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(19) **United States**(12) **Patent Application Publication**
Whalen et al.(10) **Pub. No.: US 2014/0243119 A1**(43) **Pub. Date: Aug. 28, 2014**(54) **ADJUSTABLE FLEXIBLE SPORTS NET SYSTEM**(71) Applicants: **Robert Tremaine Whalen**, Los Altos, CA (US); **Sean Tremaine Whalen**, Los Altos, CA (US)(72) Inventors: **Robert Tremaine Whalen**, Los Altos, CA (US); **Sean Tremaine Whalen**, Los Altos, CA (US)(21) Appl. No.: **13/815,444**(22) Filed: **Feb. 28, 2013****Publication Classification**(51) **Int. Cl.**
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A63B 61/00 (2006.01)(52) **U.S. Cl.**
CPC **A63B 61/02** (2013.01); **A63B 61/003** (2013.01)
USPC **473/493**; **473/494**(57) **ABSTRACT**

And adjustable sports net system comprising a plurality of ground anchors (105), two standard assemblies (108), elastic guy line assemblies (107) connecting the ground anchors to the standards, and a net fabric (101) disposed between the two standard assemblies. The net fabric (101) is adjustable in length and height, independent of initial placement of the standard assemblies (108). The standard assemblies (108) may deflect substantially upon impact from a game object (503) but return to a nominal position because of the elastic spring elements (110) in the guy line assemblies (107). The energy from such impact is absorbed over a longer time period, and the peak forces are kept lower for use of cheap, light materials, for system that is lightweight, fast to set up by a single person, and cost effective to manufacture. A safety structure provides protection to the consumer from inadvertent pullout of each ground anchor (105).

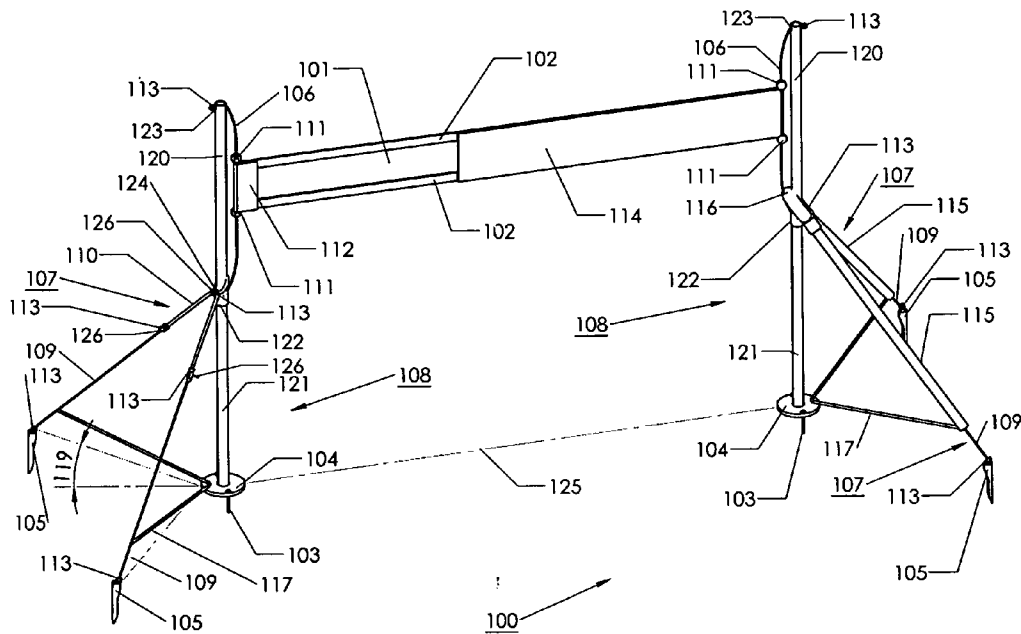
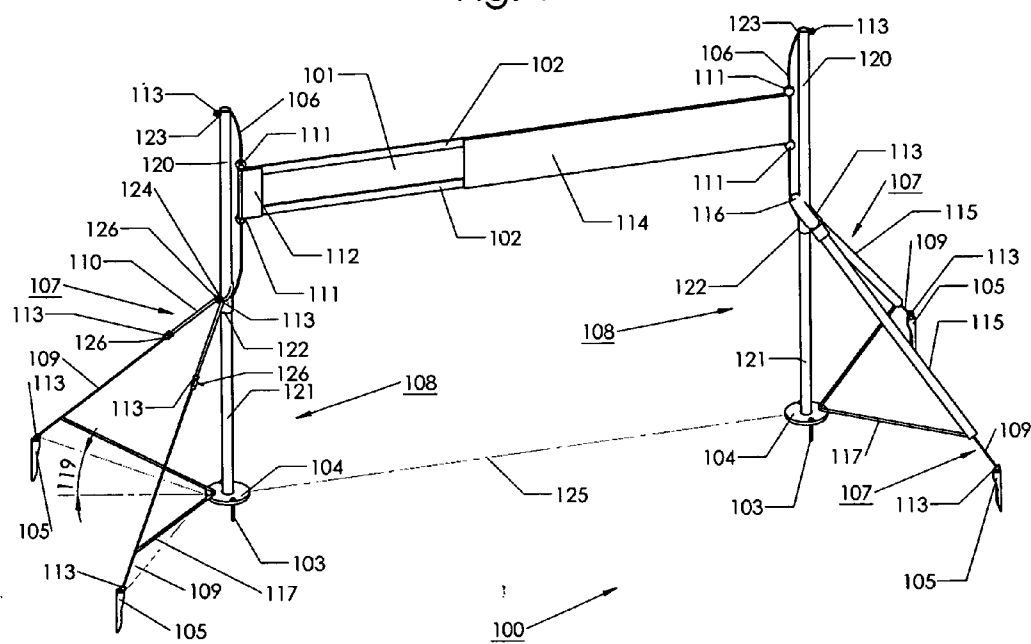


Fig. 1



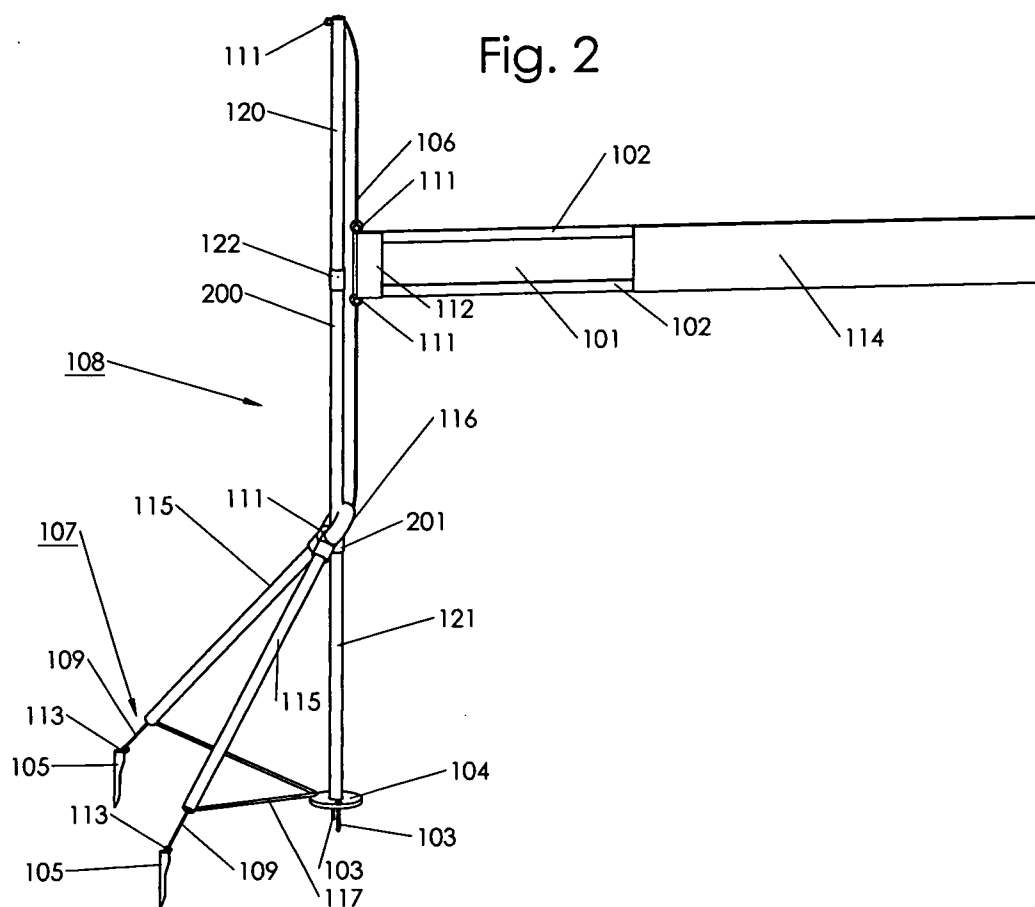


Fig. 3

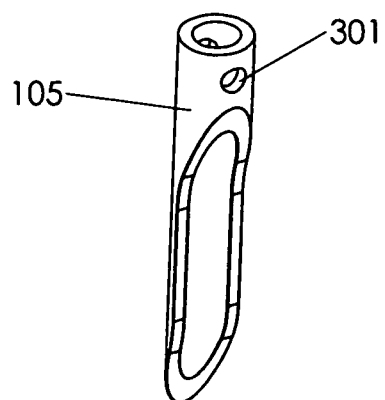


Fig. 4

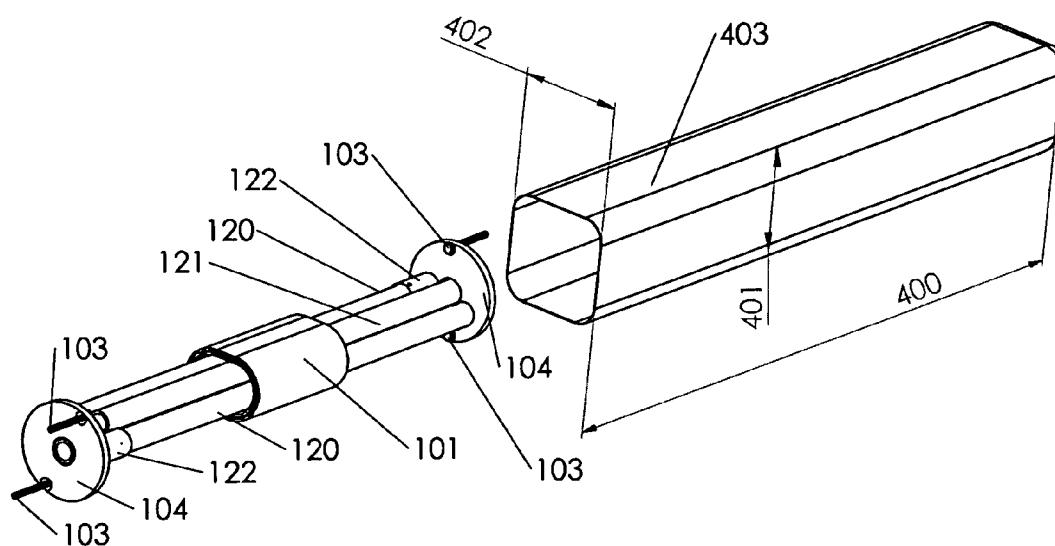


Fig. 5

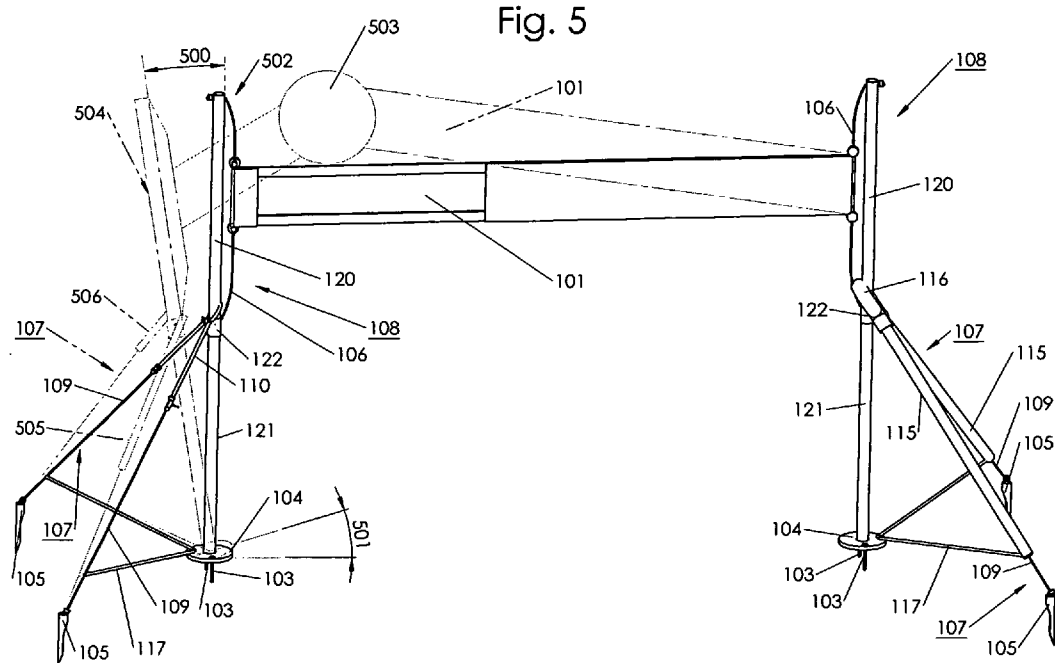


Fig. 6

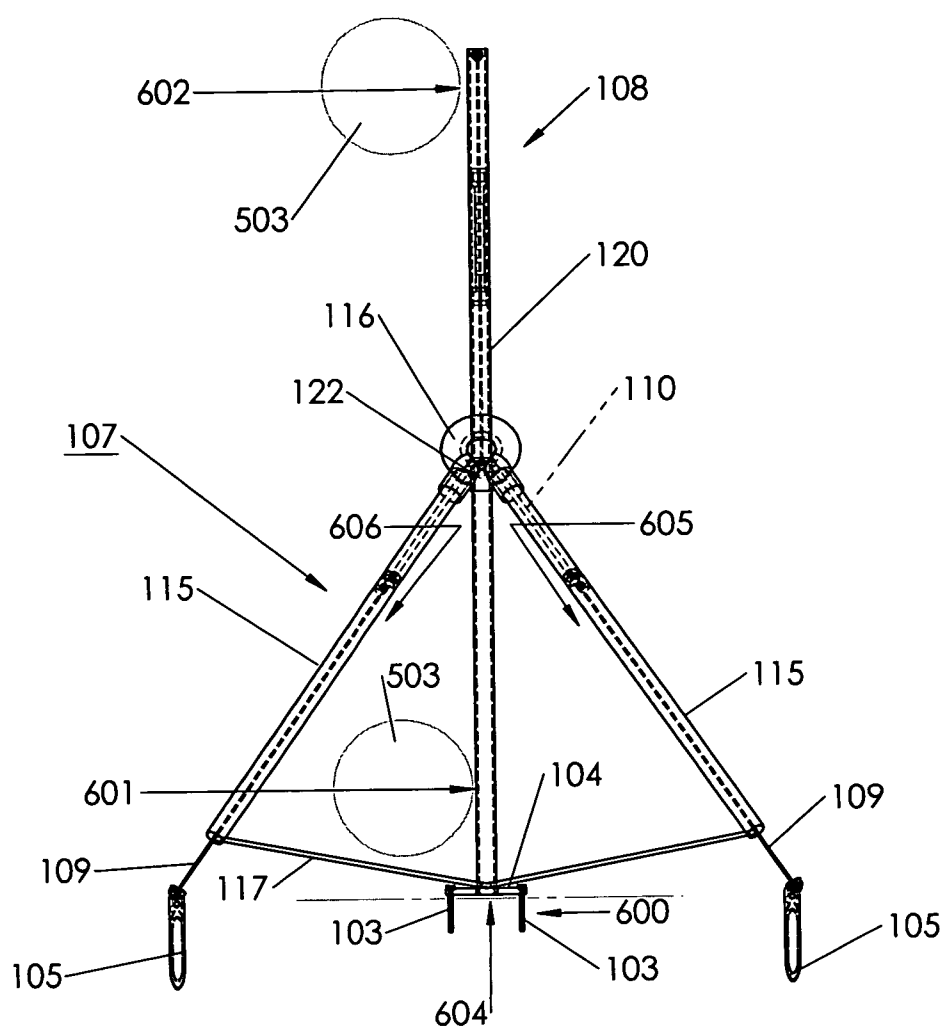
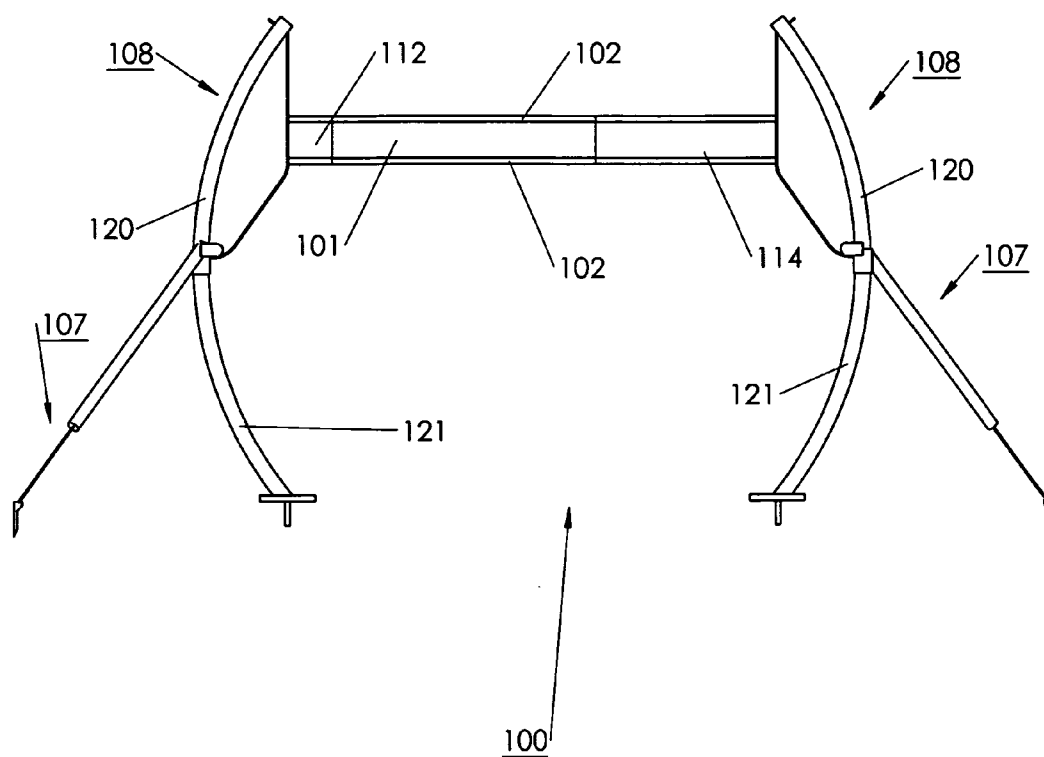


Fig. 7



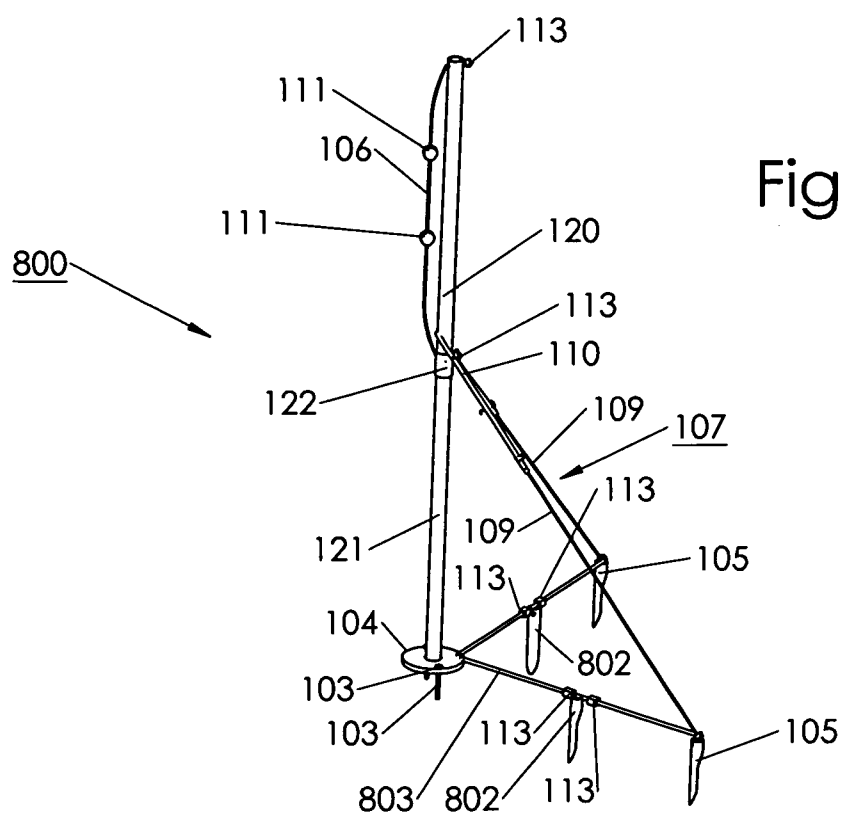
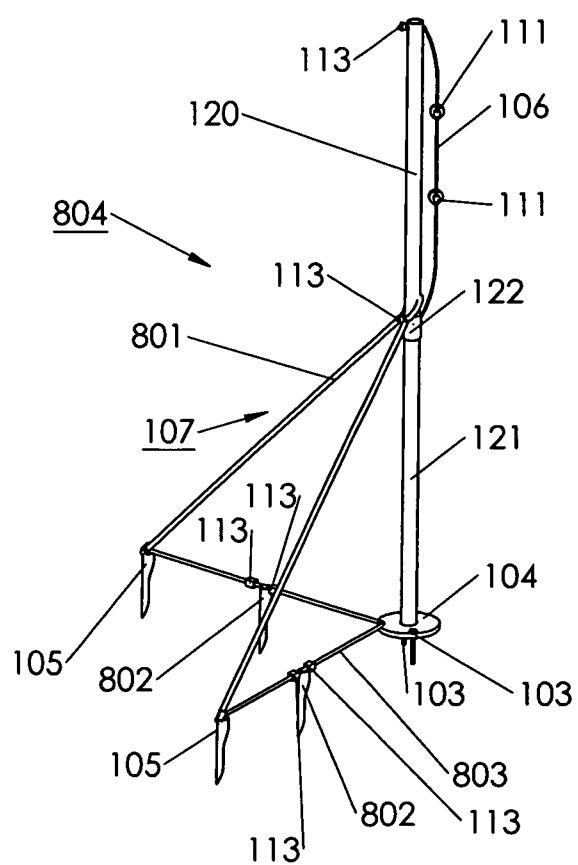


