

[54] **ELECTRIC INDICATOR SYSTEM FOR BALL GAMES**

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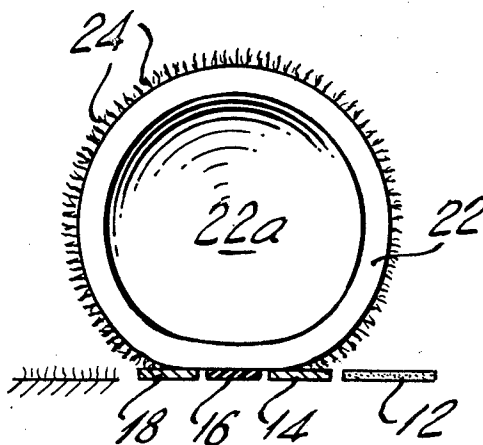
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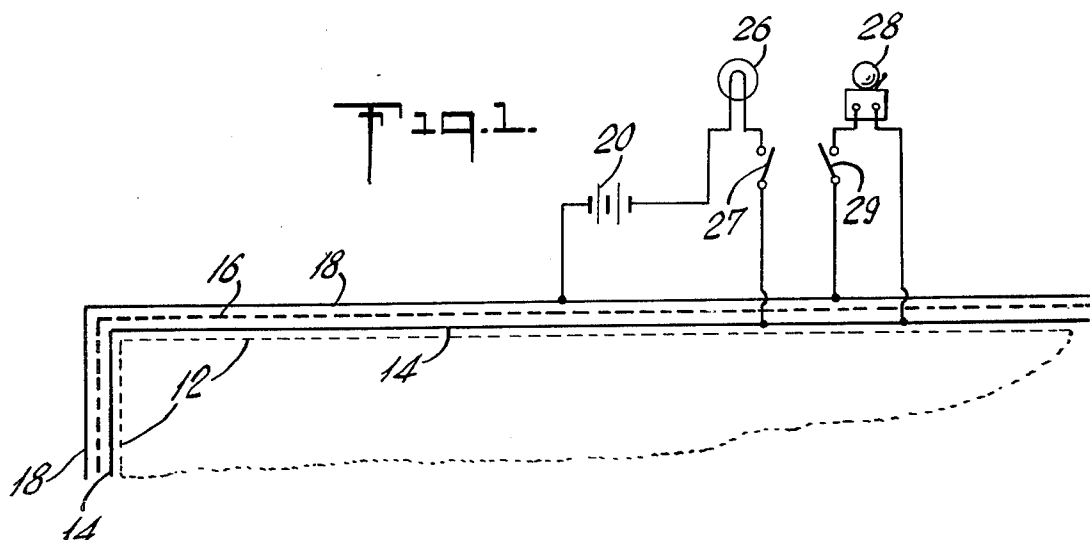
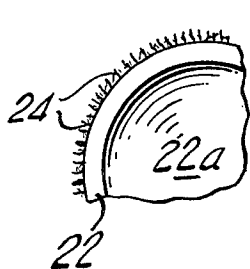
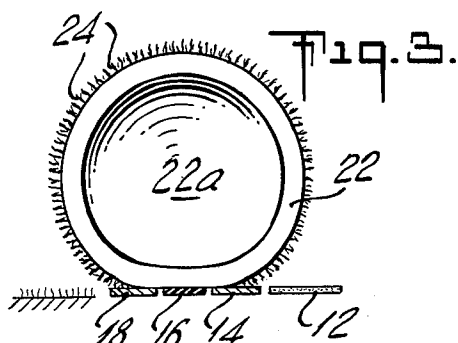
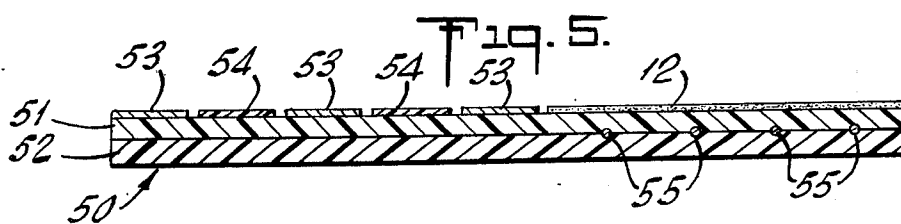
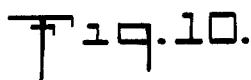
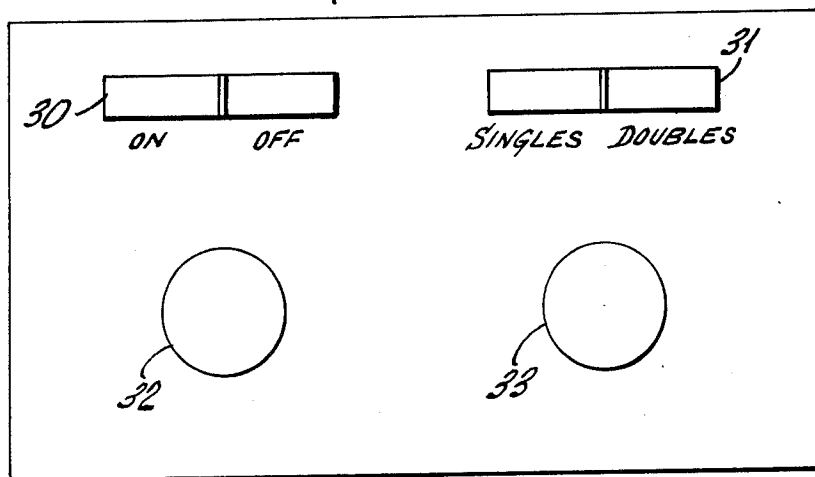
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ABSTRACT

