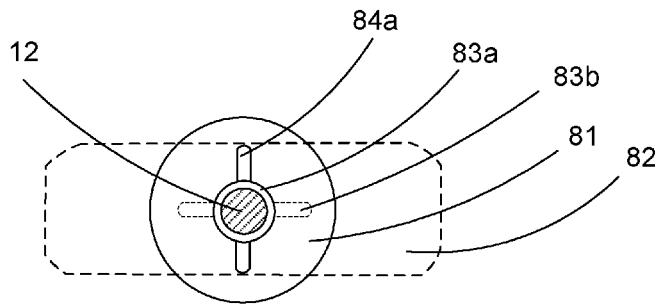


Fig. 8E

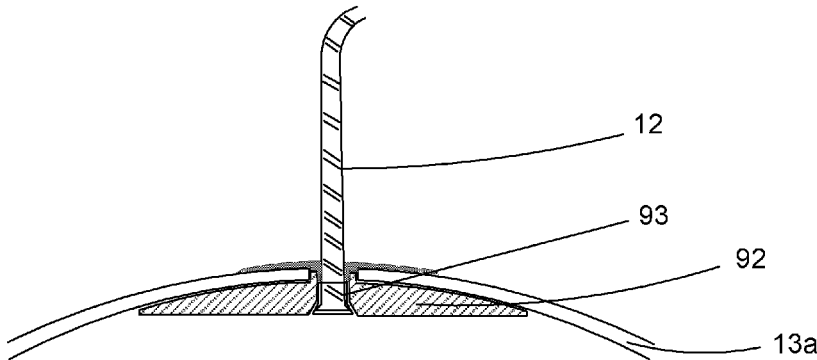


Fig. 9A

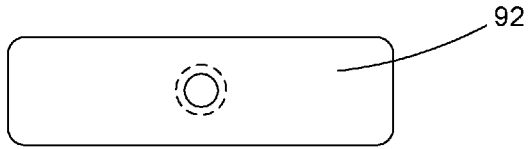


Fig. 9B

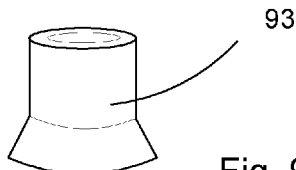


Fig. 9C

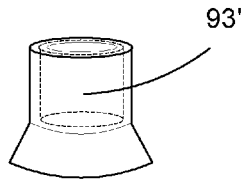


Fig. 9D

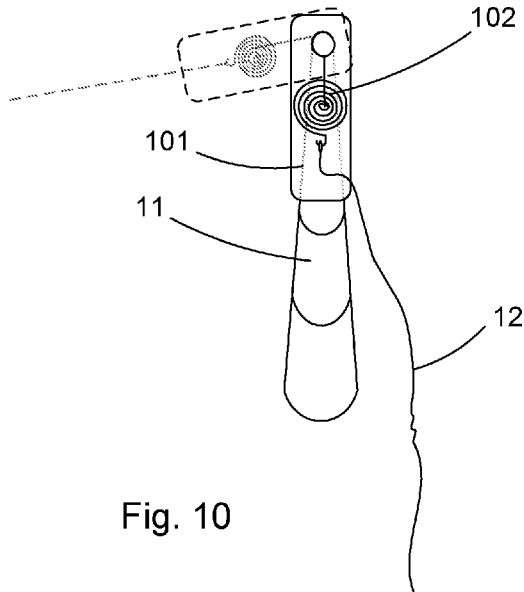


Fig. 10

BALL TRAINING EQUIPMENT COMPRISING FLEXIBLE STRING

BACKGROUND

[0001] The use training equipment for training with ball, by which a ball in various ways is maintained in a system that ensures that its movement is limited and often that it returns to a starting point, is well known. This may be appropriate for several reasons, not least to enable training where limited space is available and for minimizing the risk of damage to surrounding facilities. It may also be an argument in itself to save time retrieving the ball, as well as obtaining frequent ball contact.

