United States Patent

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[33] **Canada**
[31] **998,855**

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[54] **GAME DEVICE INCLUDING SELECTIVELY IMPACT OPERABLE LIGHTS**
14 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **273/58,** 273/1, 273/138, 272/76, 46/228, 46/175, 46/232, 46/117, 240/6.4, 340/262

[51] **Int. Cl.** **A63b 43/06,** A63h 33/26

[50] **Field of Search** ..... 273/186, 213, 58, 102.2, 181 (G), 1, 138, 139; 46/228, 229, 230, 226, 232, 117, 175; 116/114; 272/76; 340/262, 261

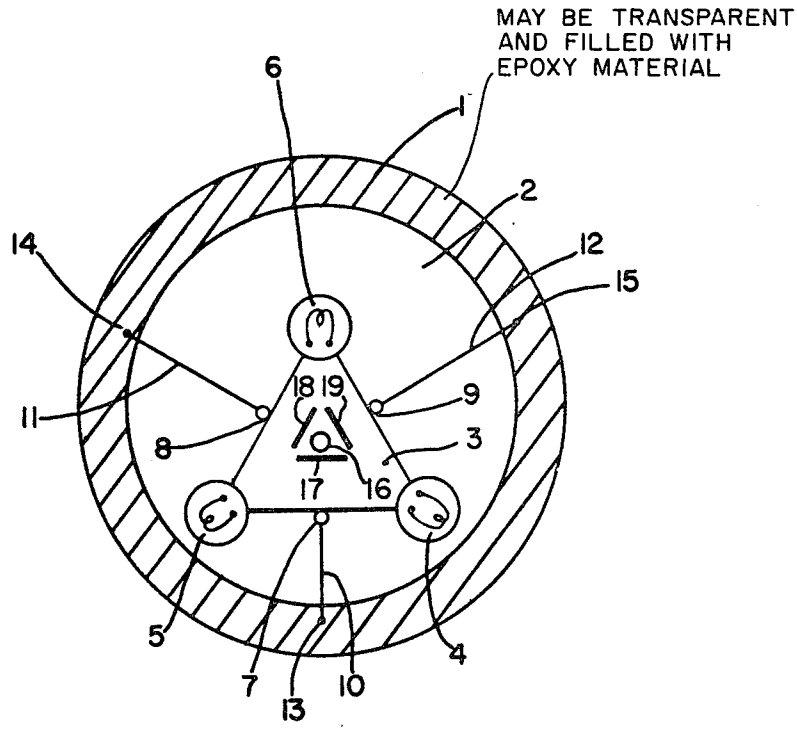
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ABSTRACT: An impact toy, such as a ball, capable of withstanding an impact and having three different colored lamps supported within the interior of the toy. A switch device having a movable contact and three fixed contacts each associated with a different colored lamp is provided in an electrical circuit so that when the toy is subject to an impact, the movable contact touches a fixed contact to cause one lamp to be illuminated. The selected fixed contact is dependent on the point of impact. In alternative embodiments, the lamps may be embedded in the wall of the ball or within a transparent epoxy resin material filling the interior of the ball. The impact toy may take the form of a punching toy simulating a human figure, include audible signalling devices and electrical circuits including transistors and capacitor-resistor networks.



