A sports training structure having a planar face, wherein the planar face includes a plurality of targets and each of the plurality of targets has a light emitting diode (LED) array adjacent thereto. The planar face is adapted for attachment across the front opening of a sports net, such as a hockey net, a soccer net or a lacrosse net. The sports training structure is useful as a training aid for improving the accuracy of a player's shot while the player is practicing shooting while looking at the targets on the face of the structure.
TRAINING APPARATUS FOR SHOOTING IN
HOCKEY AND OTHER SPORTS

RELATED APPLICATION

[0001] This application is a non-provisional of, and claims 35 USC 119 priority from, U.S. Provisional application Ser. No. 62/286,629 filed Jan. 25, 2016.

BACKGROUND

[0002] This invention relates primarily to hockey, but can be readily adapted for lacrosse, soccer, and potentially other such sports where players shoot a projectile such as a ball or hockey puck towards a goal. More particularly, the invention relates to a training apparatus to improve shooting skills of players.

[0003] For convenience, all references in this application will be to hockey, but it should be recognized that the application of the invention to other sports such as soccer and lacrosse is clearly contemplated.

[0004] Shields of canvas, plywood or other material to place in front of a hockey net for training purposes are well known. These shields typically have cutout areas representing preferred shooting targets, for example the four upper and lower corners of the net, and the so-called “five-hole” in the lower center of the shield, representing the puck going between the goaltender’s legs.

[0005] In the prior art, the player generally chooses any of the openings available and targets that opening with his or her shot, or is told which opening to shoot at. The player is not motivated or forced to look at the target while shooting, which doesn’t encourage the player to keep his or her head up when shooting, which is desirable so that the player can see the goaltender’s position when shooting. With the prior art devices, the player tends to look at the target while getting ready to shoot, but then to look down while shooting. This does not produce the desired skill level, especially for higher levels of hockey, and instead results in the formation of bad habits. Teaching the player to shoot with his or her head up and looking at the target is highly desirable, but the skill is difficult to learn.

SUMMARY

[0006] It is an object of the invention to address the issues and problems referred to above, by providing a training device which encourages head-up shooting.

[0007] This invention therefore provides a structure (preferably but not necessarily of canvas or other sufficiently robust material) which is positionable across the front of a hockey net (for example) or which may be mounted to any other desired structure such as a wooden frame or wooden posts.

[0008] The structure has a number of target areas, preferably but not necessarily openings in the structure, each one corresponding to a desirable shooting target, such as the aforementioned upper and lower corners of a hockey net, and the so-called “five-hole”. Additional target areas may also be provided, for example areas corresponding to just over a crouching goaltender’s shoulders.

[0009] Adjacent to each target opening is an indicator assembly, such as an LED array, for example, controlled such that any one indicator assembly can be selectively illuminated to indicate the specific target area for the player to aim at. For convenience, the target areas will henceforth be referred to as “openings”, that being the preferred embodiment, but it should be understood that there does not necessarily have to be an opening. There could be just a visually indicated area, or an area provided with sensors such that hitting the target area triggers an event, such as light or a sound or perhaps simply a change to a different target area (i.e. illuminating one target area until it is hit, and only then switching to a different target area.

[0010] The LEDs are controlled via a microprocessor, which receives input from a smart phone “app”, or a hard-wired controller, or a wireless controller. Regardless of the control means, the player or coach can select a random sequence, a selected pre-programmed sequence, or a custom sequence, for illumination of the LED arrays. The system preferably is powered by a battery pack (preferably rechargeable), but could be hard-wired to an electrical supply if desired.

[0011] The preferred embodiment of the structure has multiple arrays of LEDs, each array preferably having several LEDs (five for example), secured adjacent to specific target areas or openings. Obviously, there could be fewer or more target areas or openings if desired, but 5 or 6 are most typical. Similarly, each area could have any number of LEDs. The structure preferably is attached across the front of the hockey net, but could be otherwise mounted. The programmed LEDs flash or blink in different sequences chosen by the user or a coach.

[0012] One aim of the invention is to have players electronically interact with the invention to improve their shooting skills. The players are forced to constantly look at the target while shooting. Otherwise, most players shoot with their head down, not looking at their target. They look at the target and then look down to shoot, which is not desirable, especially at higher-level hockey. The invention improves shooting accuracy, encourages quick-release shooting, and improves shooting reaction time.

[0013] According to one aspect of the present invention, there is provided a sports training structure comprising a planar face, wherein the planar face comprises a plurality of targets and each of the plurality of targets has a light emitting diode (LED) array adjacent thereto.

