May 9, 1944. B. A. WARMEY ET AL 2,348,431

SCOREBOARD

Filed June 13, 1940 3 Sheets-Sheet 1

Fig. 1.

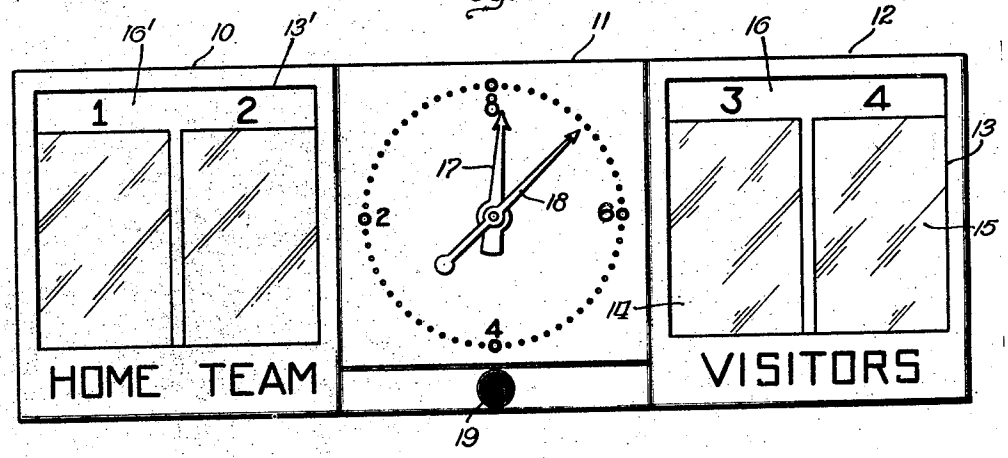


Fig. 2.

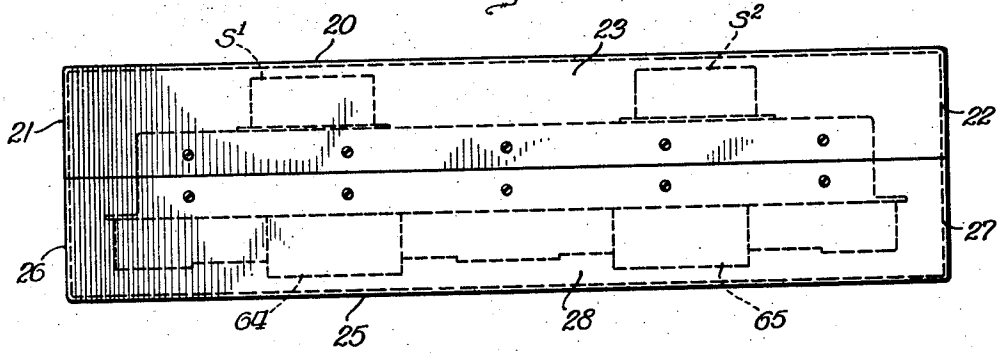
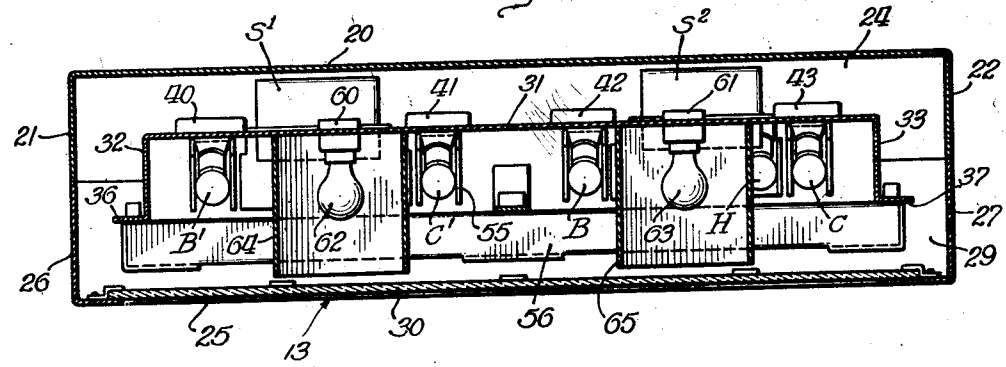


Fig. 3.



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SCOREBOARD

Filed June 13, 1940 3 Sheets-Sheet 2

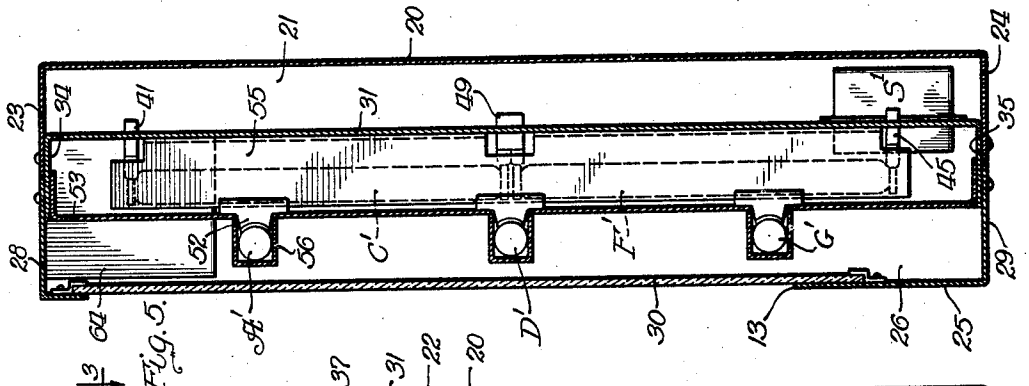


Fig. 5.