[0002] U.S. Pat. No. 6,168,539 describes attaching a football to a line connected to an elastic band, which in turn is attached to a handle that the athlete can hold. It is indicated that the ball should be able to rotate freely. The ball, however, is shown as secured to the line by means of a considerable number of straps running around the ball, which will affect the ball "feeling". Furthermore, the requirement of holding the handle while carrying out exercises, limits the athlete's freedom of movement, and there will always be a risk that the grip slips.

[0003] U.S. Pat. No. 6,220,974 discloses a device in which a ball is suspended in a frame by strings horizontally and vertically, intended for kick-training. It is furthermore stated that it be appropriate for goalkeeper training and aerobic training. The framework and the way the ball is attached to it, however, offer quite limited possibilities for variation in training.

[0004] WO publication 01/58 537 discloses a training equipment where a ball is surrounded by a net which is attached to a string which in turn is attached to either a plate or a vertical attachment intended to be screwed into the ground. The equipment also includes a swivel, which will allow the ball to rotate. This equipment provides more variability than the foregoing, but the net that surrounds the ball is in many situations undesirable and ground mounted equipment for tethering the ball involves a risk for athletes to be injured unless the equipment is used solely for kicking a ball at rest.

[0005] JP 2007082579 describes a device for ball training, utilizing a branched suspension of a vertical elastic line that holds a ball. This system has the advantage over, for example, WO 01/58 537 that it does not include ground-mounted equipment on which athletes can injure themselves. However, it is difficult to see that the equipment may be used for other purposes than singular kicks on a ball at rest, albeit with the possibility to measure the direction and speed of the ball.

[0006] U.S. Pat. No. 5,398,940 describes a device for practicing heading of the ball, where a ball is suspended by a line, which is passed through a tube arranged at a high elevation. With this type of training the line flexibility is of little importance and it is stated that it may well have a relatively inelastic, rope-like structure. The tube, through which the line is run, is essentially a passive component that primarily provides for height. This equipment does not allow varied training such as passing and kicking a ball in motion.

[0007] U.S. Pat. No. 7,935,006 deals with equipment of the same general kind as discussed above, with a ball tethered to a line that can be attached to the ball without enclosed the ball in a net or slings that significantly affects the ball behaviour. The line, however, is attached to a handle,

and although it is stated that as an advantage thereof that it may be held at different heights to place the ball back at different heights, this is something that negatively affects the athlete's freedom of movement, as well as the risk that the grip slips so the ball continues its path until it undesirably hits an object which may be damaged.

[0008] US 2011 124442 is another example of known technology in this field. This describes a comprehensive system with two vertical posts carrying a horizontal top rail. From the crossbar is attached two cords which meet in a node corresponding to the case of the above mentioned Japanese publication, with a single line extending vertically down from the node to a ball attached to the end thereof. The vertical posts are attached to the ground and each is also guyed with two tension straps to further stabilize the structure. Again it must be pointed out that although such equipment may be well suited for certain exercises, especially exercises with ball which initially is at rest, it is not unproblematic or harmless to arrange a lot of equipment on the ground if the purpose is more dynamic oriented training. In this case, there are a total of 6 mounts to the ground.

[0009] CN 202478255U discloses training equipment for badminton, where a badminton ball is flexibly suspended from a telescopic rod.

[0010] Generally, the prior art is characterized by the disadvantages, shortcomings or limitations that the equipment provides little versatility, i.e. it is only suitable for a very specific type of training, such as shooting at targets with the designated target point, as well as the use of ground-mounted equipment with which the athletes easily can come in conflict and possibly be injured. Furthermore, much of the known equipment is so adapted that it causes damage to and bumps in the training field or that the arena or training field is arranged in a manner not allowing installation of equipment at the desired location due to the need for penetration of the ground surface.