[0014] According to another aspect of the present invention, there is provided the structure described herein, wherein the planar face is made of canvas.

[0015] According to still another aspect of the present invention, there is provided the structure described herein, wherein each target in the plurality of targets is an opening in the planar face.

[0016] According to yet another aspect of the present invention, there is provided the structure described herein, wherein the LED arrays are supplied with electrical power through a wiring harness removably attached to a rearward-facing surface of the planar face.

[0017] According to a further aspect of the present invention, there is provided the structure described herein, wherein the wiring harness is removably attached to the rearward-facing surface of the planar face through a plurality of flaps secured to the rearward-facing surface.

[0018] According to still a further aspect of the present invention, there is provided the structure described herein, wherein the plurality of flaps are secured to the rearward-facing surface through loop-and-pile fasteners.

[0019] According to yet a further aspect of the present invention, there is provided the structure described herein,
wherein the electrical power is supplied from a battery pack connected to the wiring harness.

[0020] According to another aspect of the present invention, there is provided the structure described herein, wherein the battery pack is rechargeable.

[0021] According to still another aspect of the present invention, there is provided the structure described herein, wherein the LED array adjacent to each of the plurality of targets is selectively illuminable through a microprocessor.

[0022] According to yet another aspect of the present invention, there is provided the structure described herein, wherein the microprocessor is programmable to control one or both of sequence and frequency with which the LED array adjacent to each of the plurality of targets is selectively illuminable.

[0023] According to a further aspect of the present invention, there is provided the structure described herein, wherein the microprocessor is programmable through a remote control.

[0024] According to still a further aspect of the present invention, there is provided the structure described herein, wherein the remote control operates through a smartphone application.

[0025] According to yet a further aspect of the present invention, there is provided the structure described herein, wherein one or more targets in the plurality of targets are each equipped with a sensor that registers when any of the one or more targets is struck, thereby sending a signal to the microprocessor to take one or more actions selected from the group consisting of illuminating a light, set off an audible sound and illuminate an LED array adjacent to another target in the plurality of targets.

[0026] According to another aspect of the present invention, there is provided the structure described herein, wherein the planar face is configured for mounting across the front opening of a sports net.

[0027] According to still another aspect of the present invention, there is provided the structure described herein, wherein the sports net is a hockey net, and there are at least five targets in the plurality of targets.

[0028] According to yet another aspect of the present invention, there is provided the structure described herein, wherein the at least five targets comprise targets at each of two upper corners, each of two lower corners and at a lower central portion of the hockey net.

[0029] According to a further aspect of the present invention, there is provided the structure described herein, wherein the sports net is a soccer net.

[0030] According to still a further aspect of the present invention, there is provided the structure described herein, wherein the sports net is a lacrosse net.

[0031] Further details of the invention will be described or will become apparent in the course of the following detailed description and drawings of specific embodiments of the invention, presented as examples only.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The invention will now be described, by way of example(s) only, with reference to the accompanying drawings, in which:

[0033] FIG. 1 is a front elevational view of an embodiment of the invention mounted on the front opening of a hockey net;

[0034] FIG. 2 is a perspective view of one side of the embodiment seen in FIG. 1, showing the hockey net as seen from the front and side, with the embodiment of the invention mounted on the front opening of the net; and

[0035] FIG. 3 is a rear elevational view of the embodiment seen in FIGS. 1 and 2, but not mounted on the net.

DETAILED DESCRIPTION

[0036] As illustrated in FIG. 1, an embodiment of the invention is shown as a sports training structure 100, having a planar face 1, here shown to be made of rugged canvas, which is mounted across the front of a hockey net 2. The planar face 1 is secured to the goal posts 3 and crossbar 4 of the net by any suitable means, such as a number of bungees 5 through grommets 6 in the canvas, the distal ends of the bungees 5 having hooks 7 which hook onto the netting 8 of the hockey net 2 (seen in FIG. 2). The combination of the bungees 5 and the netting 8 ensures that the canvas has some resilience, so that the structure withstands the impacts of hockey pucks more easily. The bungees 5 can be positioned in such a way that they are not impacted by pucks, since otherwise their life might be limited. As another wear-prevention feature, there may be a layer of foam (not shown) between the canvas and the goal posts and crossbar, to extend the life of the canvas. In one embodiment, the foam is 8 mm thick.

[0037] The planar face 1 may have some sort of artwork applied thereto, for example an illustration of a goaltender 20, and a logo or other graphics.