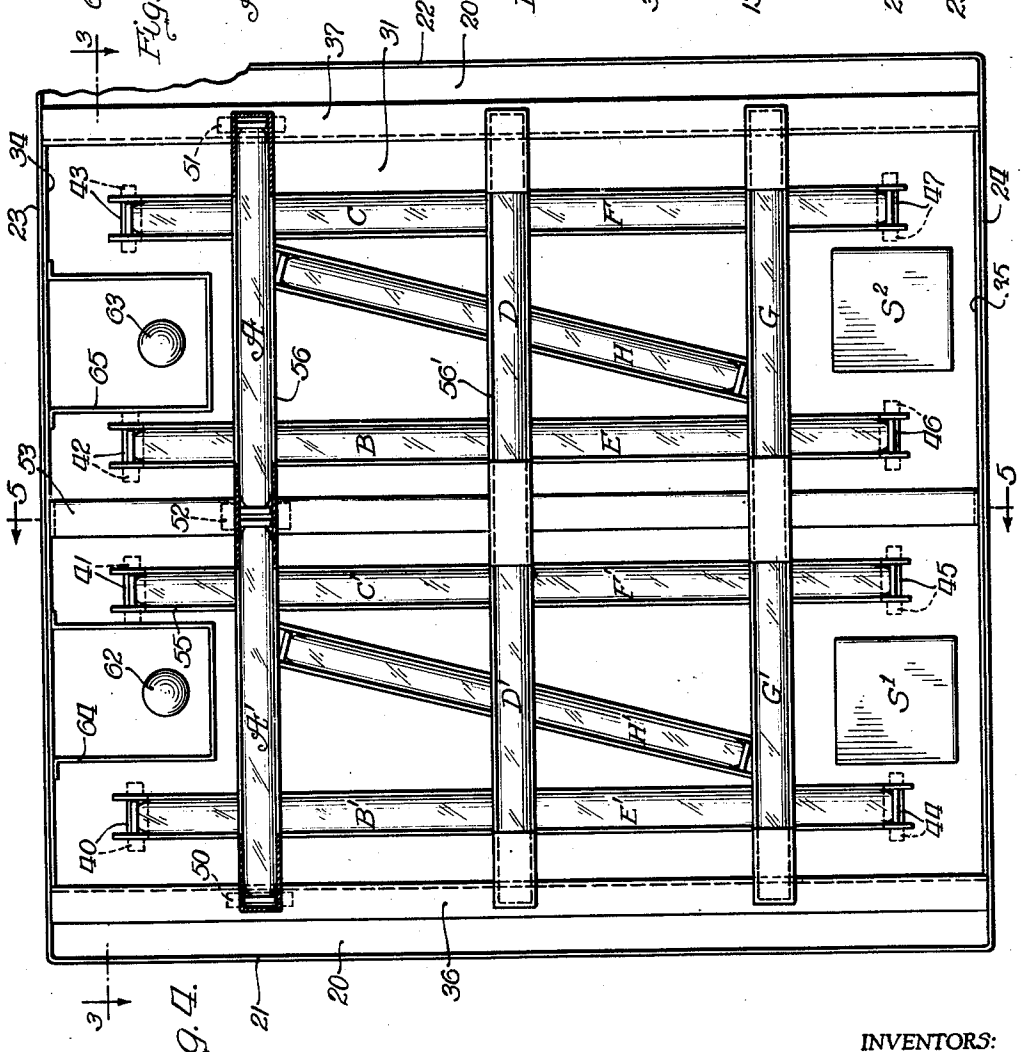


Fig. 4.