OBJECT

[0011] It is thus an object of the present invention to provide training equipment with greater versatility, which allows execution of a variety of different exercises with the same equipment, and which is arranged so that the risk that athletes accidentally collide with the equipment and be hurt is eliminated or substantially reduced. It is also an object that the athletes' freedom of movement should be limited as little as possible.

[0012] It is a particular object that training with football can take place in a way that is perceived as dynamic, i.e. allowing training with a ball that all times is moving along the ground as well as in the air, even when an athlete is training alone, that the training can be uninterrupted within any desired time interval.

[0013] Moreover, it is an object that the training equipment can be combined with or provided with electronic sensors, preferably combined with transmitters and receivers, which in dependence of certain criteria can give points or score for the quality of the exercise being performed, including the ball's speed and direction and possibly the athlete's energy consumption.

THE PRESENT INVENTION

[0014] The above objects are achieved by the training equipment according to the present invention as defined by claim 1.

[0015] Preferred embodiments appear from the dependent claims.

[0016] The term “one at least partially elastic line” as used herein, is intended to include that at least a part of the line is elastic, meaning that the line typically is not uniform between the attachment point to the rod and the attachment point to the ball.

[0017] The present invention provides a device where the ball is free of surrounding net. It is free to be hit from various positions along the ground level, but also to be hit when moving either along the ground or at a distance above ground, including with other body parts than the athlete’s foot. It is thus possible for example to train heading or cushioning, by first shooting the ball in one direction and then give it a new impact when it returns, be it by foot, hand, head, chest or any part of the body the athlete may desire.

[0018] In its basic form the equipment does not include equipment to be placed or mounted on the ground, and thus no danger of injury to the athlete other than the risk which is always present during such physical exercises. In a particular variant of the invention, the extendable rod is arranged on a cart that is wheeled out on a training field. Depending on which exercises to be performed, this cart can be shielded with cones, ribbons, etc. so that athletes receive a warning if they approach the cart closely.

[0019] There is thus no doubt that all objects stated above are achieved.

[0020] When, in this document, a fixed or stationary structure is referred to, it primarily refers to structures like a building wall or post for lighting or the like, which are already present at the location in question and which do not have to be carried or placed there in connection with the execution of a workout. A goal for a football or handball court is generally not difficult to move and therefore does not satisfy the strict requirements for what a fixed or stationary structure might be. Nevertheless, such goals can, for the purpose of the present invention, be regarded as existing permanent structures, as they normally are in place and used at the training field independent of any use of the equipment of the present invention, and they have a permanent location, again regardless of the present invention. Thus, it is not so that athletes need to think particularly on the goals and it is not so that the use of goals as a supporting structure for the equipment of the present invention, involves addition of equipment which may represent a hazard to the athletes.

THE INVENTION IN FURTHER DETAIL

[0021] Below the invention is described in further detail in terms of exemplary embodiments with reference to the accompanying drawings, in which:

[0022] FIG. 1 shows a first exemplary schematic diagram of the training equipment according to the present invention in a first embodiment.

[0023] FIG. 2 shows a variant of the training equipment shown in FIG. 1, shown from another angle.

[0024] FIG. 3 shows a magnified detail of the training equipment shown in FIGS. 1 and 2.

[0025] FIG. 4 shows a schematic diagram of another embodiment of the training equipment of the present invention.

[0026] FIG. 5 shows a magnified detail schematic view of a third embodiment of the training equipment of the present invention.

[0027] FIG. 6 shows an alternative embodiment compared to the one of FIGS. 1 and 2.

[0028] FIG. 7 shows yet another embodiment of the training equipment of the present invention.

[0029] FIGS. 8A-E show magnified an example of some details of the equipment of the present invention.

[0030] FIGS. 9A-D show magnified examples of details of the equipment of the present invention, which are alternatives to the details shown in FIGS. 8A-E.

[0031] FIG. 10 shows a detail of a non mandatory part of the training equipment of the present invention.