Fig. 8B



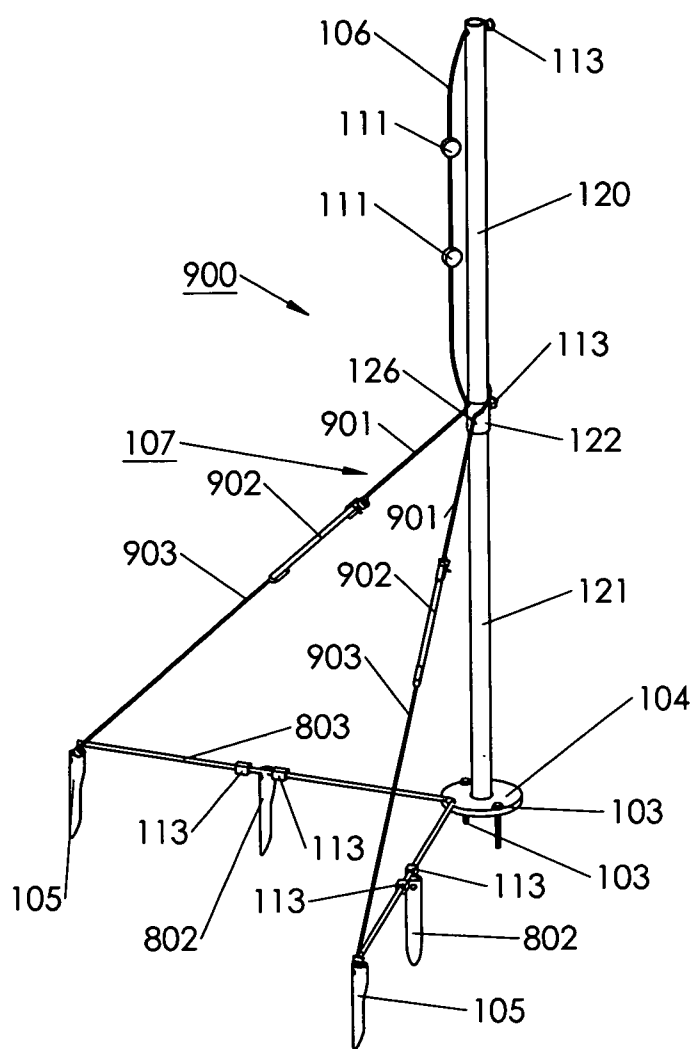
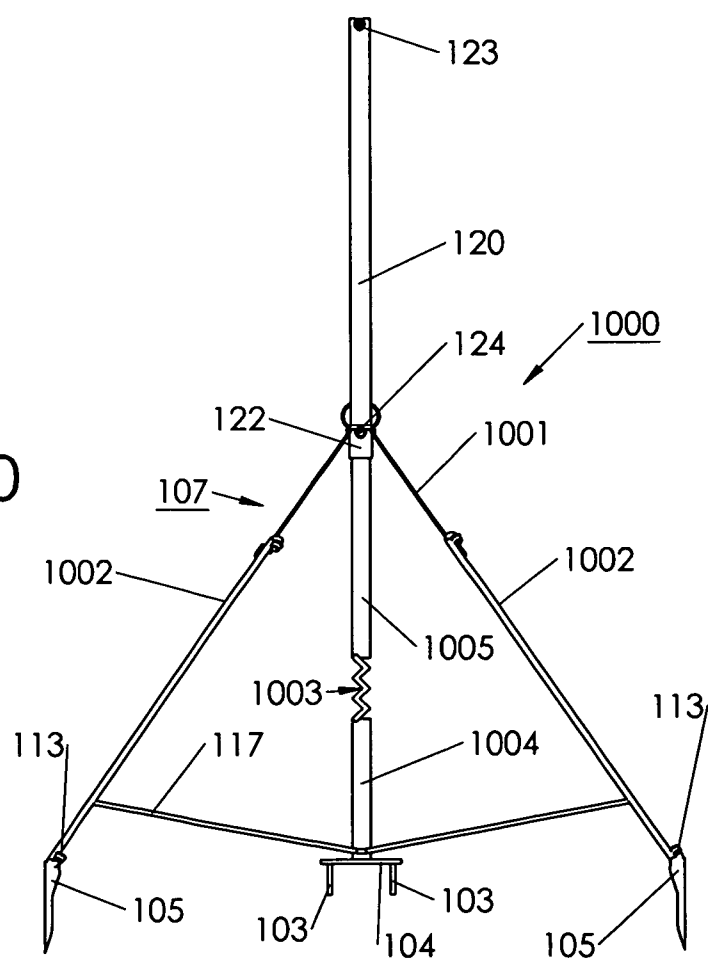


Fig. 9

Fig. 10



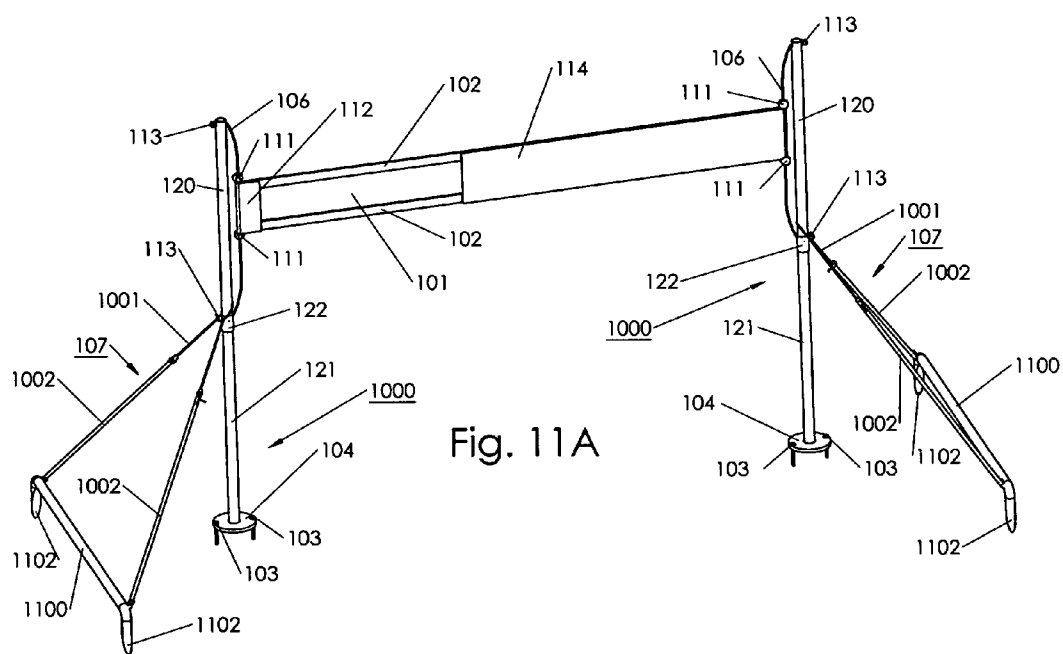


Fig. 11B

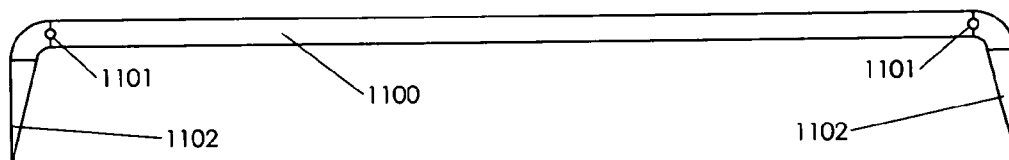


Fig. 12

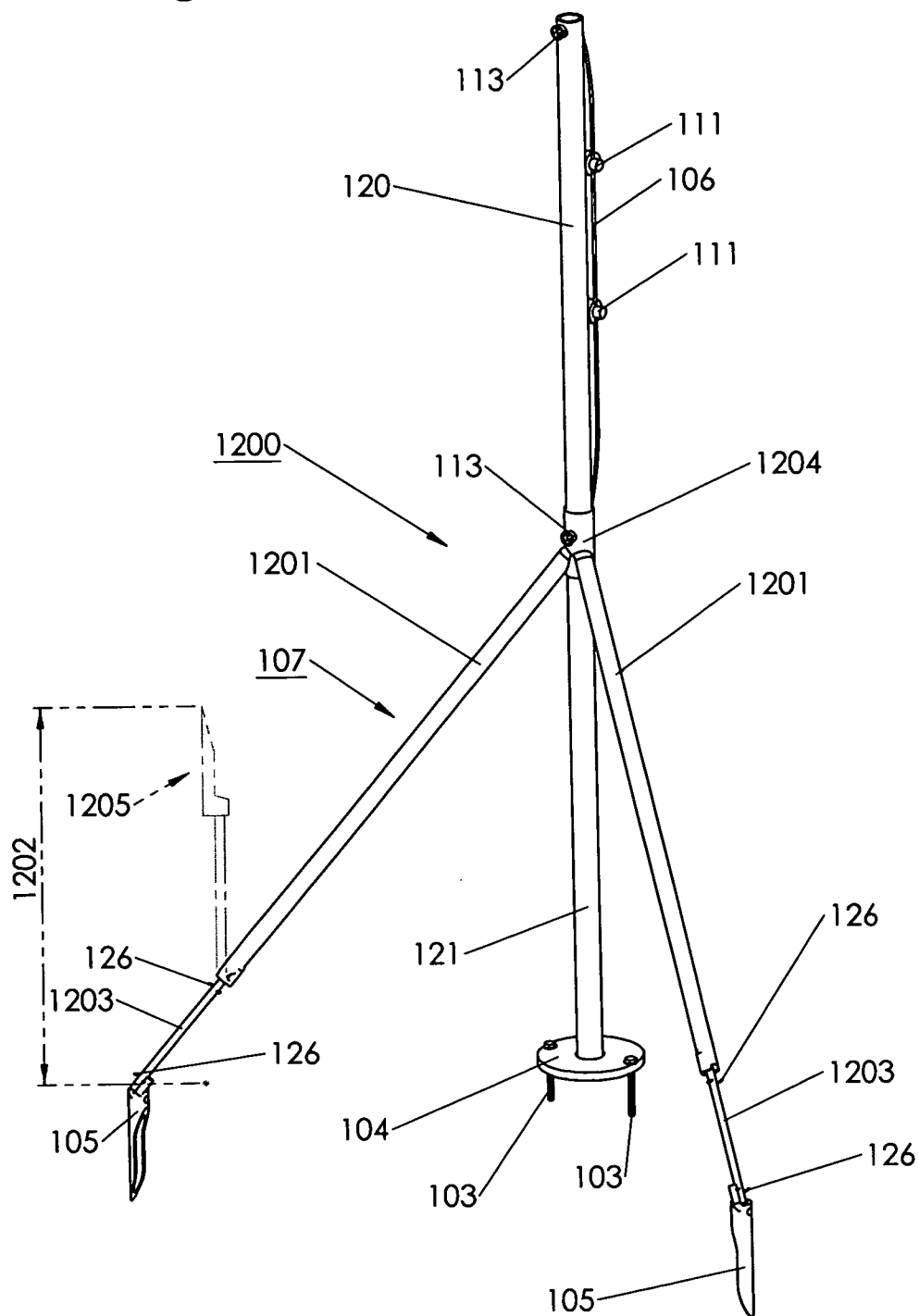


Fig. 14

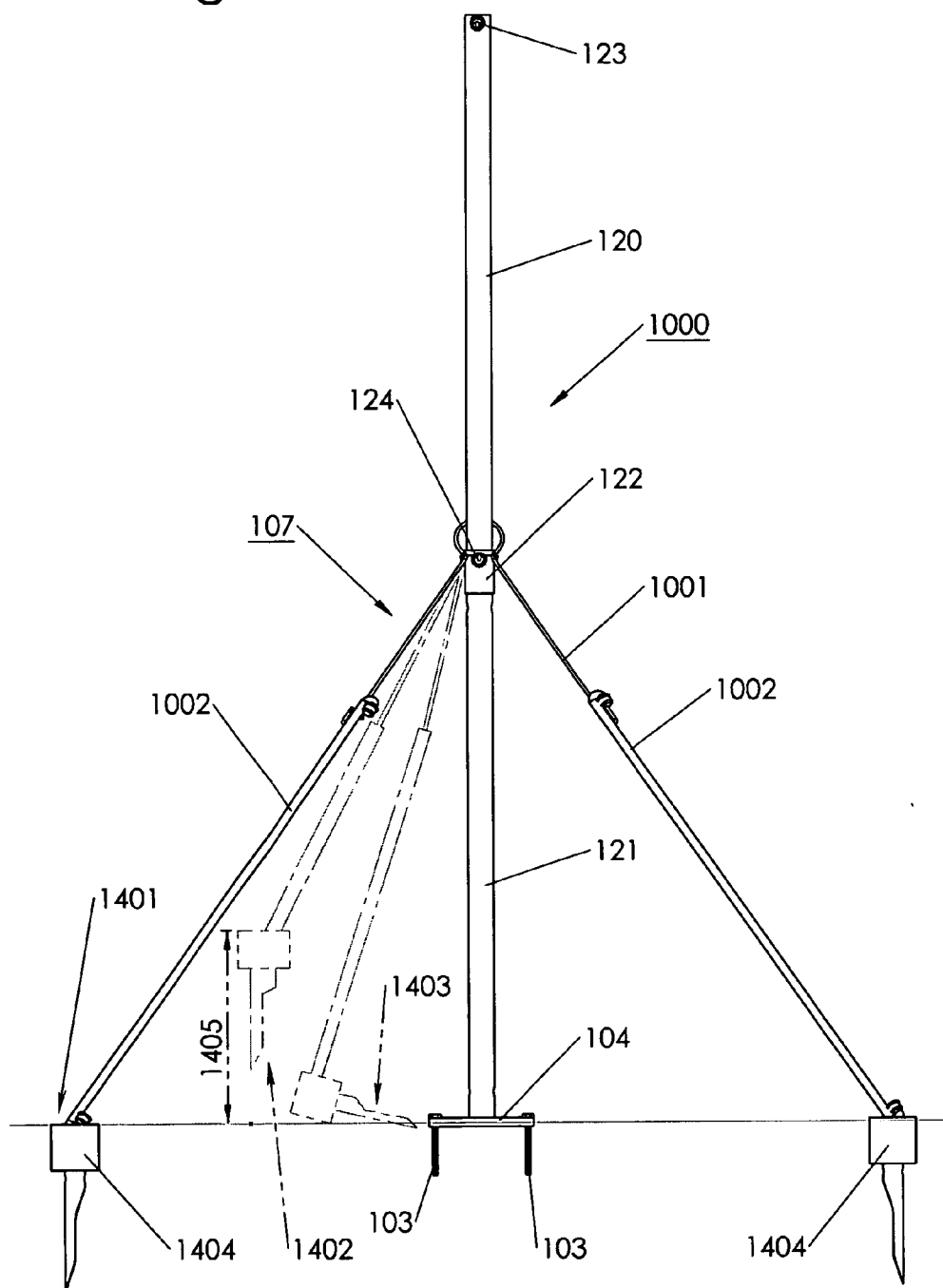
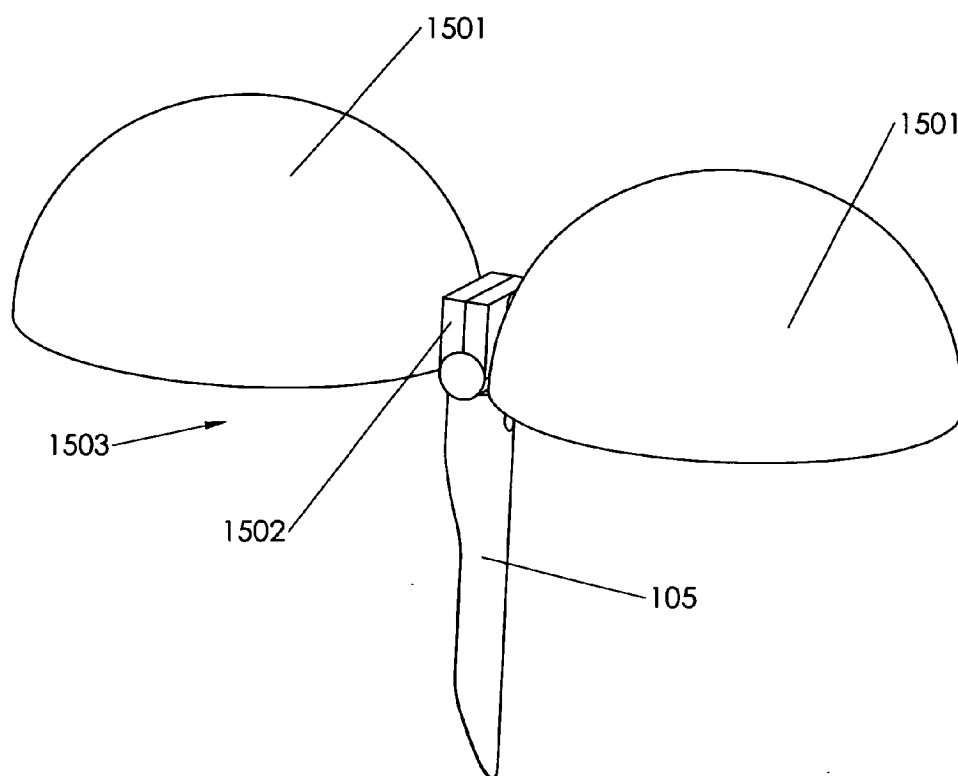


Fig. 15A



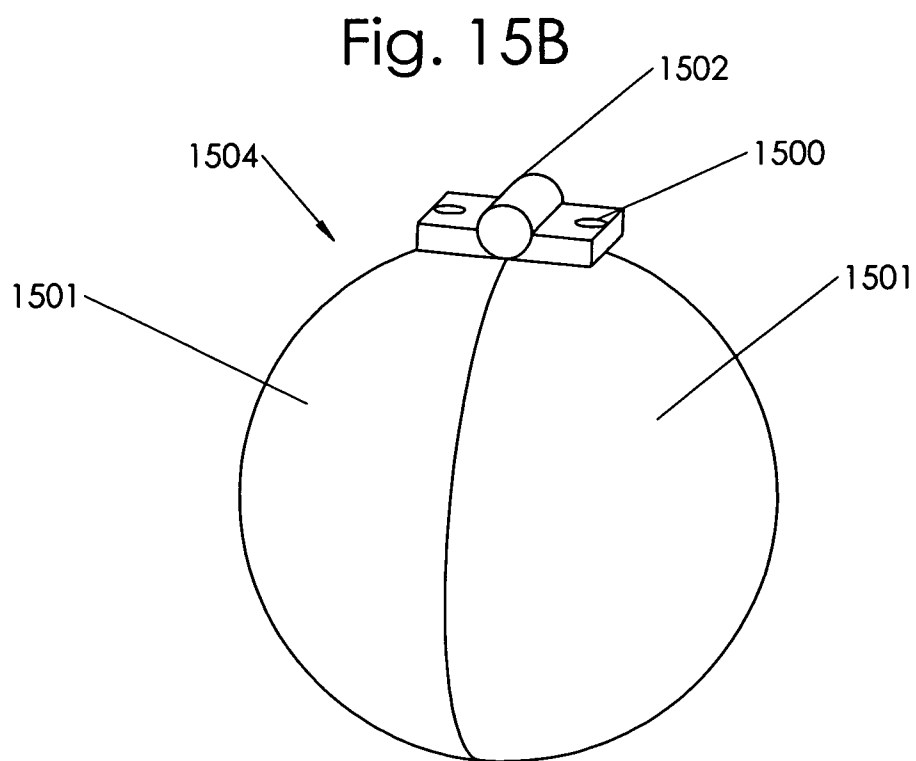


Fig. 16

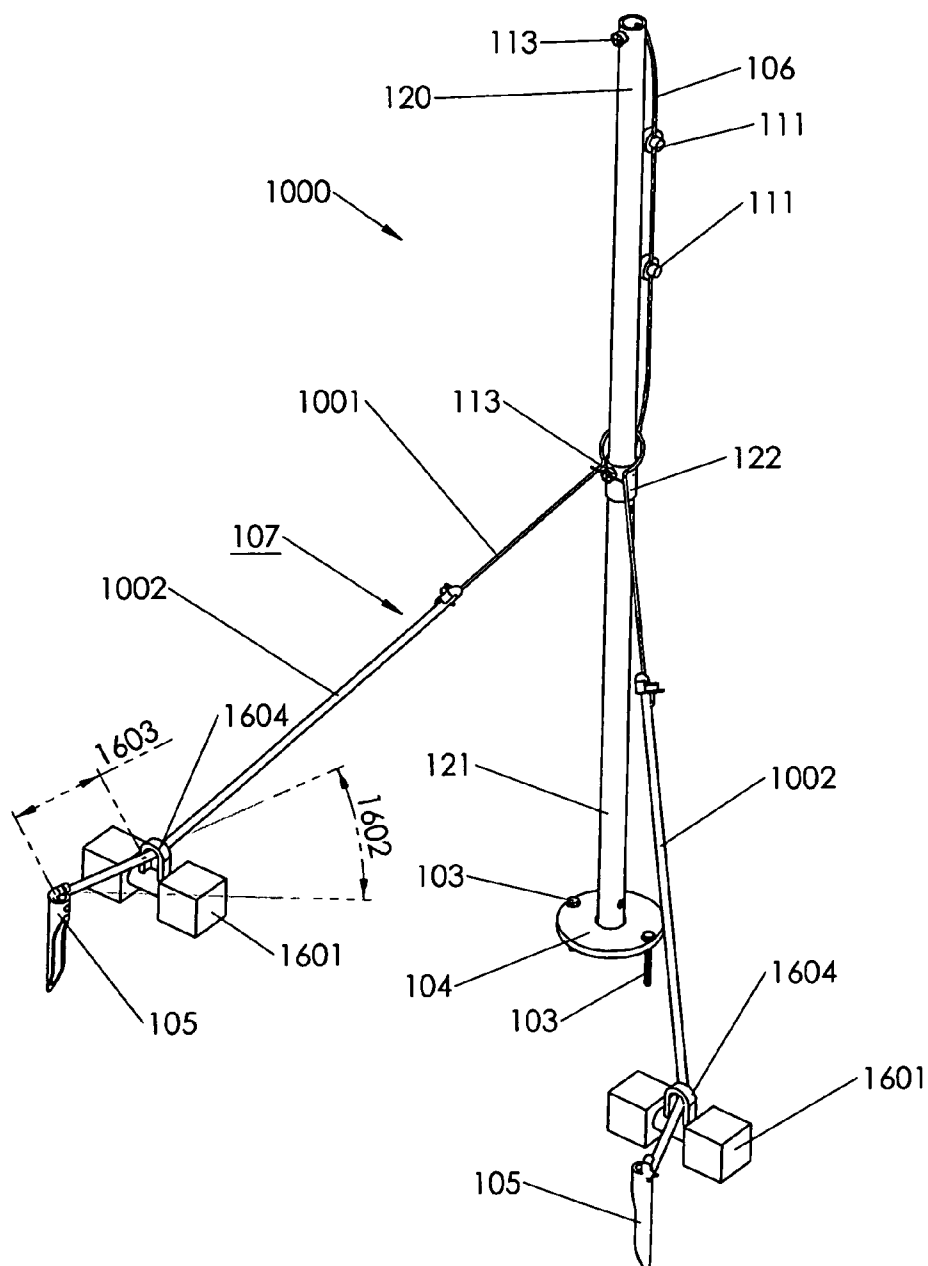
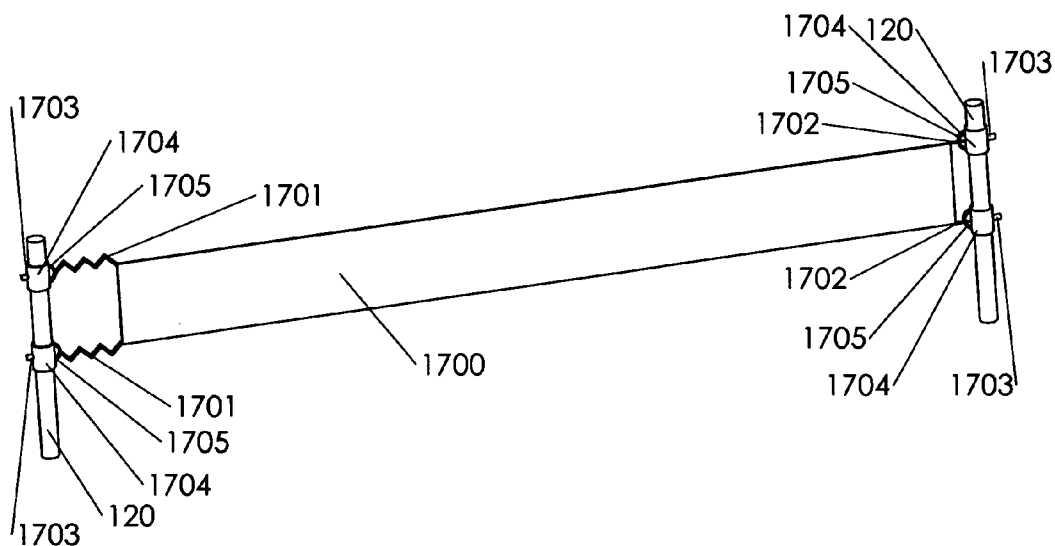
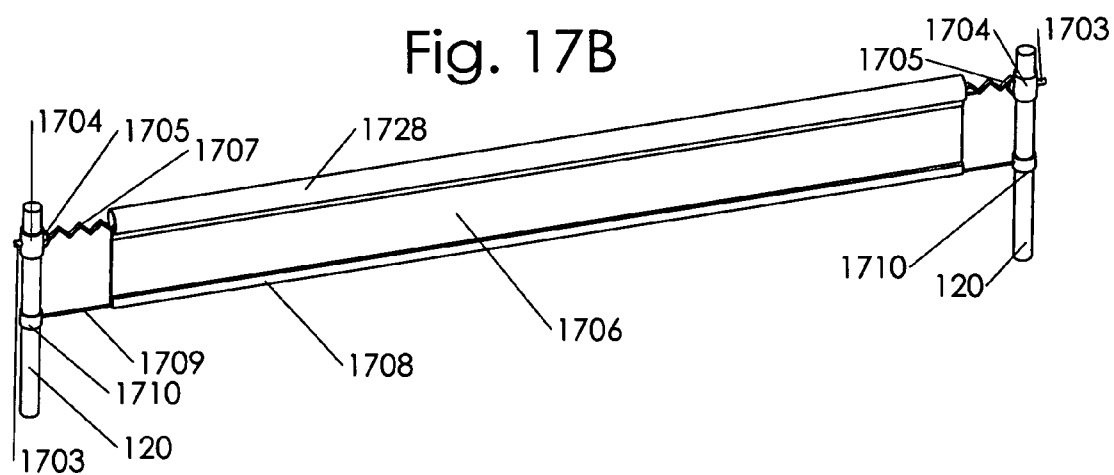
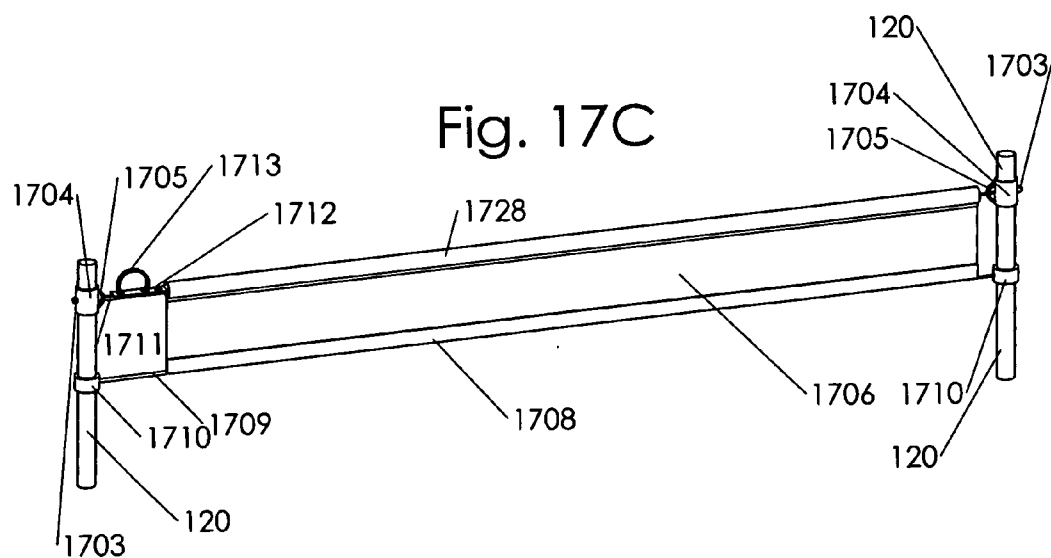


Fig. 17A







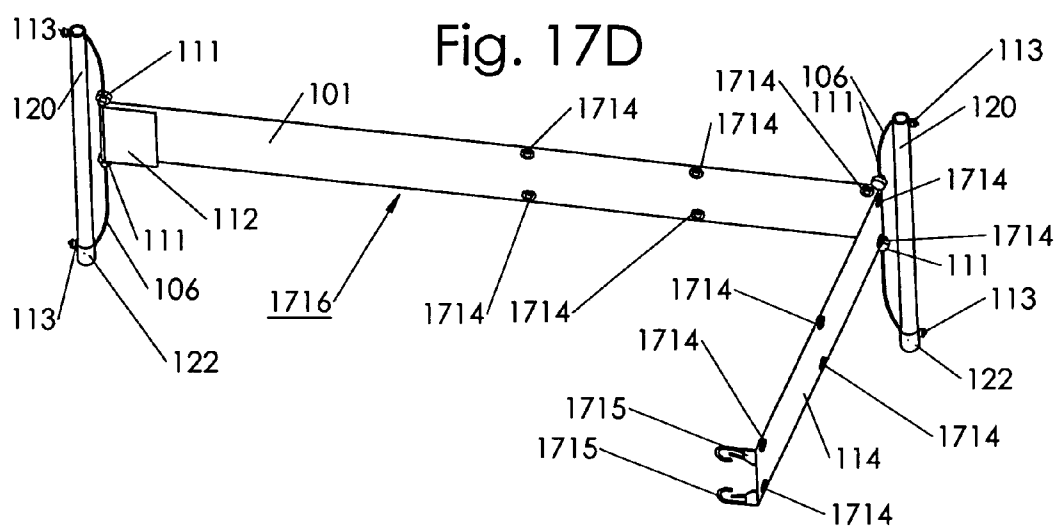


Fig. 17E

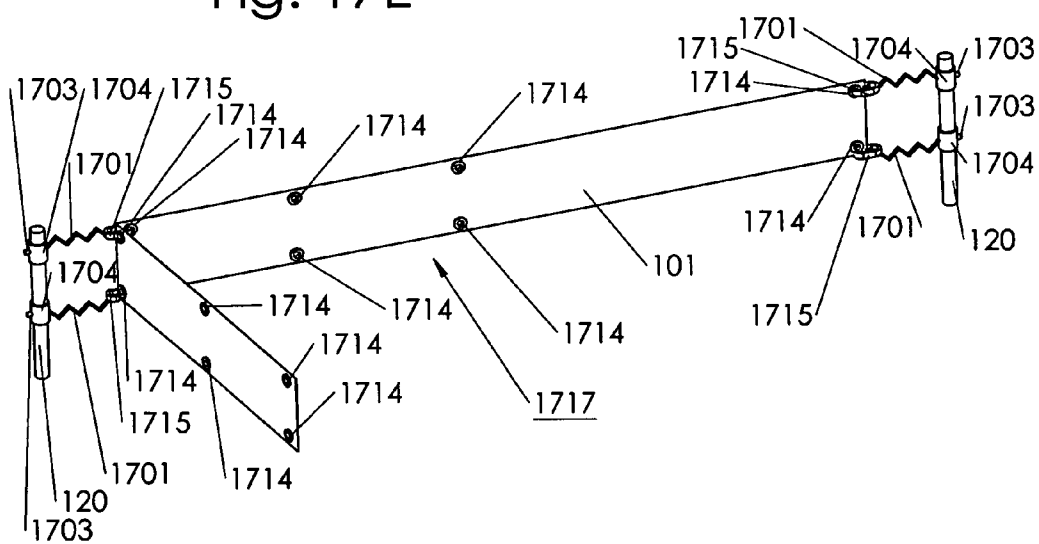


Fig. 17F

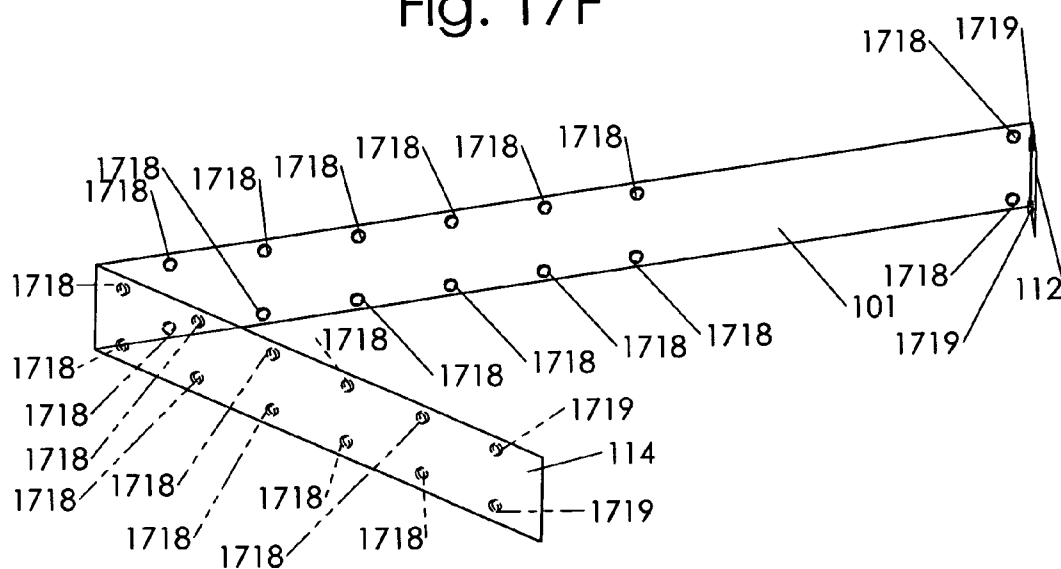
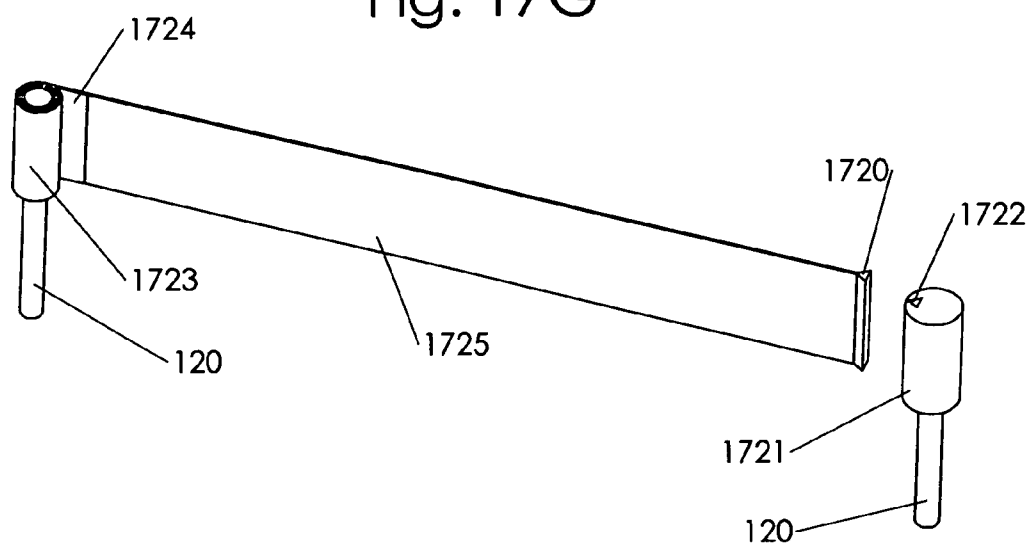


Fig. 17G



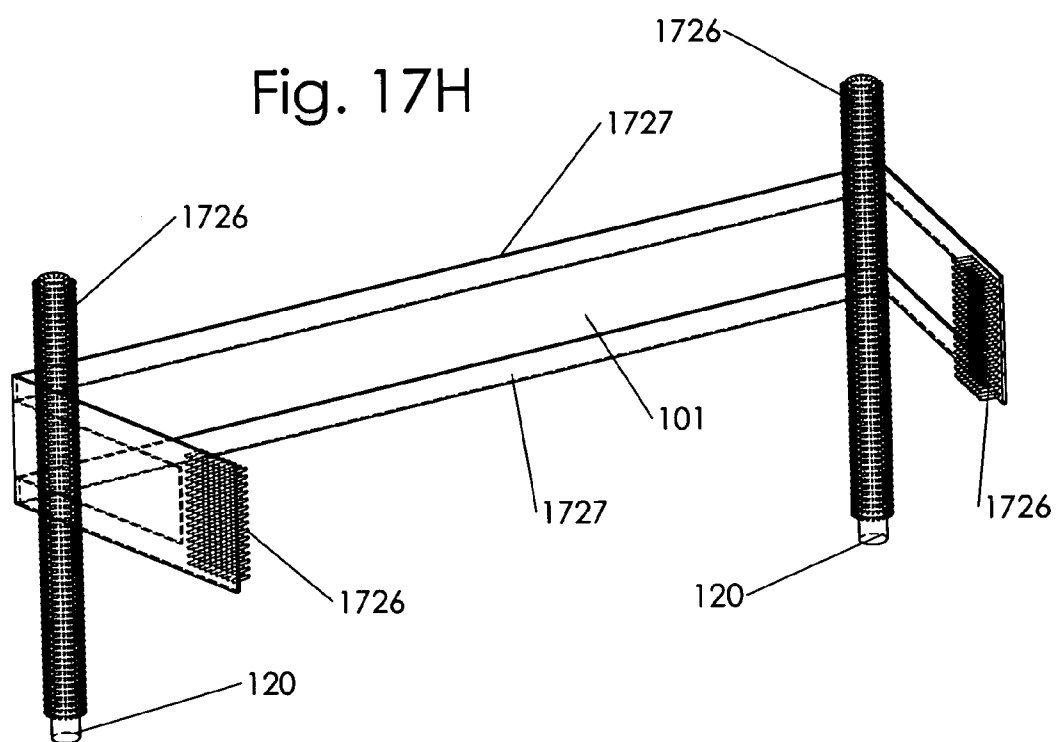


Fig. 18A

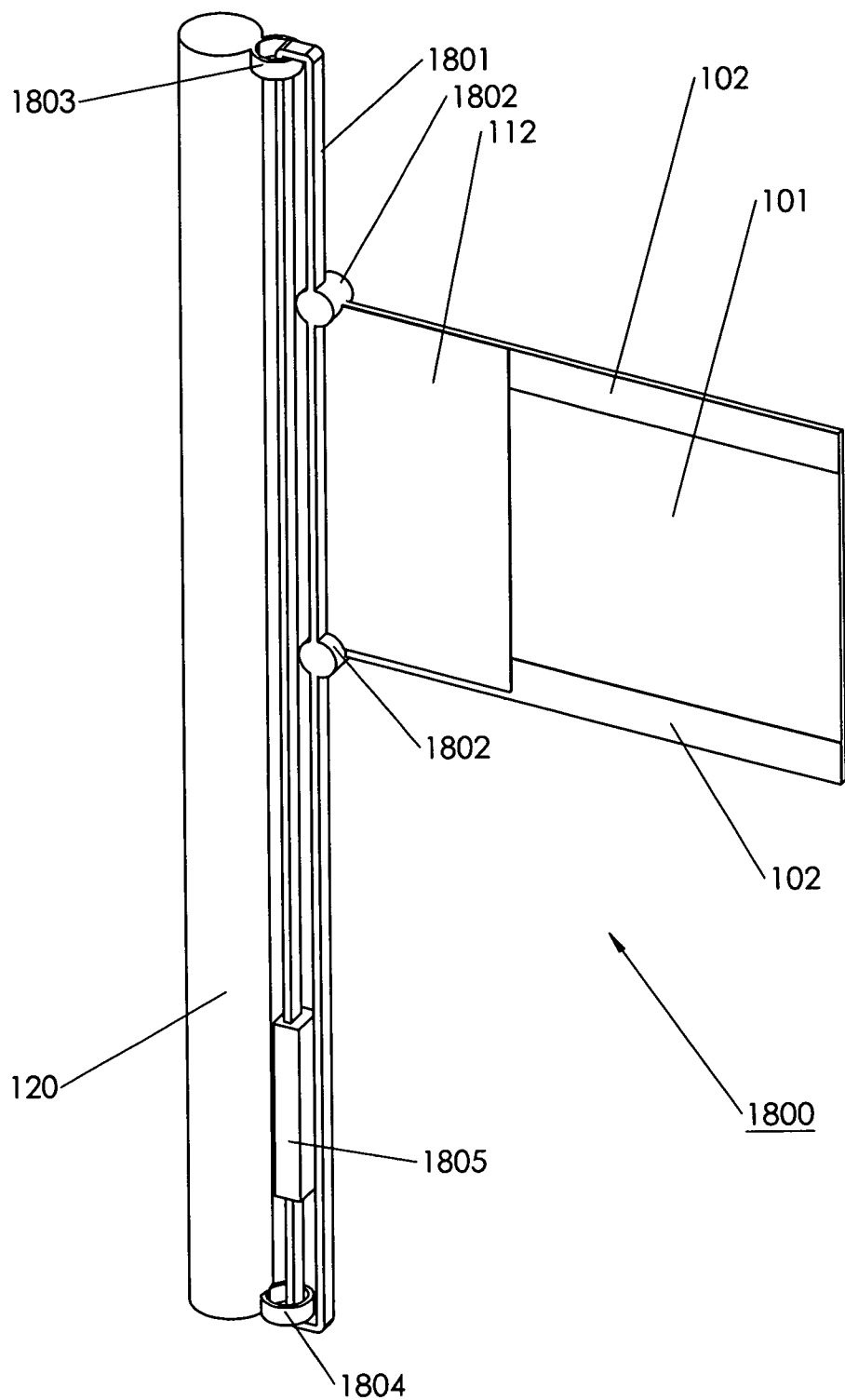
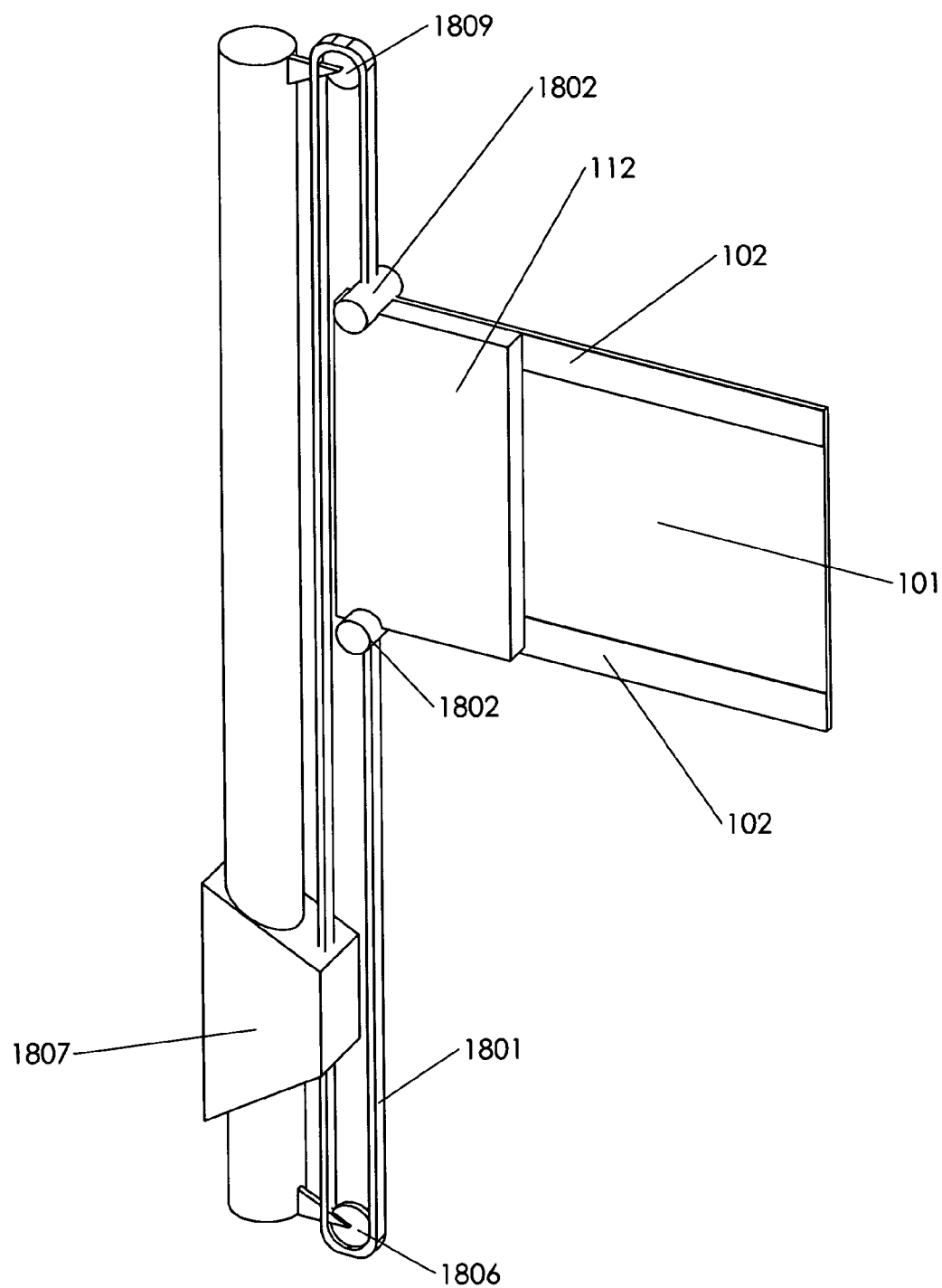


Fig. 18B



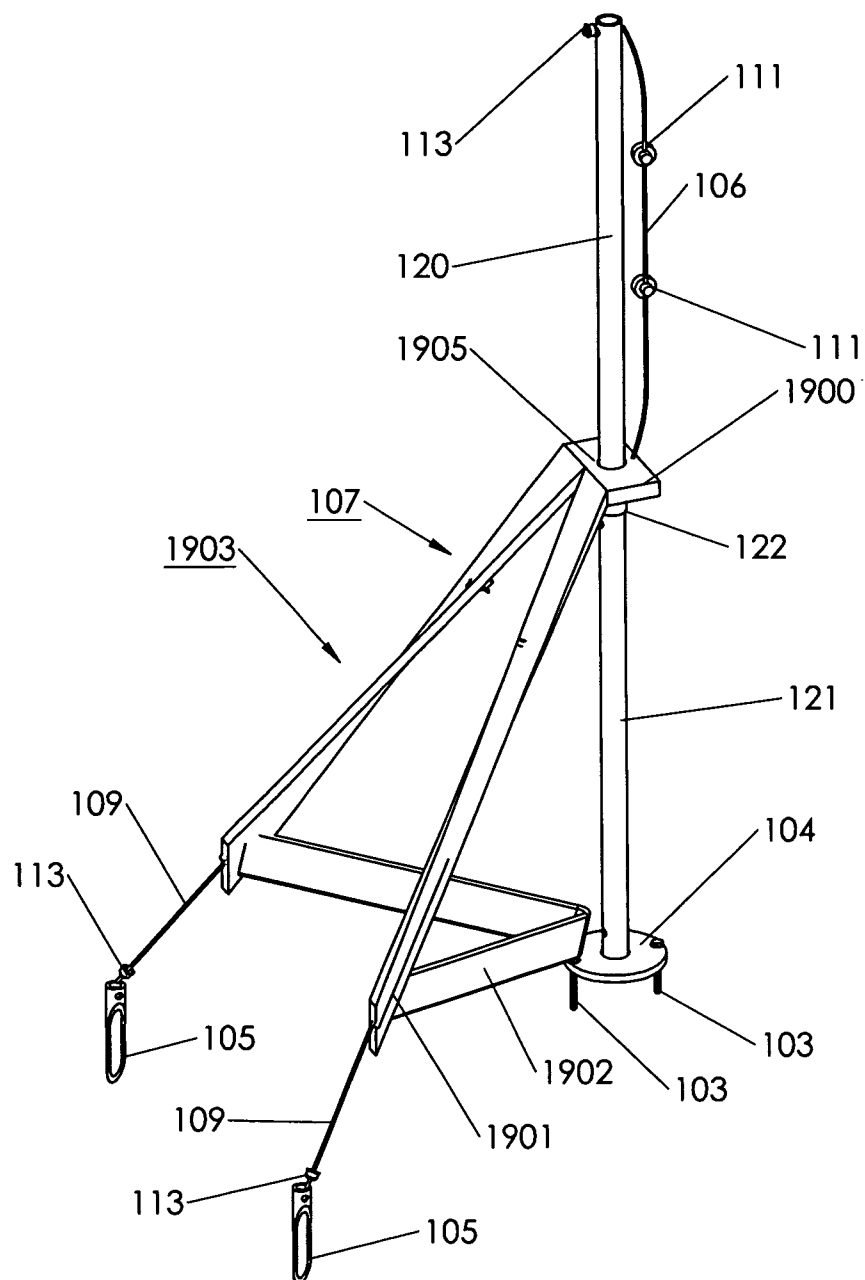


Fig. 19B

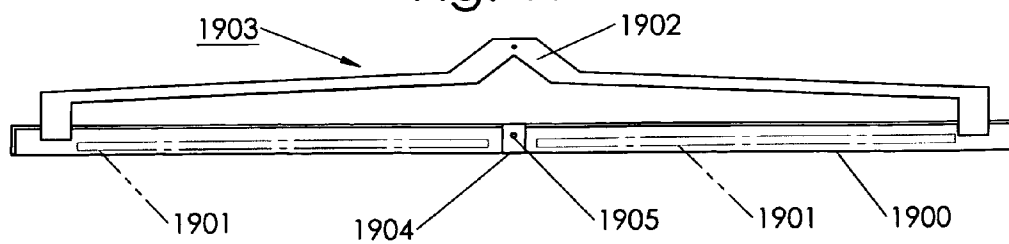


Fig. 20

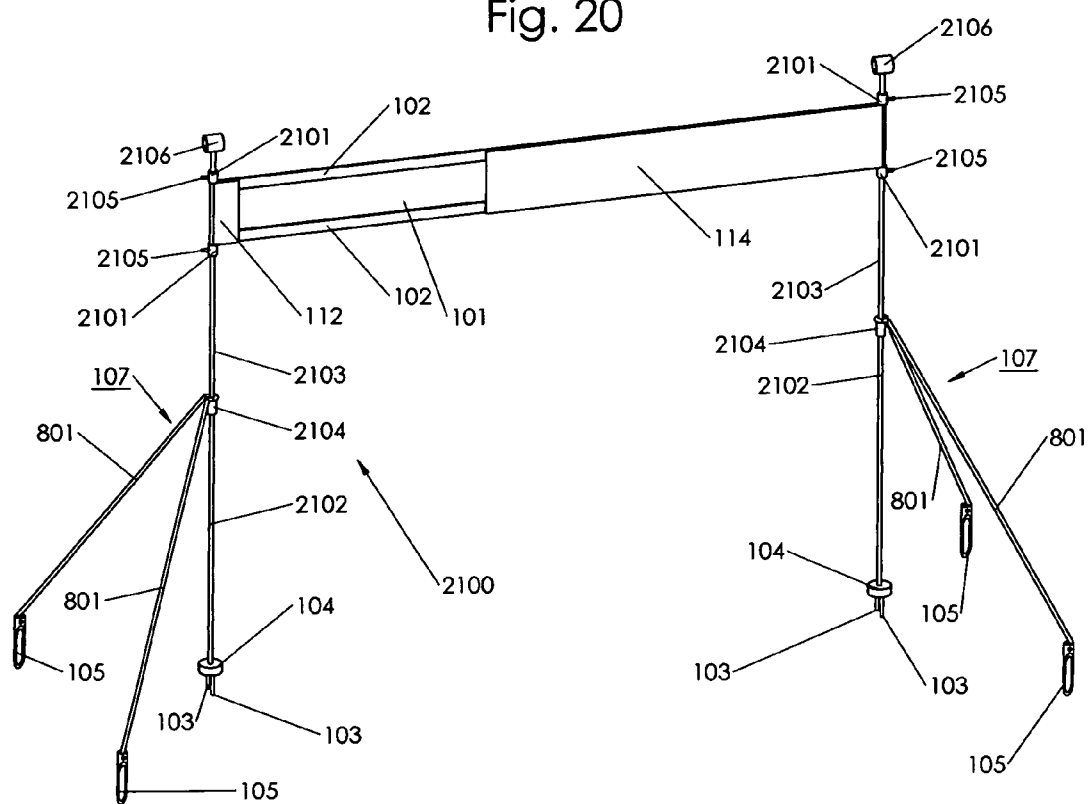
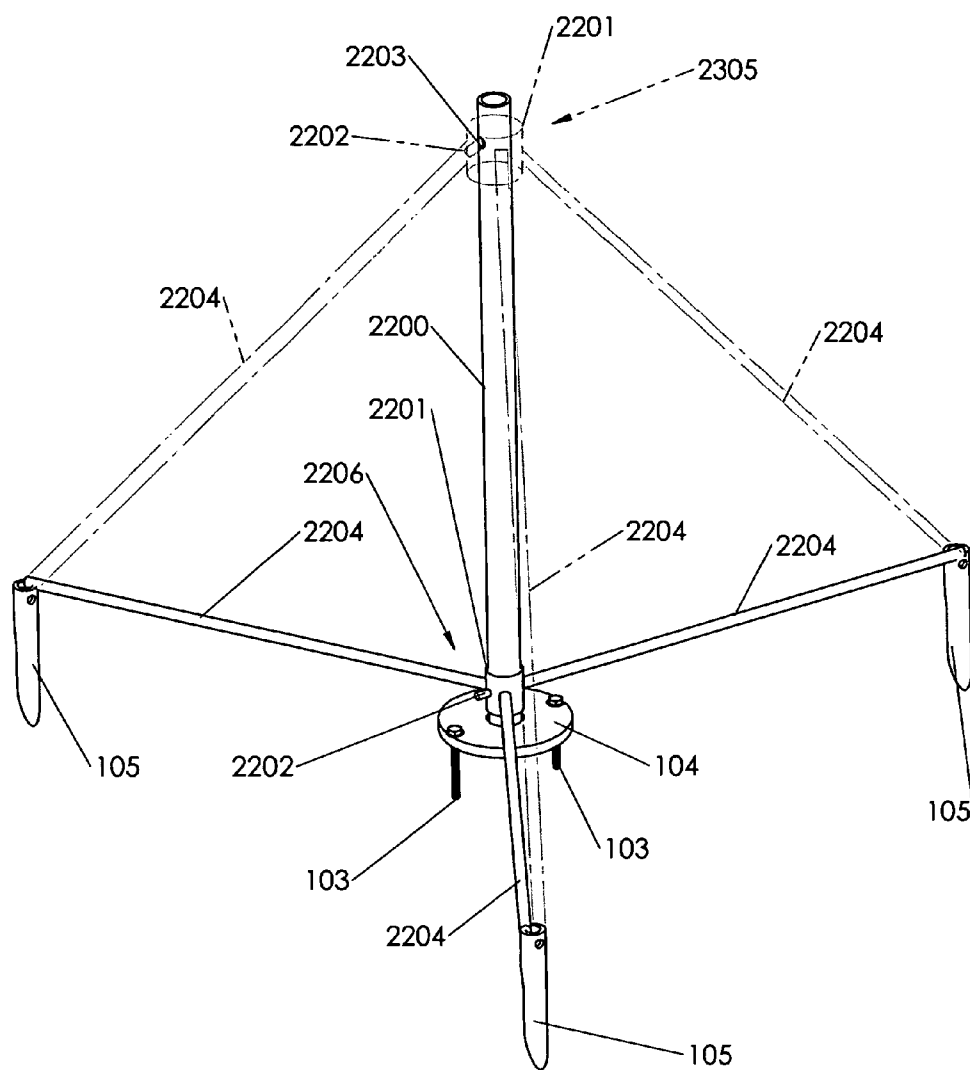


Fig. 21



ADJUSTABLE FLEXIBLE SPORTS NET SYSTEM

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/634,427, filed Feb. 29, 2012 and U.S. Provisional Application No. 61/848,374, filed Jan. 2, 2013 each filed by the present inventors.

FEDERALLY SPONSORED RESEARCH

[0002] Not applicable

SEQUENCE LISTING OR PROGRAM

[0003] Not applicable

BACKGROUND OF THE INVENTION

Field of the Invention

[0004] This invention relates to portable sports net assemblies, and more specifically to a portable, horizontally and vertically adjustable assembly which uses flexibility in the design to dissipate energy from impact plus a safety mechanism to limit the potential harm of the stored energy to the user or bystanders, allowing for a light weight, cheap construction.

[0005] Sports nets are used in a variety of sports such as volleyball, tennis, badminton, soccer tennis, etc. In the interest of brevity, the invention shall be described as how it relates to the sport of soccer tennis, but the constructions and inventions described and claimed in this specification may be used in any such game which requires one or more nets or net substitutes such as a barrier or wall that marks a horizontal boundary above ground level.

[0006] Soccer tennis is a game played on a field created with two halves of a court with equal dimensions and a net separating the two halves similar to tennis or volleyball. The object of the game is to play a ball over the net and have it land in the opponent's court without them returning the ball into the first player or team's court. Typically a player or team will have one or more touches allowed on the ball with which to return the ball to the opponent's side; for example three touches may be allowed as in volleyball. Many variations of the game are played, including allowing the ball to bounce one or more times prior to declaring a point over (as in tennis), or no bounces allowed at all, such as in volleyball. One important aspect of the game is the rules may be altered to teach a specific skill. Allowing bounces will teach the ability to receive a ball off the ground with the body, whereas a rule set where bounces are banned teaches the player to receive the ball in the air. Soccer tennis is played without use of the hands, and is used to develop touch, meaning the ability to hit the ball with the correct direction and velocity, with various parts of the body other than the hands. As previously stated, sports involving hands also benefit from the inventions described, and the application of the inventions and sports net system described herein shall be understood to one skilled specifically in the art of those sports.

[0007] Soccer tennis is a game which can be played by 2 persons, or sometimes played 11 against 11, which would involve all players typically on a soccer team's roster. Soccer tennis can be played by young children, for example 8 or 9 years old, up to adults. Because of the greatly varying char-

acteristics of the players, such as quantity, physical size, and skill level, it is important that the equipment used to play the game be adjustable in height and length. A field for use in a 1 vs. 1 game must be much smaller than a field for 11 vs. 11. Likewise the net height for an 8 year must be much lower in general than the net height for an adult. Even within a given age group, net adjustability changes the dynamics of the game such that a higher net typically creates a slower game and may be played without allowing the ball to touch the ground, like volleyball, whereas a lower net creates a much faster, direct, game as in tennis. A single net system which can be adjusted allows greater flexibility and utility in developing various skills of the players. Adjustability also makes the net useful for other sports than soccer tennis. For example, a typical soccer tennis net may be 4 ft high, but a net that could extend up to 8 ft could also be used to play volleyball. Not only is adjustability important, but speed and real time adjustability is also crucial. A coach may wish to have a warm-up game with the net in a lower position, and raise the height to transition the skill level to more of an aerial game as players warm up or improve in skill. Alternatively a large gathering of people of different ages, sizes, etc. and skill level may wish to play a tournament (for example a family reunion) and a net that is quickly and easily adjusted in height and/or length allows for quick transition between a junior bracket where a net would be in a lower position, and an adult bracket where the net would be in a higher position. Without this fast adjustability in length and height, and therefore the need to fully or partially take the net down each time, such a tournament becomes cumbersome, which limits the scope of usefulness and therefore the advantage of the system to the end user. Finally, the size, weight, and portability are essential characteristics of the sports net system. For use in a team setting, a coach will typically need to carry to the field and set up multiple net systems so having something lightweight, compact and fast to set up is crucial. If a net system is too cumbersome to carry around, then a coach will not take the time to incorporate the game into the session. Likewise if a net system is too heavy or unwieldy for a young player to carry on a bicycle for example, this again limits the utility of the system as the child needs someone to take them around to set up the game.

[0008] Many examples of prior art, in particular the Kwik Goal™, Bownet™ and U.S. Pat. No. 5,156,408 to Hall et al, do not provide any means for height or length adjustment, limiting the utility of such a system to a particular type and quantity of player as described above. Other patents U.S. Pat. No. 4,415,163 to Schoenig, U.S. Pat. No. 5,344,157 to McCord, U.S. Pat. No. 4,720,112 to Stettner et al, U.S. Pat. No. 5,885,176 to Wong et al, U.S. Pat. No. 5,611,539 to Watterson et al, U.S. Pat. No. 7,731,610 to Hun Im, and U.S. Pat. No. 5,326,109 to Robl, all discuss the desire for height adjustment with either telescoping members, discrete positions along the vertical length of a right and left standard for attaching the net, or a combination of both. Telescoping poles have the inherent disadvantage that they increase manufacturing costs and assembly complexity by requiring tubing of different sizing that must stay straight along the length that is to be in contact between the inner and outer member. With respect to telescoping systems, portability is a common desirable theme of much of the prior art, however a tube can easily get bent in transit, in the back of a car, or from a small child stepping on it while on the ground. A bent tube ruins the entire system because the tubes can no longer slide within each

other. To resist such bending, tube dimensions must be increased and a heavier duty material used which adds cost and weight to the system, and still doesn't fully protect against bending. Indeed Stettner mentions the diameter of such tubing being 2" compared to the 1/2" PVC tube discussed in the preferred embodiment of this application. Kessler mentions the tolerance of such pipes to be between 0-0.015" on the diameter, which is a tighter tolerance than most common plastic tubing extrusions, meaning a custom extrusion, which is more expensive to manufacture. Indeed, this tolerance must be maintained along the entire telescoping length which is quite difficult to achieve cheaply, even in metal. Kessler and others who discuss the need for low cost and portability recognize that plastic is a far cheaper option. However with a telescoping design, Kessler and others fail to realize that plastic warps in the sun and deforms over time, which will ruin the telescoping ability and lead to binding. Thus, the best chance a telescoping system has of being functional is to be made of metal which is heavier and more costly than a plastic alternative that doesn't telescope. Additionally, as described in McCord, Schoenig, Wong, and Watterson by example, telescoping standards are described that are under inward forces on the upper member of the standard from the net tension. This inward force causes a binding friction between the inner and outer members of the standard, and to some degree will bend the standards when the net is tensioned, making real time height adjustment in situ virtually impossible without releasing the tension in the net. The tension in the net must first be released by detaching the net, the standards adjusted, and then the tension re-applied by attaching the net again. Once the net is detached, the guy lines will pull the standard to the ground because there is no counterforce. To prevent this, a user must hold the standard in place while adjusting the height and while re-attaching the net. This makes adjustment a two person job, one to manage the standard and one to manage the net. Requiring two people is problematic in a setting where a coach is setting up a training session by themselves. Further, Wong, Kessler, Stettner, and Schoenig all describe telescoping systems with vertical height adjustment systems that require some degree of re-tensioning of two or more guy lines post-vertical adjustment to maintain tension in the system in addition to requiring additional bodies to adjust the height without the system collapsing. This is because the upper section of the standard, where the guy lines are attached, is moved downward, decreasing the length of the guy line. Because there is no elastic element in the guy line, the guy line becomes slack and net tension is lost. McCord describes a telescoping scheme where a collar slides around a standard of fixed height, the guy line is attached to the top of the standard, and therefore does not change its position vertically on height adjustment. However, McCord fails to realize that it is virtually impossible for the user to put the standards in perfectly parallel when applying tension, so inevitably the net will be tensioned for a given net height, when the net is adjusted in situ, the distance between the standards will change and the net tension will change, and in some cases decrease and lead to a drooping net. This problem would be alleviated by flexible standards which could deflect to provide the extra distance to make up for lack of parallelism, however this would mean the standards bend slightly, and this would not prevent McCord's sleeve to translate along the standard. Therefore, McCord's design is not able to guarantee net tension over a wide range of heights without readjusting guy lines or repositioning stan-

dards. Vertical telescoping height adjustment described in the prior art therefore is a cumbersome process compared to the inventions in this specification, which disclose methods of height adjustability without taking apart any components of the system. Additionally, telescoping systems have superfluous material in the system by virtue of requiring a minimal amount of overlap between the two tubes. A minimal section of overlap (in the extended position) is required on the inner member and the outer member, however if the two members are simply joined, and the height adjusted by other means, this extra overlap in material does not exist. Additionally, telescoping systems, by their nature are not optimized for the forces put on them, because a standard will have a given set of dimensions (wall thickness and diameter) for a given maximum force, and because the inner and outer members must be different sizes, the larger member will, by necessity, be over-designed (the smaller member must be designed to take the force, yet fit inside the larger member). Both this overlap and the non-optimal use of tube dimensions means the system will be heavier and more costly by material use alone than an optimized system that did not rely on telescoping members for height adjustment. Finally, most of telescoping systems described do not have a guard to prevent from inadvertently pulling one member out of the other during adjustment, which would delay setup time. Such a provision, which would be required of a practical telescoping system, would add to the complexity, cost, and number of adjustment operations to change the height of the system.

[0009] Systems such as the FootTennisSoccer™, Wong et al., Watterson et al., rely on discrete height adjustment positions, and are non-optimal as they require the net to be disconnected in at least two points, in most cases four corners of the net, moved, and then reconnected. In the case of Wong et al. changing height requires threading a strap through a slot, then threaded through a buckle, which can be difficult, frustrating, and time consuming depending on the stiffness of the strap. In the case of FootTennisSoccer™, two settings are available at 1 meter and 1.6 meters. An extra length is required to be attached on top of the base standards, and then the net re-attached. This is not practical if the setup is to be changed quickly in the middle of a training session because the tension must be released to remove the net, then the height extenders put on, then the net re-attached. This takes unnecessary time, and setup/adjustment time is a critical operating parameter for a coach who has limited time, and needs to quickly change the dynamics of the training session. In reality, coaches or players either will not adjust the initial height, or not use the system, both of which reduce or eliminate the potential utility of the system. Discrete vertical height positions also, by their nature add more complexity with attachment points, and mating elements that increase manufacturing part count, operations, and cost. At the same time discrete height adjustment systems also limit the amount of possible positions the net can have to the number of height adjustment spots. For FootTennisSoccer™, the two positions are almost double one another meaning there are a lot of possible heights that are missed. Because of the inherent limitations, increased manufacturing cost, and increased setup/adjustment time in telescoping and discrete position net height adjustment systems, a system in which the net is continuously and quickly adjusted in the vertical direction is big advantage to increasing the utility of the system and its incorporation into coaching sessions or events where large variance in users want to use the same field.

[0010] As discussed above, it is also an important aspect of a sports net system to be simply and quickly adjustable in length to accommodate a varying quantity of players. Prior art, such as the existing soccer tennis systems on the market (Kwik Goal™, Bownet™, FootTennisSoccer™), don't provide for length-wise adjustment, probably because most games are played with a fixed dimension according to the rules of the game. Bownet™ and Kwik Goal™ describe placing multiple nets together, however this requires multiple systems and more cost to the consumer. Further, if the desired length is actually 1.5× a Bownet™ or Kwik Goal™ net length, this is not achievable with their products. It is an added benefit of the system for all sports, volleyball, badminton, soccer tennis, etc. to be length adjustable to maximize the enjoyment of the game by preventing a situation where a single player has to run around a court that is too large, or conversely too many players need to cram into a court that is too small. Because of the nature of the operating environment of these systems, parks, backyards, etc. there may not be space for a full size court. Such a situation would render a product useless if it can't be adapted to fit the available space. Therefore a net that can adapt in length to the environment is beneficial and opens up the range of settings in which the sports net system can be used. Furthermore, it is always much easier to find one person with free time to play 1v1 than to find 6 people to play 3v3. However, without a system that is functional for games with varying quantities of players, a larger system, such as the FootTennisSoccer™ (7 m in length), will not be used to the full extent it should be unless a minimum number of players are brought together to play. U.S. Pat. No. 5,303,932 to Kessler in particular has no means of length adjustment so if the bases are not placed just right, the user will have to move heavy, ballasted bases to try and put tension on the net. This may not be possible in the case children using the system who don't have sufficient strength. Watterson et al, discusses a system for discrete length adjustment using a net with four attachment straps, one of which has a series of hooks. However this system keeps the length of the actual net portion a fixed length, meaning the sides are left open and ambiguous as to whether the ball or object has gone over or under the net. The wider the standards are placed, the more of the length without a portion of the net is present and the less effective the system becomes. Watterson's design also ends up with superfluous material hanging and the hooks may get tangled on the net and cause a mess in the packaging process, or float into the court on a windy day. Watterson's design also relies on heavy well secured standards to the ground. Because of the discrete length adjustments, it is necessary to move the distance between the standards when adjusting the net length, and this is not trivial given how securely they must be planted into the ground. U.S. Pat. No. 5,816,956 to Ellis et al shows a net that can be disconnected in a portion and allowed to droop down which again interferes with the look and function of the system, and would blow into the field of play on a windy day. Both Watterson and Ellis describe only discretely length adjustable systems. In a quick setup a player does not want to have to measure the length precisely, therefore, in the case of a system with separable standards like Watterson, there must either be a lot of length adjustment hooks (increased cost and complexity), or the standard must be able to bend to accommodate changes in length. Watterson's requirement and depiction of stiff telescoping poles relies on straightness, which is counter to this flexibility requirement. In the case of Ellis, the support appa-

ratus is of a fixed net length so the support structure must be the maximum desired length that will ever be used. Ellis' design also requires a cross member to hold the tension in the net, which adds significant material and cost. Indeed for a tennis court as Ellis mentions, there is so much extra material the system is not really even portable anymore. Ellis describes the structure being made of aluminum tubing meaning a significant added cost in terms of material, connecting joints, etc. that is typically not required as the system will likely not be used at the maximum net length most of the time. Additionally the fixed net length of the support tubing structure in Ellis necessitates a larger playing area which is detrimental in a situation where a coach may want to have multiple nets set up side by side, but only be allocated a limited amount of space on a training field. It is therefore desirable a net system adjusts in length continuously to take up the minimal amount of surface area required for any given available field size, and eliminate the need for precise placement of the standards in the case of separable standards, enabling fast and simple setup by a single person, and ability to make fields of substantially different net lengths.

[0011] For systems that incorporate guy lines such as Kellams, Stettner, Robl, and McCord, guy lines are attached to the top of the standards. To achieve an acceptable angle with the ground, the guy lines must be anchored a greater distance from the base than if the guy lines were attached lower on the standard. Current designs using guy lines are configured this way because they must carry the net tension directly from the net at the top of the standard to the ground. However this creates a larger footprint for the guy lines and makes the guy lines more likely to be accidentally pulled out by someone tripping on them. This can pose a dangerous situation as the person may then fall on the exposed ground stake. It is therefore desirable that a net assembly not require guy line attachment at the top of the standard, but at a lower point as described in the disclosed invention.

[0012] Net games, like soccer tennis, are frequently played in parks and small fields between a group of friends or family getting together to have fun. Therefore it is important for the net to be very light and portable and require minimal setup time. Increased portability increases the utility of the system as it makes it less of a hassle for the players to transport and therefore more likely they will use the system. Specifically for soccer tennis, it is the object of the system that a pair of 8 year olds can take a system on their bicycle and set up at a local field to play. Furthermore, a coach or trainer with a roster of 24 players for example, may want to use 6+ systems during training sessions for 2v2 or 3v3 tournament play and therefore must be able to easily carry these systems without having to take multiple trips back to the car. Existing products such as the Kwik Goal™ (11 lbs), FootTennisSoccer™ (13 lbs) are heavier than they need to be due to construction design such as an added cross bar in the example of the Kwik Goal™, and too large of a net and metal side posts in the case of the FootTennisSoccer™. These systems are 2-3 times heavier than the system described herein and not really portable in quantities of 4 or more. Systems relying on ballast such as Kessler have bases that are required to cover a large surface area to provide a solid enough base, so while they may be light without the ballast, they are physically large and difficult to carry. The ballast material, typically water or sand, may also be difficult to source onsite once the system is setup. Systems such as Watterson, which rely on heavy plates that cover larger surface areas for stability, also contradict port-

ability. Telescoping systems such as Schoenig require more material than is necessary to carry a given force as described above and also are prone to bending. If the telescoping system is to resist bending, it must be made of substantially higher gauge steel or other material which increases weight.

[0013] One crucial aspect of many net systems is that they inherently involve contact between the net and the player or the game object (like a volleyball). This contact puts a stress on the system which must be absorbed and transmitted to the ground without displacement of the equipment, which would require putting the equipment back into place to maintain the integrity of the field boundaries. Weights are commonly used to anchor a system to the ground. However, this contradicts the goal of compactness, portability, and low carrying weight. Designs such as Kessler et al. remove the weight from the system, but require the user to source the weight at the place where the system is to be setup, for example sand on a beach, which is not feasible in the case of a public park. This limits the utility of such designs primarily to beaches. Ellis and the Kwik Goal™ ignore the need to secure the system to the ground all together, most likely because they are designed to operate on hard surfaces like artificial turf which can't receive any sort of stakes or ground anchors. This is a big oversight however; these systems use a net that will absorb the entire impact of the ball, yet have nothing but the friction on the ground to secure it into place. In reality, the entire net system ends up tipping over or sliding on the surface of the grass which requires the players to reposition it after every net impact, slowing down the pace of the game. Other systems, such as Hall and Watterson et al. require implantable ground supports, or supports with bases with large surface areas that are staked into the ground. In the case of implantable ground supports this requires digging a hole, which is not practical when low setup time, net length adjustment, and portability are crucial requirements. With regard to a flanged support base as depicted in Watterson, to prevent the standard from tipping over, the diameter or outer dimension of such a flange needs to be significant to absorb the torque put on the standard if the ball hits the top of the standard, reducing portability. Hall mentions the material for the support structure to be plastic, but this will not provide sufficient weight to keep the support from moving. If only the standard is plastic, it risks breaking from high impact as the standard acts as a long lever arm for an impact at the top of the standard. In all systems prone to movement or loosening in the ground, the net will lose tension after impact with the player and/or ball, and repositioning will be required to restore tension to the net. Weighted or large diameter bases unnecessarily increase the physical size and weight of the system for transport. Therefore it's important that a system be designed to flexibly absorb this energy and transmit to the ground surface.

[0014] While the designs described above do not address the need to transmit forces to the ground, Schoenig et al., McCord, Stettner et al., Kellams, Robl, and Wong et al, Foot-TennisSoccer™, anchor their systems to the ground with stakes and guy lines with tensioning devices. A typical configuration is two guy lines coming from the top of a standard to two stakes on the ground, the same on the opposite side, and a net connecting the two standards. However, in all of these systems, there is no compliance built into the system. The guy lines are all tensioned and locked during setup, and therefore not able to change their length. This means the net has very little compliance. A force from the ball or a person running into the net is transmitted directly down to the stakes in the

ground without any dissipation of this energy. A high enough force, or a small child running around the field who kicks the rope connected to the ground stake, means the stake comes dislodged and the entire net collapses and must be set up again. Additionally, after repeated impacts into either the net or the standard from the ball or player, the standard and stakes will tend to loosen in the ground. This reduces the tension in the system causing the net to droop, and requires the game to stop so the net can be re-tightened. The FootTennisSoccer™ system illustrates exactly this problem as the net will frequently absorb the full impact of the ball, not to mention the standards are prone themselves to impact from the ball. It only takes a few impacts for the standard to no longer remain substantially upright. Wong et al, offers a built in re-tensioning solution, but it is very difficult to manufacture because it requires welding or gluing inside of a long narrow tube. Further, Wong's design does not offer flexibility in the tensioning system so it will still result in net droop as the posts and stakes loosen over time in the ground. Kellams recognizes the deficiency of just using ropes and stakes to locate and keep tension on a sports net system by providing extra base support. However, Kellams' solution is to add more parts, cost and weight to the system. Kellams also fails to take into account impacts at the base support, parallel to ground, will cause the base support to slide out from under the net and the system will collapse. Furthermore, Kellams' design helps to spread the force to the ground, but the system is still rigid and therefore, impacts which pull the standards inward, i.e. a ball crashing into the middle of the net, transmit forces directly to the stakes, causing the stakes to loosen and eventually pull out. Robl's solution is similar to Kellams by providing a substantial base support of 6 square inches with a 6 inch spike. Not only is such a design dangerous in transportation (a small child riding a bike with a 6 inch spike for example), but it is unnecessarily large and costly when compared to the invention described herein. Intentional compliance in the system as described and claimed herein maintains net tension through impacts, and drastically reduces the chance of net loosening and stake pull out as there is far more physical movement allowed by all system components without exceeding the pullout force of the stakes. This reduced force on the stakes also means that the stakes can be shorter which makes them easier to put in, and less dangerous/more convenient to carry around and package up (no tangling). Indeed, a system built according to this specification was battered with a ball and left erect for over one week with no appreciable loss in net tension. Some patents referenced herein such as Schoenig et al, rely on stakes, and acknowledge the need for a hammer to put the stakes in the ground. This again adds setup hassle and weight to the system. A net system with built in compliance therefore allows for a smoother operation of the game, with fewer instances of re-tensioning required, more flexibility in net length setup, and a better overall user experience.

[0015] In an elastic system, most of the energy from impacts goes into deforming the elements of the system, whereas in a non-elastic system the energy is transmitted to the anchoring elements through high peak forces which will cause loosening or pullout from the ground. This allows for shorter ground spikes, and lighter weight materials because of the lower peak forces each member must carry. Indeed, prototype nets functioned well with 3.5" ground spikes whereas a typical spike for a volleyball net would be 4-5". A shorter stake is in general safer to the consumer, and lighter weight

materials are cheaper to fabricate and lighter to carry around. While it is a great benefit that an elastic system will reduce peak forces on the ground anchors, a flexible, elastic system will store energy when a force is put on the net or standards. A mechanism therefore is required to dissipate this energy in a safe manner without the chance of injury to a player or bystander. All references herein, lack any type of safety mechanism against stake or standard pullout, primarily because they do not incorporate elastic members, and therefore are incapable of storing energy. In an elastic system, as described and claimed herein, the energy stored in the elastic members can be transmitted to a ground anchor/stake and, should the ground anchor/stake release, force it to fly upwards with an appreciable velocity, posing a safety risk. A further aspect of the safety mechanism should be that it absorbs energy without limiting the stretch or bending of the elastic member(s). For example, a rope overlapping and secured to either end of a shorter section of bungee cord is used in sailing applications to limit the amount of possible stretch in the bungee cord. This is perfectly suitable for sailing applications where the purpose is mainly to prevent a catastrophic failure of the bungee cord from a gust of wind on the sail. This would not work in a flexible sports net system however. Such a safety mechanism limits the stretch, so a user can theoretically stretch/bend the elastic member to the maximum amount during initial setup, and therefore any further impacts on the system would not be absorbed by further compliance (because the elastic limit was reached during setup), and these forces would be transmitted directly to the stakes, causing loosening and loss of net tension. The compliance of the system would have effectively been bypassed. Furthermore, for elastic members that change properties over time (such as bungee cords), it is also detrimental to limit the amount of stretch with the safety mechanism, since over time, more stretch may be required to produce the same compliance force and net tension. Therefore, with a elastic system, a safety mechanism which dissipates the stored energy from the elastic member(s) without limiting the amount of compliance that can be achieved should be incorporated as described herein.

[0016] Finally, it will be noted that systems which use a traditional net structure may over complicate what is actually required to fulfill the object of the game. A net that is the traditional size of a volley ball, or soccer tennis net as described in the referenced patents, or sold with the Kwik Goal™ or FootTennisSoccer™, adds weight to the system by virtue of the amount of material. Such a net also increases the chance of entanglement with other parts of the system in the netting during packaging, increasing frustration on setup/teardown. In the case of soccer tennis, or tennis systems, the net also blocks the ball from traveling through to the other side which requires a player to walk up to the net and retrieve the ball. This slows down any game played, and is typically not required to tell if the ball went over or under the net. A net which is much shorter in height, or doesn't go all the way to the ground, accomplishes the goal of allowing players to determine if a shot went over or under, yet allows the ball to travel through to the other player with the energy it already has and prevents a player from having to retrieve the ball. This is of particular relevance in relation to the Kwik Goal™ and FootTennisSoccer™ systems.

Objects and Advantages

[0017] Accordingly, besides the objects and advantages of elastic adjustable sports net system described in this specification, several objects and advantages of the present invention are:

- [0018] a) to provide a sports net system that accommodates varying height settings along a continuous vertical adjustment path without the net to detach the net or re-tension or re-tighten any components;
 - [0019] b) to provide a sports net system that accommodates varying length settings along a continuous length-wise adjustment path;
 - [0020] c) to allow the adjustments described in a) and b) to be made by a single person and in real time without the need for disassembly of parts of the system to minimize time required to make the adjustment;
 - [0021] d) to provide a sports net system that is light in weight;
 - [0022] e) to provide a sports net assembly that is easily collapsible, portable, and compact;
 - [0023] f) to provide a sports net assembly that is cheap and simple to manufacture;
 - [0024] g) to provide a sports net assembly that is flexible and resilient to absorb impact from an object, ball or player for example, and deflect sufficiently to transmit this impulse of energy to the ground without permanent movement or loosening or ground attachment points, and then return to a nominal position without the need for readjustment by a user;
 - [0025] h) to provide a sports net assembly that absorbs the energy stored in its elastic member(s) without posing a safety risk to the player(s) or bystander(s);
 - [0026] i) to provide a sports net assembly that has easily interchangeable nets for embroidering of a logo;
 - [0027] j) to provide a system where a single person may independently place the standards into a penetrable surface at any reasonably length, and then string a net between them so setup does not take multiple players, and the length does not require precise location or pre-assembly;
 - [0028] k) to provide a sports net system whose net tension does not loosen under impacts to the system;
 - [0029] l) to provide a sports net system that is adjustable to take up the minimum required footprint for a given field size while maintaining resiliency, flexibility, portability, and adjustability;
 - [0030] m) to provide elements a)-l) in a single system that is simple and easy and safe to transport, durable, and fast to setup.
- [0031] Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

SUMMARY

[0032] In accordance with the present invention, an adjustable sports net assembly comprises two standards, vertical guides running a portion of the length of each standard, a net connected to and disposed between each of these guides with cord stops to secure the vertical position of the net for continuous vertical adjustment of the net. The net is adjustable in length via doubling back on itself using strips of hook and loop fastener, to allow for continuous adjustment in net length of the assembly. Each standard is connected to the ground via a guy line incorporating a spring element two guy line elements connected each to a ground stake. The spring elements absorb impact of an object on the net, allowing each standard to deflect about its base in any direction, yet return to a nominal position once the full impact has been absorbed and transmitted to the ground stakes. A safety system is attached

to each stabilization assembly to limit the height each stake could reach should it inadvertently pull out of the ground.

DRAWINGS

Figures

[0033] FIG. 1 shows a perspective view of a sports net system in accordance with the present invention

[0034] FIG. 2 shows perspective view of one standard of a sports net system with an additional intermediate section for height extension

[0035] FIG. 3 shows an anchor design

[0036] FIG. 4 shows a perspective view of a packaging configuration of the sports net system shown in FIG. 1

[0037] FIG. 5 shows a deflection path of the sports net system from FIG. 1 from an impact of a game object on the net

[0038] FIG. 6 shows a side view of the sports net system from FIG. 1 and a force diagram indicating the sports net system's reaction to impact from a game object on one standard

[0039] FIG. 7 shows an exaggerated side view of the flexibility provided by the sports net system from FIG. 1

[0040] FIG. 8A shows a perspective view of alternate configuration of the safety mechanism from FIG. 1

[0041] FIG. 8B shows a perspective view of an alternate configuration of the stabilization assembly from FIG. 8A

[0042] FIG. 9 shows a perspective view of another alternate configuration of the stabilization assembly from FIG. 8A

[0043] FIG. 10 shows a side view of an alternate configuration of the sports net system of FIG. 1 with an alternate guy line configuration and optional flexibility in the standard

[0044] FIG. 11A shows perspective view of an alternate configuration of the safety mechanism of the standard assembly in FIG. 10, the safety mechanism incorporating a staple design for safely preventing dangerous inadvertent pull out of the anchors

[0045] FIG. 11B shows a detailed side view of the staple in FIG. 11A

[0046] FIG. 12 shows a perspective view of an alternate safety scheme for the standard assembly of FIG. 1 using stiff tubes inserted or surrounding the guy line to block the path of the anchor upon inadvertent pullout

[0047] FIG. 13 shows a perspective view of an alternate safety mechanism for the standard assembly of FIG. 10 in the event of inadvertent pull out of the anchors using stiff tubes attached the base of the standard assembly

[0048] FIG. 14 shows in side view an alternate safety scheme of the standard assembly in FIG. 10, illustrating a height limited pullout path of a weighted anchor

[0049] FIG. 15A shows a perspective view of an open position of an alternate safety mechanism for protecting the user from inadvertent anchor pullout

[0050] FIG. 15B shows a perspective view of a closed position of an alternate safety mechanism for protecting the user from inadvertent anchor pullout

[0051] FIG. 16 shows a perspective view of an alternate safety scheme of the standard assembly from FIG. 10 using a loose weight for guiding the pull out path and then restricting the anchor

[0052] FIG. 17A shows perspective view of an alternate length and height adjustment scheme for the sports net of FIG. 1 using springs attached to the net and sliding collars along the standards

[0053] FIG. 17B shows perspective view of an alternate length and height adjustment scheme for the sports net of FIG. 1 using a single spring element for connecting the two standards and a weighted net bottom and sliding collars along the standards

[0054] FIG. 17C shows a perspective view of an alternate length and height adjustment scheme for the sports net of FIG. 1 using a rope slack take up device and sliding collars along the standards

[0055] FIG. 17D shows a perspective view of an alternate length and height adjustment scheme for the sports net of FIG. 1 using hooks and grommets, and sliding collars along the standards

[0056] FIG. 17E shows a perspective view of an alternate length adjustment scheme for the sports net of FIG. 1 using springs with hooks and grommets, and sliding collars along the standard assembly

[0057] FIG. 17F shows a perspective view of an alternate length adjustment scheme using snaps for the sports net of FIG. 1

[0058] FIG. 17G shows a perspective view of an alternate length and height adjustment scheme for the sports net system of FIG. 1 using a coiled spring connecting one end of the sports net to one standard and a receptacle in the opposing standard to secure the other end of the sports net

[0059] FIG. 17H shows a perspective view of an alternate length and height adjustment scheme for the sports net system of FIG. 1 using hook and loop fasteners attached to each standard and to the length of the sports net for adhesion of the sports net to either standard at any point along the length of the sports net, and the height of each standard

[0060] FIG. 18A shows a perspective view of an alternate height adjustment scheme for the sports net system of FIG. 1 with a loop of cord running through a top and bottom loop, a tensioner to apply and release tension on the cord, and the net being hooked to section of cord opposite the tensioner. When tension is applied the cord is difficult to move and net height is fixed, when released the cord is easy to move and height may be easily adjusted

[0061] FIG. 18B shows a perspective view of an alternate height adjustment scheme for the adjustment mechanism of FIG. 18A where pulleys are used for smooth movement of the cord, and a locking grip on the pole is used to lock the height position of the net.

[0062] FIG. 19A shows a perspective view of an alternate safety mechanism for the sports net assembly of FIG. 1 incorporating a fabric sleeve for branding, and stiffening rod and webbing to limit anchor pullout height

[0063] FIG. 19B shows a top view of the fabric safety mechanism of FIG. 19A laid out flat after sewing

[0064] FIG. 20 shows a perspective view of an alternate sports net assembly to that of FIG. 1 using fiberglass rods and tip protectors

[0065] FIG. 21 shows a perspective view of an alternate solution for securing a standard perpendicular to a playing surface allowing for placement of the standards prior to applying tension to the spring elements

[0066]

DRAWINGS - REFERENCE NUMERALS

100 - adjustable and elastic sports net system

-continued

DRAWINGS - REFERENCE NUMERALS
101 - net fabric
102 - paired hook and loop fastener
103 - ground spike
104 - base plate
105 - anchor
106 - height adjustment guide
107 - stabilization assembly
108 - standard assembly
109 - guy line
110 - spring element
111 - movable cord stop
112 - first overlap flap
113 - immovable cord stop
114 - length adjustment overlap flap
115 - safety tube
116 - safety tube connector
117 - height limiting member
118 - NA
119 - anchor angle
120 - upper tube
121 - lower tube
122 - coupling
123 - upper hole
124 - lower hole
125 - half court line
126 - cord clamping fastener
200 - extension tube
201 - extension coupling
301 - connection point
400 - packaged length
401 - packaged height
402 - packaged width
403 - bag
500 - deflection angle
501 - rocking angle
502 - initial standard position
503 - game object
504 - deflected position
505 - elongated spring element
506 - contracted spring element
600 - FS
601 - VB1
602 - VB2
603 - NA
604 - FG
605 - FT1
606 - FT2
800 - standard assembly with safety stake
801 - single spring element
802 - safety stake
803 - safety stake connecting member
804 - standard assembly with single spring element
900 - standard assembly with interim spring element
901 - first guy line
902 - intermediate

-continued

DRAWINGS - REFERENCE NUMERALS
spring element
903 - second guy line
1000 - standard assembly with spring post
1001 - central guy line
1002 - lower spring element
1003 - optional spring element
1004 - lower spring tube
1005 - upper spring tube
1100 - staple
1101 - staple attachment point
1102 - anchor point
1200 - standard assembly with inline safety members
1201 - rigid guy line
1202 - maximum height
1203 - end terminating spring element
1204 - rigid guy line coupling
1205 - pull-out position
1301 - rigid lower safety member
1302 - lower tube collar
1303 - stiff tube short anchor connector
1401 - initial position
1402 - maximum height position
1403 - resting position
1404 - weighted anchor
1405 - maximum weighted anchor height
1500 - guy line attachment point
1501 - protecting hemisphere
1502 - spring biased hinge
1503 - open position
1504 - closed position
1601 - loose safety weight
1602 - pullout angle
1603 - initial distance
1604 - guide loop
1700 - plain net
1701 - net spring element
1702 - short net connector
1703 - set screw
1704 - sliding tube collar
1705 - collar connection point
1706 - weighted net
1707 - single net spring
1708 - net weight
1709 - net bottom tension line
1710 - optional net collar
1711 - net cord
1712 - net cord adjustment clip
1713 - net cord adjustment loop

-continued

DRAWINGS - REFERENCE NUMERALS
1714 - grommet
1715 - grommet hook
1716 - hook and grommet net
1717 - Spring hook and grommet net
1718 - male snaps
1719 - female snaps
1720 - net end plug
1721 - adjustable net receptacle
1722 - net end receptacle slot
1723 - coiled spring net holder
1724 - coiled spring
1725 - net strapping
1726 - hook fastener
1727 - loop fastener
1728 - net channel
1800 - continuous loop height adjustment scheme
1801 - height adjustment cord
1802 - cord connection point
1803 - upper ring
1804 - lower ring
1805 - tensioner
1806 - lower pulley
1807 - tube clamp
1808 - NA
1809 - upper pulley
1900 - fabric safety sleeve
1901 - stiffening rod
1902 - safety webbing
1903 - safety sleeve stabilization assembly
1904 - optional sleeve reinforcement patch
1905 - pole through hole
2000 - NA
2001 - NA
2002 - NA
2003 - NA
2004 - NA
2005 - NA
2006 - NA
2007 - NA
2100 - fiberglass two pole system
2101 - movable tube stop
2102 - lower fiberglass tube
2103 - upper fiberglass tube
2104 - fiberglass ferrule
2105 - movable tube stop set screw
2106 - tip protector
2200 - tri spring collar post
2201 - tri spring collar
2202 - tri spring collar plunger

-continued

DRAWINGS - REFERENCE NUMERALS
2203 - upper adjustment hole
2204 - tri spring element
2205 - taught position
2206 - slack position

DETAILED DESCRIPTION

Preferred Embodiment

Description

[0067] A preferred embodiment of an adjustable elastic sports net system **100** is shown in FIGS. 1-7. FIG. 1 depicts a perspective view of the adjustable and elastic sports net system **100** which consists of two standard assemblies **108**, the standard assembly erected by connecting an upper tube **120** to a lower tube **121**, via a coupling **122** and standing on a penetrable ground surface with a net fabric **101** disposed between and connecting the two standard assemblies. The reader shall note that two safety tubes **115** and a safety tube connector **116** are hidden from view on the left standard assembly for easier viewing of the internal components, but that the construction of each side of the adjustable and elastic sports net system **100** is intended to be identical to what is depicted in the right standard assembly. The coupling **122** may be fully separable or fixed to the upper tube **120** or lower tube **121** with suitable attachment means including, but not limited to, friction fit, glue, threading, bolts, set screws, etc. It is suggested for the game of soccer tennis, the upper tube **120** is approximately 24" in length and the lower tube **121** also is 24" in length, and each are 0.5" schedule **80** PVC tubing. It shall be noted however that the upper tube **120** and lower tube **121** may be solid rods, or scaled to any length, material, or diameter as suitable for a multi-purpose net. As one example, a net for use in volleyball in addition to soccer tennis may need to be a slightly thicker PVC tube and each section of tube may be 48" in length. The upper tube **120** holds a height adjustment guide **106**. The height adjustment guide is preferably 1/8" polypropylene rope and is fed through an upper hole **123** and a lower hole **124** and fixed on the outside on each end by an immovable cord stop **113**. It shall be noted that any material, such as aluminum tube, steel cable, etc and diameter is suitable which serves the function of vertically guiding and securing a net **101** to set a specific height for game play. The cord stop **113** may alternatively be removable, or may be crimped, glued, tied in a knot etc, at the end of the height adjustment **106** to secure it in place on the upper tube **120**. Likewise, where discussed elsewhere immovable cord stops **113** may simply be a knot, in the case when the member in question is a polypropylene or other flexible rope or cable. It shall be recognized that many generic cord stops are readily known and any such suitable material which prevents a member from passing through a hole may be used. The net fabric **101** may be made of any suitable material, for example 400 denier pack cloth, rope mesh, medium poly mesh, sail cloth, or even a single small diameter rope or string. The net fabric **101** may also be of any height and length as to maximize utility for the game to be played. The suggested net fabric **101** width for soccer tennis is 6" and the suggested length is 18 ft,

but the game of soccer tennis may for instance be played with a single piece of rope spanning the two standard assemblies **108**. The length of the net fabric **101** may be adjustable as described later. It shall be recognized that many nets and banners are readily known and any such suitable material which denotes a boundary and is visible and useful to the players as such may be used. Likewise any suitable means of connecting height adjustment guide **106** to the upper tube **120**, other than passing through an upper hole **123**, may be used. Such examples being: an eye bolt, welding in the case of a metal upper tube and metal height adjustment guide, etc.

[0068] Two movable cord stops **111** are attached onto each height adjustment guide **106**. The movable cord stops **111** for example are spring loaded clamps, such as those used to synch and hold a duffle bag closed. Any mechanism which has a closed position for gripping the height adjustment guide **106** preventing vertical travel along the height adjustment guide, and an open position for movement along the height adjustment guide may be used. The net fabric **101** is disposed between the two standard assemblies **108**, and located on the height adjustment guide **106**, held in place vertically between the two movable cord stops **111**. The net fabric **101** is attached by wrapping a first overlap flap **112** around one of the height adjustment guides **106**. A length adjustment overlap flap **114** is wrapped around the other height adjustment guide **106**. In the preferred embodiment the first overlap **112** and length adjustment overlap flap **114** are secured by doubling back attachment means in the form of strips of paired of hook and loop fasteners **102** (e.g. Velcro), so that the net fabric **101** attaches to itself around each of the height adjustment guides **106**. Continuous strips of paired hook and loop fasteners **102** are preferred, but any suitable means of attachment such as zippers, magnets, snaps, buttons, grommets and hooks may be used. Other net length adjustment designs are discussed later. The first overlap flap **112** can alternatively be a sewn loop so that it is not separable from the height adjustment guide **106**, and would require placing around its respective height adjustment guide prior to assembly with the upper tube **120**.

[0069] Each standard assembly **108** comprises a base plate **104** and at least one ground spike **103**. The base plate **104** may be any suitable shape, for example a 4.5" diameter circle, that covers enough surface area to prevent the lower tube **121** from moving extensively and loosening in the ground too much during play. Diameters down to 2" have been tested and deemed usable. The base plate **104** is connected to the lower tube **121** by suitable means including but not limited to glue, threads, set screws, friction fit, slotted pins, welding, etc. This connection may be separable or permanent. Each ground spike **103** is connected to the base plate **104** via suitable permanent or separable means including but not limited to glue, threads, welding, bolt with a nut etc. Each ground spike **103** may be for example, a 1/4-20 by 2" threaded bolt, either threaded into the base plate **104** or fixed with a nut (not shown) on the opposite side of the base plate. Alternatively the lower tube **121**, base plate **104**, and ground spike **103**, or some combination thereof, may be made as one piece in an injection molding process.

[0070] In one form, a stabilization assembly **107** is made of at least one guy line **109** connected in line with at least one spring element **110**, means of connecting a first end of the stabilization assembly **107** to a first object, such as an anchor **105**, means of connecting a second end of the assembly to a second object such as the standard assembly **108**, and a means

for incorporating with an optional safety mechanism as characterized below. Such connection means to the first object and connection means to the second object may be made with a knot, crimp, glue, friction grip, looped end, hook or otherwise described elsewhere in this specification as related to connecting items to the anchor **105** or the standard assembly **108**. Further, if used, the optional safety system is fixed relative to one end of the stabilization assembly **107**, but allows the components of the stabilization assembly to translate relative to the safety system as described below. In its most basic form, the stabilization assembly **107** may omit the guy line **109**, and consist therefore of only a spring element **110** and the connection means mentioned as shown in FIG. 8B. In addition to the base plate **104**, it shall be noted that at least two ground connections for the standard assembly **108**, for example anchors **105**, are required to stabilize each standard assembly of the adjustable elastic sports net system **100** from impacts. To accomplish this, the stabilization assembly **107** may consist of two legs, which if separated, would each individually constitute itself a stabilization assembly as defined. To reduce parts and cost, it is preferred that a single stabilization assembly **107** consist of two legs, each leg providing one of the two required ground connections, but the reader shall recognize that this configuration could be broken into two separate stabilization assemblies **107**, each having one ground connection and each attaching to the same standard assembly **108**. For connecting to the standard assembly **108**, the stabilization assembly **107** may be attached to the upper tube **120**, for example by looping the spring element **110** around upper tube **120**, and closing the loop with cord clamping fastener **126** such as a knot, clamp, hog ring or other suitable means. The stabilization assembly **107** may include a second guy line **109** which leaves an equal amount of the spring element on each side of the loop. Each guy line **109** and the spring element **110** are connected for example by interlocking loops where the guy line is crimped to itself with an immovable cord stop **113** after running through a loop in the spring element. The loop in the spring element is created by overlapping itself and crimping with a cord clamping fastener **126** such as a hog ring. It shall be understood that many ways of connecting two cord-like members are known and suitable in this application, and accordingly, further detail repeating the description of this type of junction is not provided in all figures. FIG. 1 shows the stabilization assembly **107** on the left standard assembly **108** where components of the safety system described below have been hidden from view to make visible the respective stabilization assembly. The guy line **109** is preferably 1/8" polypropylene rope, but may be any material such as nylon rope, solid plastic or metal rod, metal or plastic rigid or flexible tube, so as to allow the system to function as described in the operation below. The spring element **110** is preferably 8 mm bungee cord, but may be any metal extension spring, rubber band, air cylinder, or other spring-like material of any length or size which gives sufficient strength and flexibility for the system to function as described below in the operation. The spring element **110** may shall be long enough to accommodate the intended elongation from deflections in the standard assembly **108** without surpassing its maximum recommended percent of stretch. This is estimated at a length of approximately 10" per side with intended elongation of 4" for a stretch of 140 percent. Alternative connection means are acceptable such as creating a hole in the coupling **122** and running the spring element through the hole, then securing the spring element from translating further through the hole with

stops, such as crimps or knots, on each side. In this case, the stabilization assembly 107 is preferably attached through both the coupling 122 and the upper tube 120, or lower tube 121, for reinforcement of this joint. Connection points of stabilization assembly 107 may also be created with eye bolts threaded into upper tube 120 and the stabilization assembly looped around the eye bolt. Other such methods for attaching guy lines to a pole are known and shall be considered within the scope of this specification. As stated previously, stabilization assembly 107 may be broken into multiple similar discrete assemblies for attachment to different points on upper tube 120, though this adds part count and is therefore not preferred. Each side of each stabilization assembly 107 runs through a safety tube 115 and the two safety tubes are connected on one end by a safety tube connector 116. The safety tube connector 116 wraps around the upper post 120 and prevents the safety tubes 115 from slipping down the stabilization assembly 107. The safety tube connector 116 may have a hole, slit or other provision for allowing the spring element 110 to wrap tightly and connect to itself around upper tube 120 with the cord clamping fastener 126 as described above. The safety tube connector is preferably a flexible material, such as a rubber tube, to allow bending of the safety tubes parallel to the lower tube 121 or upper tube 120 for compact packaging. The safety tube connector may also be a stiff material which has added benefits as described in FIG. 12. Alternatively, the safety tube connector 116 may be eliminated and the safety tubes allowed to translate along the length of the guy line 109 and spring element 110. The safety tube 115 may be made of fiberglass, metal, plastic, fabric with a sewn in stiffener or any stiff material combination that resists buckling. The safety tube connector 116 may be rubber, metal, plastic, but is preferably flexible and connects to the safety tubes via suitable means such as friction, glue, crimped ferrules, etc. A height limiting member 117 is attached to the end of each safety tube 115 opposite the safety tube connector 116 via suitable means. The attachment may be done by tying the height limiting member 117 through a loop (not shown) on the end of the safety tube 115, buckled into a clip (not shown) protruding from the safety tube, or other suitable means. The height limiting member 117 is also fixed at its midpoint to the base 104 via suitable means such as looping through a hook, hole, snap, hook and loop fastener, bolt through hole, etc. The height limiting member 117 may have a grommet at its midpoint and one of the ground spikes 103 going through the grommet prior to connection to the base 104, therefore holding the grommet in the height limiting member tight against the upper surface of the base. The anchor 105 is attached to the end of each guy line 109 for pressing into the ground. The anchor 105 may be any form of rigid or semi rigid material such as an aluminum or steel spike or tent stake, or preferably plastic. The anchor 105 may be made of the same tubing as the upper tube 120 and the lower tube 121 to increase manufacturing efficiency. It will be known that there are many different shapes and materials already in use to penetrate the ground and this invention shall not be limited to the specific anchor designs illustrated or referenced herein. The anchor is fixed to the end of the guy line by suitable connection means, such as passing through a connection point 301 shown in FIG. 3, and fixing an immovable cord stop 113 on the opposite end. Other suitable means for terminating a guy line on an anchor are known and shall be considered within the scope of this invention. Alternatively the anchor 105 may clip onto a loop on the end of the guy line

109 and be removable, allowing for anchors of different lengths to be used for different conditions.

[0071] FIG. 2 shows how a standard assembly 108 may increase in length and consist of more than just two tubes by adding one or more extension tubes 200 and extension couplings 201. The second standard assembly is omitted for clarity but the reader shall realize how to erect the system as previously described. By adding the extension tube 200, the net fabric 101 may cover a broader height adjustment range for use in low net sports like soccer tennis and tennis, to higher net sports like volleyball or badminton. The quantity and length of additional sections may be optimized to make the system short enough for portability yet tall enough when assembled to serve the use of a particular game. Preferably the extension tube 200 and extension coupling 201 are identical with the upper tube 120 and coupling 122 such that economies of scale are achieved in manufacturing, but this is not a requirement. It is preferred that the guy line assemblies 107 remain attached near the top of the lower tube 121 such that downward force from the spring element 110, when stretched, compresses the standard assembly 108 against the penetrable ground surface, while minimizing the footprint the stabilization assembly uses. For example to maintain a proper angle to the ground, a stabilization assembly 107 that attaches higher on the standard assembly 108, should have the anchors 105 placed further from the base 104, which takes up more space and is undesirable. However, the stabilization assembly 107 may be attached anywhere along the height of the standard assembly 108 and still function properly, thus the invention must not be limited by this lower attachment position. The height adjustment guide 106 may be long enough to accommodate the additional height and may be secured at either or both ends by a movable cord stop 111 after passing through the upper hole 123 or lower hole 124. If the extension tube 200 is not used, the height adjustment guide 106 is pulled further through one of the holes so that tension is maintained in the height adjustment guide, and the extra length can dangle by the side of the standard assembly 108 or be tied of to the standard assembly. When assembled with the extension tube 200, tension in the height adjustment guide 106 ensures that the upper tube 120 and coupling 122 remain pulled tight against the extension tube 200, and can't be knocked off from an impact. When the extension tube 200 is not used, the height adjustment guide may be removed to allow attachment of the stabilization assembly 107. Alternatively, the coupling 122 may be fixed to the top of the lower tube 121 with a provision for fixing the stabilization assembly permanently. In this case, the extension coupling 201 would be placed on the top of the extension tube 200 and the upper tube 120 would fit into that. Any order, mix or match that accomplishes the goal of inserting one or more extension tubes shall be considered within the scope of this invention. Connection of extension tube 200 is preferably a friction fit, with tension in the height adjustment guide 106 providing the locking force, but may also be via screw, clamp, or other suitable removable means.

[0072] FIG. 4 shows a perspective view of a packaging configuration. The upper tubes 120 lay longitudinally next to the lower tubes 121. The net fabric 101 may be wrapped around the two upper tubes 120 and two lower tubes 121 to hold everything together, or the net may be wrapped separately. A wrapping or bag 403 may be placed over the packaged assembly. Many such bags are known such as duffle bags, tent bags, etc.

[0073] Just to reiterate, the dimensions discussed in this preferred embodiment are for a system specifically designed and optimized for the game of soccer tennis. For other games, or a multipurpose net that functions for various types of net games (for example a single net for volleyball, tennis, badminton, etc.) the dimensions of the components discussed above may be increased, decreased, thickened, thinned, lengthened, shortened, as necessary without taking away from the invention of a sports net assembly that allows for continuous vertical and horizontal adjustment, with flexibility to absorb impact without moving position relative to a fixed place on a court or field. Similarly members which are described as stiff, may be flexible, and vice versa, if the goals of the inventions are accomplished. Further, connection points described as fixed may be removable, and vice-versa, without departing from the spirit of the invention described herein.

Preferred Embodiment

Operation

[0074] The setup of the adjustable and elastic sports net system **100** discussed above may be achieved by a single person or by multiple people. A single person can assemble the adjustable and elastic sports net system **100** because there is no preassembly of the net fabric **101** and standard assemblies **108**, which would otherwise require multiple people to lift such an assembly and plant into the penetrable ground surface simultaneously; an operation by its nature not possible with a single person.

[0075] First the contents of the carrying bag **403** are removed. The components for the standard assemblies **108** are then separated. The net fabric **101** may be loose or attached around one of the height adjustment guides **106**. Each base plate **104** is preferably left connected to its respective lower tube **121** and the ground spikes **103** at all times. In an alternate embodiment these pieces may be assembled and disassembled for each use and more compact storage. The base plate **104** is pressed into the penetrable ground surface, where the ground spikes **103** hold the lower tube **121** approximately perpendicular to the ground surface. The upper tube **120** and coupling **122**, which hold the stabilization assembly **107** are attached to the top of the lower tube **121**, forming a single standard assembly. The stabilization assembly **107** is then stretched in the direction away from the field of play, at an anchor angle **119** of approximately 30-45 degrees on either side of the halfway court line **125** as shown in FIG. 1. The exact angle is not very important, however the displacement on either side of the half court line should be approximately the same as to equalize the forces in the system. The height limiting member **117**, which should be non-elastic, indicates the correct amount of stretch in the spring element **110** because as the stabilization assembly **107** is stretched and placed in the ground, a point is reached where a triangle is formed by the safety tube **115**, lower tube **121**, and taught height limiting member **117**. While the stabilization assembly **107** may be stretched further, this causes the guy line to bend outward at the end of the safety tube and rub on the edge, which alerts the user they shouldn't stretch the stabilization assembly any more. At this maximum stretch distance, each anchor **105** is then pressed into the penetrable ground surface, resulting in a triangular prism shape with the standard assembly **108** tilting slightly towards the anchors **105** and the spring element **110** is un-stretched. At this point, if desired, exten-

sion tubes **200** and extension couplings **201** may be added to the system to increase the height. For simplicity these components are not shown in all the figures. Any order of operations that accomplishes this final setup of the standard assembly **108** is acceptable.

[0076] The desired distance between the two standard assemblies **108** is measured or estimated according to the needs of the players and the game for that session and the same procedure is repeated to erect a second standard assembly **108**. As would be obvious to a player, the two standards are oriented such that they line up along the half court line **125** with the axis of each upper tube **120**, height adjustment guides **106**, and net fabric **101** all being substantially coplanar.

[0077] At this point, the field consists of two standards, both of which have pivoted around the ground spikes **103**, slightly leaning away from one another, outward from a line perpendicular to the penetrable surface. This is because each standard assembly **108** is being pulled by the spring elements **110** which are in the contracted state until the two standard assemblies **108** are connected with the net fabric **101**. If it was not already connected to one of the height adjustment guides **106**, the net **101** will now be connected to one height adjustment guide with a first overlap flap **112** as described below. The movable cord stops **111** are separated to a width greater than the width of the net fabric **101** and then collapsed to hold the net in position on the height adjustment guide **106**. The net fabric **101** is looped around the height adjustment guide **106** and the overlap flap **112** is doubled back on itself and one side (preferable the hook side) of paired hook and loop fastener **102** is attached to a mating patch of pair of the hook and loop fastener to secure one side of the net around the height adjustment guide **106**. As mentioned above, the height adjustment guide **106** may be other than a rope with spring loaded cord stops. For example, a threaded rod could be used with nuts and washers on either side of the net **101** to control the height. The invention shall not be limited specifically to the constructions described herein.

[0078] On the other standard assembly **108**, the two movable cord stops **111** are similarly separated to a width greater than the width of the net fabric **101**. The net fabric **101** is then pulled across the length of the field along the half court line **125** and the length adjustment overlap flap **114** is looped around the other height adjustment guide **106**, between the two movable cord stops **111**. The length adjustment overlap flap **114** is doubled back on the net fabric **101**, and the net pulled taught until the standard assemblies **108** are standing upright axially along a line substantially perpendicular to the penetrable surface. The initial net tension force in the net fabric **101** may be increased if desired by pulling the standard assemblies **108** slightly inward further, causing them to bow as shown in exaggerated fashion in FIG. 7. Such bowing is insignificant and will not interfere with the performance or function of the adjustable and elastic sports net system **100**. Once the desired net tension force is achieved, the length adjustment overlap flap **114** is pressed to the mating paired hook and loop fastener **102** on net fabric **101** completing the assembly and keeping the tension in the system. Lastly, the movable cord stops **111** on both height adjustment guides **106** are adjusted to place the net fabric **101** at the desired height, evenly on both standard assemblies **108**. For disassembly the above steps are simply reversed and the packaging configuration of FIG. 4 replicated for easy, simple transport.

[0079] After setup, if needed, minor adjustments may be made if alignment is not exactly correct because the base plates 104 may be easily picked up off the penetrable surface past the height of the ground spikes 103 for repositioning. The nature and flexibility of the system and ability to keep tension without requiring precise placement of any of the components is a big benefit over prior art. The nets with rope guy lines described in prior art cannot be lifted off the surface for example without also pulling up the stakes as well. Additionally, the setup may be easily created by a single person, which is not possible with many of the prior art systems that require the net and standards to be assembled prior to lifting the assembly and placing perpendicular to the playing surface, which takes two people at a minimum.

[0080] The independent nature of the height adjustment design on each standard assembly 108 allows for a horizontal net fabric 101 regardless of levelness of the penetrable surface. Furthermore, during play, the dynamics of the game may be very quickly changed as the net height is very easily movable up and down on each side by sliding the position of the movable cord stops 111. A coach wishing to emphasize aerial play may move the net fabric 101 to a higher position in a matter of seconds. Or, if emphasizing a more direct and faster play, the coach may place the net fabric 101 at a lower position in a matter of seconds. Additionally, if on a team there are players of varying skill levels, the net 101 may be placed lower for some and higher for others. If the coach sees the game is too easy or too hard, he can again adjust the height within seconds to change the dynamics of the game. Finally, a net configuration may also be achieved where one side is higher than the other, which is useful in a fitness drill where players must jump over the net fabric 101 that is changing in height along the length of the court. Likewise, changing the length involves simply, removing adjustable overlap flap 114, and repositioning one of the standard assemblies 108, and then reconnecting the net fabric 101 at a different length.

[0081] FIG. 5 shows the operation of the adjustable and elastic sports net system 100 in reaction to impact from a game object 503. As the game object 503 impacts the net fabric 101, the net fabric bends backward to accept the impact of the game object. This causes both standard assemblies 108 to deflect from an initial standard position 502 at a deflection angle 500 to a deflected position 504. For simplicity, FIG. 5 only depicts a deflection in one standard assembly 108, but it shall be understood that in reality, both standard assemblies deflect some amount. The deflection angle 500 will increase the closer the point of impact of the game object 503 is to the corresponding standard assembly 108. As previously mentioned the material for the upper tube 120 and lower tube 121 is preferably PVC, which is, by its material properties, flexible. Thus, some of the deflection angle 500 will be taken up simply by the bending of the upper tube 120 and lower tube 121. The remainder of the deflection angle 500 will be allowed via the pivoting of the standard assembly 108 around the ground spikes 103 at a rocking angle 501. During the deflection process, one side of spring element 110 will become an elongated spring element 505, increasing the tension its corresponding guy line 109, and the other side of the spring element will become a contracted spring element 506, decreasing the tension its corresponding guy line 109. The deflection will be limited once the momentum from the game object 503 has been absorbed and stored in the extension of the elongated spring element 505. At this point the spring

element 110 will recoil and pull the standard assembly 108 back from the deflected position 504 to the initial standard position 502. Of course some minimal overshoot will be expected, but the opposing side of spring element 110 will counteract this, and the standard assembly 108 will quickly settle and remain stationary in the initial standard position 502 where the tension forces on each side of the guy line assemblies 107 are once again equal. It is well known in physics that for a first object striking a second object with a given amount of momentum, the longer the impact reaction takes and the more the second object can cushion the impact and the lower the peak force seen by either object. This is significant as the peak impact force is transmitted to the anchors 105 via the stabilization assembly 107. The compliance of the system reduces the peak force trying to pull out the anchor 105, meaning a much smaller risk of pull out and ability to use a smaller anchor, which is generally safer to the consumer. A lower peak force also reduces the amount of loosening of the anchor 105 within the penetrable surface that happens over time with repeated impacts. This translates to a safer, more durable, and reliable adjustable and elastic sports net system 100 over time, maintaining net tension better and being more tolerant to inevitable impacts than the prior art.

[0082] FIG. 6 shows a force illustration and force diagram of the standard assembly 108 upon impact from the game object 503 in two positions corresponding to velocity vectors VB1 601 and VB2 602. For an impact at the top of the standard assembly 108 associated with velocity VB1 601, spring element 110 and standard assembly 108 will both deform to reduce considerably the peak impact force. A transient shear reaction force will act upon the base plate 104 and spikes 103 in addition to the shear reaction force FS 600 normally present as part of the balance of forces that stabilize the standard assembly 108 during normal operation. For a direct hit at the bottom of the standard assembly 108 associated with velocity vector VB2 602, the force of impact is transmitted directly to the base plate 104 and spikes 103. This means that the ground spikes 103 must be sufficient to handle an impact from a game object 503 or player for an impact at the lowest point corresponding to a force VB1 601 on the standard assembly 108. In the preferred embodiment the ground spikes may be 1/4" rods, 2" in length, but shall not be limited to this shape, length or diameter.

[0083] The entire assembly can be considered a cantilevered system with one end of the standard assembly 108 fixed to the ground through the base plate 104 and ground spikes 103, and the other end free to displace. The ground spike 103 resist shear forces and therefore prevent slipping of the base plate 104 and constrain the standard assembly 108 in place on the ground. The ground spikes 103 alone only provide a small resistance to rotation of the standard assembly 108 with respect to the ground. Thus, for the purpose of an approximate structural analysis, the base can be considered simply supported, or pinned. The standard assembly 108 resists rotation by a balance of forces applied to the standard assembly 108, which include a tensile force FN (not shown because it is into the page) applied to the standard assembly 108 by the net fabric 101, the tensile forces FT1 605 and FT2 606 applied to the standard assembly 108 by the spring element 110, the shear FS 600, and vertical ground reaction force FG 604 applied to the ground spikes 103 and base plate 104.

[0084] An effective sports net system is one that maintains its shape and position, and if displaced, for example as shown in FIG. 5, will return to its original shape and position, while

minimizing peak forces in any of its components. When the system is stressed from an impact, if the forces and energy can be absorbed over a longer period of time, the peak forces seen by the components will be lower. For example, a lower spring element **110** forces **FT 1 605** and **FT2 606**, and proportionally lower shear **FS 600** and normal **FG 604** ground reaction. In contrast, if a higher force in the spring element **110** is transmitted to the ground anchor **105**, then more elastic energy is stored in the spring element **110**, which increases the hazard if the anchor inadvertently dislodges from the ground. Higher spring element tensile forces and higher shear ground reaction forces will require longer anchors **105** and longer ground spikes **103**, and/or firmer ground to hold the system in place during normal play, which work against the goals of safety, compactness, and portability.

[0085] A unique feature of this system is its robustness and resilience compared to a rigid or stiff system as described in the prior art; that is, 1) its ability to reduce peak forces internal to the system from incidental impact or contact, 2) its ability to absorb energy from incidental impact or contact, and 3) and its ability to rebound to its original unperturbed position after incidental impact or player contact. An optimally designed sports net system will take into account the force versus displacement properties of the various elastic elements in the system in relation to the overall size and mass of the net system. While all materials deform and exhibit some elastic recovery, in describing the restoring capacity of this system, only the spring elements **110**, upper tubes **120**, and lower tubes **121** are considered to absorb energy and store it as strain energy. Proper selection of stiffness and elastic properties of the spring element **110**, upper tube **120**, and lower tube **121** facilitate routine net height adjustment and improve system response to incidental ball impact or player contact as shown in **FIGS. 5** and **6**. **FIG. 7** illustrates a compliant system where both spring elements **110** and both standards assemblies **108** contribute to the total system deformation such that a fixed-length net (not shown) can be accommodated at different heights by a sharing of deformation between the spring element and standard assembly. Alternatively, a rigid standard assembly **108** requires the spring element **110** alone to deform until the two standard assemblies are the correct distance apart to attach the fixed-length net. This configuration will create higher forces in the spring element **110**, with all stored energy in the spring element **110** resulting in an increased chance of anchor **105** pullout, creating a more hazardous condition. It is therefore desirable, albeit not necessary, that the standard assembly **108** also be flexible and elastic.

[0086] The stiffness of the spring element **110** is also important. If the spring element **110** stiffness is too low for the size and mass of the sport net, then the system will be sluggish, deform excessively on impact, and will not have a sharply-defined restored position after game object **503** impact or player contact. Conversely, if the spring element **110** stiffness is too high for the size and mass of the sport net system, then the system will approximate the behavior of a rigid net system such as described in the prior art. On game object **503** or player impact, higher forces will be transmitted to the anchors **105**, causing pullout or necessitating better anchorage.

[0087] In addition, a robust and resilient system must also have enough combined spring element **110** and standard assembly **108** elastic deformation to account for—without significant change in dynamic response characteristics—

small non-recoverable changes in length from anchor **105** loosening and/or non-recoverable stretch of the net fabric **101** or guy line **109** etc. A stiff, non-elastic, system as described in the prior art, is not capable of fully absorbing impacts, and thus susceptible to loosening of the anchors and loss of tension in the net after repeated impact. It was found in testing that for a 4 ft high system using 0.5" schedule **80** PVC pipe for the upper tube **120** and lower tube **121**, and 8 mm bungee cord for the spring element **110** created an optimal set of response characteristics: deflections at the top of the standard assembly up to 2+ feet, consistent return to nominal vertical position, and 3.5" long anchors **105**. It shall be noted and understood that these materials and size shall in no way limit the scope of this invention and that scaling would likely be needed for taller or wider net systems.

[0088] Finally, it is important to note that at all times, the tension forces **FT1 605** and **FT2 606** have a vertical downward facing component, which pull the upper tube **120** and coupling **122** down on top of the lower tube **121** against the penetrable surface with a force vertical force **FG 604** (shown as a ground reaction force on the standard assembly). This is important because the compression prevents the upper tube **120** from being knocked off the top of the lower tube **120** from impact of the game object **503**. As the force associated with velocity vector **VB2 602** from the game object increases, the corresponding tension force also increases and pulls the two tubes even tighter together, increasing **FG 604**. It shall be noted that although not illustrated, if additional extension tubes **200** and extension couplings **201** are added, as long as guy line assemblies **107** are attached above the lower tube **121** the compression of the standard assembly **108** under impact is preserved.

[0089] The safety structure provided consists of safety tubes **115**, safety tube connector **116**, and height limiting member **117**. If one of the anchors **105** releases from the ground, the stretched spring element **110** will recoil and pull the guy line **109** into the safety tube **115** at a high velocity, pulling the anchor with it. The safety tube **115**, which is a stiff material, will act as a stop and block the anchor from moving further vertically. The anchor **105** will crash into the tip of the safety tube, ricochet, and fall to the ground harmlessly. In most cases the safety tube **115** alone is sufficient to dissipate the energy from a flying anchor **105** and the height limiting member **117** can be omitted, however, due to the elastic and flexible nature of the system and safety tube connector **116**, it may be possible for the safety tube **115** to pivot about its connection to the safety tube connector, and send the anchor **105** flying higher vertically. The height limiting member **117** is non-elastic and connects the end of the safety tube **115** to the base **104**, such that the amount of vertical pivot is minimal. As the safety tube **115** attempts to pivot upward about the connection point with the safety tube connector **116**, the height limiting member **117** is pulled taught, putting the safety tube in compression. But since the safety tube **115** is a stiff material, it jams into the safety tube connector **116** and stops its movement. Thus, the height the anchor can achieve due to rebound and pivot of the safety tube **115** about its connection to the safety tube connector **116** is greatly minimized.

[0090] An added benefit of the design, which was discovered in testing, is that when an anchor **105** releases from the penetrable surface, the standard assembly **108** immediately begins to fall down, pulling the flying anchor down with it. This is particularly beneficial in a simplified system that

doesn't include a height limiting member **117** as discussed later. A standard assembly **108** that holds firmly into the penetrable surface will flex under stress, then when the anchor **105** releases, will act as a catapulting arm for the anchor, and will be quite dangerous if it doesn't incorporate some form of additional hardware for protection. Much of the prior art relies upon a deep and firm junction with the penetrable surface because the systems are non-elastic and therefore must transmit all forces through the standard assembly's **108** connection with the penetrable ground surface without falling down or loosening too much.

[0091] For packaging, as shown in FIG. 4, for each standard assembly **108**, the upper tube **120** and coupling **122** are disconnected from the lower tube **121** at the coupling and the tubes laid side by side longitudinally. The two disassembled standard assemblies **108** are then lain side by side, forming a bundle as shown clearly in FIG. 4. The net fabric **101** may be wrapped around the two upper tubes **120** and two lower tubes **121** to hold all tubes together. A wrapping or bag **403** may be placed over the packaged assembly. The packaged length **400** is limited to the length of the lower tube **121** plus two ground spikes **103** plus the coupling **122** length. The packaged width **402** is approximately limited to the diameter of the base plate **104**. The packaged height **401** is also limited to approximately the diameter of the base plate **104**. In the packaged configuration, the other components (not shown for clarity) are loosely placed around the assembly shown in FIG. 4 for insertion into bag **403**. In some cases the base plate **104** diameter may be shrunk to approximately 2", and therefore the diameter of the upper tube **120** and lower tube **121** protrude slightly past the edge of the base plate. Therefore the minimum dimensions would be determined by the diameters of the tubes. A test product was built and packaged easily in a 3.5"x3.5"x30" package weighing under 5 lbs, which is significantly smaller and lighter than Kwik Goal™, Bownet™, or other net systems on the market.

Alternate Embodiment—#1

[0092] FIG. 8A shows one standard assembly with safety stake **800** as an alternate embodiment of the standard assembly **108** of FIG. 1. Instead of a height limiting member (not shown), a safety stake **802** similar in size and shape to the anchor **105**, is connected in line, or fixed along a portion of a safety stake connecting member **803**. The safety connecting member may be for example 1/8" nylon cord, metal cable, etc. The safety stake connecting member **803** may pass through a hole in the safety stake **802** similar to the connection point **301** on the anchor described earlier. There may be immovable cord stops **113** disposed on both sides of the safety stake **802** to lock the position of the safety stake on the safety stake connecting member **803**. The midpoint of the safety stake connecting member **803** is fixed the base **104** and extends outward and holds a second safety stake **802**, fixed along the length similarly with immovable cord stops **113**. The connection to the base **104** may be achieved with a hook, a bolt running through a hole in the safety stake connecting member **803**, a knot tied through a hole in the base, or any connection means generally known that prevents translation of the safety stake connecting member relative to the base. Each end of the safety stake connecting member **803** is further extended and connected a corresponding anchor **105** via suitable connection means as previously described. The addition of a safety stake **802** and accompanying components eliminates the need

for a safety tube, safety tube connector, or height limiting member as described in FIG. 1.

[0093] The operation of the system is generally the same, however the safety mechanism is different. During setup, the spring element **110** is stretched away from the base **104** until the safety stake connector **803** is pulled taught. The anchor **105** is then placed in the ground, and its corresponding safety stake **802** is similarly pressed into the ground. The geometry of placement is similar to that of the preferred embodiment. When the anchor **105** releases from the ground, the maximum height it will achieve will be limited by the distance between itself and the corresponding safety anchor **802**. Upon release, the spring element **110** will recoil and pull the anchor **105** upward along the axis of the guy line **109** until the section of safety stake connecting member **803** between the safety stake **802** and released anchor **105** is pulled taught, which translates further load to the safety stake **802**. However, by the time this section is pulled taught, most of the energy will have been absorbed and the further forces on the safety stake **802** will not be sufficient to pull it from the ground. In testing this distance was estimated to ideally be about 10", leading to a maximum vertical height of the anchor **105** of about 10" plus potentially the length of the anchor. The length of the short safety member **116** just must be long enough to allow the spring element **110** to contract and dissipate its store energy before too much force is transferred to the safety anchor **117**, yet short enough to provide minimal vertical travel.

Alternate Embodiment—#2

[0094] FIG. 8B shows a standard assembly with single spring element **804** as an alternate embodiment of the standard assembly with safety stake **800**. The guy lines **109** have been eliminated and a single spring element **801** connects to the anchor **105**, wraps around an upper tube **120** and/or coupling **122** and translates down and to connect to a second anchor **105**. The single spring element **801** is fixed around the upper tube **120** similarly to the spring element **110** in FIG. 1. Alternatively the single spring element **801** maybe run through either upper tube **120**, lower tube **121**, and/or coupling **122** and be secured on each side by an immovable cord stop (not shown). The single spring element **801** is preferably a long length of 8 mm bungee cord but may be any similar material which has sufficient elasticity as discussed previously. Additionally, the single spring element **801** may be split into two identical pieces and terminated on either side of the upper tube **120** with suitable attachment means such as an eye bolt, hook, etc.

[0095] The operation of the standard assembly **800** is substantially similar to that of FIG. 8A, but involves fewer components and connection joints, which reduces manufacturing and assembly costs. If the single spring element **801** is run through the upper tube **120**, lower tube **121**, and or coupling **122**, the design may require reinforcement provisions where the single spring element **801** goes through those elements.

Alternate Embodiment—#3

[0096] FIG. 9 shows a standard assembly with interim spring element **900**, which describes an alternate configuration of stabilization assembly from FIG. 8A. In this embodiment an intermediate spring element **902** is disposed between a first guy line **901** and a second guy line **903**. The first guy line **901** may be a single piece going through upper tube **120** and/or coupling **122**, or may be two discrete parts on either

side, fixed to the upper tube as described previously with eye bolts, hooks, loops, etc. The second guy line **903** connects on one end to the intermediate spring element **902** and on the opposite end to the anchor **105**. Such connection means have been described previously and are not shown for clarity. In the case the first guy line **901** is a single element, the first guy line **901** shall be secured on either side of the upper tube **120** and/or coupling **122** with immovable cord stops **113**, which prevent the first guy line from translating through the upper tube **120** and/or coupling **122**. The first guy line **901** and second guy line **903** are preferably $\frac{1}{8}$ " nylon cord, but may be any suitable material as previously discussed. Likewise, intermediate spring element **902** is preferably 8 mm bungee cord, but may also be any material as discussed in this application. The intermediate spring element **902** may be placed at any point between first guy line **901** and second guy line **903** and shall be long enough to accommodate the intended elongation from deflections in the standards without surpassing its maximum recommended percent of stretch as previously discussed.

[0097] The operation of the standard assembly **900** is substantially similar to that of FIG. **8A**, the difference being the different placement of the elastic section. The intermediate spring element **902** provides the same function and behaves substantially similar to spring element **110** from FIG. **8A**, from impacts.

Alternate Embodiment—#4

[0098] FIG. **10** shows a standard assembly with spring post **1000**, which is an alternate embodiment of the standard assembly **108** from FIG. **1**. Safety tubes **115** and safety tube connector **116** are not shown for clarity, but are recommended and function in the same manner as described in the preferred embodiment. A central guy line **1001** is connected to a lower spring element **1002**, wrapped around or run through the upper tube **120** and/or coupling **122** and secured as previously described, and extended down to a second lower spring element **1002**. Each lower spring element **1002** is further connected to an anchor **105** with means previously described. The central guy line **1001** and lower spring elements **1002** would all run inside the safety tube and safety tube connector (not shown) if such elements are provide. The central guy line **1001** may be a single piece, preferably $\frac{1}{8}$ " nylon cord, or may be two discrete pieces. An optional spring element **1003** may be added into the system along the axis of the upper spring tube **1005** and lower spring tube **1004**. The optional spring element **1003** is connected to the upper spring tube **1005** and lower spring tube **1004** by any suitable means of clamping an extension spring to the end of a tube, for instance in using a compression spring to overlap the end of the tube and clamped around the perimeter of the tube at the end of the tube with a radial clamp. The optional spring element may alternatively be a section of rubber hose that is clamped onto the ends of upper spring tube **1005** and lower spring tube **1004**. Other attachment means may be used.

[0099] The operation of the standard assembly **1000** is substantially similar to the preferred embodiment. Where optional spring element **1003** is used, the upper tube **120**, upper spring tube **1005** and lower spring tube **1004** may be made of inflexible material, such as metal, and the system may still retain the beneficial flexibility and elasticity of the preferred embodiment made of PVC. The optional spring element **1003** may be placed at any location along the length, but is more functional lower to the base plate **104** because

impacts with the standard assembly with spring post **1000** will mostly occur above the optional spring element **1003**, therefore allowing the spring element to flex and aid in deflection, reducing the force transmitted to the ground spikes **103**.

[0100] It shall further be noted that any positional combination for guy line and spring elements, or multiple spring elements in series or parallel, shall be considered under the scope of this specification and claims. Further, it shall be noted that while the discussion of guy line material and spring elements is typically referred to as a rope, cable, or bungee material in this specification, solid members such as tubes or rods will also suffice in the case of guy lines and air cylinders or axial or torsion springs shall suffice in the case of spring elements.

Alternate Embodiment—#5

[0101] FIG. **1** shows a preferred embodiment with safety tubes **115**, a safety tube connector **116**, and a height limiting member **117**. It shall be noted that for the system to function, these components are not actually required. The components are provided for the purpose of limiting the height the anchor **105** can fly up should it ever pull out. However, in proper installation, and disassembly, the anchor **105** is designed to never dislodge from the penetrable surface until the sports net assembly is taken down. Therefore an alternate embodiment is the same as the preferred embodiment, but without these safety items.

[0102] The operation of this alternate embodiment is substantially the same as the preferred embodiment, but the part count and cost are reduced. However, the safety protections are no longer present, but as mentioned, with proper use, the system is designed to absorb all reasonable impacts without pull out of the anchor **105**. It shall further be noted that other designs which incorporate additional components for the added benefit of safety, these added components may be eliminated to reduce the cost and complexity further, all the while relying on the user to properly set up and use the adjustable sports net system.

Alternate Embodiment—#6

[0103] FIG. **11A,B** show an alternate embodiment of a safety system to protect from the anchor **105** flying out based around standard assembly with spring post **1000** depicted in FIG. **10**. The safety mechanism is formed by joining the two anchor elements **105** into a single bar that resembles a staple **1100**. The safety tubes **115**, safety tube connector **116**, and height limiting member **117** are removed. The staple **1100** is connected to the upper tube **120** via lower spring element **1002** coupled to central guy line **1001** as described in FIG. **10**. Each lower spring element **1002** attaches to the staple **1100** at attachment points **1101**. The rest of the system is assembled and connected as described in FIG. **10** without the optional spring element (not shown). The staple **1100** has anchor points **1102** on each end which are designed to penetrate into the ground surface. The anchor points **1102** may be folding and locking, removable, or fixed substantially perpendicular to the section which joins them. The staple **1100** may also be a single molded piece.

[0104] The operation of this alternate embodiment is slightly different than that of FIG. **10** and the preferred embodiment. The staple **1100** is pulled away from the base **104** such that the midpoint between the two anchor points **1102** lies on a line coplanar with each standard assembly with

spring post **1000** and height adjustment guide **106**. The staple is extended to provide the desired stretch in the lower spring elements **1002**. One side is stepped on and pressed into the ground. Then the other side of staple **1100** is pressed into the ground. The staple **1100** makes it easier for the user to gauge the position and angle as it serves as an easy eye ball reference because of its size and the fact that the anchor points **1102** are coupled. Only the orientation and distance in relation the lower tube **121** must be gauged and this is simple to do accurately by eye. Additionally, there is the added advantage that more tension can be applied to the net by stretching the lower spring elements as much as needed. As a force is applied to the standard assembly **1103**, one of the lower spring elements **1002** increases in tension and pulls at the corresponding end of the staple **1100**, trying to dislodge the corresponding anchor point **1102**. However, this force tries to pivot the staple **1100** about the opposite anchor point **1102**, pushing this opposite anchor point further in the ground. Because the staple **1100** is rigid, it is therefore not able to release from the ground. Once the impact energy is absorbed and dissipated by the lower spring elements, the original position is restored and the forces on the staple **1100** are once again balanced. The staple **1100** is preferably made of a single piece of material as shown in FIG. **11B**, however it may be made out of the same tube material as the upper tube **120** and lower tube **121**, the material being either bent, or in the case of PVC, elbows being glued on the ends and additional anchor point **1102** sections glued into the end facing vertically downward. Alternatively the staple **1100** may be separable along the length and connectable during assembly to reduce the packaging length if the length of assembled staple (not shown) would be longer than the length of the lower tube **121** plus the length of two ground spikes **103**. Alternatively the staple **1100** made be made of flat bar stock with anchor points connected to the ends via bolting, welding, glue, bending or other suitable means. Other staple designs shall be considered within the scope of this specification if they accomplish the goal of grabbing the ground to prevent dislodgment of the staple **1100**. An advantage of this embodiment is that many parts are eliminated, which reduces manufacturing and assembly time, and cost. Further, setup is simplified as the two anchor points **1102** are connected and the user does not have to think about where to place them relative to one another.

Alternate Embodiment—#7

[0105] FIG. **12** shows an alternate safety mechanism for limiting the pull out height of anchor **105**. A standard assembly with inline safety members **1200** is constructed similar to standard assembly **108** of FIG. **1**, however a rigid guy line **1201** replaces and serves the function of safety tube **115**. The rigid guy line **1201** connects an end terminating spring element **1203** to a rigid guy line coupling **1204** via suitable means such looping the end terminating spring element through a hole in the rigid guy line and doubling back and clamping with a cord clamping fastener **126**, or as otherwise discussed elsewhere in this application. The end terminating spring element **1203** is further connected to a corresponding anchor **105**. The rigid guy line coupling **1204** replaces the coupling **122** of FIG. **1**, but serves the same purpose of connecting the upper tube **120** to the lower tube **121** in the manners previously described. The rigid guy lines **1201** and rigid guy line coupling **1204** may be a single molded piece or the rigid guy lines may be separable and assembled during

setup for more compact packaging. The connection between the rigid guy lines **1201** and the rigid guy line coupling **1204** is preferably stiff and does not allow the rigid guy line to pivot or move once connected. In this configuration the safety tubes **115**, safety tube connector **116**, guy lines **109**, height limiting member **117**, and coupling **122** are all removed, which reduces part count, simplifies the construction and assembly, and decreases cost. Alternatively the rigid guy line **1201** may be attached to the rigid guy line coupling **1204** via hooks and loops, welding, glue, injection molding, etc. If the junction between the rigid guy line **1201** and rigid guy line coupling **1204** allows movement and rotation, it may be desirable to add in the safety height limiter **117** for reasons described previously to limit the recoil height of the anchor **105**.

[0106] The safety mechanism operates as follows. When the anchor **105** pulls out of the ground, the anchor will retract rapidly until the contracted length of the end terminating spring element **1203** is reached. The maximum height **1202** the anchor **105** is allowed to reach is the contracted length of the end terminating spring element **1203** plus the length of the anchor **105** above the end of the rigid guy line **1201**. This height is shown via the alternate pull-out position **1205** in FIG. **12**. By using a rigid guy line **1201** connects immovably to rigid guy line coupling **1204**, the rigid guy line cannot itself fly upward as there is no vertical movement allowed.

[0107] Alternatively, the position of the end terminating spring element **1203** and the rigid guy line **1201** may be switched so that the rigid guy line is attached to, or part of the anchor **105**, and the end terminating spring element is attached to the standard assembly **108** of FIG. **1**. In effect, this is the same configuration as in FIG. **1**, where the guy line is a solid member instead of the preferred $\frac{1}{8}$ " nylon cord. This has the advantage of requiring only one spring element **110**, which would run through or attach around, the upper tube **120**. An added benefit in the operation of the safety mechanism is the spring element **110** will pull the rigid guy line **1201** and anchor **105** along the line of the spring element until the rigid guy line collides with the upper tube **120**. At this point, the momentum in the system will transition from an axial trajectory to a rotary motion about the collision point of the rigid guy line **1201** and the upper tube **120**. The momentum of the rigid guy line **1201** plus the downward motion from gravity as the rigid guy line initially begins to move will cause the rigid guy line to rotate down toward the ground (like a pendulum swinging), and this will pull the anchor **105** toward the ground. This would further limit the maximum height **1202** of the anchor **105**. This phenomenon was observed in prototype testing. Height limiting member **117** may subsequently be added as in FIG. **1** to assist with this downward motion and guarantee the maximum height **1202** of the anchor **105**.

Alternate Embodiment—#8

[0108] FIG. **13** shows an alternate safety mechanism for standard assembly in FIG. **10** for limiting pull out height of anchor **105**. A standard assembly **1000** is constructed similar to that described in FIG. **10**, however instead of safety tubes **115**, safety tube connector **116**, and height limiting member **117**, a pair of rigid lower safety members **1301** are disposed between a lower tube collar **1302** encompassing the lower tube **121** near the base **104**, and between a stiff tube short anchor connector **1303** on each end. The stiff tube short anchor connector **1303** is preferably $\frac{1}{8}$ " nylon cord, or other suitable material, and is connected via a suitable method

previously described. The stiff tube short anchor connector **1303** is further connected to the anchor via a suitable method previously described. The lower tube collar **1302** is preferably locked to the lower tube **121** with a set screw, glue, or other means. Each rigid lower safety member **1301** is connected to the lower tube collar **1302** in a stiff immovable fashion such as insertion into a tight hole, glue, set screw, etc. The connection between the rigid lower safety member **1301** and lower tube collar **1302** may be permanent or removable, but should not allow rotation about the juncture. Alternatively the lower tube collar **1302** may be eliminated and holes placed in the lower tube **121** for insertion of the rigid lower safety members **1301**. In this case, suitable locking mechanism, such as a cap on the end of the rigid lower safety members **1301** should be provided to fix them to the lower tube **121**.

[0109] The operation of this alternate embodiment is very similar to the preferred embodiment. If the anchor **105** is dislodged from the ground, the travel is limited to the length of the stiff tube short anchor connector **1303** plus the length of the anchor **105**. In the case of a loose connection between the lower tube **121** and the rigid lower safety member **1301**, some slight vertical movement may occur from the momentum of the anchor **105**, but such displacement will be minimal as the mass of the anchor is insignificant.

Alternate Embodiment—#9

[0110] FIG. 14 shows an alternate safety mechanism for the adjustable sports net. A standard assembly with spring post **1000** is constructed substantially similar to the standard assembly of FIG. 10, except a weighed anchor **1404** is attached in place of the standard anchor **105**, and the safety tubes **115**, safety tube connector **116**, and height limiting member **117** are eliminated. While this adds weight to the system, it eliminates parts and manufacturing and assembly complexity. Alternatively, the anchor **105** can be increased in size and weight and the weight anchor **1404** eliminated from this embodiment, or a provision may be provided on the anchor such as a hook and loop fastener band, for connection to a separate weighted object such as a sports bag.

[0111] In operation, it follows that the maximum weighted anchor height **1405** of the weighted anchor **1404** is limited by the size of the weighted anchor. As the weight anchor **1405** pulls out of the ground, the lower spring element **1001** contracts and pulls the weighted anchor diagonally upwards along the axis of the lower spring element. The weighted anchor **1404** goes from an initial position **1401** to a maximum height position **1402** with the corresponding lower spring element **1002** fully contracted and the energy transferred to potential energy of the height of the weighted anchor **1404**, and finally to a resting position **1403**. The weighted anchor **1404** is sized to minimize the weight while maintaining a maximal weighted anchor height **1405** that is safe.

Alternate Embodiment—#10

[0112] FIG. 15A,B show an alternate safety mechanism for the adjustable sports net in replacement of the safety mechanisms described elsewhere in this application. Two protecting hemispheres **1501** are attached to each half of a spring biased hinge **1502** via suitable means such as screws, welding, gluing, etc. Each protecting hemisphere should be soft and deformable such as a rubber shell like a tennis ball. The spring biased hinge **1502** in turn is attached to the anchor **105** via

suitable means such as screwing, gluing, etc, and also to the guy line **109** (or equivalent) at guy line attachment point **1500**. The spring biased hinge **1502** may also be incorporated in the protecting hemispheres via molding, and thus, an extra part eliminated. The spring biased hinge **1502** is biased to force the two protecting hemispheres together to encompass the anchor **105**. Termination methods for guy lines or their equivalents have been previously discussed and any suitable method, separable or permanent, may be used. Use of this safety mechanism eliminates the need for other safety provisions discussed in this application and may simplify construction and costs. Other hinge mechanisms such as a spring loaded door hinge may be applied to accomplish this same concept.

[0113] The operation of this alternate embodiment is similar to those discussed above, however the height the anchor **105** can reach upon pull out is limited only by the length of the attaching members, vertically oriented, which can be quite high. To protect the players, the protecting hemispheres **1501** close over the anchor **105** on pull-out to a closed position **1504**, forming a softer barrier which cannot injure a person. The protecting hemispheres **1501** are opened by the user to an open position **1503** when pressing the anchor **105** into the ground. As the anchor **105** begins to dislodge, the spring biased hinge **1502** of the protecting hemispheres **1501** begin to close around the anchor, eventually enclosing it entirely before it can injure a person.

Alternate Embodiment—#11

[0114] FIG. 16 shows an alternate safety mechanism for the adjustable sports net. A standard assembly with spring post **1000** is constructed substantially similar to that of FIG. 10, except a loose safety weight **1601** is placed on the ground, and the lower spring element **1002** passes through a guide loop **1604**, or other connection means, in the loose safety weight before extending up towards the upper tube **120**. Additionally the safety tubes **115**, safety tube connector **116**, and height limiting element **117** are eliminated. The loose safety weight **1601** may be fixed to the lower spring element **1002**, but is preferably left loose. The loose safety weight **1601** shall be sized such that it remains on top of the ground at an appreciable initial distance **1603** from the anchor **105**. Additionally, instead of a loose safety weight **1601**, a shoe bag or other weight component (not shown) that may be available can be connected to the lower spring element **1002** and simple connection means such as a band of hook and loop fastener supplied. In such a configuration any connection means such as a spring clip, rope, etc. shall be provided to connect this external weight to the lower spring element **1002**.

[0115] The safety mechanism operates in a few distinct ways. First, the loose safety weight **1601** reduces the pullout angle **1602** by turning the tension force on the anchor **105** to more of a horizontal force than a vertical force. This transition is significant as the anchor **105** is much stronger in resisting horizontal forces than vertical forces regarding pull out. Second, the anchor **105** must pass through the loose safety weight **1601**, which is impossible if the guide loop **1604** or connection means is sized or configured properly to prevent this action. Thus the anchor **105** will rapidly dislodge, travel substantially horizontally as the lower spring element **1002** contracts, and stop when it impacts the loose safety weight **1601**. In this manner, the maximum pull out height of the anchor **105** is kept to virtually at the level of the ground because of the trajectory path along the reduced pull out angle **1602**. The

downside is the need to carry more weight with the system, though this may not be a burden if weights are carried already for other purposes as can be common with a sports team.

Alternate Embodiment—#12

[0116] FIG. 17A-H show alternate means of net length and height adjustment designs for the adjustable sports net. In some cases the illustrations provide both a new height adjustment scheme and a new net length adjustment scheme. It shall be noted at this point that where a height and net length adjustment scheme are discussed relating to the same figure, the net length and system height adjustment designs are not mutually inclusive. Indeed, throughout this entire description section, the designs discussed may be interchangeable, meaning a sports net system may incorporate one of a many system height and/or net length adjustment combinations to function within the spirit of the inventions disclosed. Additionally, FIG. 17A-H only illustrate the upper section of a standard assembly. Many different standard designs have been previously discussed and for brevity, only the net length and system height adjustment schemes depicted in FIG. 17A-H shall be discussed in this alternate embodiment. It shall be assumed that one skilled in the art can combine one of the system height and net length designs of FIG. 17A-G with a standard design discussed elsewhere in this description to create an adjustable sports net system. This standard interchangeability shall also apply to other alternate embodiments described herein.

[0117] FIG. 17A shows sliding tube collars 1704 disposed in an upper and lower position for connection to a plain net 1700 via net spring elements 1701 and collar connection points 1705. Collar connection points 1705 may be a hole, hook, or other general means for terminating a spring element like a bungee cord or metallic spring. It shall be noted that only the top collar 1702 is required and the bottom of plain net 1700 may be loosely dangling, dangling but weighted as in FIG. 17B,C, or attached to upper tube 120 via a string, bungee and hook as shown in FIG. 17B,C,D, or other suitable means to introduce tension into the bottom of the net. The sliding tube collars 1704 are fixable to the upper tube 120 via a set screw 1703. Alternatively a pin, clamp, high friction fit, or other suitable means for grabbing a tube to fix a position of the sliding tube collar 1704 may be used. Preferably the net spring elements 1701 are made of $\frac{3}{16}$ " bungee cord, but any suitable material such as rubber bands, metal extension springs, etc. may be used. FIG. 17A shows the net spring element 1701 on one side only of the net, with the other side of the net being connected via short net connectors 1702 which may be nylon cord for example; however it shall be recognized that short net connectors may also be made of other suitable material including net spring elements 1701, or even rigid material such as metal or plastic tubes or rods. The plain net 1700 is attached to the short net connectors 1702 and net spring element 1701 via any suitable means including stitching (as shown in the figure), hooks and grommets, stapled, knots etc. Further it is desired that the tension on the top of the plain net 1700 is always greater than the tension on the bottom of the net, therefore the upper net spring element 1701 shall be sized or stretched more such that it pulls tighter on the top of the net than the net spring element 1701 on the bottom of the net. This is advantageous as it provides a straight line on the upper edge of the net which is the boundary line.

[0118] The net system described in FIG. 17A operates by allowing varying net length because of the stretch in the net spring elements 1701. The plain net 1700 may be separable at one end, or both ends from the collar connection points 1705, or alternatively separated at the junction between the plain net and the net spring elements 1701 and/or short net connectors 1702 if such separation means is provided. Two standard assemblies (full standard assembly not shown as stated above) are placed on the playing surface. The plain net 1700 is attached to one standard assembly via sliding tube collars (s) 1704 and stretched until it can be hooked to the other standard assembly via the other set of sliding tube collar(s) 1704. The sliding tube collars 1704 may be vertically adjusted by loosening, moving, and then retightening set screw 1703, and this operation may be done before or after plain net 1700 is attached. The tension in the plain net 1700 is thus kept by the tension in the net spring elements 1701. The net spring elements 1701 shall be sized such that in the minimal net length position there is sufficient tension in the net spring elements to make the plain net 1700 sufficiently taught, but the spring elements have sufficient length as to stretch far enough to accommodate the greatest net length desired.

[0119] FIG. 17B shows an alternate version where a single net spring element 1707 is used to span the distance of the two standard assemblies. A weighted net 1706 is placed on the single net spring element 1707 by stringing the single net spring element through a net channel 1728 stitched in the top of the net as shown in FIG. 17B. Instead of stitching the loop may be created with overlapping Hook and loop fastener or other suitable means. The bottom of the weighted net 1706 may be held straight and vertical by attaching a net weight 1708 by stitching the net weight to the net. The net weight 1708 may likewise be placed in one or more pockets sewn in the weighted net 1706, or alternatively may clamp to the weighted net. The net weight 1708 is preferably flexible to provide for easy packaging and made of any material that provides suitable downward force to keep the weighted net 1706 hanging vertical against wind forces. In place of, or in addition to the net weight 1708, a net bottom tension line 1709 may connect weighted net 1706 to the upper tube 120 via optional net collar 1710. Alternatively, the net bottom tension line 1709 may hook around the upper tube 120, and may be connected to weighted net 1706 via permanent or detachable means such as stitching, a hook and grommet, etc. The net bottom tension line 1709 is optional, and preferably $\frac{3}{16}$ " bungee cord but may be made of any suitable material which stretches to provide tension to the bottom edge of the weighted net 1706. The net bottom tension line 1709 may further attach to any point on the edge of weighted net 1706. A stiffener (not shown) may be clamped along the vertical end edge of the weighted net 1706, the stiffener then attached to the net bottom tension line 1709, so that the force from the bottom tension spring is transmitted to the entire edge of the net pulling the full net taught.

[0120] The net system described in FIG. 17B operates with its length-wise adjustment derived from the stretch in single net spring element 1707, whose length shall be such that a minimal tension is applied in the shortest net configuration. Such minimal tension must be sufficient to hold the weighted net 1706 in place against the weight of the net. The single net spring element 1707 shall similarly be flexible enough so as to expand to allow for the largest desirable net length. Similar to FIG. 17A, the weighted net 1706 may be detachable at one or both ends via detachment of the single net spring element

1707 and net bottom tension line **1709** (if it is used). The height adjustment is as described in the operation of FIG. 17A above. The optional net collar **1710** is loose to move up and down on the upper tube **1712** so only the sliding tube collar **1704** must be adjusted and fixed to the upper tube **120** to fix the height. The weighted net **1706** can be sized at any length between the minimal length and maximal length required. In the case of the minimal length, the weighted net **1706** will not stretch the full length of the court, however the single net spring element **1707** may serve as the boundary line in this case on either side of the net. In the case of the maximal length, the weighted net **1706** may be scrunched up to accommodate shorter lengths. In this scenario the bottom tension springs would not be used. In the case of the use of the net weight **1708** instead of the net bottom tension line **1709**, it shall be noted that an advantage is the net is free to deflect and rotate along the single net spring element **1707**. This swinging motion absorbs impact of a game object (not shown) without transmitting the full force to the base and anchors of the sports net system, and this reduces the strength and material requirements of the rest of the system. The impact is partially absorbed by movement of the net weight **1708**, but the majority of the energy passes through the net assembly as the game object moves past and is deflected by the net weight.

[0121] FIG. 17C shows a similar setup to FIG. 17B. In this configuration the single net spring element **1707** is replaced with a net cord **1711**, or cable. A net cord adjustment clip **1712** is provided to pull a required amount of net cord **1711** through to form a net adjustment loop **1713**, and to hold this net adjustment loop secure and prevent it from slipping. Many such net adjustment clips **1712** are known in activities such as climbing and boating. FIG. 17C shows the net cord **1711** running through the net channel **1728**, and the weighted net **1706** being freely movable along the length of the net cord. As in FIG. 17B, optional net bottom tension lines **1709** may be served to pull the bottom edge of the weighted net **1706** tight, in place of or in addition to a net weight **1708**. Instead of net cord **1711** running through the net channel **1728**, the net cord may be fixed to the end of the net, the net being the minimal length required, and the net cord adjusted to allow expansion of the length. In this case net cord **1711** forms the remainder of the upper boundary as an extension of the top of the weighted net **1706**. To cover the section without a net present under the net cord **1711**, additional sections of material (not shown) could be wrapped or affixed to this empty space. Alternatively, overlapping sections (not shown) of the net could allow telescope axially outward to cover the empty length. Finally, similarly to FIG. 17B, the weighted net **1706** could be made the maximum length and simply bunched up along the net cord **1711** to create a shorter court with components net bottom tension lines **1709** and optional net collar **1710** not used.

[0122] FIG. 17D shows a length and height adjustment means similar to the preferred embodiment, and the height adjustment scheme is the same as the preferred embodiment. For means of length adjustment, the hook and grommet net **1716** does not use hook and loop fasteners for the length adjustment overlap flap **114**, but instead uses grommets **1714** and grommet hooks **1715** to attach the overlap flap and apply tension. The first overlap flap **112** may be attached as previously described in other embodiments. The grommets **1714** are spaced axially along the hook and grommet net **1716** at a distance long enough as to minimize the number of grommets, but short enough that the flex in the rest of the system,

as described above, is adequate for allowing the grommet hooks **1715** to reach a grommet which provides adequate net tension. A small elastic member (not shown) may be added between the grommet hook **1715** and the hook and grommet net **1716** to provide some additional adjustment. Essentially, if the grommet hook **1715** does not quite reach a grommet **1714**, the net can be pulled slightly tighter and the system flexes until the hook reaches the grommet to secure the standard assemblies **108** together. In such a manner, the standard assemblies **108** may be placed independently of precise distance measurements and the system of grommet hook **1715** and grommet **1714** tensioning will compensate regardless. Such grommet **1714** spacing of 12" is suggested.

[0123] FIG. 17E shows a spring hook and grommet net **1717** as another length and height adjustment method similar to FIGS. 17A-C. In FIG. 17E, a pair of sliding tube collars **1704** is used in conjunction with net spring elements **1701**, each terminating in a grommet hook **1715**, to grab a grommet **1714** sewn into the net fabric **101**. Sliding tube collars **1704** are provided for hooking to a grommet **1714** in each corner of the net fabric **101**. The sliding tube collars **1704** may alternatively be made of high friction material, such as rubber, to grip the upper tube **120** under tension to prevent vertical movement. The grommets **1714** are axially spaced frequently enough that the spacing, plus the additional flex standard assemblies (i.e. from the flex in the standard and the ability to tilt inward from the flex in the guy line assemblies as discussed previously), plus the stretch in the net spring element, allow for continuous horizontally length adjustment, and correspondingly, independent placement of each standard assembly without regard to precise distance measurements for initially placing the standards. Such spacing of grommets **1714** is suggested to be every 12" for example.

[0124] FIG. 17F shows a net design almost identical to FIG. 17D, however the grommet hooks **1715** are replaced with female snaps **1719** and the grommets **1714** are replaced with male snaps **1718** and the male and female snaps being attachment means for securing the first flap overlap flap **112** and length adjustment overlap flap **114**. Such a configuration may be cheaper to manufacture and lower profile. Also grommet hooks **1715** may tend to get tangled during packaging. Otherwise the operation is the same as FIG. 17D. It shall be noted that other means of connecting a portion of net fabric **101** to itself shall be considered within the scope of this specification.

[0125] FIG. 17G shows an alternate form of height and length adjustment. A coiled spring **1724** is wrapped inside a coiled spring net holder **1723**. One end of the coiled spring **1724** is fixed to the coiled spring net holder **1723**, while the other end is fixed to a net strapping **1725**. The coiled spring **1724** may be a spring steel material or material with similar properties. The net strapping **1725** is attached via suitable means such as stitching, clamping, rivets, or the like. Attached to the other end of net strapping **1725** is net end plug **1720**. The coiled spring net holder **1723** slides vertically and locks to upper tube **120**, as well as resist rotation and unwinding on the upper tube, for example by use a sliding track (not shown) or a set screw (not shown). A mating adjustable net receptacle **1721** is disposed and vertically slides and locks along the opposite upper post **120**. The net end plug **1720** may be placed and secured in a net end receptacle slot **1722** to connect the two standard assemblies and form the net boundary.

[0126] To operate, the standards are independently placed at a desired distance relative to one another. The adjustable net receptacle 1721 and coiled spring net holder 1723 are adjusted to the desired height and locked into place. The net strapping 1725 is then pulled out of the coiled spring net holder 1723 and the net end plug 1720 placed and secured in the net end receptacle slot 1722. The height may further be adjusted as this point due to the flexible nature of the net strapping 1725 and the coiled spring 1724. The tension in the net strapping 1725 is determined by the strength of the coiled spring 1724, and it is desirable the tension of the coiled spring 1724 be strong enough to hold the two standard assemblies together and perpendicular to the playing surface against the outward force from spring elements 110 (not shown in this figure).

[0127] FIG. 17H shows another height and length adjustment system. The net fabric 101 is disposed between two upper tubes 120. Each upper tube 120 is covered in a hook fastener 1726. The net fabric 101 has attachment means in the form of a strip of loop fastener 1727 on the top and the bottom along the length (only the length needed for overlap needs the Hook and loop fastener but the entire length is shown for simplicity). Alternatively the net fabric 101 could be made entirely of loop fastener 1727. At each end of net fabric 101 is a section of hook fastener 1726. The two standard assemblies are placed independently at a desired distance. One end of the net fabric 101 is wrapped around one upper tube 120, the loop fastener 1727 on the net fabric, sticking to the hook fastener 1726 on the upper tube. The net fabric 101 is then pulled tight and the desired tension put in to the system. Finally the net fabric 101 is wrapped around the second upper tube 120, doubled back and attached to itself, and the second end patch of hook fastener 1726 placed on the loop fastener 1725 of the net fabric 101. In this manner the height is fixed by the stickiness of the Hook and loop fastener and the tension and length is retained as well by the stickiness of the Hook and loop fastener.

Alternate Embodiment—#13

[0128] FIG. 18A,B show an alternate height adjustment design in a continuous loop height adjustment scheme. An upper tube 120 is provided with an upper ring 1803 attached at the top of the height adjustment range and lower ring 1804 attached near the bottom of the height adjustment range. A height adjustment cord 1801 is looped around the upper ring 1803 and down around the lower ring 1804. In between the upper ring 1803 and lower ring 1804, the net fabric 101 is connected to the height adjustment cord 1801 at cord connection points 1802. A tensioner 1805 is placed into a section of the height adjustment cord 1801, the position being such that the net fabric 101 has full vertical adjustment without the tensioner interfering with the upper ring 1803 or lower ring 1808. The tensioner 1805 may be a turnbuckle or other mechanism for adjusting the tension in a cable or rope. To operate, the two standards are independently placed on either side of a court at a desired distance. The net fabric 101 may be connected to the height adjustment cord 1801 as described in the preferred embodiment or the net fabric is connected to each height adjustment cord 1801 at or between connection points 1802. Such connection could be a hook through a grommet, a button, or other known means. Alternatively the net fabric 101 may be fixed or sewn onto one of the height adjustment ropes 1801 and attachable at the other height adjustment rope, with length adjustment via other means

discussed in this specification. Once connected, the net fabric 101 is moved to the desired vertical position and the tensioner 1805 is tightened, pulling the height adjustment ropes 1801 tight against the upper ring 1803 and lower ring 1804. The sharp angle turned by the height adjustment rope 1801 around the upper ring 1803 and lower ring 1804 causes significant enough friction that the net 1800 does not move vertically under impact. The tensioner 1805 may be further loosened to allow changing the position of the net fabric 101.

[0129] FIG. 18B shows an alternate version of FIG. 18A, where instead of an upper ring 1803 and lower ring 1804, there is an upper pulley 1809 and lower pulley 1806. Also, instead of a tensioner 1805 there is a tube clamp 1807. The tube clamp 1807 may be an active clamp such that it prevents the height adjustment cord 1801 from moving vertically unless the grip is pulled away from the surface of the upper tube 120. The tube clamp 1807 is required because of the low friction rotation ability of the pulleys. Setup is the same as described in FIG. 18A, but to adjust the height, the tube clamp 1807 loosened and pulled away from the surface of the upper tube 120, the height adjusted, and the tube clamp re-tightened to once again contact the upper tube. The tube clamp 1807 may be also a collar (not shown) that can be fixed to the upper tube 120 similar to shown in FIG. 17A. Other means of fixing a portion of the height adjustment cord 1801 to the upper tube 120 such as weaving through a metal cork screw (not shown) or a cord grip (not shown), etc shall be considered within the scope of this specification.

Alternate Embodiment—#14

[0130] FIGS. 19A-B show an alternate safety sleeve stabilization assembly 1903 to the safety scheme of standard assembly 108 of FIG. 1. The safety tubes 115, safety tube connector 116, and height limiting member 117, are removed and replaced by a fabric safety sleeve 1900 enclosing stabilization assembly 107, and incorporating stiffening rod 1901, and connected the base 104 via safety webbing 1902. The safety sleeve passes around the upper tube 120, which runs through pole through-hole 1905, and through an optional sleeve reinforcement patch 1904, which may be added to reinforce this opening. FIG. 19B shows the fabric safety sleeve 1900 laid out flat. The safety webbing 1902 is sewn to each end of the fabric safety sleeve 1900, and the stiffening rod 1901 is sewn into and along substantially the full edge of the fabric safety sleeve to provide resistance to buckling, as the safety tubes 115 did in the preferred embodiment. The safety webbing 1902 may have a hole at its midpoint which one of the ground spikes 103 may run through to fix the midpoint of the safety webbing to the base 104. The guy line 109 is fed through each side of the fabric safety sleeve 1900 and attached to the corresponding anchor 105 as in FIG. 1. The fabric safety sleeve 1900 rests atop the coupling 122 and is prevented from moving down the standard assembly via mechanical interference with the top surface of the coupling. The stiffening rod 1901 may be fiberglass, plastic, metal, etc. The fabric may be 600 denier nylon for example, and the webbing may be 2" heavy duty pack webbing.

[0131] When the anchor 105 pulls out of the ground, the guy line 109 retracts into the fabric safety sleeve 1900 until the anchor runs into the end of the stiffening rod 1901. The momentum carries the stiffening rod 1901 back toward the upper tube 120 where it is prevented from moving further due to being sewn into the fabric safety sleeve 1900. Because the fabric safety sleeve 1900 is flexible, the stiffening rod 1901

may begin to pivot with its corresponding section of fabric safety sleeve about the connection of the fabric safety sleeve and the coupling 122, rotating the anchor upward. The safety webbing 1902 is added to limit to amount of travel of the end of the fabric safety sleeve 1900 similar to the height limiting member 117 in FIG. 1. Thus the height the anchor can reach, is minimal and not harmful to the consumer. A benefit of this flexibility using fabric for the safety sleeve is that the assembly folds well for packaging and transport, which is an important design aspect. Further, fabric provides a convenient and inexpensive area for imprinting of a logo.

Alternate Embodiment—#15

[0132] FIG. 20 shows an alternate adjustable sports net assembly, fiberglass two-pole system 2100, made of fiberglass tube or rod. Like the system described in FIG. 1, this figure illustrates one example, but any of the height and/or length adjustment or flexibility designs discussed in this specification may be incorporated in lieu of the design shown. The fiberglass two-pole system 2100 consists of two standard assemblies, each based off a lower fiberglass tube 2102 connected to an upper fiberglass tube 2103 by a fiberglass ferrule 2104. The lower fiberglass tube 2102 is further fixed to a base plate 104 and terminated with at least one ground spike 103, which is driven into the ground. Attached to the upper fiberglass tube 2103 are two movable tube stops 2101 which grip the fiberglass tube via suitable means, for example but not limited to, a movable tube stop set screw 2105, spring loaded friction, etc. The net fabric 101 is looped around the each upper fiberglass tube 2103 and doubled back on itself via the first overlap flap 112 and length adjustment overlap flap 114, to be attached as described previously in other embodiments, preferably with hook and loop fastener 102, but may also be hooks and grommets, snaps, etc. Other means of connecting a length adjustable net as discussed previously, may also be used. A single spring element 801 may connect the upper fiberglass tube 2103 to anchors 105. Although not shown, the various safety mechanisms described in this specification for protecting against inadvertent pullout of the anchor 105 may be applied to this design. The main advantage of the design is simplification of parts, and even more light weight and minimalistic than the PVC tubing suggested earlier. Also, PVC material may be brittle, while fiberglass is very strong, yet flexible to assist in absorbing impacts from a game object (not shown). The components for the fiberglass ferrule and tubing are readily available parts already in use in items like corner flags for soccer fields, kites, etc. and because fiberglass is stronger and more resilient than PVC, a smaller diameter tube or rod may be used and this system kept even more light-weight and compact for increased portability. Finally, the elimination of height adjustment cord 106, movable cord stops 111, and immovable cord stops 113, further reduces part count and assembly/manufacturing costs. The operation of the system is substantially the same as in the preferred embodiment of FIG. 1 with the exception that the net is connected directly to the upper fiberglass tube 2103 instead of the height adjustment cord 106. Real time height adjustment is likewise performed by releasing movable tube stops 2101, adjusting the height, and releasing or fixing the movable tube stops to the upper fiberglass tube 2103. Finally a tip protector 2106 is provided to guard against eye injuries because of the smaller diameter of the upper fiberglass tube 2103 or rod.

Alternate Embodiment—#16

[0133] FIG. 21 shows an alternate embodiment for the lower half of the standard assembly 108 from FIG. 1. The basis of the standard assembly 108 remains the same as the preferred embodiment of FIG. 1, with tri spring collar post 2200 being connected to base 104, which in turn is holds ground spikes 103. However the tri spring collar post 2200 provides for a tri spring collar 2201 to move vertically from a slack position 2206 to a locked taught position 2205. The sliding tri spring collar 2201 has a loose fit over the tri spring collar post 2200 and provides connection means for three tri spring elements 2204 which in turn each connect to an anchor 105. Such connections means may include but is not limited to be hooks, loops, knots, glue, etc. The tri spring elements 2204 are aligned such that one tri spring element is co-linear with the half court line (not shown) and the other two tri spring elements are positioned 120 degrees apart from the half court line. A tri spring collar plunger 2202 is attached to, or made part of tri spring collar 2201. Tri spring collar plunger 2201 is preferably spring biased inward against tri spring collar post 2200 and self-locks when aligned in the locked taught position 2205 with upper adjustment hole 2203 in the tri spring collar post.

[0134] To operate, the tri spring collar post 2200, base plate 104, and ground spikes 103 are pressed into the ground. The anchors 105 are then pressed into the ground at an equal distance from the tri spring collar post 2200 at the degree spacing and orientation mentioned above. Although not shown, any of the safety mechanisms for preventing inadvertent pull out of the anchors 105 may be incorporated and/or modified to fit the three spring system shown. At this stage the tri spring elements are all loose and the tri spring collar 2201 is in the slack position 2206 with tri spring collar plunger 2203 in contracted position, but pressing against the tri spring collar post 2200 because of the spring bias. The sliding tri spring collar 2201 is moved from the slack position 2206 to an upper position vertically until the tri spring collar plunger 2202 aligns with the upper adjustment hole 2203 and is extended into the upper adjustment hole, holding the tri spring collar in the taught position 2205. This sets the standard assembly vertically and self-aligning, contrary to previously discussed designs where the tension in the guy lines biases the standard assembly outward toward the anchors 105. This design may be advantageous in a design such as shown in FIG. 17G where it may be difficult to develop a large force from the coiled spring 1724 due to the need for compactness and ease of fabrication. In such a system, it is better not to rely on the coiled spring 1724 to hold the standard assemblies vertically, but rather have the standards vertically self-aligning as in FIG. 21, and rely on the coiled spring 1724 only for net tension, length, and height adjustment.

CONCLUSION, RAMIFICATIONS, SCOPE

[0135] To reiterate, none of the designs described are mutually exclusive or inclusive and many if not all of the height adjustment, length adjustment, and system flexibility, and safety concepts may be intermingled to create a fully functioning sports net system in the spirit of the inventions disclosed herein. One skilled in the art will recognized any minor modifications that would be needed for such an intermingling and such modifications shall be considered within the scope of this specification and claims. Further, it shall be recognized that many of the components described may be combined into

a single object via different manufacturing processes such as welding, injection molding, casting, etc. While the applicant discusses some of these options briefly in the application, it shall be recognized any and all combinations of the components discussed herein shall be considered within the scope of this application and covered by the claims written. Similarly, it shall be recognized that many components in the system and their connection points, or connection means, may also be interchanged or rearranged to achieve the same effect as the disclosed configurations. Similarly, where components are discussed as being flexible and/or tubular, such components may also be solid if this accomplishes the same function as described in this specification. While the applicant discusses and illustrates several of these configurations, this application and claims shall not be limited solely to the different configurations discussed and other derivations shall be considered understood.

[0136] The reader will see that the adjustable sports net system of this invention is compact, portable, and easy to assemble by one person. The net may be used for many sports, not just soccer tennis, but badminton, tennis, volleyball, etc for example. Further the reader will recognize that the system has significant advantages over prior by broadening the utility of the system for different uses and inclusion in training schedules where setup time and adjustment time are crucial factors to whether a piece of equipment is used or not. Further still the reader shall recognize that the above is made possible because of the unique inventions described and combined to create a system that is continuously adjustable in length and height, and uses designed in flexibility to absorb impact, reducing forces on the system, and therefore component size and material requirements, all while maintaining tension in the system in manner that is safe to the consumer. Further still the reader shall recognize that the inventions described herein are useful in other areas than sports nets, for example building compliance into a tent stake system to avoid a person tripping over a tent stake rope and pull the stake out, leading to collapse of the tent. A elastic stake attachment would alleviate this problem. Another example where an elastic element would be useful is in tying trees and plants which are typically tied to stakes in the ground. This restricts their ability to grow as it prevents them from swaying in the wind which would normally stress the branches and trunk, which promotes growth. Instead of a stake, if one or more elastically deformable guy lines with a safety mechanism were used to secure the tree upright, the tree would be allowed to sway in the wind, deforming the guy lines, but not pulling them out of the ground. A safety mechanism in this case would be important to protect the gardener from inadvertent stake pullout, for example on a really windy day where stake pullout force could potentially be exceeded. The reader shall also recognize that height adjustment markings may be added to various components to create a height setting guide to ensure levelness of the game net.

[0137] Although the description above contains many specifications, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. Thus the scope of this invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.

We claim:

1. A stabilization system for stabilizing an object in a nominal position relative to a surface, said stabilization system comprising:

a) at least one stabilization assembly, each said stabilization assembly comprising at least one spring element, said spring element able to elongate and contract in reaction to an impact on said object, said stabilization assembly further comprising a first attachment means for attaching at least a first portion of said stabilization assembly to said surface, and a second attachment means for attaching a second portion of said stabilization assembly to said object,

whereby said stabilization system restores said object substantially to said nominal position relative to said surface without additional intervention.

2. The stabilization system of claim **1** wherein the object is a standard of a net game system, and a net is disposed between a plurality of said standards and held taught with an initial net tension force.

3. The net game system of claim **2** wherein said standards are made of elastically deformable material.

4. The net game system of claim **2** wherein said standards comprise a height adjustment means for vertically adjusting the height of said net, and said initial net tension force is substantially maintained across a height adjustment range by said stabilization system.

5. The net game system of claim **4** wherein said height adjustment means comprises a height adjustment guide, said net slidably attaching to said height adjustment guide and a movable stop attached above and a movable stop attached below said net whereby a user may slide said net and said movable stops along said height adjustment guide continuously across said height adjustment range.

6. The net game system of claim **4** wherein said second attachment means fixes said stabilization assembly to said standard below a maximum height of said standard and to a non-adjustable portion of said standard.

7. The net game system of claim **4** wherein said spring element is made of bungee cord between about $\frac{1}{4}$ and about $\frac{1}{2}$ " in diameter, and said net may translate from a minimum height of about 24" to a maximum height of about 8 ft.

8. The stabilization system of claim **1** further comprising a safety means, said safety means safely dissipating energy stored in at least one said stabilization assembly, whereby said safety means prevents harmful effects to a person should said stabilization assembly inadvertently release from said surface.

9. The safety means of claim **8** further comprising:

a rigid tube comprising a first tube end and a second tube end, said rigid tube encompassing a length portion of said stabilization assembly, said second tube end fixed substantially near said second portion of said stabilization assembly, where said stabilization assembly is allowed to translate through said rigid tube;

and a blocking means secured to said first tube end for preventing said first attachment means from translating past said first tube end.

10. The safety means of claim **9** wherein said blocking means comprises a rigid tube opening that is smaller than said first attachment means, thereby providing mechanical interference between said first tube end and said first attachment means.

11. The safety means of claim 8 further comprising:

- a) a fabric sleeve disposed around said stabilization assembly, said fabric sleeve comprising a first sleeve end and a second sleeve end, said second sleeve end attached substantially near said second portion of said stabilization assembly;
- b) a rigid member constrained by said fabric sleeve, said rigid member running substantially the length of said fabric sleeve, and blocking means to prevent said first attachment means of said stabilization assembly from translating past said first sleeve end.

12. The safety means of claim 8 wherein a safety connecting member is disposed between said object and said first attachment means of said stabilization assembly, and a tertiary attachment means is connected along the length of said safety connecting member for securing said safety connecting member to said surface.

13. The tertiary connecting means of claim 12 being a safety stake.

14. The safety means of claim 8 wherein a bar comprises a first penetrating end pressed into said surface and a second penetrating end pressed into said surface, and at least one of said stabilization assemblies is disposed between said object and said first penetrating end and a second of said stabilization assemblies is disposed between said object and second penetrating end whereby a pullout force on said first penetrating end causes said second penetrating end to be pressed tighter into said surface.

15. The safety means of claim 8 wherein a height limiting member is disposed between a base of said object and said stabilization assembly, said height limiting member connecting substantially near said first attachment means.

16. A method of stabilizing an object in a nominal position relative to a surface comprising:

- a) providing at least one stabilization assembly, each said stabilization assembly comprising at least one spring element, said spring element able to elongate and contract in reaction to an impact on said object, said stabilization assembly further comprising a first attachment means for attaching at least a first portion of said stabilization assembly to said surface, and a second attachment means for attaching a second portion of said stabilization assembly to said object,

whereby said stabilization system restores said object substantially to said nominal position relative to said surface without additional intervention

17. A continuously length adjustable net for attachment between a plurality of standards of a net support structure, said continuously length adjustable net comprising:

- a) a net fabric spanning at least a predetermined maximum usable length;
- b) a first net end with net attachment means for connecting to a first standard; and a second net end with said net attachment means for connecting to a second standard, whereby said net may span any of a desired length continuously up to said maximum predetermined usable length.

18. The net attachment means of claim 17 wherein said first net end is attached to said standard with hook and loop fastener and said second net end wraps around said second standard, doubles back, and connects to said net fabric with hook and loop fastener.

19. The continuously length adjustable net of claim 17 wherein the length of the net may be adjusted from about 9 ft to about 18 ft.

20. The continuously length adjustable net of claim 17 wherein a width of said net may range from about 4" to about 24".

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