[0038] When adapted to other sports, the size of the planar face 1 will obviously vary, and other forms of attachment obviously could be used. The planar face 1 also is not necessarily mounted to a hockey net 2 or any net for a particular sport; it could be mounted to a separate purpose-built frame, for example, or stretched across any opening, such as across a garage door opening for example. However, the version of the embodiment described herein is intended for installation on a hockey net 2, and for convenience that is the version described herein, on the understanding that the invention is not limited to that configuration.

[0039] The planar face 1 may have any desired number of target areas, which in the embodiment described herein are openings 9 in the canvas. However, as previously stated, the target areas are not necessarily openings. In the embodiment illustrated in FIG. 1, there are seven target areas or openings 9, corresponding to the four corners of the net 9a, 9b, 9c and 9d, areas above the goaltender’s shoulders 9e and 9f, and the so-called “five-hole” between the goaltender’s legs 9g.

[0040] Adjacent to each target area 9 is an LED array 10. Although one LED adjacent to each target area could theoretically suffice, it is preferable that each LED array 10 should include a number of LEDs (five for example), first to provide sufficient target visibility for the player, and second to allow for longer usability of the structure should one or two of the individual LEDs be damaged. Prototype testing has shown that the LED arrays 10 can withstand repeated impacts from hockey pucks fired at 70, 80 or even 90 mph. With few exceptions, even professional hockey players cannot fire a puck at over 90 mph.

[0041] There is no doubt that in time, especially if used extensively, the LED arrays 10 or individual LEDs will eventually sustain damage, and replacement will be required. It is a feature of the structure 100 that this damage does not mean that the entire structure 100 must be replaced.
The structure 100 is designed in such a way that the wiring harness 12 (as illustrated in FIG. 3), through which LED arrays 10 are connected and supplied with power, is readily replaceable in the event of damage. It is also designed so that if any individual LEDs are damaged, the others still work. Thus in each LED array 10, the individual LEDs are wired so that the failure of any one LED does not affect the others in the array 10. Of course, the structure 100 could be configured such that individual LEDs or LED arrays 10 could be replaced. However, the cost of manufacturing the wiring harness 12 in that way would be excessive; it is easier and more cost-effective (both for the manufacturer and for the end user) to simply replace the entire wiring harness 12 only so many of the LEDs have been damaged that the effectiveness of the invention is reduced to an undesirable degree.

[0042] In addition to LED arrays 10 next to the openings 9, in the embodiment described herein and shown in FIG. 1, there are additional LEDs 11 representing the goalmaker’s eyes. These are simply for entertainment value, not for a training function per se. For example, they can be caused to flash occasionally.

[0043] The LEDs of the LED arrays 10 can be of any desirable wattage, lumen outputs, color, etc. The choice of specific LED is not part of the invention as such.

[0044] As can be seen from FIG. 3 (a rear view of the structure 100), the wiring of the circuitry is in one continuous wiring harness 12. From a power source 13, which is in the embodiment described herein a rechargeable battery pack, but could be any power source, the wiring routes first to a microprocessor 14, and then to the upper right target area or opening 9b (as viewed from the front of the net 2 as seen in FIG. 1; upper left as viewed from the back as in FIG. 3). From the upper right opening 9b, the path of the wiring harness 12 continues to the lower right 9d, then to the “five-hole” 9e, then to the lower left 9a, then to the upper left 9f, then to the lower right 9g, and finally to the goalmaker’s eyes 11. Obviously other routings could be used.

[0045] The wiring harness 12 is held in place by flaps 15 (shown in dashed lines in FIG. 3) sewn to the canvas of planar face 1, provided with Velcro™ or other hook and pile fasteners. The wiring harness 12 is held in a suitable position with the LED arrays 10 properly positioned such that the LEDs align with holes in the planar face 1 so as to be visible from the front of the net 2. In FIG. 3, the flaps 15 are shown in dashed lines only, for clarity so that the wiring harness 12 can be seen. However, it should be understood that in fact the flaps 15 cover the wiring harness 12, so that the wiring harness 12 is neither exposed nor visible.

[0046] Thus to replace the wiring harness 12, all that is required is to open the Velcro™ flaps 15, disconnect the harness 12 from the microprocessor 14 (suitable connectors being used), and then replace the defective harness 12 with a new one, and re-close the flaps 15.