[0032] FIG. 1 shows an extendable rod **11** fixed to the crossbar **15** of a goal **14**. To the outer end of the extendable rod is attached to one at least partially elastic line **12** which in turn is attached to a ball **13**. The line **12** does not have to be uniform in its entire length and the entire line does not need to be elastic. For example, it may be appropriate to allow the outer portion of the rope closest to the ball, to be as light and thin as possible and may well be without substantial elasticity. The extendable rod is typically telescopic, but may also have the form of separate parts screwed together, which can be more convenient if one wants to achieve high strength with small dimensions. Although the extendable rod **11** is shown attached to the target **14** about the middle of the crossbar **15**, there is nothing preventing attachment close to the vertical posts. The arrows labelled “L” respectively, “R” in FIG. 1 indicates that the extendable rod may advantageously be attached by a fastening mechanism allowing the extendable rod to be pivoted an angle different from 90 degrees in relation to the goal line, and locked in such positions. FIG. 1 also provides an indication of the horizontal component of the length (L_h) of the rod **11**, which can be for example 8-10 meters.

[0033] It will be appreciated that the ball in an arrangement like the one shown here can be used for shots on goal, but also for passes and subsequent goal-attempts, since kicking the ball in the direction of an imaginary side line, will cause the ball comes back, low or high, so that the athlete with or without parrying the ball can try to direct the ball into the goal with any part of the body, including the head. It is also readily seen that here is no ground-mounted equipment involved against which the athletes may be injured due to inattention.

[0034] Training equipment can conveniently include sensors for calculating speed or establish points of impact etc. as more fully explained below, but it is not a prerequisite.

[0035] FIG. 2 shows the equipment shown in FIG. 1 seen from the side. Here you get better idea of how the extendable rod can be arranged so that it extends inwardly over the field relative to the goal and the end line. The line length can vary, but it is often appropriate to use a line of a length that makes the ball spend so much time for returning to the starting point that the athlete has time enough to reposition and prepare for a finishing attempt before the ball returns, which tends to require more than 5 meters of line, and typically 7-15 meters of line, without this being considered as any limitation of the invention. The curved arrows in FIG. 2 indicate that the direction of the extendable rod **11** is preferably adjustable vertically, i.e. the angle between the extendable rod (**11**) and the horizontal plane is adjustable. Furthermore, the arrow labelled with the letter “L”, indicates the length of the extendable rod also advantageously can be adjustable.

[0036] It is significant that the line length and length of the rod are adapted to each other. When used for football (soccer) training, as illustrated by FIGS. 1 and 2, the rod length may be of the order of between 3 and 15 meters, more preferably between 6 and 11 meters and typically from 8 to 10 meters. The free end of the rod, where the line leaves the rod, will typically be at a height of minimum 2.5 meters. The line may be attached to the free end of the rod, but may desirably, as an alternative, be attached inside the pole, at or near the rod attachment, and run through the inside of the rod to the rod free end or outside of the rod, through line guides like on a fishing rod.

[0037] With the rod projecting slightly upwards, though at a modest inclination angle above the horizontal plane, the free end of the rod typically protrudes up to 8 meters in the horizontal direction (L_h) over the pitch. With a line length in the stretched state is at least as long as the rod length, but not much longer, for example 9.11 meters for a 9-meter rod, the active training area extends at least 16 meters out from goal. This provides good opportunities for training of passes as well as shots and finishing attempts with the head. More generally the line length in the stretched state should be longer than the rod length, but a maximum of about 2 meters longer. It is the overall, free line length referred to here, that is, the sum of the lengths of elastic and non-elastic parts of the line that connects the ball to the rod, but not including any portion of the line contained within the rod.

[0038] The relatively high attachment point for the line prevents the line from coming at rest on the ground when training actively with the ball. The line will virtually all the time and in its entire length, soar over ground and not disturb the athletes. When kicking or heading towards the goal, the line is sufficiently long to let the ball touch the net and show the point of impact, before the elastic portion of the line and the rod pulls the ball back out. For exercise with the rod attached to a goal, the adaptation of the line length to length of the rod a parameter of importance. Moreover, shots that do not hit the goal only continue a maximum of a few meters past the vertical plane at the goal line before the ball turns and enters the field again, over the crossbar if the shot has passed thereover. In such cases, various experiments show that the ball almost always return to the pitch without getting stuck at the back of the goal.