An electric circuit and indicator system for a court game, such as tennis, using conductive elements on both the ball and outside the court playing area to activate a visual and audible indicator when the ball drops outside of the playing area.

10 Claims, 10 Drawing Figures





ELECTRIC INDICATOR SYSTEM FOR BALL GAMES

BACKGROUND OF THE INVENTION

The present invention relates to an electric indicator system for a field or court and ball game, and more particularly to an electric circuit system for determining when struck balls fall outside a field or court, such as a tennis court. It is within the scope of the present invention to utilize the present system in other types of games in which the playing area is within defined boundaries.

A principal object of the present invention is to provide a system in which players, spectators and umpires are able to determine accurately by visual or audio means, or both, whether or not a ball drops, i.e. hits the ground, outside the designated playing area. It is another major object of the present invention to render unnecessary the use of linesmen at tennis matches. A further object of the present invention is to provide an electric indicator and warning system for court games which is relatively easy to install, instantaneous in response, inexpensive to manufacture and will not tend to distract the players while playing the game.

The need for an improved method of determining which tennis balls are "out" and which are still "in play" stems entirely from the difficulty for the human eye of a player, linesman or umpire to infallibly perceive whether a "close" ball is truly an "out" ball, or whether the ball has touched the ground inside a line, or whether the ball has touched a line no matter how slightly, and therefore is still in play. A person can usually, without danger of error, recognize and out ball touching the ground an inch or more outside the line in question. It is the principal object of the present invention, therefore, to ensure that balls touching the ground on the out side of, but in close proximity to a line, can immediately, automatically and infallibly be identified as being out, thereby terminating the point. The problem of erroneous line calls in even the most important matches using experienced linesmen is a serious one. This problem usually arises with respect to either (a) those out balls that are very close, i.e. those that touch the ground within one inch from the outside edge of the line, or (b) those close balls that actually remain in play, i.e. those that are not actually out but are erroneously identified as such. It is estimated that elimination of these types of erroneous calls would preclude at least 95% of the errors that are made.

The system of the present invention offers advantages not appreciated in the relevant prior art. The most relevant prior art that I am aware of is the Swedish Pat. No. 206,864 to Johansson which is unsatisfactory for a number of reasons. Johansson describes a signalling installation for a tennis court and the like wherein the impact of the ball on any of the lines defining the playing surface triggers the signalling means. This is accomplished by provision of conductive wires spaced apart by one or a few millimeters distance and located directly on the boundary lines. The main disadvantage of this system is that repeated signals are obtained while the ball remains in play, as opposed to the present invention wherein the signalling means is activated only when the ball is out. Also, in the Johansson system, if a ball drops close to a boundary line, it is not possible to distinguish between a ball which does not touch the boundary line but is in, from a ball that is out. As the

paramount object of all ball and court indicating devices is the elimination of erroneous "line calls", i.e. of misjudging balls touching the ground on or close to a line, the Johansson system, which does not identify close out balls, does not meet this objective. Moreover, in the Johansson system, a ball touching the inner or outer edge only of the boundary line will not activate the system. Johansson also requires a series of very closely spaced strips of wire, which is highly impractical under actual playing conditions. In accordance with the present invention, the placement of the conductive strips or tapes outside the boundary lines of the court ensures that only out balls will trigger the signal. This has the advantage most important for tennis players, that the system be triggered only once, i.e. when the point is over, so that the distraction of a bell or light does not interfere with play.