[0047] The microprocessor 14 is programmed to make the LED arrays 10 flash in different sequences which can be chosen by user or coach, or the coach can select a specific LED array 10 to flash. Each LED array 10 is separately connected to the microprocessor 14.

[0048] In a typical example of the program implemented by the microprocessor 14, an LED array 10 will flash for approximately four seconds, then pause for approximately two seconds, then another LED array 10 will be randomly chosen by the microprocessor 14, the LEDs of the other array 10 will flash for approximately four seconds and pause for approximately two seconds. This random sequence continues until the program is changed or shut off by the user or coach. The microprocessor 14 can have many different flashing programmed patterns which can be switched at any time by the user or coach.

[0049] For example:

[0050] each LED in an array can flash simultaneously once in a second or flash 50 times in a second

[0051] In an array of four LEDs (named LED one, LED two, and so on), LED one will flash then LED two will flash, LED three will flash and LED four will flash, then three, two, one, and continue again from 2, 3, 4 as the sequence continues.

[0052] middle/out patern: the flashing begins with the middle LEDs of an array and flashes each adjacent LED in the array until reaching the end LEDs of the array of LEDs, and then flashes each LED of the array on the way back to the middle LED and continues this sequence.

[0053] all LEDs of the array starting as turned on, and turning off individually as a puck goes through the respective opening (9a to 9g in the embodiment of FIG. 1). The player’s goal is to turn off all LED arrays. As a puck goes through an opening where the LEDs of an array are off, they could turn back on. Thus the player’s goal could be to first turn all the arrays off, and then turn them all back on. If desired, this could be a timed exercise or competition. (Obviously this feature requires a sensing means to detect when a puck has hit the target, i.e. when it has passed through the targeted opening.)

[0054] Thus as an advanced feature, each target area or opening 9 may have a sensor or trigger mechanism of some type (not shown), which will allow an LED array 10 that is flashing to shut off when an object (i.e. a hockey puck in the case of hockey) goes through the opening 9. Once the object goes through the opening 9 of the flashing array 10, the object triggers the microprocessor 14 to choose another random LED array 10 to flash. The next randomly chosen LED array 10 will not shut off until the object goes through the opening 9 that is adjacent to the flashing array 10 and triggers the sensor to send a message to the microprocessor 14 to switch to another random LED array 10.

[0055] The specific sensor to be used may be selected from a wide variety of options. For example, an electronic motion-detecting device may be used. Alternatively, an electromechanical device could be used, such as a spring-loaded paddle across the opening 9, triggering a microswitch when rotated by impact of the puck. Or a compression pad or impact-sensitive device could be positioned across the opening 9, for example with two spaced-apart layers which come into contact with each other when the pad is impacted, to close a circuit.

[0056] The sequence of flashing of the LED arrays 10 can also be controlled by a remote control wired controller, or by a Wi-Fi or Bluetooth device, or from a smart phone “ap”, allowing the player or coach to choose any LED array 10 to flash or pick one of many flashing patterns. The smartphone app may provide basic control of the microprocessor 14, or preferably may provide full control of all parameters, including which LED arrays 10 flash when and for how long, whether randomly or according to preprogrammed or cus-
7. The structure of claim 4, wherein the electrical power is supplied from a battery pack connected to the wiring harness.

8. The structure of claim 7, wherein the battery pack is rechargeable.

9. The structure of claim 1, wherein the LED array adjacent to each of the plurality of targets is selectively illuminable through a microprocessor.

10. The structure of claim 9, wherein the microprocessor is programmable to control one or both of sequence and frequency with which the LED array adjacent to each of the plurality of targets is selectively illuminable.

11. The structure of claim 10, wherein the microprocessor is programmable through a remote control.

12. The structure of claim 11, wherein the remote control operates through a smartphone application.

13. The structure of claim 9, wherein one or more targets in the plurality of targets are each equipped with a sensor that registers when any of the one or more targets is struck, thereby sending a signal to the microprocessor to take one or more actions selected from the group consisting of illumination of a light, set off an audible sound and illuminate an LED array adjacent to another target in the plurality of targets.

14. The structure of claim 1, wherein the planar face is configured for mounting across the front opening of a sports net.

15. The structure of claim 14, wherein the sports net is a hockey net, and there are at least five targets in the plurality of targets.

16. The structure of claim 15, wherein the at least five targets comprise targets at each of two upper corners, each of two lower corner and at a lower central portion of the hockey net.

17. The structure of claim 14, wherein the sports net is a soccer net.

18. The structure of claim 14, wherein the sports net is a lacrosse net.

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