[0039] The elastic portion of the line **12** may be of limited length, for example of the order of half of the line length, but can also be longer or shorter than this. How much of the line being selected as elastic depends on the characteristics of the line, the characteristics of the rod, the weight of the ball used, etc. There is no need for a line that is able to cache all the kinetic energy of the ball, as also the rod is slightly elastic and will cache considerable amount of energy even at a modest curvature of the rod.

[0040] For training of handball and in front of a handball goal, the dimensions will typically be smaller than the dimensions described above in connection with practice with a soccer ball, but still with the same considerations with regard to the interrelationship of rod length and line length. The convenience of having a high attachment point for the line applies also here, both to ensure that the risk of athletes being injured by contact with the rod it is entirely ruled out, but also in order to keep the line suspended in the air under use.

[0041] When shooting against a goal with a net, the ball will touch the net with the elastic part of the line already

somewhat stretched, and the ball will therefore come back with speed and not come to rest in the goal. As mentioned, also the rod is somewhat elastic, not unlike a fishing rod, and will contribute to temporarily maintain the ball's kinetic energy when the ball turns and again regains this kinetic energy in the form of movement in substantially the opposite direction.

[0042] Without limiting the training equipment according to the invention to a particular use, it is clear that it is very suitable for training finishing attempts, i.e. shots and headers towards a goal with a ball in motion. If positioning oneself directly beneath the rod free end, one is guaranteed to get the ball back in whatever direction it is sent. It can be sent toward corner flag to receive the ball back like a corner kick. One can strike the ball in the direction outwards on the pitch and get it back as receiving a pass from behind (when facing the goal). Always the ball returns quickly. Whether practicing alone or with others, training in this way is very effective.

[0043] Although the ball always returns, it does not return to exactly the same place as from where it was struck. That may happen in exceptional cases, such as when the ball is struck from a position right under the free end of the rod or when it is struck in a direction such that it passes directly beneath the free end of the rod. In other cases, the ball will return to a substantially circular area under the free end of the rod, with an inaccuracy that depends on several factors such as the characteristics of the equipment, surface irregularities and not least the direction of the ball prior to its latest strike, seen in relation to the free end of the rod. Since the exact point of return can not be predicted, a further element of uncertainty is achieved which reflects the true nature of ball games, which makes the training more realistic, more efficient, more challenging and more fun.

[0044] FIG. 3 shows in further detail how the extendable rod **11** may be attached to a crossbar **15** which has the form of an extruded aluminium profile, with recesses at one side of the profile to receive fasteners for the goal net. The extendable rod **11** is attached to a mounting bracket **31** which comprises an attachment plate **32** for attachment to the recess on the crossbar **15** backside. Furthermore, the mounting bracket may comprise a vertically arranged, rotatable pin **33** which makes it possible to pivot the extendable rod **11** from one side to another. There will in case be a need for a locking device to prevent the extendable rod from pivoting every time it is affected by forces.

[0045] Furthermore, FIG. 3 shows the mount assembly **31** comprising a rotating joint **32** which enables height adjustment of the extendable rod **11**. Also this joint must naturally be lockable in desired position.

[0046] Although the mounting bracket is only shown for attachment to a goal, it is understood that the functionality that allows different positions laterally and in respect of height can be included with any mounting bracket used for any application of the training equipment according to the present invention.

[0047] FIG. 4 shows schematically that the extendable rod **11** can be attached with a special mounting bracket **41** to a wall **42**. The applications are essentially the same as for the embodiment shown in FIGS. 1 and 2, but naturally with somewhat less room for movement towards the wall compared to towards a goal. It is assumed not to use a wall that includes windows, doors or the like which can be damaged.