For purposes of understanding this specification and drawings a regulation size tennis court and ball will now be described. The overall area of a tennis court is divided into (1) the "playing" area within which a ball must drop in order to be in play, measuring for "singles" (two players) 27 feet by 78 feet and for "doubles" (four players) 36 feet by 78 feet, and (2) the area outside the playing area, all of said areas being usually enclosed by a fence or the like. A net essentially 3 feet high is strung laterally across the middle of the court separating opposing players. In addition, a tennis court has inner lines all as shown in the following diagram.

The following terms will be used in this application.

Court — the playing area defined by those lines within which the ball must drop in order to be in play.

Singles Lines — the longitudinal lines 1 and 2 defining the singles court.

Doubles Lines — the longitudinal lines 3 and 4 defining the doubles court.

Base Lines — the lateral lines 7 and 8 defining the singles and doubles court.

Service Lines — the lateral lines 5 and 6 defining the service courts.

Center Line — the center line 9 parallel to the singles and doubles lines defining the service courts.

Singles Court — the court defined by the two singles lines 1 and 2 and the two base lines 7 and 8.

Doubles Court — the court defined by the two doubles lines 3 and 4 and the two base lines 7 and 8.

Service Court — the court (of a total of four) in which the ball being put in play (served) must drop.

Aisles — the two rectangular areas between the singles court and the doubles court.

Far Court — the half of the singles or doubles court shown in the upper half of the diagram.

Near Court — the half of the singles or doubles court shown in the lower half of the diagram.

out ball — a ball dropping outside the court, i.e. outside a line defining the appropriate court area. Such a ball is not or no longer in play.

Activating Lines — connecting the electric leads described herein which form an open circuit and correspond to the visible lines defining a court, to the power source.

Open circuit — the elements of an electric circuit formed by two or more separate leads, a power source, an indicator, connecting means and selective contact means, such an open circuit being capable of being closed by the electrically conductive surface of a ball touching two neighboring electric leads.

Point — an exchange of "shots" or hit balls commencing with a serve and ending when the ball is no longer in play.

The surface of the court, including the lines which form part of the court, may consist of any non-conductive material such as clay, cement, grass, textiles, plastic, wood and other electrically non-conductive substances.

BRIEF DESCRIPTION OF THE INVENTION

According to one embodiment of the present invention, I provide separate electric current conductive surfaces outside and adjacent to the lines defining a tennis court playing area. In addition, the tennis ball is covered with electric current conductive fibers which co-act with the electric current conductive surfaces in order to close an electric circuit and to activate the electric indicator system. According to another embodiment, such as for baseball, I provide electric current conductive surfaces outside and adjacent to the "foul lines" in a baseball park. In addition, the baseball has an electric current conductive surface which co-acts with the said electric current conductive surfaces outside the foul lines in order to activate the electric indicator system.

According to this one embodiment, the tennis court and surrounding area is composed of an artificial, plastic grass or other fibrous material which can be metallized and rendered electrically conductive. According to another embodiment, plastic sheets comprise the surface on which the electrically conductive tapes described below may be installed. According to yet other embodiments, conductive bands are printed on porous webs or plastic sheets by coating or printing.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features, objects and advantages of the present invention will be fully understood from the following description considered in connection with the accompanying illustrative drawings in which:

FIG. 1 is a partial diagrammatic representation of an electric indicator circuit for a playing court, including both light and bell indicating means.

FIG. 2 is a fragmentary elevation view of a ball used in tennis with conductive fibers thereon.

FIG. 3 is an elevation view of the ball of FIG. 2 shown upon impact and contact with the conductive strips forming a closed circuit in my electric indicator system for tennis.

FIG. 4 is a cross-sectional elevation view of a line and separated conductive leads, in which the court surface constitutes a polymeric fiber web.

FIG. 5 is a cross-sectional view of a composite plastic tape for installation on any type of court surface.