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SCOREBOARD

Filed June 13, 1940 3 Sheets-Sheet 3

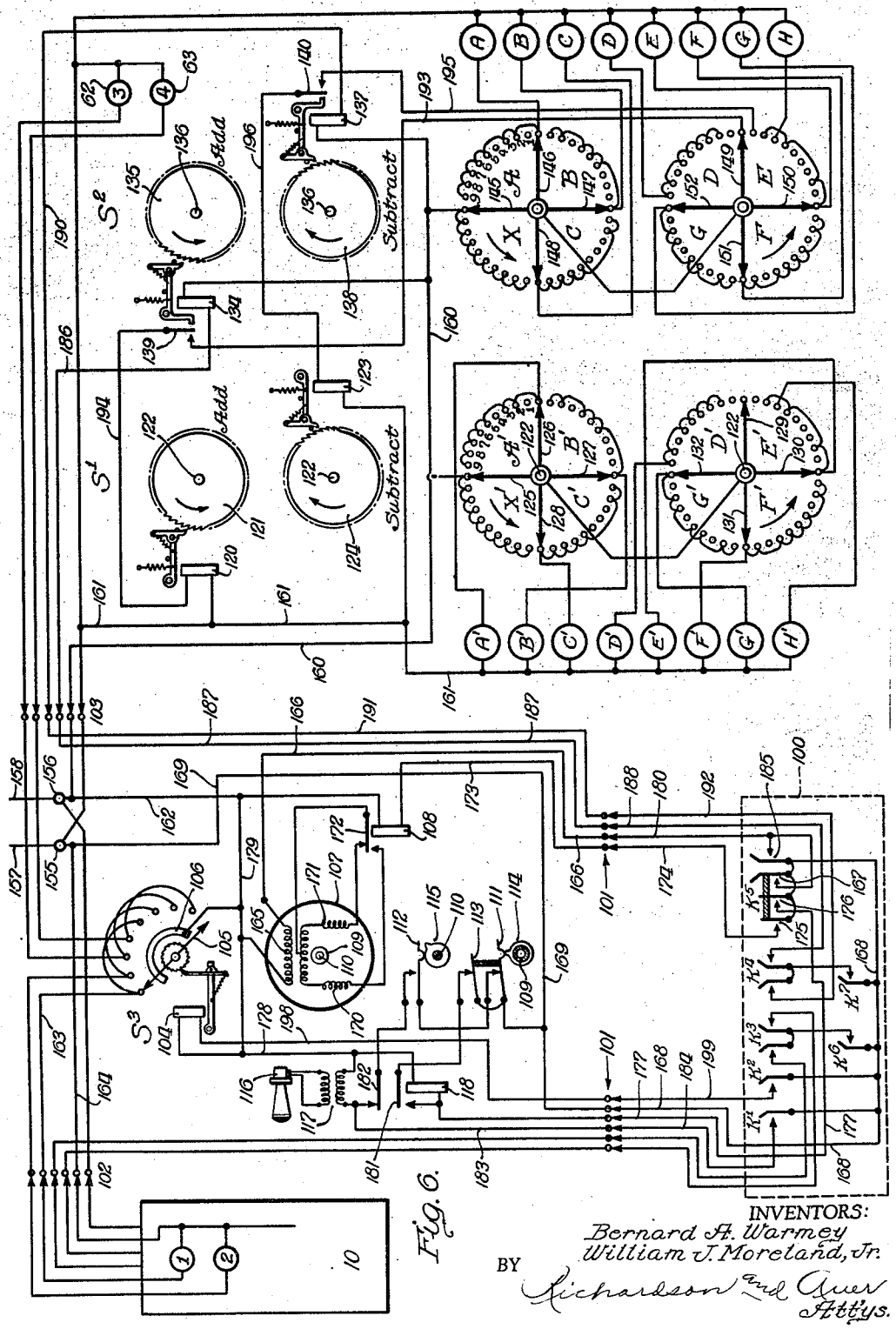


Fig. 6.

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Patented May 9, 1944 2,348,431

UNITED STATES PATENT OFFICE

2,348,431

SCOREBOARD

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Application June 13, 1940, Serial No. 340,378

12 Claims. (Cl. 177—384)

The present invention relates in general to scoreboards, such as may be used for visually indicating the progress of a game to the spectators, and more in particular to a scoreboard of this type which is adapted for use in connection with the game of basketball. The object of the invention is the provision of a new and improved device of this character.

The invention and various features thereof will be described in detail hereinafter, reference being made to the accompanying drawings, in which—

Fig. 1 is a front view of the complete scoreboard, comprising home team and visitors scoring devices and a central clock cabinet;

Fig. 2 is a top view of one of the scoring devices, with casing assembled;

Fig. 3 is a section through one of the scoring devices, on the line 3—3, Fig. 4;

Fig. 4 is a front view of one of the scoring devices, with the front part of the casing removed;

Fig. 5 is a section on the line 5—5, Fig. 4; while

Fig. 6 is a diagrammatic circuit drawing showing the electrical connections.

Referring to Fig. 1, the scoreboard is constructed on the sectional plan, and comprises three separate casings or cabinet sections 10, 11, and 12, which are of uniform height and are adapted to be mounted side by side against a wall or other support to form a complete scoreboard. While the installation may be more or less permanent, the scoreboard is portable and the sectional construction greatly facilitates handling and transportation from place to place. At the same time the arrangement is such that the appearance of a unitary structure is presented when the three sections are assembled for use.

The right hand section 12 comprises a sheet metal casing in which is contained scoring apparatus capable of displaying any number containing one or two digits. This apparatus consists of an arrangement of tubular lamps and a switch for controlling them, all of which will be described in detail. The front of the casing has a rectangular opening 13 therein, behind which there is secured a sheet of glass 30 (Figs. 3 and 5) having translucent portions 14 and 15 and a portion 16 which is opaque to light. The portion 16 may be made opaque by a coating of black paint or other suitable material. The numerals 3 and 4 are translucent and are made in any suitable manner, as by pasting paper numerals to the glass before the paint is applied and removing them after the paint is dry. The word "Visitors" appears below the opening 13 in large letters which may be painted or stencilled on the casing in any suitable manner.

The first section 10 is similar to the third section in all respects, except that the words "Home team" appear below the display opening 13', and the numerals 1 and 2 are shown in the opaque space 16' instead of the numerals 3 and 4. It may be mentioned here that the numerals 1 to 4 are used to indicate the four quarters of the game and are conveniently divided between the two scoring sections, which makes a symmetrical arrangement.

The second or central section 11 comprises a casing in which is contained the clock motor, a signal horn, and two relays which will be described hereinafter. The front of the casing is arranged to resemble a clock face, as shown in Fig. 1. The hand 17 is the minute-hand and is driven by the clock motor through the medium of suitable gearing so that it makes one complete rotation in eight minutes, corresponding to the length of the quarters in high school basketball. The hand 18 is the second-hand and makes one complete rotation in one minute. These hands traverse a dial which is subdivided into 60 parts, the points of division being represented by circles, as shown. From the standpoint of the second-hand, each division represents one second. As regards the minute-hand, fifteen divisions represent two minutes, thirty divisions four minutes, and so on. The hands are mounted on two concentric shafts which extend through the front of the casing, said shafts being driven at the proper speeds by suitable gearing and a motor in known manner. The motor will be described more in detail in connection with the circuit drawings, Fig. 6. At the lower front of the casing 11 there is a grill 19 behind which the signal horn is mounted.

It will be convenient now to consider one of the scoring sections such as 12 more in detail, reference being made to Figs. 2 to 5, inclusive. The outer casing is made in two parts, each resembling a shallow rectangular pan. The rear part of the casing comprises the back 20, sides 21 and 22, top 23, and bottom 24. The front part comprises the front 25, sides 26 and 27, the top 28, and bottom 29. The two parts are assembled edge-to-edge, as shown in Figs. 2, 3, and 5. The front 25 is cut out at 13, as indicated in Fig. 1, and behind the opening the sheet of glass 30 is supported as shown.

Within the casing there is a chassis comprising the back 31, sides 32 and 33, top 34, and bottom 35. The chassis also resembles a shallow rectangular pan. The sides 32 and 33 are extended at right angles as indicated at 36 and 37. The chassis is of the proper height to fit snugly within the casing, where it is hold by screws. As indicated in Figs. 2 and 5, there are a plurality of screws passing through the top members 23 and 28 of the casing, said screws being threaded into the top member 34 of the chassis. Similar screws pass through the bottom members 24 and

29 and are threaded into the bottom member 35 of the chassis. Since the front and rear parts of the casing are both secured to the chassis, the latter forms a means for holding the two parts of the casing together, either part being removable at will, leaving the chassis assembled with the other part.

The lamps forming the visual indicator may be of the type known as "Lumeline" and are mounted on the chassis. The sockets 40 to 47, inclusive, are mounted on the back member 31 of the chassis, together with four double sockets such as 49, and serve to support and conduct current to the vertical lamps B', C', E', F', B, C, E, and F. There are also four sockets mounted on back member 31 for accommodating the diagonally positioned lamps H' and H. The horizontal lamps A', D', G', A, D, and G are supported on three sockets such as 50 mounted on the chassis rim 36, three sockets such as 51 mounted on the opposite rim 37, and three double sockets such as 52 mounted on a vertical strip 53 which is attached above and below to top and bottom members 34 and 35 of the chassis.

The vertical lamps are provided with shields such as 55, of U-shaped cross-section, which are cut out around the sockets and are secured to back member 31. Each shield takes care of two lamps, as indicated clearly in Fig. 5. Similar shields are provided for the lamps H' and H. Each pair of horizontal lamps, such as A' and A, is provided with a shield such as 56, the construction of which will be obvious from the several views of the drawings. The purpose of the shields is to prevent diffusion of light to the sides of the lamps, which would otherwise render the outline of the lamps indistinct.

There are two lamp sockets 60 and 61 mounted on the chassis, as seen in Fig. 3, which support lamps 62 and 63. The sockets are properly located so that the lamps are directly behind the numerals 3 and 4 shown in Fig. 1. Shields 64 and 65 are provided to prevent diffusion of light from these lamps. Also mounted on the chassis are two switches S^1 and S^2, only the outline of which is shown, owing to the scale of the drawings. These switches are of known type and are explained in connection with the circuit drawing.

Lamps A' to H' constitute a set and are used for displaying the tens digit in the score. Lamps A to H likewise constitute a set and are used for displaying the units digit. In order to display desired digits, the lamps are lighted in different predetermined combinations in which they are effective to form the outlines of the digits. Thus, if the digit 0 is to be displayed on the units set, the lamps A, B, C, E, F, and G are lighted. For convenience the following table is inserted to show the lamp combination used for each digit:

Digit	Lamps
0	A, B, C, E, F, G.
1	C, F.
2	A, C, D, E, G.
3	A, C, D, F, G.
4	B, C, D, F.
5	A, B, D, F, G.
6	A, B, D, E, F, G.
7	A, H.
8	A, B, C, D, E, F, G.
9	A, B, C, D, F, G.

It will be understood that the two scoring devices, sections 10 and 12, are the same except for the slight differences mentioned in connection with Fig. 1, and hence the preceding description will serve for both. The description of the casing and chassis will also suffice as regards the clock section 11, where the different equipment items are mounted on the chassis in any suitable manner.

Referring to Fig. 6, the scoreboard is operated from a control panel indicated by the rectangle 100. This equipment may be in the form of a small cabinet adapted to be supported on a table or in any convenient manner. On the cabinet are mounted keys K^1 to K^7, inclusive, the function of which will be explained presently.

In order to carry out the quick assembly and portability feature, the control cabinet and the three equipment sections are connected by plug and jack connections, as indicated at 101, 102, and 103. The jacks are preferably located on the central clock section at the rear of the casing. The conductors coming from the scoring sections 10 and 12 are in the form of cables, three or four feet long, terminating in plugs. The conductors coming from the control cabinet are also preferably in the form of a plug-ending cable which, however, should be much longer. One hundred feet or more may be supplied, depending on the situations in which the equipment is to be used.

The different items of equipment in the clock section will now be described briefly. The switch S^3 is a step-by-step switch of known type, comprising a stepping magnet 104, an associated ratchet mechanism for driving a double wiper or brush 105, and a bank of eight or more contacts which are multipled together in groups of four, as shown. The brush 105 connects the common segment 106 with the individual contacts selectively, as will be readily understood.

The clock motor and associated gearing for driving the hand shafts are represented by the circle 107. The motor is of known type, being a reversible synchronous motor, adapted to run on commercial 60-cycle alternating current. Relay 108 is a reversing relay. A cam 114 is mounted on the minute-hand shaft 109 and controls contact springs 111 and 113. A similar cam 115 on the second-hand shaft 110 controls the contact spring 112. These cams control the circuit of the signal horn 116, which is preferably of the low voltage type and is supplied with current by the step down transformer 117. Relay 118 is for stopping the horn under certain conditions which will be explained.

At the right of Fig. 6 are shown the tens and units switches S^1 and S^2 which are provided for controlling the lamp sets in the scoring section 12. The switch S^1 comprises two ratchet mechanisms and two banks of contacts with their associated wipers or brushes 125 to 128, inclusive, and 129 to 132, inclusive. Both sets of brushes are mounted on a common shaft 122, and all the brushes are conductively connected. The shaft 122 is rotated in a counterclockwise direction by a ratchet mechanism comprising stepping magnet 120 and ratchet wheel 121, and in a clockwise direction by the ratchet mechanism comprising stepping magnet 123 and ratchet wheel 124.

The banks are divided into eight quadrants which are labeled in the drawings as X' and A' to G', inclusive. Each quadrant has ten contacts, corresponding to the digits 0 to 9 and numbered in that order when the counterclockwise direction of the switch is considered. The wiper which moves over the X' quadrant makes connection with one side of the current source in

all positions and thus renders all the other wipers active. Each of the other quadrants is associated with a particular lamp, quadrant A' being used for controlling lamp A', quadrant B' for controlling lamp B', etc. An exception to the foregoing is quadrant E', which controls lamp H' as well as lamp E'. In view of the numbering of the contacts it will be understood that the switch adds when driven in a counterclockwise direction and subtracts when driven in the opposite direction.

The switch S^2 is similar to switch S^1. The ratchet mechanism comprising stepping magnet 134 and ratchet wheel 135 drives the shaft 136 in a counterclockwise direction, and the ratchet mechanism comprising stepping magnet 137 and ratchet wheel 138 drives the shaft in a clockwise direction. On the shaft 136 are mounted two sets of wipers 145—148 and 149—152. With each set of wipers there is associated a bank of contacts, divided into four quadrants, as shown. The arrangement here is the same as in switch S^1, already described.

Switch S^2 is provided with means for controlling switch S^1 comprising a contact spring 139 which is effectively operated when the armature of stepping magnet 134 is fully attracted, and a contact spring 140 which is similarly controlled by the armature of stepping magnet 137.

The scoring section 10 for the home team is the same as section 12 and consequently is not shown in detail in Fig. 6, being indicated merely by a rectangle. The circuits for the lamps which illuminate the quarters digits 1 and 2 are, however, shown in the drawings.

The central clock section 11 may be provided with a pair of power terminals 155 and 156, to which a plug-ending cord comprising conductors 157 and 158 is attached. By plugging into an available socket commercial current is supplied to the equipment. It should be mentioned that the various magnets and relays are designed to operate on alternating current; that is, they will hold their armatures attracted as long as their circuits are closed.

The operation of the equipment in scoring a game of basketball will now be explained briefly. Shortly before the game is to start, the plug attached to the cord comprising conductors 157 and 158 is inserted in a convenient socket, as mentioned previously, and power is supplied to the equipment.

Assuming that the tens and units switches S^1 and S^2 are in the position in which they are shown, that is, the position corresponding to the digit 0, the lamp set comprising lamps A' to G', inclusive, will display the digit 0 as the tens digit and the lamps of set A to G, inclusive, will display the digit 0 as the units digit. The circuit of the tens lamps extends from terminal 156 by way of conductor 160, zero contact of quadrant X', brush 125, brushes 126, 127, 128, 130, 131, and 132 in parallel, lamps A', B', C', E', F', and G' in parallel, and thence over conductor 161 to terminal 155. The circuit for the units lamps is similar and need not be traced in detail, it being understood that the corresponding lamps A, B, C, E, F, and G are lighted. Thus the digit 0 is displayed as the tens and units digits at the scoring device 12.

It may be assumed that the tens and units switches in scoring device 10 are also in zero position, and accordingly this scoring device will also display the digit 0 as both the tens and units digits.

Assuming that switch S^3 is in the position shown, a circuit for lighting the lamp in scoring device 10 which illuminates the quarters digit 1 will be closed, said circuit extending from terminal 156 by way of conductor 162, conductor 179, common segment 106, brush 105, first contact in bank of switch S^3, conductor 163, lamp behind digit 1, and conductor 164 to terminal 155. The illumination of the quarters digit 1 indicates that the first quarter is about to start.

Having observed that the scoring devices are in proper order, the operator at the control cabinet now notes the positions of the hands of the clock, which should both be set at the digit 8, Fig. 1. Assuming that the hands are in the position in which they are shown, the operator throws the key K^5 to the left, thereby closing three circuits which will be described. The first circuit extends from terminal 156 by way of conductor 162, conductor 179, field winding 165 of the clock motor, conductor 166, conductor 180, contact 167 of key K^5, conductor 168, and conductor 169 to terminal 155. This circuit energizes winding 165. The second circuit extends from terminal 156 by way of conductor 162, winding of relay 108, conductor 173, conductor 174, contact 175 of key K^5, conductor 168, and conductor 169 to terminal 155. This circuit energizes relays 108, which attracts its armature 172 and opens the circuit of shading coil 171, at the same time closing the circuit of shading coil 170. Winding 165 being energized, the clock motor now runs in the proper direction to move hands 17 and 18 backward, or in a counter-clockwise direction. The hands will come together at the digit 8, and when they reach this point the clock motor is stopped by restoring key K^5

The third circuit above referred to extends from terminal 156 by way of conductor 162, conductor 179, conductor 178, winding of relay 118, conductor 177, contact 176 of key K^5, conductor 168, and conductor 169 to terminal 155. Relay 118 energizes when the circuit is closed and locks itself to conductor 169 via its armature 181 and contact 113, the latter being closed at this time by minute-hand cam 114. The locking circuit is independent of key K^5, so relay 118 remains energized after the key is restored. In its energized position, relay 118 holds open a circuit for operating the signal horn, said circuit extending from terminal 156 by way of conductor 162, conductor 179, conductor 178, primary winding of transformer 117, contact 182, contact at spring 112 (closed by the second-hand cam 115 when the hand points to the digit 8), contact at spring 111 (closed by minute-hand cam 114), and conductor 169 to terminal 155. Thus it will be seen that when the hands are backed up to the starting point at digit 8 the horn is not sounded.

When the game is to start, the operator momentarily actuates key K^1, which closes a signal circuit extending from terminal 156 by way of conductor 162, conductor 179, conductor 178, primary winding of transformer 117, conductor 183, conductor 184, key K^1, conductor 168, and conductor 169 to terminal 155. Upon the closure of the above circuit current is caused to flow in the secondary winding of transformer 117 and through the horn. When the horn sounds, the ball is put in play and at the same time the operator actuates key K^5 to the right. This operation of the key closes a circuit for the motor winding 165 over a path the same as that previously traced, except that it includes contact 185 of key K^5, and the clock motor is started.

Relay 108 not being energized, the motor runs in such a direction that the hands 17 and 18 are moved forward, that is, in a clockwise direction. As soon as the hand 17 has advanced a short distance the cam 114 permits the locking circuit 184 of relay 118 to open at spring 113 and the relay deenergizes.

The clock continues to run while the ball is in play and its instant position always indicates the number of minutes and seconds of the quarter which remain to be played. In case a foul is committed, the signal horn is sounded and the clock motor is stopped by restoring key K^5. The clock is again started by operating the key when play is resumed. It will be understood also that the clock is stopped and started again when time is taken out for any other reason.

The operation of the scoring devices may now be considered. Assuming that the visiting team scores on a free throw, the key K^4 is actuated to the right, or to adding position, and key K^7 is momentarily operated, thereby closing a circuit which extends from terminal 156 by way of conductor 160, winding of stepping magnet 134 of units switch S^2, conductor 186, conductor 187, conductor 188, key K^4, key K^7, conductor 168, and conductor 169 to terminal 155. Upon the closure of this circuit, magnet 134 is energized and the ratchet wheel 135 is advanced one step, which advances the brushes 145—152 from the zero position to the position corresponding to the digit 1. The digit 1 is thus displayed as the units digit instead of the digit 0. The digit zero, however, is still displayed as the tens digit.

Assuming now that the visiting team scores on a field goal, the operator goes through the same procedure as before, except that the key K^7 is actuated twice momentarily. Magnet 134 is thus given two impulses, which advances the switch S^3 to the position corresponding to the digit 3. Accordingly this digit is now displayed as the units digit.

When the home team scores, the units switch in the scoring device 10 is advanced in the same manner as described, by means of keys K^3 and K^6, the former key being set in the adding position.

In case a point is scored by mistake, or is not allowed after being scored, the units switch such as S^2 is stepped backward in order to correct the score. In order to accomplish this the operator actuates key K^4 to the left, or to the subtract position, and then actuates key K^7 once or twice, depending on the amount of the error. One or more impulses are thus transmitted to the stepping magnet 137 and the switch is stepped in a reverse direction to the proper position. The circuit of magnet 137 extends from terminal 156 by way of conductor 160, winding of stepping magnet 137, conductor 190, conductor 191, conductor 192, key K^4, key K^7, conductor 168, and conductor 169 to terminal 155.

Assuming now that nine points have been scored by the visiting team, the units switch will have been advanced to its ninth position, wherein the digit 9 is displayed as the units digit. When another point is scored, the stepping magnet 134 will be given another add impulse in the manner explained, and the switch brushes will be advanced from ninth position to zero position, each brush moving ahead into the next quadrant. When brush 150 moves from ninth position in quadrant E to zero position in quadrant D, a circuit is completed for advancing the tens switch S^1, said circuit extending from terminal 156 by way of conductor 160, brush 146 (now in quadrant X), brush 150 (now in quadrant D), conductor 193, contact at spring 139 (now closed by armature of stepping magnet 134), conductor 194, winding of stepping magnet 120, and conductor 161 to terminal 155. The above circuit is not closed until stepping magnet 134 is nearly fully energized, or until the brushes have reached the zero position, and remains closed momentarily until magnet 134 is deenergized. The result is that an impulse is transmitted to the stepping magnet 120 and the tens switch S^1 is advanced one step from zero position to the position corresponding to the digit 1. The digit 1 is now displayed as the tens digit and the digit 0 as the units digit, showing a score of ten points.

As the game continues the units switch is advanced one or two steps at a time as scores are made until the score of nineteen is displayed. When the next point is scored the tens switch is again advanced in the manner described, and the digit 2 is displayed as the tens digit, while the digit 0 is displayed as the units digit. Thus the scoring device shows a score of twenty points.

In the event a point is scored in error which advances the tens switch S^1, as when the switches are advanced to show a score of ten or twenty points, it becomes necessary to step both switches backward in order to correct the mistake. The units switch S^3 is stepped backward from zero to ninth position in the manner already explained. When the wiper such as 150 moves from quadrant D back to the ninth bank contact in quadrant E, a circuit is completed for the stepping magnet 123 which extends from terminal 156 by way of conductor 160, brush 145, brush 150, conductor 195, contact at spring 140 (magnet 137 being energized), conductor 196, winding of stepping magnet 123, and conductor 161 to terminal 155. An impulse is thus transmitted to the stepping magnet 123 which steps the tens switch backward one step. Thus the error is corrected by the reverse stepping of both the units and tens switches. It will be understood that in case the score is changed from a number such as nineteen to twenty-one by mistake, two subtract impulses will have to be transmitted to the units switch. The first subtract impulse will step the units switch back one step while the second will step back both switches in the manner described.

When the time for the first quarter has nearly expired the hand 17 will have made nearly one complete rotation and cam 114 will again close the contact at spring 111. When the second-hand 18 catches up with the hand 17 on the eighth rotation of the second-hand, the hands will come together at the digit 8 on the clock dial and cam 115 will close the contact at spring 112. The latter operation, which has been ineffective during the seven previous rotations of the second-hand, due to the inoperative position of cam 114, now closes the previously traced signalling circuit and the horn 116 is automatically sounded, indicating the end of the quarter. The horn is sounded for about two seconds, being stopped automatically when the clock runs past the starting point. The operator then stops the clock motor by restoring key K^5 and starts it in the reverse direction by reversing the key in order to set the hands at the digit 8, as previously explained. The operation of key K^5 to reverse the clock motor also operates relay 118 over a circuit previously traced and the relay locks itself at armature 181, thereby preventing the re-

operation of the horn 116 by opening the signalling circuit at armature 182.

The clock hands are now in position to start the second quarter, and the scoring devices display the scores made so far by the respective teams. During the intermission the operator will advance the switch S^3 one step by momentarily operating the key K^2, which closes a circuit extending from terminal 156 by way of conductor 162, conductor 179, winding of stepping magnet 104, conductor 198, conductor 199, key K^2, conductor 168, and conductor 169 to terminal 155. The single impulse thus transmitted to the stepping magnet 104 causes the latter to advance the switch S^3 one step from position 1 to position 2, in which a circuit is completed for the lamp located behind the quarters digit 2 in the scoring device 10. The illumination of this digit indicates that the second quarter is about to be played.

The operation of the equipment during the second and succeeding quarters is the same as described. At the end of each quarter except the last the operator sets the clock hands in readiness for the next quarter and steps the switch S^3 ahead one step. Thus during the third and fourth quarters, respectively, the lamps 62 and 63 will be lighted. If the score is a tie at the end of the fourth quarter, the operator prepares for the overtime period by reversing the clock and allowing it to run backward until it shows three minutes left to play. In other words, the clock motor is run in the reverse direction until the second-hand has made three complete rotations. The length of the overtime period can, of course, be varied by agreement and may be two minutes instead of three. The reversibility of the clock motor is of considerable advantage in this situation, as it saves a large part of the time that would otherwise be occupied in running the clock forward from 8 to 3 or 2.

When the game is over the switches in the scoring devices may be stepped to zero position by transmitting subtract impulses thereto in the manner described, in order that they may be in the proper position the next time the equipment is used. The switch S^3 may also be stepped ahead to first position, or multiple thereof. The equipment is then disconnected by withdrawing the plug associated with conductors 157 and 158.

It will be seen that the invention provides a scoreboard having numerous advantages as regards simplicity and rapidity of operation, accuracy, and completeness of the information displayed, as well as the high degree of visibility afforded. While the construction and operation have been described in detail, this has been done for convenience in explaining a desirable form of the invention, and it will be understood that modifications can be made, particularly as regards the equipment items specified, without departing from the spirit of the invention. We do not therefore wish to be limited to the exact form of the invention which is shown and described herein, but desire to include and have protected by Letters Patent all forms and modifications that come within the scope of the appended claims.

We claim:

1. In a scoring device, a set of tubular lamps for displaying any tens digit, a set of tubular lamps for displaying any units digit, a step-by-step switch for controlling the tens digit lamps, a step-by-step switch for controlling the units digit lamps, means for stepping the units switch in either direction, and means controlled by said units switch for automatically stepping the tens switch in either direction.

2. In a scoring device, tens and units indicator lamps, tens and units switches for controlling said lamps, stepping magnets in each switch for driving the same in either direction, and circuits for the stepping magnets of the tens switch controlled, respectively, by the stepping magnets of the units switch.

3. In a scoring device, tens and units indicator lamps, tens and units switches for controlling said lamps, a stepping magnet in each switch, contacts controlled by the armature of the stepping magnet of the units switch, and a circuit for the stepping magnet of the tens switch which includes said contacts and a bank contact of said units switch.

4. In a lamp indicator, a chassis, sets of tubular lamps mounted on said chassis, a casing comprising front and rear pan-shaped parts disposed on opposite sides of said chassis with their open edges together, means for removably securing each of said parts to said chassis, and a translucent window in said front part through which characters are displayed by said lamps.

5. In a basketball scoreboard system, a set of lamps for displaying any units digit, a set of lamps for displaying any tens digit, units and tens switches for controlling said lamp sets, respectively, operator's control equipment, means included in said equipment for transmitting impulses to said units switch to increase or decrease the value of the units digit displayed by the associated lamps, and means automatically responsive to an impulse transmitted to the units switch at a time when the highest units digit is displayed for advancing the tens switch to increase the value of the tens digit displayed.

6. In a scoreboard, indicating means comprising two tubular lamps vertically disposed in two spaced parallel lines, three horizontal tubular lamps spaced apart and crossing said vertical lamps, a diagonally disposed tubular lamp, a step-by-step switch having a wiper for controlling each lamp, circuits closed by said wipers in one position of said switch for illuminating a combination of said lamps for displaying the digit zero, and circuits closed by said wipers in successive adjacent positions of said switch for illuminating different combinations of said lamps to display the digits one to nine, respectively, whereby the step-by-step operation of said switch through all its positions causes the display of the digits zero to nine in regular order.

7. In a scoreboard, a set of lamps for displaying any digit when lighted in different combinations, a switch for selecting said combinations, add and subtract magnets for stepping said switch in either direction, circuits for said magnets, respectively, manually operated means for selecting either magnet circuit at will and for closing the selected circuit at one point to prepare for impulse transmission thereover, and a manually operated device for transmitting stepping impulses over the selected circuit by closing the same at another point.

8. In a scoreboard, a plurality of lamps for displaying any digit when lighted in different combinations, a switch for selecting said combinations, said switch having a number of wipers equal to the number of said lamps, circuit connections including one wiper for supplying current to all the other wipers, circuit connections including said other wipers for distributing the

current to a like plurality of said lamps, respectively, and a circuit for the remaining lamp including one of said other wipers in a position in which the corresponding lamp is unlighted.

9. In a scoreboard, a set of tubular lamps for displaying any tens digit, a set of tubular lamps for displaying any units digit, two step-by-step switches for controlling the tens digit lamps and the units digit lamps, respectively, each said switch having a plurality of wipers and a plurality of cooperative contact banks for supplying current to said lamps in different digit combinations in different positions of the wipers, add-and-subtract magnets in each switch for stepping the wipers thereof in opposite directions, two contacts adapted to be closed by energization of the add-and-subtract magnets, respectively, of the units digit switch, and circuits for the add-and-subtract magnets of the tens digit switch including said contacts, respectively, the said circuit of the add magnet including also the zero contact in a bank of the units switch, and the said circuit of the subtract magnet including the ninth contact in a bank of the units switch.

10. In a scoreboard, a set of tubular lamps for displaying any digit from 0 to 9, inclusive, a switch for controlling said lamps, said switch comprising two circular rows of bank contacts, each row comprising four quadrants each having ten contacts numbered from 0 to 9 in the same direction around the row, conductors leading from said lamps and connected to selected contacts in said quadrants, respectively, a wiper shaft, two sets of wipers mounted on said shaft and associated with said rows of contacts, respectively, each set of wipers comprising four wipers spaced ninety degrees apart around the shaft, a magnet for rotating said shaft step-by-step to cause the wipers of each set to traverse in succession all four quadrants in the associated row of bank contacts, whereby each wiper becomes successively associated with the bank contacts in four different quadrants, and a second magnet adapted to be energized in place of said first magnet to rotate said shaft one or more steps in the opposite direction.

11. In a basketball scoring apparatus, a set of lamps for displaying any tens digit when lighted in different combinations, an adjacent set of lamps for displaying any units digit when lighted in different combinations, tens and units switches for selecting said combinations, respectively, each switch having a plurality of wipers for closing connections to the associated lamps, add-and-subtract magnets in each switch for stepping the same in opposite directions, circuits for the add-and-subtract magnets of the tens switch automatically controlled by the magnets and wipers of the units switch, a control cabinet located at a point remote from said lamps and switches, a cable extending between the point where said lamps and switches are located and said control cabinet, said cable including two operating conductors for the add-and-subtract magnets, respectively, of the units switch, and manually operated switching means at said control cabinet for transmitting impulses over either of said operating conductors at will.

12. In a scoring device, a set of tubular lamps arranged in predetermined fixed relation such that the illumination of said lamps in different combinations will display different digits, a step-by-step switch, said switch having a plurality of contacts individual to each digit to be displayed, a plurality of banks in which said contacts are arranged in the order of the digits to which they are individual, each bank having a contact individual to each digit, circuits for said lamps, the circuit of each lamp including a conductor connected in multiple to the contacts in one of said banks which are individual to the digits for the display of which such lamp is required, a plurality of wipers for said switch associated with said banks, respectively, stepping means for moving said wipers over said banks in either direction to cause the wipers to engage the contacts individual to successively higher or lower digits, and means for supplying current through said wipers to said lamp circuits.

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