[0048] FIG. 5 shows the equipment of the invention in the form of a rollable cart 51 with a framework 52 to which one or more extendable rods of the present invention can be attached. Since such a cart could represent a potential source of injury, it should be padded or protected behind a temporary fence 53 which is so designed that the risk of injury if running into the fence is minimal. For example, the fence comprises cones connected with a ribbon or string.

[0049] FIG. 6 principally shows the same as FIG. 2, but in a variant in which the resilient part of the string 12 is not fixed directly to the ball, but spliced with a line part 12b with different characteristics from other parts of the line 12, the line portion 12b preferably being attached the ball 13 via a swivel which helps prevent twisting of the line. In principle, the line 12 is composed of any number of different string parts, at least one of which is elastic, while other parts of the line does not have to be elastic. The elastic part of the line is usually not attached directly to the ball, and may not even be visible, as it may be located within the rod, attached to the pole, at or near the rod attachment.

[0050] The line part 12b which attaches to the ball 13 will typically be thin, light and not very elastic. The purpose of using a line which is thin and light closest to the ball is to disturb the athlete as little as possible, both in relation to the tactile contact with the ball as the aesthetics.

[0051] Also FIG. 7 shows in principle the same as FIG. 2, but in an embodiment in which a sensor 71 is arranged at the outer end of the extendable rod 11. A sensor 72 is arranged in the ball 13 and one or more sensors 73 are arranged in the goal. The sensors can register in different ways and by means of per se known technology, direction and speed of the ball at all times and likewise optionally point of impact in the goal. The sensors 71, 72 and 73 are arranged to communicate wirelessly, directly or indirectly, to a device 74 for computing, which can be localized at the training field or somewhere else entirely. The detailed operation of sensors and communication from these are not part of the present invention and therefore not described in further detail here.

[0052] Many types of sensors may be used, and the term sensors shall here be interpreted broadly. For example, within the framework of "sensors" as used herein is also the use of high-speed cameras, such as of the type used in the sport of tennis term "hawkeye". The overall purpose of the sensors is to register at least one parameter selected from the ball's position, velocity, rotation and point of impact, but preferably several of these simultaneously and in near real time.

[0053] Otherwise, the sensors typically can belong to one or more of the following groups of sensors: optical sensors, acoustic sensors, radio transmitters and wireless RTLS (Real Time Location System) tags.

[0054] FIGS. 8A-E illustrate a principle suitable for attachment between the ball 13 and the line 12. Within the ball's outer layer, the ball leather 13a a support plate 82 having suitable form and recesses is arranged, as explained below. The elastic line 12 is fixed to a freely rotatable swivel joint 83 in which a central part 83a is rotatable relative to a peripheral part 83b. FIG. 8A also shows a cover plate 81 which extends around and closely adjacent the wire 12 where this protrudes from the ball.

[0055] The swivel joint 83 may have a cross-section as shown in FIG. 8B with a substantially cylindrical central portion 83a and two extending arms 83b. Fully assembled

and with inflated ball, the two arms 83b will lie in the recess 82b and the ball's bladder (not shown) will support the swivel joint 83 from below.

[0056] FIG. 8C shows the support plate 82 from above with through opening 82a which fits the swivel joint 83 and to non-penetrating recess 82b at the support plate's down-side, allowing the swivel joint to be rotated to a position where it no longer can be pulled out of the ball. The figure further illustrates with dotted line that a sensor 82c, corresponding to sensor 72 indicated in FIG. 7, may be molded into or otherwise included in the support plate 82.

[0057] FIG. 8D shows a top view of the cover plate 81. The cover plate is usually elastic and has a central opening corresponding to the thickness of the elastic line 12, alternatively to another line 12b as shown in FIG. 6. The cover plate can be divided with a through-cut 81a from its periphery to the central aperture to be positioned around and removed from the ball and the elastic line 12 without further disassembly. A dotted circular line indicates where the cover plate at its underside is provided with a neck 81b suitable to protrude into the ball's opening for the central part 83a of the swivel joint 83. The thickness of the neck 81b is so adapted that it by the force seals the opening in the ball's outer layer 13a.