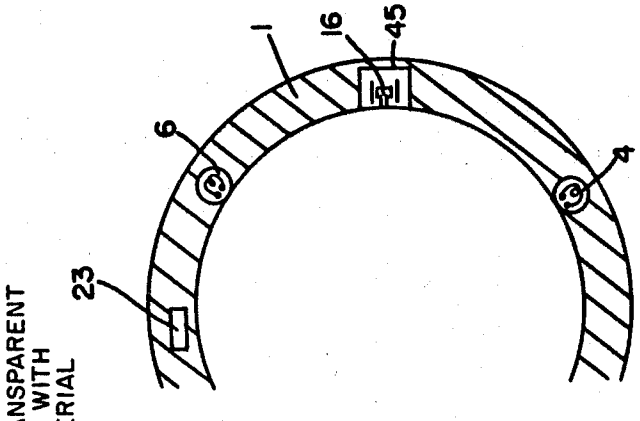


Fig 4

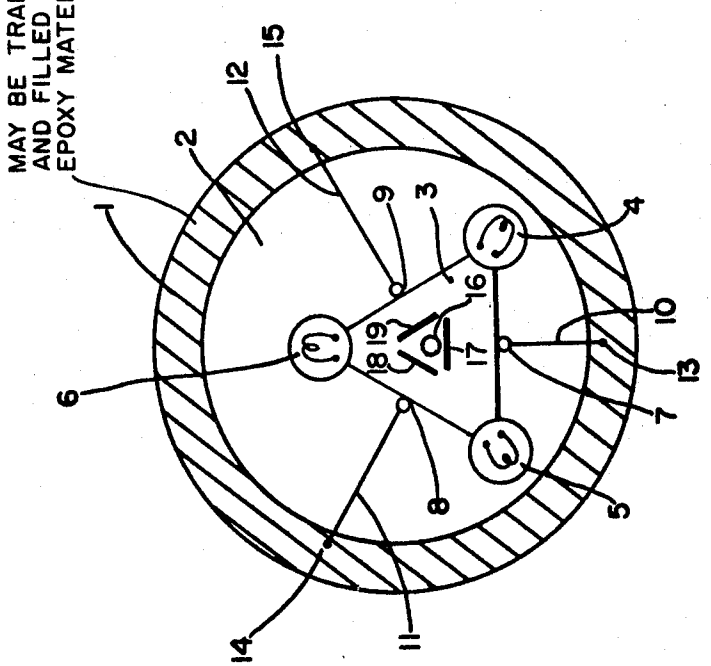


Fig 1

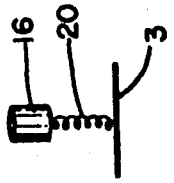


Fig 2

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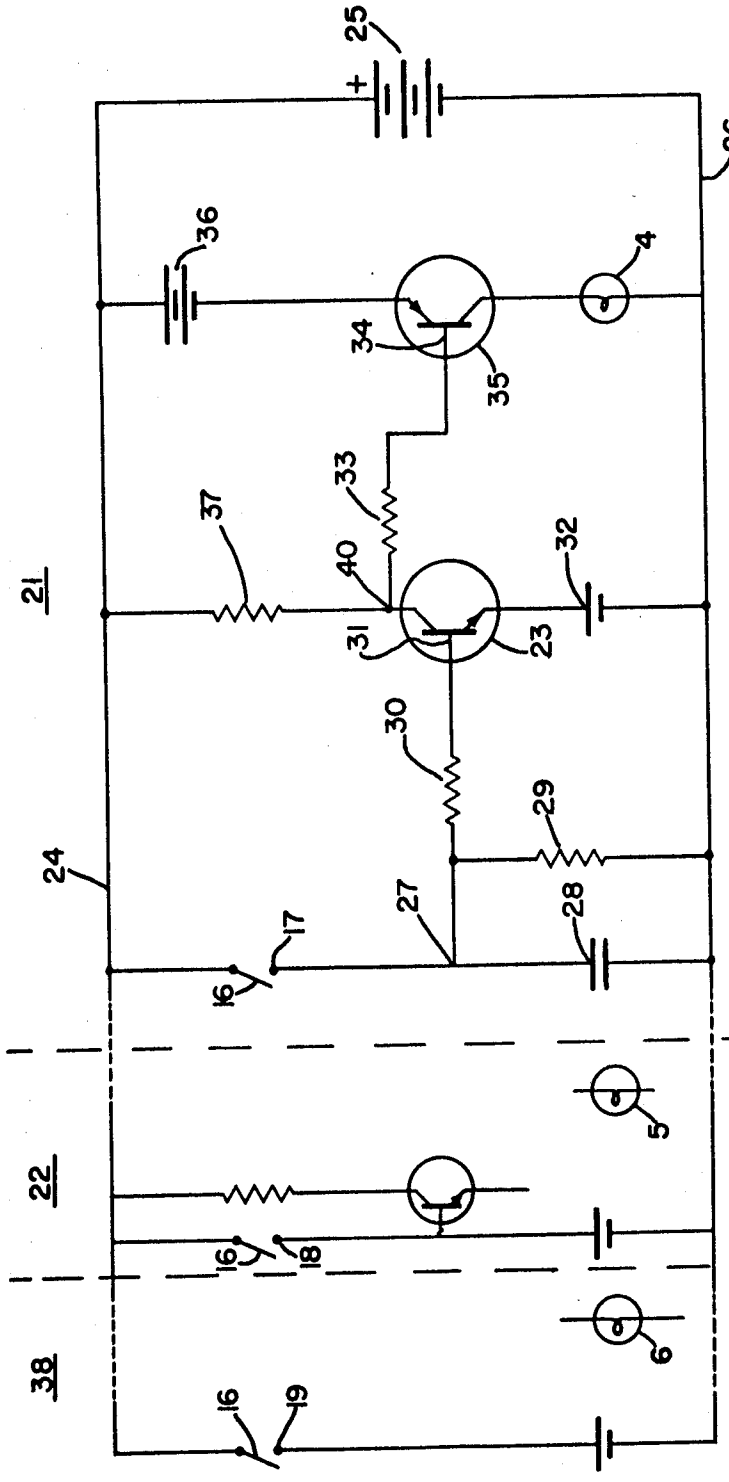