FIG. 6 is a diagram of an electric circuit as used in singles play.

FIG. 7 is a diagram of an electric circuit as used in doubles play.

FIG. 8 is a diagram of an electric circuit as used when putting the ball in play (serving).

FIG. 9 is a diagram of another electric circuit as used when putting the ball in play (serving).

FIG. 10 is a top plan view of an embodiment of a control panel and selective contact means.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is disclosed in FIG. 1 and electric (positive) lead conductive band or strip 14 which partially or completely surrounds the periphery of the lines 12. This band or strip 14 is located adjacent to and abutting, or close to abutting the outside edge of the line 12. The lead strip 14 is preferably about one-half inch in width and is parallel to the lines 12. Exterior to the electric lead or conductive strip 14, an insulating band or strip 16 is provided, which is preferably about one-half inch wide. Strip 16 is of a non-conductive band or nature. Exterior to strip 16 another conductive band or strip 18 is provided forming a second (negative) lead.

The conductive strips 14 and 18 and the non-conductive strip 16 separating the conductive strips may be separate entities or may form part of a composite tape (as in FIG. 4 having strips 14, 16 and 18 on its upper surface.) For instance, such a tape may consist of non-conductive polyvinyl chloride, preferably with a thickness of one thirty-second of an inch and a total width of one and one-half inches. Such a tape can be metallized by coating, printing, painting or spraying on one side along both edges so as to form two distinct electrically conductive bands 14 and 18, each preferably one-half inch in width and preferably separated by a one-half inch wide non-conductive band 16. Such a tape is easily installed on existing courts.

An electric power source 20 applies current to said strips 14 and 18. It is within the scope of this invention to provide more than two electric lead strips outside lines 12. A third, fourth or more leads may be provided as long as they are alternately positive and negative and insulated from each other by non-conductive strips.

The plastic grass web film or other suitable type of surface material forming the lead bands or strips 14 and 18 is metallized in any manner known to the art. For example, the strips of plastic grass may be dipped in a metal bath and the metallizing process therein is initiated by electrolytic action. In the alternative, the conductive strips 14 and 18 may be constituted of metallized yarns. In accordance with a further embodiment of the present invention, conductive bands may be produced by painting, coating or spraying a current-conductive substance on a suitable non-conductive surface in any known manner, such as by producing printed circuits or painting lines on tennis courts.

According to another preferred embodiment illustrated in FIG. 4, I provide a wider tape of the aforementioned type which includes an additional non-conductive but visible band to serve as line 12. Flat tapes of this type are easily installed on existing or new courts, being similar to and only wider than the line tapes currently in use on tennis courts. To facilitate installation, said tapes are provided in sections and the sections may correspond in length to a line.

In still another preferred embodiment illustrated in FIG. 5, in order to permit installing said tapes in separate sections (each section connected to the power source) I use a composite laminated tape 50 capable of carrying a total of two or more separate currents on the surface and inside thereof, which composite contains an upper tape 51 and a lower tape 52. In this embodiment, I use separate uninsulated wires 55 as additional concealed conductors, said wires being individually laminated between two plastic tapes. The upper tape

51 is provided with the conductive strips 53 and non-conductive strips 54. Between the upper tape 51 and lower tape 52 are embedded the concealed wires 55 which are insulated from each other and from the exposed conductive strips or bands on the upper surface of said composite tape 50. The composite tape 50 has electrically conductive coatings only on its upper surface in the form of the strips or bands previously described but does not have conductive bands on its underside. The exposed strips 53 are part of the open circuit formed by the particular tape section, while the wires 55 inside the composite tape section serve to conduct a separate current to another circuit or circuits of which the particular tape section is not a part. By this means, a tape section may carry an open circuit on its upper surface corresponding to the (adjacent) base line while carrying an additional current in its concealed wires to a (distant) service court line. This permits installing these laminated tape sections of different lengths and in different locations as required. These sections, in addition to having the desired number of conductive outer strips, also are provided with the desired number of inside conductors to carry two or more separate currents between other tape sections, the power source, switch and indicator, in order to form the various circuits described. As an example, the composite tape may have five strips on its upper surface of which the outer two and the middle strip are conductive and all connected to the power source as part of one open circuit. In addition, such a multi-current conductive tape has embedded between the upper and lower tapes a total of four wires capable of carrying two additional, separate currents.