[0058] FIG. 8E shows a top view of the assembly shown in FIG. 8A, i.e. seen towards the point where the line 12 disappears into the ball 13.

[0059] The FIGS. 9A-D show an alternative embodiment of the connection between the ball 13 and the elastic line 12. Here the support plate has reference numeral 92 and swivel joint reference numeral 93. In FIG. 9A, the supporting plate 92 has a circular flange projecting into the slot in the ball's outer layer 13a to help keep the support plate 92 centred relative to the opening. A similar flange may also be used in the embodiment shown in FIG. 8A. A difference between the support plate according to FIG. 9A in comparison with that shown in FIG. 8A is the through-opening which in FIG. 9A has a first or outer portion which is generally cylindrical and a second or inner portion that is generally conical.

[0060] As is most clearly seen in FIG. 9B, the cross-section of the through opening in the support plate 92 is circular and not large enough to allow the swivel joint to move therethrough regardless of its orientation. The swivel joint 93 shown in FIG. 9C comprises a cylindrical portion and a portion having the shape of a truncated cone. The two parts are preferably machined or molded in one piece and has a smooth surface to be rotatable in relation to the support plate 92.

[0061] The variant of the swivel joint shown in FIG. 9D is given the designation 93 and is outwardly similar to the swivel joint in FIG. 9C. The difference lays in that the swivel joint 93 'comprises an inner cylinder which is rotatable in the outer cylindrical portion of the swivel joint, which enables lower resistance to rotation. Both variants shown in FIG. 9 assume that the support plate 92 is removed if one is to replace the swivel joint or attaching a new line thereto. The operation in the mounted state is, however, for all practical purposes the same as for the embodiment of FIGS. 8A-E.

[0062] FIG. 10 shows a further possible aspect of the present invention, an element that can generally be described as an unpredictability mechanism. The purpose of possibly including such an element would be to make it more difficult to predict exactly where the ball is coming back, e.g. as a

simulation of a ball pass that changes direction by touching another player near by. In FIG. 10 this is visualized by a rotatable disc 101 at the outer end of the extendable rod, through which the elastic line 12 is passed. The rotatable disc will from an upright, neutral position, swing into the ball's direction when the ball is given a strike in one direction or another. As a result of gravity the plate will swing back when the line is no longer as tight. The disc thus represents an eccentric-mechanism that can change the ball direction somewhat when it swings back. It is also possible to combine this with a mechanism which for a short time locks the plate in a deflected position (as shown with dotted line) and releases it at a later time, such as 1-3 seconds later, regardless of the line tension. The plate must have a certain weight compared to ball's weight to be able to affect the ball significantly.

[0063] FIG. 10 furthermore shows a device 102 which is arranged to temporarily store parts of the energy supplied to the ball when it is given a strike, visualized as a single coil spring. It is however possible to use other means for storing kinetic energy for later release, and it is possible to combine this with a mechanical or electronically controlled delay which can give the ball changed speed at a time that can not be predicted.

[0064] The effect of eccentric mechanism as described and the effect of a device for storage and release of kinetic energy may be collectively referred to as an unpredictability mechanism. This is not a mandatory feature of the present invention but may contribute to make the training more varied and more realistic than if omitting these elements. It goes without saying that the two indicated elements of unpredictability can be used separately or simultaneously. If higher flexibility in this mechanism is desired, use of electronic control systems and external energy supplied to the unpredictability mechanism can be applied.

[0065] The basic, fundamental features of the equipment are described above. It is understood that this equipment is well suited for combination with sensors for recording various qualities that athletes demonstrate during in use, such as the ability to give the ball a desired direction and desired speed. The equipment can be combined with any such types of equipment, as possibly underlying computer devices that can calculate and keep track of the scores obtained, comparing with previous results etc., and presenting the results on mobile communication devices in the form of, for example, using so-called apps.

[0066] Thus, use of the equipment of the present invention in such a context may allow an athlete to monitor his or hers skill development over time; it will be possible to arrange competitions between participants locally, and it will even, by means of modern communications technology, be possible to arrange competitions where different athletes are geographically separated.

[0067] While the exemplification above mainly is given with reference to football, the skilled artisan will understand that the principles apply to training for other ball sports, such as handball and not least ball training for disabled persons.

1. Training equipment for training with ball (13) comprising an at least partially elastic line (12) attached between the ball (13) and a fixed anchoring point, characterized in that the fixed anchoring point is an extendable rod (11) adapted to be secured to an existing structure at a distance

from ground level, while the line (12) as well as the rod (11) contributes to intermediate storage of energy when the ball's movement changes direction.

2. Training equipment according to claim 1, characterized in that the extendable rod (11) is adapted to be secured to a crossbar (15) of a goal (14).

3. Training equipment according to claim 2, characterized in the extendable rod (11) is adapted to be secured to a crossbar (15) of a goal (14) with particularly suitable attachment bracket (31).

4. Training equipment according to claim 3, characterized in the mounting bracket (31) is arranged displaceable along the width of the goal (14), and is arranged so as to allow adjustment of the angle between the extendable rod (11) and the horizontal plane as well as the angle between the extendable rod (11) and the goal-line.

5. Training equipment according to claim 1, characterized in that the extendable rod (11) is adapted to be secured to a wall (42) with a specially adapted wall mount (41).

6. Training equipment according to claim 1, characterized in that the extendable rod (11) is telescopically extendable.

7. Training equipment according to claim 1, characterized in that any part of the line (12) may comprises an elastic section.

8. Training equipment according to claim 7, characterized in that the elastic section of the line (12) constitutes approximately half the total line-length.

9. Training equipment according to claim 1, characterized in that at least one line section (12b) having a different characteristic than other parts of the line (12), is arranged between the rod (11) and the ball (13) the line section (12b) being attached to the ball (13).

10. Training equipment according to claim 9, characterized in the string portion (12b) is lighter and thinner than other parts of the rope (12) and not very elastic.

11. Training equipment according to claim 1, characterized in that between the extendable rod (11) and the elastic line (12) is arranged an unpredictability mechanism.

12. Training equipment according to claim 1, characterized in that it comprises sensors adapted to measure at least one parameter selected among the ball's position, velocity, rotation and hit point.

13. Training equipment according to claim 1, characterized in that the ball (13) is equipped with a motion sensor (72).

14. Training equipment according to claim 13, characterized in the motion sensor is a sensor selected from the group consisting of an optical sensor, an acoustic sensor, radio transmitters and/or a wireless TLS tag.

15. Training equipment according to claim 1, characterized in that the sensors are arranged to communicate wirelessly, directly or indirectly, to a local or central unit (74) for data computing.

16. Training equipment according to claim 1, characterized in that the extendable rod (11) is equipped with a sensor (71) selected from the group consisting of a radio transmitter and an TLS tag.

17. Training equipment according to claim 2, characterized in that sensors (73), for detecting the hit point and possibly the speed, are arranged in connection with the goal (14).

18. Training equipment according to claim 17, characterized in that the sensors (73) are selected from the group consisting of radio receivers and high-speed camera.

19. Training equipment according to claim 1, characterized in that the line (12) is attached to the ball (13) by a swivel joint (83) inserted into an opening in the ball's outer layer (13a) and supported by a separate support plate (82).

20. Training equipment according to claim 1, characterized in that the line (12) length is adapted to the rod (11) length in its stretched state is longer than the rod (11) length by up to about 2 meters.

21. Training equipment according to claim 1, characterized in that the rod free end is located at a height of at least about 2.5 meters.

22. Training equipment according to claim 1, characterized in that the rod (11) length is between 3 and 15 meters, more preferably between 6 and 11 meters.

* * * * *