Fig. 3

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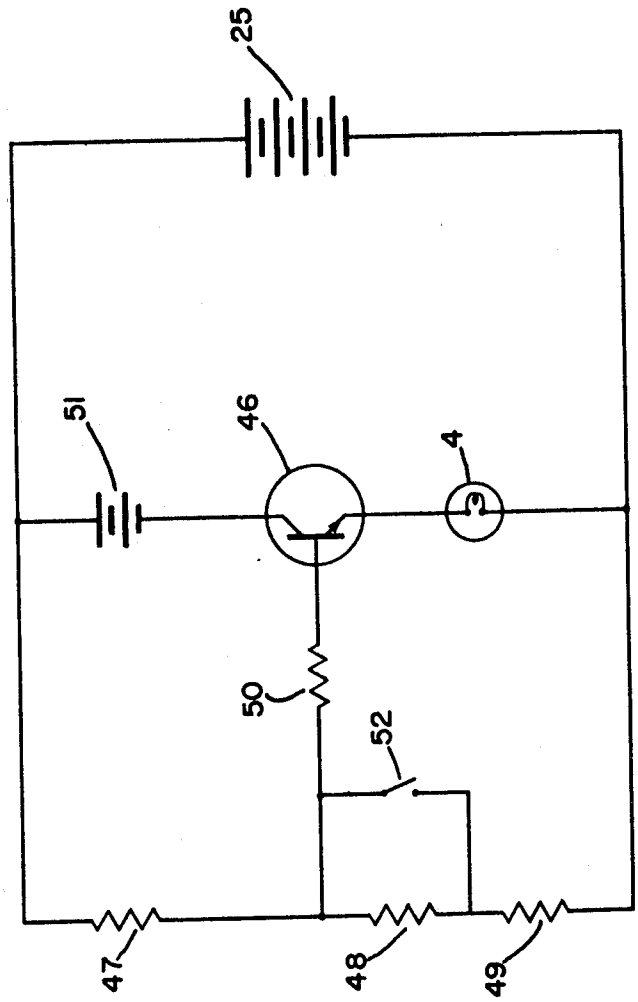


Fig. 5

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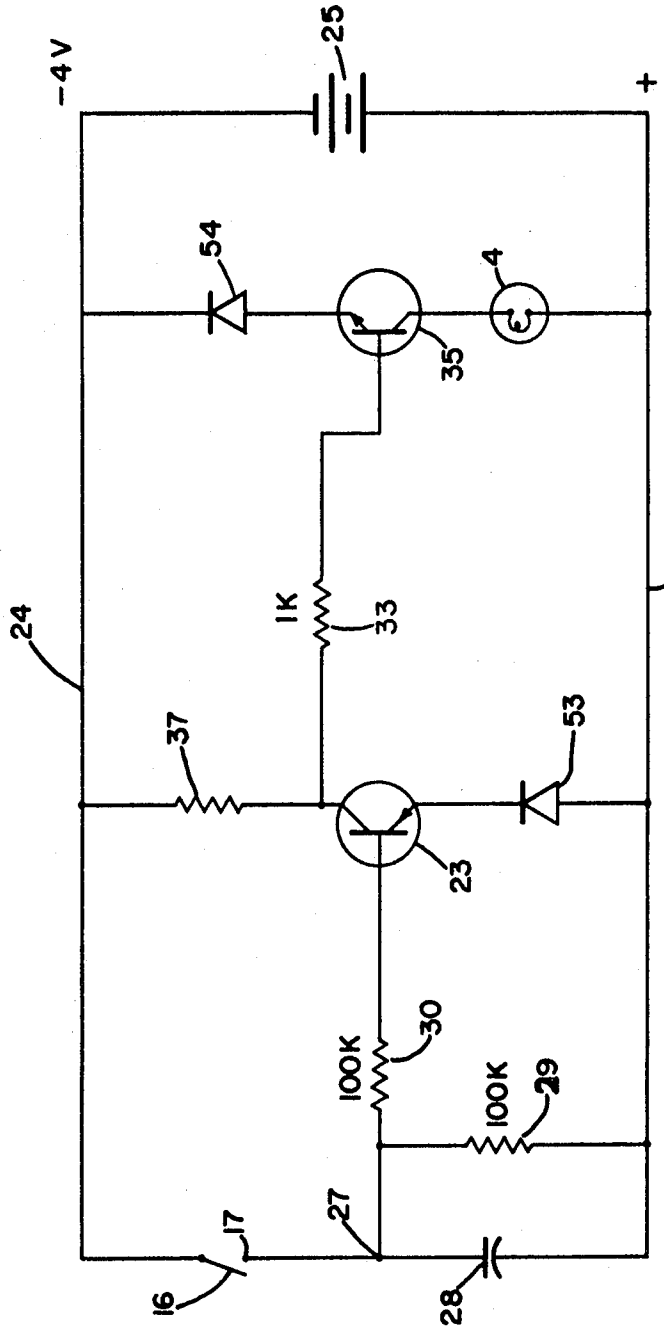


Fig. 6

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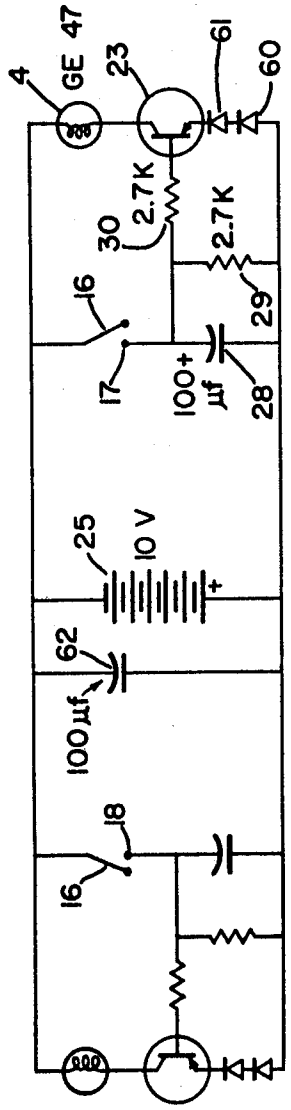


Fig. 7

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GAME DEVICE INCLUDING SELECTIVELY IMPACT OPERABLE LIGHTS

This invention relates to an impact toy and a game utilizing that toy.

Impact toys are well-known constructed in a shape simulating a figure, or, alternatively, in a spherical shape as a ball for use in a game. Many different types of balls have been constructed to satisfy the continuous craving of children and adults for a novel toy and game utilizing that toy. It has previously been proposed to put an electric lamp inside a ball to provide a constant illumination but such a ball has, obviously, limited application and use and requires little additional skill by the user over and above that required in the use of a normal ball having no electrical lamp therein. Similarly, the insertion of such an electric lamp providing constant illumination inside any impact toy would have corresponding disadvantages.

It is an object of the present invention to provide an improved impact toy which may be used in a game and, in at least one construction, requires greater skill on the part of the user to produce a particular condition.

Accordingly, from s broad aspect of the present invention, there is provided an impact toy capable of withstanding an impact and including indicating means connected in an electrical circuit, and circuit-completing means for completing said electrical circuit on the occurrence of said impact whereby said indicating means is operated.

More particularly, according to said one construction, there is provided a game ball constructed at least in part from a relatively transparent material including: (a) a plurality of indicating electric lamps, each capable of emitting light of a different color and each connected in an associated electrical circuit; (b) circuit-completing means comprising a supported movable member having a first electrically conductive portion thereon connected in each of said electrical circuits and a plurality of relatively fixed members each having a second electrically conductive portion thereon, each second conductive portion being connected in a different one of said electrical circuits whereby on occurrence of an impact to said ball, said first conductive portion is moved into contact with a corresponding one of said second conductive portions whereby the associated electrical circuit is completed to cause current to flow through the corresponding electric lamp so that light of a particular color is emitted by the respective lamp; and (c) the arrangement being such that the electric lamps are selectively operable in dependence on the point of application of an impact to the game ball.

The invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic representation, partly in section, of a ball according to the present invention;

FIG. 2 is a diagrammatic representation of a supported movable member utilized in the ball of FIG. 1;

FIG. 3 illustrates an electrical circuit for use in the ball of FIG. 1;

FIG. 4 is a cross-sectional view of part of a ball similar to that illustrated in FIG. 1 but showing an alternative way of supporting the respective electrical components;

FIG. 5 shows an alternative electrical circuit for use in an impact toy according to the present invention; and

FIG. 6 and 7 show yet other alternative electrical circuits for use in an impact toy according to the present invention.

Referring to FIG. 1, there is shown an impact toy in the form of a ball constructed according to the present invention. The ball comprises an outer wall 1 of an external spherical shape surrounding an inner space 2. Within the inner space 2, there is supported a triangularly shaped supporting plate member 3 having the electrical components of an electrical circuit mounted thereon including electrical indicating lamps 4, 5 and 6, one indicating lamp being provided at each corner of the triangular plate member 3 and each capable of emitting a different colored light when current is passed therethrough.

The plate member 3 is provided with mounting support hooks 7, 8 and 9, one on each side edge of the plate member 3.

A restrictive support cord or wire 10, 11 or 12 extends between each hook 7, 8 and 9 to a corresponding formation 13, 14 or 15 formed in the outer wall 1 so that the plate member 3 and its associated electrical components are firmly supported within the space enclosed by the outer wall 1 of the ball.

Completion of an associated electrical circuit will cause current to flow through one of the lamps 4, 5 and 6 independent on the electrical circuit which is completed. One of the electrical circuits is completed on impact of the ball with, for example, the ground and that one of three electrical circuits which is completed is dependent on the point of the ball which is in contact with the ground, as will be explained. Completion of an electrical circuit is achieved when two conductive portions of a switch-type member make contact with each other and, therefore, there is provided on the supporting plate member a supported movable member 16 having a first electrically conductive portion thereon. There are also provided on the supporting plate member 3 three relatively fixed plate members 17, 18 and 19, each made entirely of metal or in part only so as to provide second electrically conductive portions, the respective conductive portions being connected in different electrical circuits associated with the respective lamps 4, 5 and 6. The electrically conductive portion of the relatively movable member 16 is common to each of the electrical circuits so that each electrical circuit is provided with a switch-type element formed by the movable member 16 and a respective one of the relatively fixed members 17, 18 and 19. On impact of the ball with the ground, the movable member 16 moves into contact with one of the relatively fixed members 17, 18 and 19 so that completion of a respective one electrical circuit is effected to cause current to flow through one of the indicating lamps 4, 5 and 6 so as to produce the emission of colored light. As will be clear, the point of impact of the ball with the ground will determine in which direction the movable member 16 will move and this will determine which one of the relatively fixed members 17, 18 and 19 will be contacted to complete the respective electrical circuit. In this way, the color of light emitted is dependent on the point of impact of the ball with the ground since that determines which one of the electrical circuits is completed. There is thus an element of skill in the throwing of the ball so as to select the correct point of impact thereof with the ground and to obtain the emission of light in a desired color.

As stated above, the member 16 is a supported movable member and the manner of its support will be clear by reference to FIG. 2 from which it will be seen that the member 16 is a small cylindrical body supported on the plate member 3 by a resilient helical spring member 20. The movable supported member 16 may, of course, be a spherical ball and it will be clear that when the ball strikes against, for example, the ground, the movable member 16 is capable of moving into contact with one of the relatively fixed portions 17, 18 and 19 to complete the respective electrical circuit whilst the spring member 20 ensures that it can so move and also can return to its rest position wherein it is not in contact with any one of the relatively fixed members 17, 18 or 19. In fact, the actual contact of the member 16 with the corresponding fixed member can be momentary since it is only necessary to momentarily complete an electrical circuit in order to trigger a sequence of operations resulting in the illumination of one of the indicating lamps 4, 5 and 6, as will be clear from a consideration of the electrical circuit illustrated in FIG. 3.

In FIG. 3, the three electrical circuits associated with the lamps 4, 5 and 6 of FIG. 1 are illustrated diagrammatically. However, for simplicity, only the electrical circuit 21 associated with the indicating lamp 4 has been illustrated in detail, the electrical circuits 22 and 38 associated respectively with the lamps 5 and 6 being only partly illustrated. As was explained with reference to FIG. 1, the movable contact 16 is common to each electrical circuit whilst the relatively fixed contacts 17, 18 and 19 are each associated with a different electrical circuit 21, 22 or 38. In FIG. 3, for simplicity, the

movable contact 16 has been identified as the movable contact of three switches, but it will be quite clear that it is, in fact, one common contact preferably capable of closing only one switch in one electrical circuit at any one time.

For convenience, in the present description, wherever possible the same reference numerals have been applied to like parts throughout all the figures. The electrical circuit 21 will now be described in greater detail with reference to FIG. 3, it being appreciated that the electrical circuits 22 and 38 are identical to circuit 21.

The electrical contacts 16 and 17 are connected in the base electrode circuit of a first transistor 23 with the contact 16 connected to a common positive line 24 connected to a common battery 25 which is connected between the line 24 and negative line 26. The relatively fixed contact 17 is connected to point 27 to which is also connected one end of a capacitor 28 and a resistor 29 whose other ends are connected to the negative line 26. A resistor 30 is also connected between point 27 and the base electrode 31 of the first transistor 23.

The first transistor 23 is a common NPN transistor and its circuit also includes a resistor 37 connected between it and the positive line 24 as well as a biasing battery 32 connected between the transistor and the negative line 26. An output from the circuit of the first transistor 23 is fed through a resistor 33 to the base electrode 34 of a second transistor 35. The indicating lamp 4 of FIG. 1 is, as shown, connected in series with the second transistor 35 and further biasing battery 36 between the positive line 24 and the negative line 26 across which is connected the battery 25.

In operation or use, the relatively movable contact 16 is normally spaced from the relatively fixed contacts 17, 18 and 19. The circuit components and the biasing voltages in the electrical circuits such as 21 are so chosen that the respective first transistor 23 and the second transistor 35 are cut off and nonconducting. Thus, no current flows through the respective indicating lamp 4, 5 or 6. However, when the ball is bounced on the ground so as to be subject to an impact, then, for example, the movable contact 16 will be moved momentarily into contact with the relatively fixed contact 17. Due to the action of the spring 20 (FIG. 2), the movable contact 16 will rebound into a noncontacting position but at the instant of contact with fixed contact 17, the conditions in the base electrode circuit of the first transistor are changed.

On closure of 16 to 17, the capacitor 28 is connected between the positive line 24 and the negative line 26 and, therefore, becomes charged. As the voltage at point 27 rises so the first transistor 23 is caused to conduct and this results in a drop in potential at point 40, the junction of the transistor and resistors 33 and 37. This drop in potential is applied through resistor 33 to the base electrode 34 of the second transistor 35 which is a PNP transistor. The biasing potential from battery 36 is negative and when the base electrode potential of the transistor 35 falls, the transistor 35 commences to conduct and, therefore, electric current flows through the indicating lamp 4. Light is thus emitted having a color dependent on the type of indicating lamp 4 and thus the ball of FIG. 1 becomes illuminated with the corresponding light.

As soon as the movable contact 16 breaks contact with the fixed contact 17, the capacitor 28 commences to discharge through the resistor 29 and after a time determined by the respective time constant of the circuit, the voltage at point 27 has dropped to such a value as to cut off the transistor 23 which is thus rendered nonconducting. Consequently, the second transistor 35 is rendered nonconducting and electric current ceases to flow through the electric lamp 4 whereby illumination of the ball ceases.

The next bounce of the ball may cause the movable contact to make contact with the fixed contact 17 or alternatively with one of the other fixed contacts 18 and 19. In the latter case, the respective electrical circuits 22 or 38 associated with the indicating lamps 5 and 6 will be brought into operation so as to cause current to flow through the respective lamp 5 or 6. Thus, a different color may illuminate the ball dependent on the point of impact of the ball with the ground.

It will be appreciated that the inner space 2 of the ball shown in FIG. 1 may be filled with an epoxy resin in order to provide greater rigidity and also to protect the indicating lamps and the electrical components of the respective electrical circuits. Alternatively, a spherical or other shaped mold may be provided, the supporting plate member 3 with the associated indicating lamps 4, 5 and 6 and the corresponding electrical circuits may be supported in the mold and epoxy resin then poured into the mold so as to provide a ball formed of epoxy resin having the indicating lamps and electrical circuits molded within its interior. The epoxy resin or other molding material must, of course, be of such a type as to provide the required bouncing properties in the ball and also must be sufficiently transparent to enable the light from the respective lamps to be transmitted so as to be visible in the play ball.

Experiments which have been carried out indicate that an RTV-silicone material called "Eccosil 2 CN" may be suitable. This is a translucent potting compound manufactured by Emerson and Cuming Inc.

An alternative construction for a ball according to the present invention is diagrammatically illustrated in FIG. 4 wherein the indicating lamps 4, 5 and 6 and the electrical circuits 21, 22 and 38 are molded into the wall 1 of the ball. The relatively movable contact 16 and the associated fixed contacts are, of course, protected by the outer shield 45 as shown.

It will further be appreciated that the first transistor 23 and the second transistor 35 of FIG. 3 may well be replaced by a single field effect transistor having the indicating lamp 4 in its circuit. Alternatively, a circuit may well be designed utilizing a switch device incorporating a bimetal strip associated with a bulb and battery without utilizing transistors at all. Contacts may, if desired, be provided to the exterior of the ball wall 1 so as to permit rechargeable batteries to be utilized which can be connected to a recharging circuit through said contacts.

In FIG. 5, there is diagrammatically illustrated an electrical circuit utilizing only one transistor 46 connected in an electrical circuit and in series with the indicating lamp 4. The electrical circuit includes resistors 47, 48 and 49 connected across a battery 25, the junction of transistors 47 and 48 being connected through a resistor 50 to the base electrode of transistor 46. The transistor 46 is also provided with a biasing battery 51 and it will be seen that an individual switch 52 is provided across the resistor 48. Individual switches would thus be required for each indicating lamp 4, 5 and 6 (FIG. 1) but this should present no undue difficulty. Momentarily closing the switch 52 results in a change in the conditions in the circuit of transistor 46 and current is thus caused to flow through the indicating lamp 4. A delay could be built into the switch 52 to provide the desired duration of illumination or some other technique utilized. The switch member 52 may well be spring-loaded.

In FIG. 6, there is shown an alternative circuit to that illustrated in FIG. 3. The circuit of FIG. 6 is similar to that of FIG. 3 except that transistor 23 is now a PNP-type transistor whilst transistor 35 is a NPN-type transistor. Accordingly, the battery 25 is reversed in polarity so that the line 24 is now a negative line whilst the line 26 is a positive line.

In the circuit of FIG. 6, the biasing batteries 32 and 36 of FIG. 3 are also replaced by diodes 53 and 54 respectively. The operation of FIG. 6 is, however, similar to the operation of FIG. 3 and will, therefore, not be described in detail. For simplicity, the same reference numerals have been used throughout the figures to identify like or corresponding components.

In FIG. 7, there is shown yet another circuit for use in an impact toy according to the present invention. The circuit is similar to that of FIG. 6, except that the lamp, such as 4, is connected in series with transistor 23 and two silicon diodes 60 and 61. The transistor 23 is a arranged to have a gain of at least 200 whilst the lamp 4 is of the type GE 47 or equivalent. A 100 μf. capacitor 62 is connected across the 10-battery battery 25.

As mentioned above, the respective one of the relatively fixed contacts 17, 18 and 19 which is contacted by the rela-

tively movable contact **16** will normally be determined by the way in which the ball strikes the ground or other surface to produce deflection of the movable contact **16**. The corresponding most sensitive points of the ball will be spaced around the circumference of the ball and a skillful user may be able to hold the ball in his hand in such a way that it strikes the ground at a particular point on its external surface and a particular one of the indicating lights **4**, **5** and **6** is illuminated. A game of skill may thus be devised whereby several players compete against each other in an attempt to obtain a particular sequence of colored illumination from the ball. Rules may be devised whereby a player throws the ball in such a way as to produce the desired color, then he is permitted a second throw before the next player takes his turn.

Whilst the invention has been described above with reference to a ball, it will be appreciated that it is not restricted thereto but is applicable to many impact toys. For example, an impact toy which has been molded to simulate a human figure, such as a policeman, may be provided with three indicating lamps **4**, **5** and **6** and may be constructed as a punching toy for a child or adult. When the impact toy is delivered a blow from one direction, then a corresponding one of the indicating lamps would be illuminated whilst if it is delivered a blow from a second direction, a different one of the indicating lamps would be illuminated. A third direction would correspond to the third indicating lamp. The "Eccosil 2 CN" material, referred to above, may conveniently be used for such an impact toy. If desired, its characteristics may be improved by adding a reinforcing fibre, for example a nontoxic cellulose fibre.

It will be appreciated that the present invention is not restricted to the provision of three indicating lamps but any desired number may be provided. The provision of only one indicating lamp in an impact toy is also envisaged whereby the single indicating lamp is not illuminated until the impact toy is subjected to an impact. Furthermore, other devices may well be utilized instead of indicating lamps. For example, the electrical circuits may be so arranged as to each operate a different audible signal.

An impact toy according to the invention may conveniently be so constructed as to be capable of suspension from a child's crib or playpen. Tapping of such an impact toy would cause it to flash, emit a tone, and/or vibrate, thus facilitating the learned coordination of points in the child's visual, auditory, tactile and kinesthetic spaces.

I claim:

1. A game ball constructed at least in part from a relatively transparent material including:

a. a plurality of indicating electric lamps each capable of emitting a light of a different color and each connected in an associated electrical circuit;

b. circuit-completing means comprising a supported movable member having a first electrically conductive portion thereon connected in each of said electrical circuits and a plurality of relatively fixed members each having a second electrically conductive portion thereon, each second conductive portion being connected in a different one of said electrical circuits whereby on occurrence of an impact to said ball said first conductive portion is moved into contact with a corresponding one of said second conductive portions whereby the associated electrical circuit is completed to cause current to flow through the corresponding electric lamp so that light of a particular color is emitted by the respective lamp; and

c. the arrangement being such that the electric lamps are selectively operable in dependence on the point of application of an impact to the game ball.

2. A game ball according to claim **1** wherein said indicating electric lamps and the associated electrical circuit are embedded in the wall of the impact toy.

3. A ball according to claim **1** wherein the interior of the ball is filled with an epoxy material.

4. A ball according to claim **1** wherein the ball is a substantially solid ball formed from a relatively transparent material with said indicating electric lamps and the associated electrical circuit components molded within said material.

5. A ball according to claim **1** wherein each electrical circuit includes a first transistor circuit having said first and second conductive portions connected in the base electrode circuit of a first transistor whereby on said first conductive portion moving into contact with said second conductive portion there is a resultant change in the potential applied to said transistor whereby it is caused to conduct to produce illumination of the respective indicating electric lamp.

6. A ball according to claim **5** wherein each indicating electric lamp is connected in series with a second transistor controllable by said first transistor, conduction of said first transistor resulting in a change in the potential applied to the base electrode of the second transistor whereby said second transistor is caused to conduct to produce illumination of the respective indicating electric lamp.

7. A ball according to claim **6** wherein said first transistor circuit includes a capacitor-resistor network in its base electrode circuit whereby on the movable first conductive portion contacting the the respective fixed conductive portion thus the capacitor is caused to be charged from a supply battery, said capacitor when discharging through said resistor until it has discharged a predetermined amount so as to cause said first transistor to be rendered nonconducting and to interrupt the supply of electric current to the respective indicating electric lamp.

8. An impact toy constructed at least in part from a relatively transparent material comprising:

a. a plurality of indicating lights each capable of emitting light and each connected in an associated electrical circuit;

b. circuit completing means comprising a supported movable member having a first electrically conductive portion thereon connected in each of said electrical circuits and a plurality of relatively fixed members each having a second electrically conductive portion thereon, each second conductive portion being connected in a different one of said electrical circuits whereby on occurrence of an impact to said toy said first conductive portion is moved into contact with a corresponding one of said second conductive portions whereby the associated electrical circuit is completed to cause current to flow through the corresponding electric lamp so that light is emitted by the respective lamp; and

c. the arrangement being such that the electric lamps are selectively operable in dependence on the point of application of an impact to the impact toy.

9. An impact toy according to claim **1** wherein said indicating electric lamps and the associated electrical circuit are embedded in the wall of the impact toy.

10. A toy according to claim **8** wherein the interior of the toy is filled with an epoxy material.

11. A toy according to claim **8** wherein the toy is a substantially solid toy formed from a relatively transparent material with said indicating electric lamps and the associated electrical circuit components molded within said material.

12. A toy according to claim **8** wherein each electrical circuit includes a first transistor circuit having said first and second conductive portions connected in the base electrode circuit of a first transistor whereby on said first conductive portion moving into contact with said second conductive portion there is a resultant change in the potential applied to said transistor whereby it is caused to conduct to produce illumination of the respective indicating electric lamp.

13. A toy according to claim **12** wherein each indicating electric lamp is connected in series with a second transistor controllable by said first transistor, conduction of said first transistor resulting in a change in the potential applied to the base electrode of the second transistor whereby said second transistor is caused to conduct to produce illumination of the respective indicating electric lamp.

14. A toy according to claim 13 wherein said first transistor circuit includes a capacitor-resistor network in its base electrode circuit whereby on the movable first conductive portion contacting the respective fixed conductive portion thus the capacitor is caused to be charged from a supply battery, said capacitor then discharging through said resistor until it has discharged a predetermined amount so as to cause said first transistor to be rendered nonconducting and to interrupt the supply of electric current to the respective indicating electric lamp.