The laminated tapes can be prefabricated in desired lengths, having the laminated wires emerge at the ends. The emerging wires are provided with the necessary clamping or other connecting means. The tapes thus serve the dual function of providing exposed electric leads on their surface capable of forming a circuit when closed by an out ball, and of carrying additional, separate electric currents by means of conductors concealed inside said tape sections and not affected by an out ball falling near said tape section.

In one preferred embodiment of my invention, the following circuits are provided:

A. For serving in singles or doubles: two open circuits, each circuit corresponding to the lines defining one set of two service courts on opposite sides of the net including the service court into which the ball is intended to drop. Although there are four service courts, in accordance with my invention, only two such circuits need be installed, as the open circuits corresponding to two contiguous service courts on opposite sides of the net may be connected in one open circuit without in any way interfering with the efficacy of my invention. Thus, for instance, Circuit I shown in FIG. 8 is connected so as to form open circuits for service courts 41 and 43. As can readily be seen, connecting the open circuit of the left-hand service court 43 of the near court does not interfere with determining whether a ball served to the right-hand service court 41 of the far court was out. Circuit II shown in FIG. 9 is connected so as to form open circuits for service courts 42 and 44. Circuits I and II are disconnected as soon as the ball is in play.

B. For singles play, following the serve: Open circuit III is formed as shown in FIG. 6.

C. For doubles play, following the serve: Open circuit IV is formed as shown in FIG. 7. Circuit III or Circuit IV will remain connected for the duration of the match.

To the extent practical, the above circuits may be modified as desired without departing from the spirit of this invention. For instance, during service an open circuit surrounding all service courts may be formed, omitting only the leads adjacent to the center line; the latter may be connected separately and selectively as required.

In a preferred embodiment of the circuits described herein, I provide the control panel shown in FIG. 10 having on/off switch 30 for the entire system and a two-position switch 31 activating either the singles court lines or the doubles court lines. This switch 31 normally remains in the chosen position for the duration of the singles or doubles match. The first spring-loaded button 32, depressed at the time of service, activates the appropriate lines surrounding two contiguous service courts 1 and 3 (designated 41 and 43 in the drawings) on opposite sides of the net i.e. the service lines, the singles lines and the appropriate out side of the center line. The second spring-loaded button 33, depressed at the time of serving, activates the appropriate lines forming the other two contiguous service courts 2 and 4 (designated 42 and 44 in the drawings) on opposite sides of the net, i.e. the service lines, the singles lines and the other out side of the center line. The buttons 32 or 33 are pressed by the umpire prior to the instant of service and are released as soon as the ball is in play. By releasing the buttons, the service court lines are deactivated and only the singles court lines FIG. 6 or doubles court lines FIG. 7 remain activated.

In the event there is no umpire, only switches 30 and 31 will be used, thus permitting monitoring all shots once the ball is in play. This also permits monitoring that section of the service courts formed by the singles lines when the ball is served in a singles game. Without an umpire, buttons 32 and 33 are not used; however, because the number of shots in play is much greater than the number of serves, the system will in any event eliminate most of the erroneous calls.

For purposes of illustrating the uses of the present system and the sequence of activating lines, the following specific examples are given:

Singles Game

i. The umpire or the players throw switch 30 on the control panel to supply power to the system, and switch 31 to activate the singles court lines; these lines then remain activated throughout the match.

ii. To begin the match and put the ball into play, server in position 34 (FIG. 8) prepares to serve to the opponent's right-hand service court 41 in the far court. If there is an umpire (as is the case in all matches which have heretofore required linesmen), the umpire presses button 32 (FIG. 10) to activate all lines defining service courts 41 and 43. If the serve is out the server hits (serves) a second serve.

iii. As soon as the ball is in play, the umpire releases button 32 thereby deactivating the lines defining the service courts.

iv. On the second point, in order to put the ball in play, server in position 35 (FIG. 9) prepares to serve to the opponent's left-hand service court 42 in the far court. If there is an umpire, he presses button 33 (FIG. 10) to activate all lines defining service courts 42 and

44. Button 33 is released as soon as the ball is in play thereby deactivating the service court lines.

Doubles Game

i. The umpire or the players throw switch 30 (FIG. 10) on the control panel to supply power to the system, and throw switch 31 to activate the doubles court lines; these lines remain activated throughout the match.

ii. To begin the match and put the ball in play, server in position 34 (FIG. 8) prepares to serve to the opponents' right-hand service court 41 in the far court. If there is an umpire, the umpire presses button 32 (FIG. 10) to activate all lines defining service courts 41 and 43. If the serve is out the server hits (serves) a second serve.

iii. As soon as the ball is in play, the umpire releases button 32 thereby deactivating the lines defining service court.

iv. On the second point, in order to put the ball in play, server in position 35 (FIG. 9) prepares to serve to the opponents' left-hand court 42 in the far court. If there is an umpire, he presses button 33 (FIG. 10) to activate all lines defining service courts 42 and 44. Button 33 is released as soon as the ball is in play thereby deactivating the service court lines. open

It will be apparent that when serving from the far court in both singles and doubles, the server in position 36 (FIG. 9) will first serve to the right-hand service court 44 in the near court. On the second point, the server in position 37 will serve to the left-hand service court 43 in the near court.

Regulation tennis balls approved by the United States Lawn Tennis Association are approximately two and one half inches in diameter. They are hollow, have a flexible wall and an inside air pressure above atmospheric pressure. When exposed to outside pressure, such as that resulting from impact, the ball will tend to deform and flatten. A ball hit to the ground thus flattens and leaves a mark, the dimension of which will vary with the severity of the impact. At times, said marks are partial skid marks which tend to distort the true dimensional mark of the ball upon impact. Measurements taken on normal clay tennis courts using approved tennis balls indicate that, depending on its velocity, a ball clearing the 3 foot net leaves a mark, when bouncing, of not less than approximately three-fourths inches, measured in the direction of flight and ignoring skid marks.

The surface contact of the ball 22 with the ground causes lead strips 14 and 18 to be electrically connected by means of the current conductive fibers 24 on the surface of the ball 22. When this occurs, a circuit is closed which in turn activates a visual signalling device 16 and/or an audio signalling device 28, each having switches 27 and 29 respectively.

Referring to FIG. 2, the ball used in the present game is preferably a tennis ball with hollow center 22a having plastic metallized conductive fibers 24 on the exterior surface thereof. The fibers 24 may be made conductive, for instance, by coating them with a material consisting of aluminum powder dispersed in a resin. However, it is also within the scope of the present invention to use a ball without a fibrous outer surface. In that case the outer surface of the ball is coated with a current-conductive metallic substance or the cover of the ball may consist of a metallized material.

It will be apparent that if the ball strikes the tennis court area immediately outside the court lines 12 (FIG.

1), and makes contact with both lead strips 14 and 18 simultaneously, the open circuit will be closed or "made" and an electric light such as device 26 flashes or a bell such as device 28 sounds, both of which indicate to the umpire and/or to the players themselves that the ball has struck the ground or court outside the playing area and that the ball was out. (While FIG. 1 shows both a light and a bell for illustrative purposes, it will be understood that the usual system will employ one or the other).

Since virtually all balls used for court games are compressible to some degree, the ball will flatten to a certain extent at the moment of impact with the playing surface. I therefore design the widths of the conductive bands and of the insulating band in accordance with the diameter of the flattened portion of the ball at the moment of impact with the ground. If, for instance, the flattened portion of the ball has a diameter of one inch (which will be typical), I provide a first conductive band 14 and non-conductive band 16 each having a width of one-half inch. The inside edge of the second conductive band 18 closest to line 12 is therefore spaced one inch from the outer edge of line 12. A ball, having a one inch flattened portion, which just misses contact with the outside of line 12 must, therefore, touch inner band 14 and remote band 18, thereby closing the circuit and activating the indicator to signal an out ball.

It is within the scope of the present invention to provide said strips or bands on the ground or floor by any suitable means, including painting, printing, spraying and coating, as well as by installing them on the surface in the form of tapes. The strips may be transparent, of the same color as the ground or floor outside the playing area or simply different in color from the lines defining the court. Since the players wear shoes having non-conductive soles, they will not activate the signal device or devices when they step on the conductive bands or strips. Only the current-conductive fibers or surface of the ball when striking the electric lead strips 14 and 18 will close the circuit and activate the signal device or devices.

The tennis court surface may be constituted of polyamide, acrylic, polyester, polypropylene or other suitable woven, knitted, random or non-woven fabric, web, extruded sheet and the like. For example, a woven fabric may have a backing and may be woven on a broadloom. In weaving a fabric on a loom, two strips each approximately one-half inch wide and one-half inch apart and containing metal yarn such as copper, are woven into the court surface along the outer edge of the side line and other lines. Any of the synthetic fibrous, plastic or rubberized playing surfaces now commercially installed outdoors and indoors on tennis courts can be readily adapted for use in the present invention. One such surface sold under the trade name "Supreme Court" consists of a flexible woven fiberglass sheeting with a laminated underlay of a resilient vinyl foam. The conductive bands of the present invention can easily be applied as a coating on the fiberglass sheeting. The playing surface may also consist of a non-woven fabric, e.g. a needle punched web of acrylic fibers sold under the trade name "Sportface" and having the conductive and the non-conductive visible lines or bands printed thereon. Another type of surface contemplated by the present invention comprises grass imitation polymeric fibers or cut ribbons sold under the tradename "Grand-

slam" and having the lines and bands printed thereon. Another polymeric surface, sold under the tradename "Uniturf" consists of an extruded sheet which may be provided with printed, coated or sprayed lines and bands.

The visible lines are white or of a color different from the playing surface. The conductive and non-conductive bands may be either transparent, or of the same color as the playing surface, but in any case of a color different from that of the lines. With respect to clay courts, it is common at present to install white tapes representing or coinciding with the lines; my invention therefore can easily be applied in such instances by making the said tapes somewhat wider. In the case of wooden surface tennis courts, the visible lines usually are painted and the additional bands contemplated by my invention, which are either transparent or the same color as the floor, are also painted or similarly provided. Some cement or composition "all-weather courts" do not require base lines and doubles lines, the entire doubles game playing area being of a color different from the ground surrounding the doubles court. In that case, no visible base lines and doubles lines need be provided according to my invention. I only provide the exterior separated conductive bands which are either transparent or of a color different from that of the doubles court surface. I determine the width of bands 14, 16 and 18 in accordance with the type of game played and in accordance with the specifications and characteristics of the playing surface and of the ball. Bands 14, 16 and 18 may, accordingly, be wider or more narrow than one-half inch.

It also is within the scope of the present invention to incorporate a metallic substance into the surface fiber of the tennis balls or into the tapes which are to serve as electric leads rather than metallizing them on the surface; this is done by dispersing an electrically conductive substance in the polymer solution prior to extruding the fibers for the balls or the sheets which will be cut into the tapes.

Although specific embodiments and examples of my invention have been described above, it is not intended to be limited thereby as additional modifications and alternates will be readily apparent to those skilled in the art.

What is claimed is:

1. An electric out ball indicator system for a ball and court game comprising

- a. a non-conductive playing area defined by court lines,
- b. at least two spaced parallel, current-conductive strips adjacent to said court lines and exterior to said playing area,
- c. an insulating strip located between said spaced, current-conductive strips,
- d. an electric power source connected to said current-conductive strips, and
- e. an electric indicator,

wherein said a-e define an open electrical circuit; said system further containing a ball provided with current-conductive fibers on its outer surface, such that an out ball will close said open circuit and activate said indicator when contact is made between said current-conductive fibers of said ball and said spaced, current-conductive strips so as to close said open electrical circuit.

2. An electric indicator system for a ball and court game as set forth in claim 1, wherein said ball is provided with fibers attached to its outer surface that are coated with a material constituted of aluminum powder dispersed in a resin.

3. An electric out ball indicator system for a ball and field game comprising a non-conductive playing area defined by field lines, at least two spaced, parallel, current-conductive strips adjacent to said field lines and exterior to said playing area, an insulating strip located between said spaced, current-conductive strips, and an electric power source connected to said current-conductive strips and an electric indicator, in which said power source and indicator together with said current-conductive strips forming an open circuit, said ball being provided with a current-conductive outer surface, wherein an out ball closes said open circuit and activates said signalling device when said surface engages both of said spaced, current-conductive strips.

4. An electric indicator and warning system for games as set forth in claim 3, wherein said current-conductive strips are contained in a coating on the surface exterior to said playing area, said coating comprising an electric current conducting substance.

5. An electric indicator and warning system for games as set forth in claim 1, wherein the inside edge of the current-conductive strip most remote from the court line is spaced from said court line a distance approximately equal to the diameter of the flattened portion of the ball at the moment of impact with the ground.

6. An electric indicator and warning system for games as set forth in claim 3, wherein the inside edge of the current-conductive strip most remote from the court line is spaced from said court line a distance approximately equal to the diameter of the flattened portion of the ball at the moment of impact with the ground.

7. In an electric out ball indicating system for tennis courts, an open circuit comprising

- a. a power source,
- b. an indicator,
- c. non-conductive tapes parallel to and corresponding to the tennis court lines located on the ground exterior to said lines, each tape having at least two electric leads comprised of separated, exposed, conductive bands on its upper surface, and
- d. connecting means between said power source, indicator and conductive bands,

such that an out tennis ball provided with conductive surface fibers and touching two of said electric leads will close said open circuit and thereby activate said indicator.

8. An electrical out ball indicating system in a court and ball game comprising in combination:

- a. an electric power source connected to an open circuit formed by:
- b. a plurality of non-conductive tapes, each tape having on one side thereof:
 - i. a non-conductive, visible line along one edge, said line defining the playing area of the court, and
 - ii. at least two separate parallel electrically conductive bands on the out side of said line, said bands acting as electric leads, separated by a non-conductive band, and

c. an electric indicator capable of being activated upon said open circuit being closed by the electrically conductive surface of an out ball dropping on any two neighboring electric lead bands.

9. An electric out ball indicator system to indicate the end of a point and selectively usable for singles or doubles games on tennis courts having an electrically non-conductive surface inside and outside the lines defining the singles and doubles courts, comprising a power source, an out ball indicator and two open electric circuits, said circuits comprising a first set of alternately positive and negative electric leads in spaced parallel relationship located on the out side of the peripheral lines defining the playing area of the single court, and a second set of alternately positive and negative electric leads in spaced parallel relationship located on the out side of the peripheral lines defining the playing area of the doubles court, and further comprising contact and connecting means for alternatively and selectively connecting said power source and indicator to said first set of singles court leads to form a first open circuit or to said second set of doubles court leads to form a second open circuit, so as to provide a means for a tennis ball having an electrically conductive surface to close the selected circuit and to activate said indicator when it touches two neighboring electric leads outside the lines of the selected court.

10. An electrical circuit system for indicating out balls in a court, net and ball game comprising at least four, at least partially distinct selectively activatable electric circuits, said circuits being formed by:

- a. at least two spaced, current-conductive strips parallel and adjacent to each of the doubles lines, each of the singles lines, each of the base lines and each of the service lines, said conductive strips being located on the out side of said lines,
- b. at least four spaced, current-conductive strips par-

allel and adjacent to the center line, at least two of said conductive strips being located on either side of the center line;

wherein all of said conductive strips are separated by nonconductive strips, said system further comprising,

- c. an electric power source,
- d. selectively activatable, electrical contact means capable of forming at least four, at least partially distinct electric circuits,
- e. electric connecting means between said power source, contact means, indicating means and conductive strips,
- f. electric indicating means to signal out balls, and
- g. a partially deformable ball capable of flattening upon impact with the ground and having electrically conductive fibers on its outer surface so as to be able to create electric contact between two neighboring conductive strips on the out side of a line,

wherein

- i. a first circuit of said system comprises the doubles lines and base lines,
- ii. a second circuit of said system comprises the singles lines and base lines,
- iii. a third circuit of said system comprises the service lines, the singles lines and the out side of the center line defining a first two contiguous service courts on opposite sides of the net, into one of which courts the served ball is intended to drop, and
- iv. a fourth circuit of said system comprises the service lines, the singles lines and the out side of the center line defining a second two contiguous courts on opposite sides of the net, into one of which courts the served ball is intended to drop.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,883,860

DATED : May 13, 1975

INVENTOR(S) : Henry Von Kohorn

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title page, third line, please cancel "von Kohorn" and substitute --Von Kohorn--;

Title page, fifth line, please cancel "Assignee: John J. Schlager" and substitute --Assignee of 25% interest: John J. Schlager--.

Signed and Sealed this

fifth Day of August 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. 3,883,860

DATED May 13, 1975

INVENTOR(S) : Henry von Kohorn

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title page, fifth line, shall read --Assignee of 25%
interest: John J. Schlager, Springfield, N.J.--

Signed and Sealed this

eleventh Day of November 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks