

July 4, 1950

J. C. KOCI

2,513,728

AMUSEMENT APPARATUS

Filed Nov. 19, 1945

4 Sheets-Sheet 1

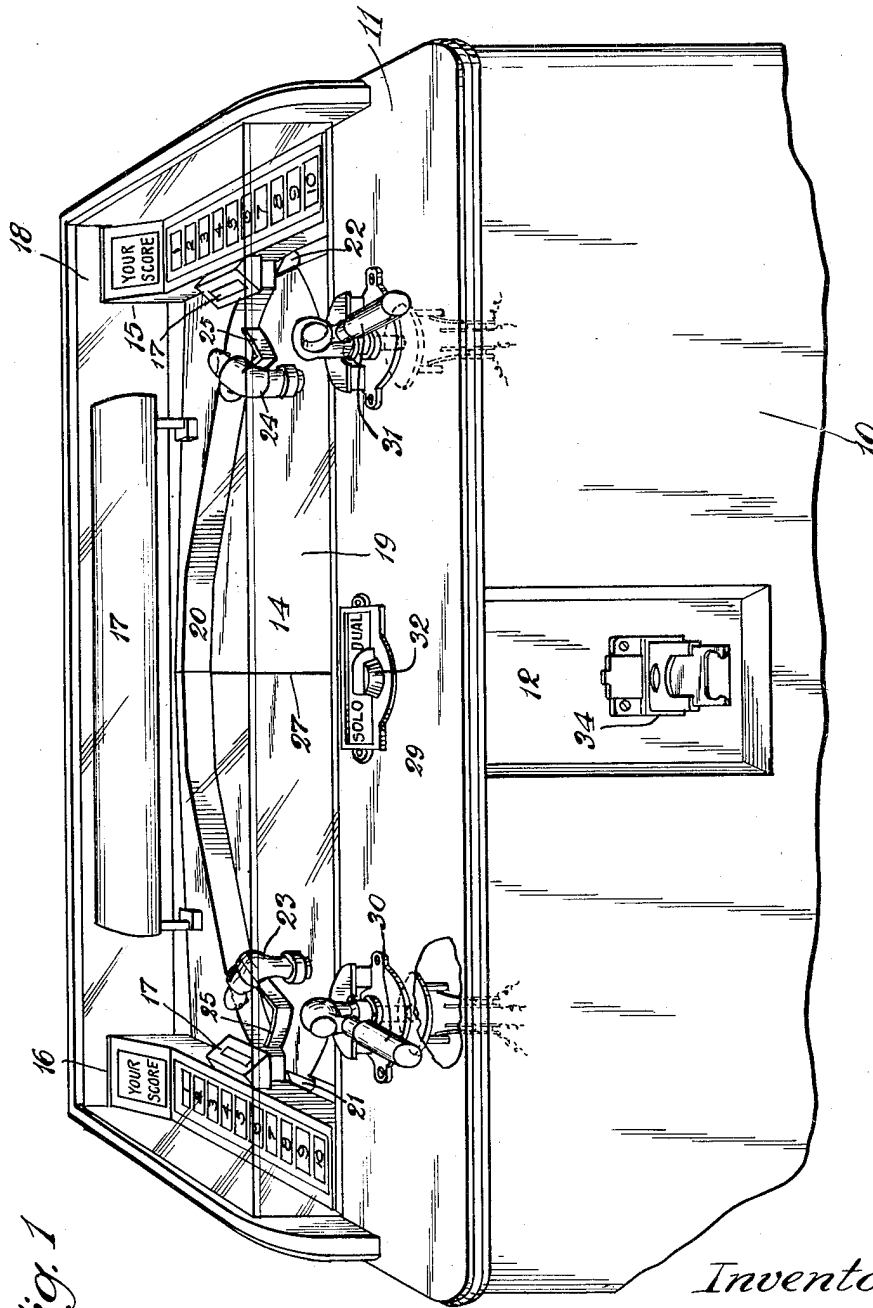


Fig. 1

Inventor
Jerry C. Koci
by Robert L. Kalin
Attorney.

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Fig. 2

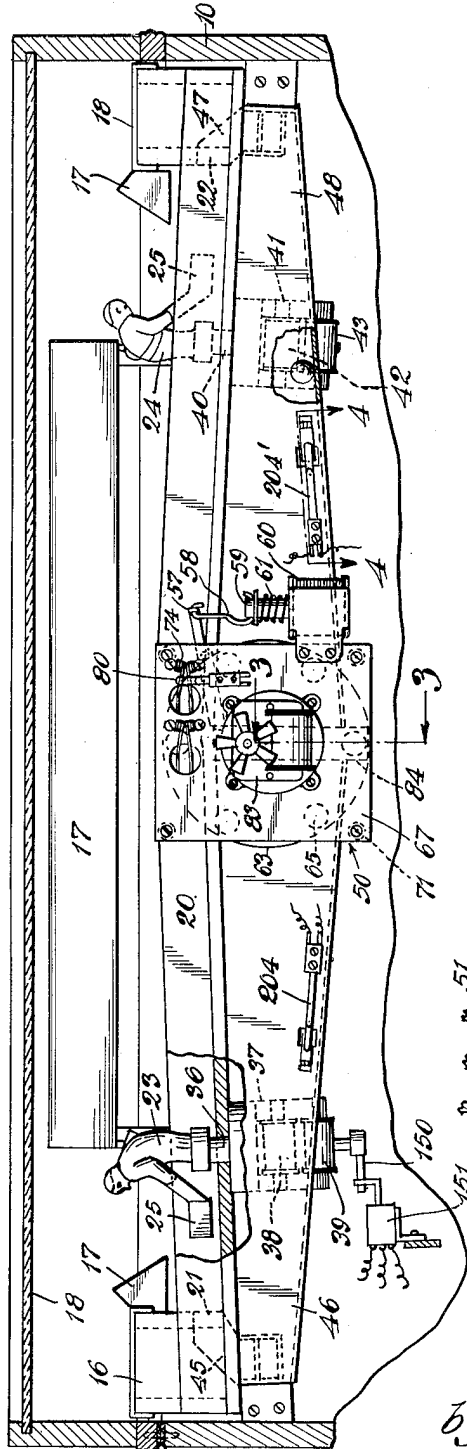


Fig. 4

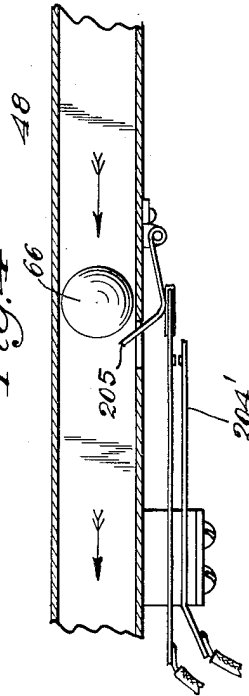
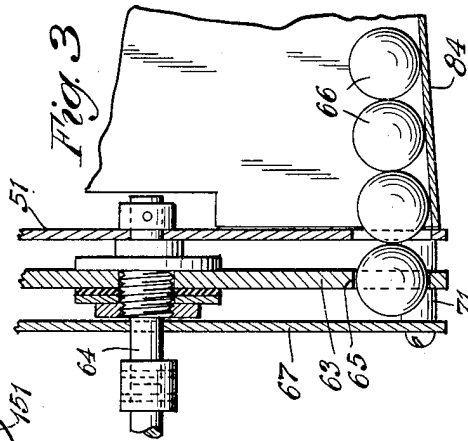


Fig. 3



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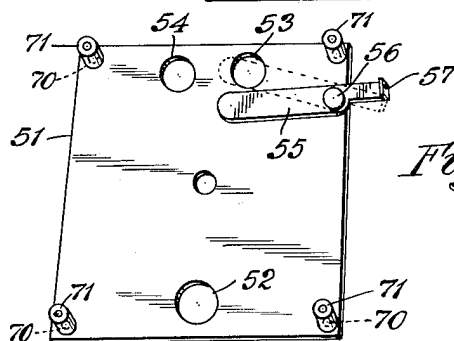
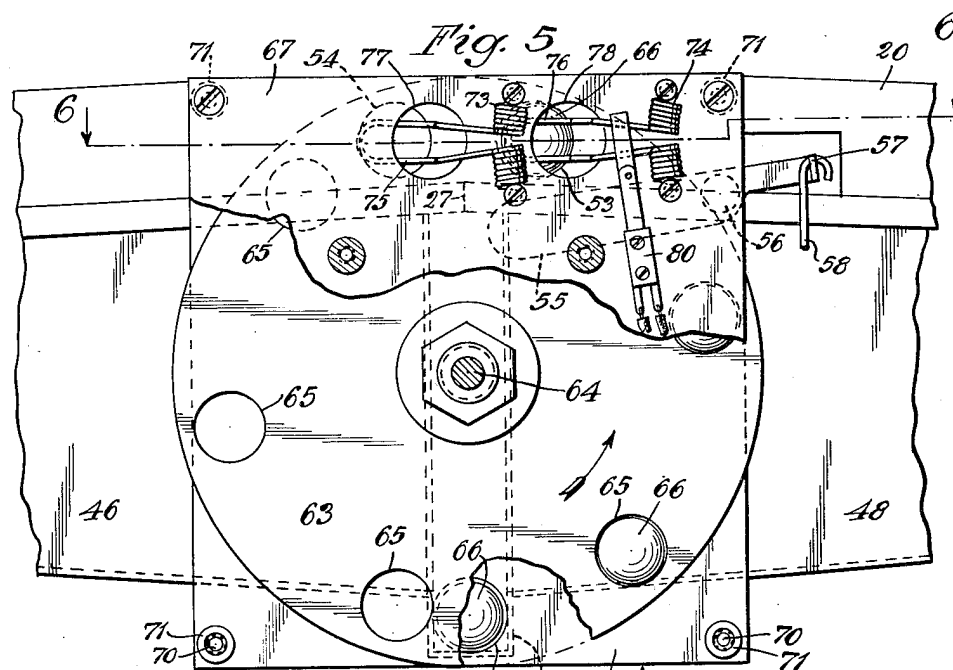
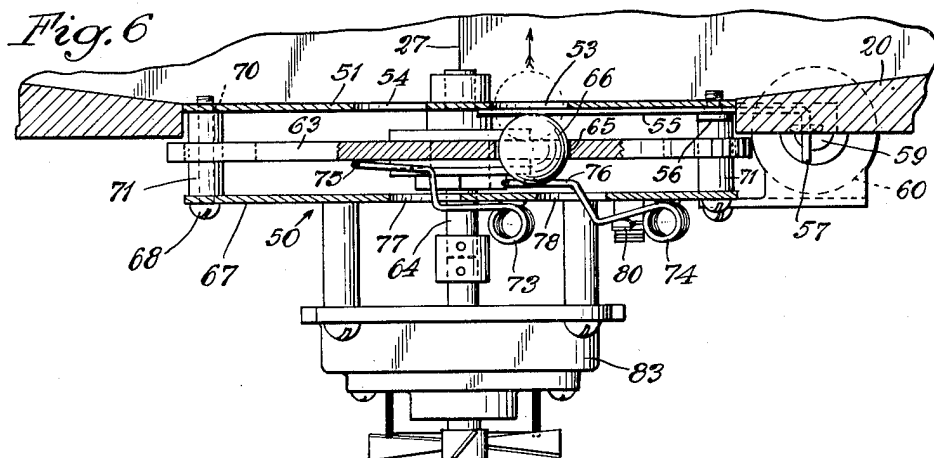


Fig. 7

Inventor
Jerry C. Koci

by Robert L. Kalne
Attorney.

July 4, 1950

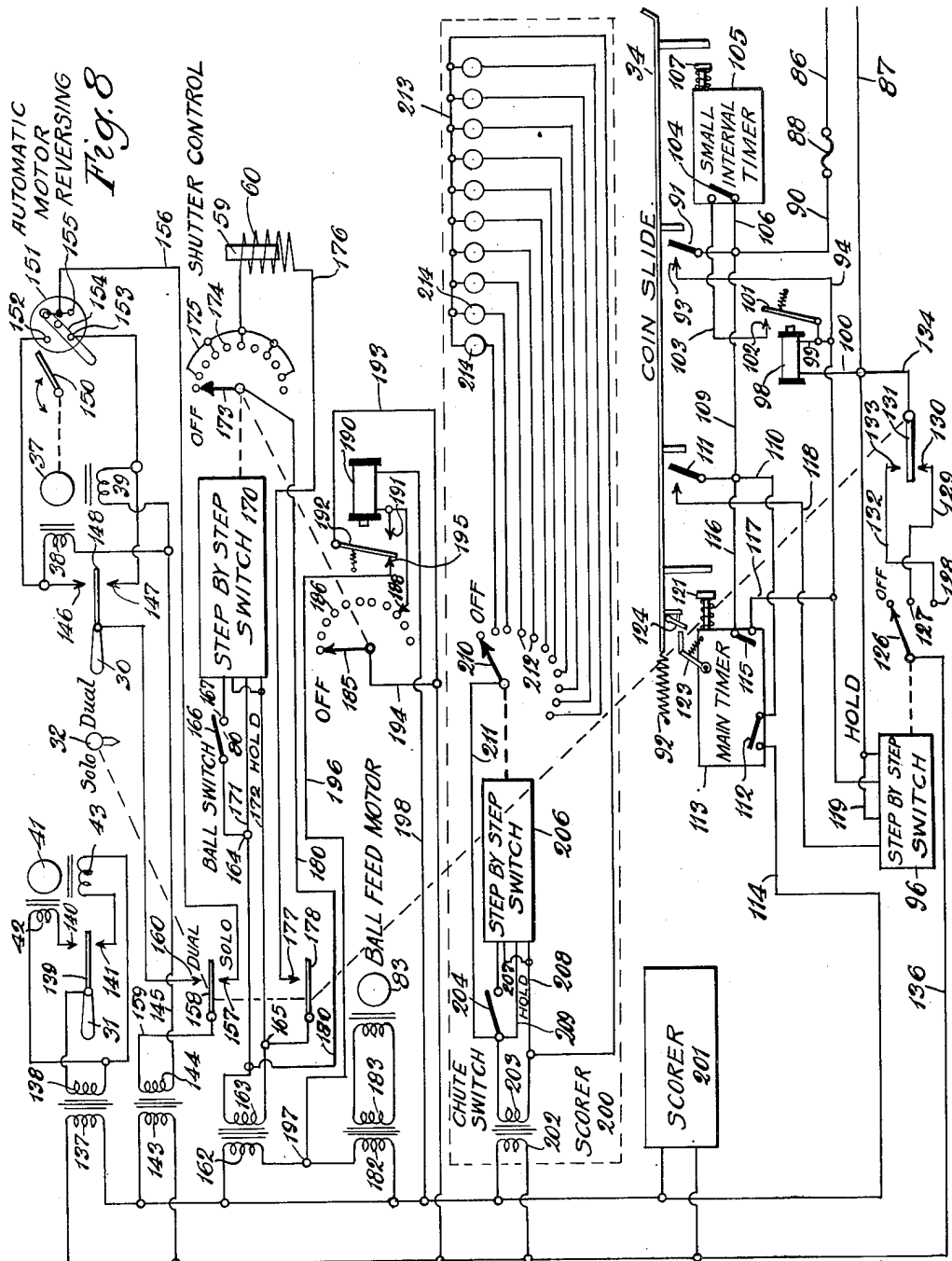
J. C. KOCI

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4 Sheets-Sheet 4



Inventor
Jerry C. Koci
 by *Robert L. Kalin*
 Attorney

UNITED STATES PATENT OFFICE

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AMUSEMENT APPARATUS

Jerry C. Koci, Riverside, Ill., assignor, by mesne assignments, to Chicago Coin Machine Co., Chicago, Ill., a corporation of Illinois

Application November 19, 1945, Serial No. 629,456

4 Claims. (Cl. 194—9)

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This invention relates to amusement apparatus and particularly to that type of apparatus where a player may pit his skill against another player or, in the alternative, against a robot player, this latter being an automatically actuated playing means. Thus, the game may be any one of a number where two players ordinarily participate. While the apparatus has been illustrated with reference to hockey, it is manifest that other games, like tennis, may form the basis of the amusement apparatus.

The apparatus forming the subject matter of this invention constitutes an improvement upon Patent 2,318,169 issued May 4, 1943, to La Rock. In this patent, a game for playing hockey is shown wherein two mannikins or robots are provided, these robots being under the control of one person. While the apparatus patented above provides an entertaining game, the invention herein improves upon the latter. The invention provides an apparatus where one person controls only one robot and where the other opposing robot is under separate control. Thus, the separate control may be exercised either by the machine to provide a robot opponent or selectively may be under the control of a different person. The skill and speed required of one or both persons operating the apparatus is enhanced over that necessary in the apparatus of the patent referred to above.

It is understood that the selection of the type of game played on the new apparatus must be made at the beginning of the game. Thus, prior to the initiation of the game, a control may be set so that either dual or solo play is provided. In general, the game resembles the game of the patent in that a predetermined number of balls are preferably fed in succession on the playing field. While means may be provided to restrict the ball feed so that only one ball is used at any one time, it is preferred to feed a number of balls in quick succession. Thus, a fast and exciting game is provided.

The invention herein provides a convenient means whereby one coin will condition the game apparatus for solo play, while two coins condition the apparatus for dual play. Any predetermined number of balls may be used for a complete game, the limit being readily adjusted. Once the ball limit has been reached, the ball feed to the playing field is stopped.

The playing field is preferably divided by a median transverse line from which line the field slopes gently. Opposed playing regions are provided on opposite sides of the median line and

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beyond the playing regions are goal regions. At each playing region may be one or more robots provided with means to intercept a ball or whatever is used in the game.

5 The game apparatus embodying the present invention also includes totalizing means for scoring both sides, irrespective of the type of game.

For a more complete understanding of the invention, reference will now be made to the drawings wherein an exemplary embodiment is disclosed, it being understood, however, that various modifications within the scope of the invention may be provided.

Figure 1 is a perspective view from the front of a game apparatus embodying this invention. Figure 2 is a sectional view of the apparatus shown in Figure 1 showing certain details of the robot operating means and ball feed. Figure 3 is a sectional view along line 3—3 of Figure 2 showing the ball feed mechanism. Figure 4 is a sectional view along line 4—4 of Figure 2, showing the details of a switch in a ball return chute for counting purposes. Figure 5 is a front view of the ball feed portion of the system with certain parts broken away. Figure 6 is a section on broken line 6—6 of Figure 5. Figure 7 is a perspective view of the end or discharge plate and shutter of the ball feed portion of the system. Figure 8 is a wiring diagram showing the electrical connections in the system.

The entire game apparatus may conveniently be housed in cabinet 10 having top panel 11 and front panel 12. Top panel 11 has playing field 14 bordered by score-indicating means 15 and 16 at opposite ends of the field. Lights 17 may be provided for illuminating the field. Glass panels 18 and 19 serve to cover the playing and score-indicating means.

Playing field 14 may be bordered by a generally oval shaped wall 20. The playing field has ends 21 and 22 which may be considered as representing goals. These goals are guarded by robots 23 and 24 suitably mounted for rotation as hereinafter described. Each robot carries hockey stick 25, which stick is just long enough to operate snugly within the narrowing end regions of the playing field.

As described in the patent referred to above, playing field 14 has transverse median line 27 from which line the field slopes gently toward the two ends. The angle of slope may be set to any desired value and, in practice, may be small, something of the order of about four or five degrees.

In front of playing field 14, cabinet top 11 has

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operating panel 29 upon which are disposed robot controls 30 and 31 and game selecting means 32. Front panel 12 has coin slide 34. Game selecting means 32 consists of a control which may be moved to either dual or solo positions. As will be hereinafter explained, this control determines whether two persons play against each other or whether one person plays against the machine. It is understood, of course, that coin slide 34 disposes the mechanism in an operative condition upon receipt of a coin so that playing conditions may be provided. As will be apparent later, game selector 32 must be operated first. Then coin slide 34 is operated, the projecting part being pushed in against spring pressure for each coin deposited. Thus, for a dual game, two coins are successively deposited.

Irrespective of whether a dual or solo game is played, one robot will be directly under the control of a person. For convenience, this may be assumed to be robot 24 controlled by means 31. Robot 24 is adapted to be still, turn clockwise or anti-clockwise depending upon whether control 31 is moved from a normal position and, if so, upon the direction of movement of control 31. In the event that a dual game is selected, robot 23 will be controlled by means 30 and is thus subject to the same type of control as the opposing robot. Means for discharging small objects, such as ball bearings, may be provided as will be shown later. Such means may conveniently discharge the balls on playing field 14 from any suitable spot, such as that portion of the field bordering game selecting control 32. With dual play, alternate balls are discharged on field 14 on opposite sides of median line 27. Thus, the balls tend to roll toward the nearest robot. A complete game may use any desired number of balls. Any number of balls may be discharged any desired number of times to total a complete game.

In the event that a solo selection is made, then control 30 is inoperative, and means are provided whereby robot 23 is alternately turned first in one direction and then in the other as an automatic player. In such case, the balls discharged on field 14 may be directed on alternate sides of median line 27 or only on one side. As described later, means are provided for directing the balls on one side of median line 27 in a solo game. As will be apparent, the object of the game is for a player to prevent any balls from entering his own goal, and instead to knock the balls beyond the opposing player to the other goal. Upon the making of a goal, means are provided for indicating a score. The goal regions are connected by suitable chutes to the ball return as hereinafter described.

Robot 23 is mounted on shaft 36 coupled to motor 37 having windings 38 and 39. Motor 37 may conveniently be a simple induction type motor having windings for determining the direction of rotation and including speed reducing means. Thus, winding 38 may cause rotation in one direction and winding 39 may cause rotation in the reverse direction.

Robot 24 is similarly mounted upon shaft 40 coupled to motor 41 having windings 42 and 43 for determining the direction of rotation. The speed of rotation of the robots may be set to any desired value and, in practice, may be something of the order of one or more revolutions per second. Robot 23 guards goal region 21, which region is connected through suitable passage 45 to chute 46 extending beneath field 14. Similarly,

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robot 24 guards goal 22 connected by passage 47 to chute 48.

Chutes 46 and 48 meet at ball feeding means generally indicated by numeral 50. Ball feed 50 has control plate 51, which may be any shape desired and is here shown as rectangular. Plate 51 is flat and has ball inlet opening 52 and discharge openings 53 and 54. Ball inlet opening 52 is at one side of the plate, this being the bottom where chutes 46 and 48 meet, while discharge openings 53 and 54 are at the top of the plate on opposite sides of the center line. As is evident from Figure 2, discharge openings 53 and 54 are normally adapted to lie on opposite sides of median line 27 of playing field 14.

Control plate 51 is provided with shutter 55 pivoted at 56 and movable to cover discharge opening 53. Shutter 55 has lug 57 to which hook 58 is attached, this hook being carried by armature 59 of solenoid 60. Spring 61 normally biases armature 59 in a position to maintain shutter 55 open. This may be reversed if desired.

Operating in proximity to plate 51 is circular ball feed plate 63 rotatively secured to shaft 64. Plate 63 has a plurality of apertures 65 therethrough, these apertures being disposed circularly around shaft 64. Each aperture 65 is large enough to accommodate one ball bearing 66 used in the game. Plate 63 is so mounted with respect to control plate 51 and apertures 65 are so disposed relative to shaft 64 that, during rotation of plate 63, apertures 65 will periodically register with inlet opening 52 and discharge openings 53 and 54 of control plate 51.

On the side of ball feed plate 63, remote from control plate 51, is front cover plate 67. Cover plate 67 and control plate 51 are rigidly maintained with respect to each other by bolts 68 engaging tapped apertures 70 in the four corners of control plate 51. Spacing sleeves 71 between the cover and control plates maintain the plates separated a predetermined distance. This separation distance is just enough larger than the diameter of balls 66 so that clearance between the cover and control plates may be provided. It is understood that ball feed plate 63 is rotatable between the cover and control plates and that shaft 64 passes through a suitable clearance opening in cover plate 67.

Cover plate 67 carries a pair of coil springs 73 and 74 suitably mounted thereon and having fingers 75 and 76 extending through apertures 77 and 78 in the cover plate. Fingers 75 and 76 are adapted to bear against ball feed plate 63, and the position of engagement with plate 63 is such as to register with discharge openings 53 and 54 in control plate 51. It will be noted that fingers 75 and 76 are shaped to engage balls 66 and urge them through discharge openings 53 and 54. Co-operating with finger 76 is switch 80, this being adapted to have its contacts closed every time a ball comes up under finger 76. This switch controls the shutter for dual play and also counts the number of balls for terminating the game after a predetermined number of balls, such as ten, have been projected on the field.

Ball feed plate 63 is connected by drive shaft 64 to driving motor 83. This driving motor may be any type desired and is adapted to turn ball feed plate 63 at a desired speed. Driving motor 83 may conveniently be of the induction type having reducing gearing therein and well known in the trade for driving clocks, time-controlled mechanism, and other devices. It is clear that the direction of drive of ball feed

plate 63, as seen in Figure 5, is anti-clockwise. A friction clutch may be provided to prevent damage in case a ball jams.

Referring now to Figure 8, a circuit diagram showing the connections between the various parts of the system is given. It will be understood that the actual electrical circuit elements may be disposed in any suitable portion of the cabinet and connections made to the various motors and switches. Thus, wires 86 and 87 may be connected to any suitable source of power, such as a 60 cycle, 110 volt outlet.

Wire 86 is connected through fuse 88 to lead 93 going to one terminal of switch 91. Switch 91 is operated by coin slide 34. When coin slide 34 is pressed inwardly against spring 92, switch 91 is one of a number of switches which are closed. When the pressure on coin slide 34 is withdrawn, it is understood that it returns to its normal position and that switch 91 is opened. Switch 91 has fixed contact 93 connected by wire 94 to one terminal of step-by-step switch 96. Step-by-step switch 96 may be any one of a number of well-known types generally used in telephone or other work wherein a movable contact wiper is progressively actuated to go from one fixed contact to another fixed contact. Such step-by-step switches, or selector switches as they are sometimes called, are generally provided with holding means for preventing the wiper arm from returning to its starting position until after a predetermined amount of travel or if the power for the holding circuit is cut off. Thus, a simple diagrammatic form of step-by-step switch which may be used here is disclosed on page 2038, particularly Figures 35 and 36, of Standard Handbook for Electrical Engineers, Seventh edition, published by McGraw-Hill. As used in the circuit of Figure 8, the wiper operated by the step-by-step switch plays over one bank of contacts corresponding to one digit in telephone switching. It is understood, of course, that such a bank may provide more than nine or ten contacts, and may provide as many as are necessary.

Wire 87 is connected to another terminal of step-by-step switch 96. Thus, wires 94 and 87 are connected to the holding coil of step-by-step switch 96.

Connected across wires 94 and 87 is relay 98 having leads 99 and 100 respectively. Relay 98 has armature 101 which is normally away from back contact 102. Armature 101 is connected to lead 99 of the relay. From contact 102, connection 103 goes to switch 104 of timer 105. Switch 104 has its other terminal connected by lead 106 to wire 90.

Timer 105 is provided with push-button 107. Timer 105 may be any simple time switch that will keep switch 104 closed upon actuation of push-button 107. The closure time is short and of the order of about a half a minute. This timer is provided to hold a circuit closed during the time between the deposit of two successive coins in slide 34. With each coin, slide 34 must be pushed in and, in order to allow for any reasonable delay in depositing a succeeding coin, timer 105 is provided to maintain a circuit closed after the initial coin slide operation. It is understood that slide 34 may be provided with means well known in the art to prevent operation of any of the mechanism and switches controlled by the slide such as switch 91 and timer 105 unless a coin is actually deposited into the coin slide. Thus, an idle operation of coin slide 34 should not operate any of the switches or timers.

From wire 90, connection 109 is made to wire 110. Wire 110 is connected between switch 111, operated by coin slide 34, and switch 112 in main timer 113. Switch 112 has its other terminal, in this case the fixed contact, connected to line 114. Main timer 113 has second switch 115 connected by lead 116 to wire 110 and further connected by lead 117 to wire 94. Coin controlled switch 111 has its fixed contact connected by wire 118 to step-by-step switch 96. Jumper 119 connects line switch 87 to the advancing coil of switch 96. Thus, lead 118 and jumper 119 go to the portion of step-by-step switch 96 which advances the wiper to be described later. Wires 87 and 94 go to the holding coil of the step-by-step switch.

Referring back to main timer 113, this may be any suitable timer switch which has actuating member 121 for closing the switches and energizing the timer in a manner similar to timer 105. Timer 113, however, differs from timer 105 in two particulars. Thus, timer 113 is adapted to stay closed for a period such as five minutes or ten minutes representing the maximum period of time required for a complete game, either dual or solo. Timer 113 is also provided with trip 123 which is adapted to be initially engaged by dog 124 on coin slide 34.

Thus, coin slide 34 when properly loaded with a coin and actuated by a player pushes dog 124 against trip 123 and releases main timer 113 from any previous setting. Thus, for example, if main timer 113 is of the type controlled by a spring movement, trip 123 may be connected to the main spring and cause the same to unwind. After trip 123 has been operated, further movement of coin slide 34 will depress spring button 121 to start timer 113 on a new timing cycle. On the return movement of coin slide 34, dog 124 will turn in a clockwise position to clear trip 123. It will be noted that timer 105 does not have such a trip so that, once the timer is started on a timer cycle, no means for suddenly cutting off the cycle is provided.

Step-by-step switch 96 operates wiper 126, it being understood that wiper 126 is advanced one step at a time by an energization of wires 118 and 119 for any continuous period of time. Thus, irrespective of how long wires 118 and 119 are energized, wiper 126 will be moved only one step. After wires 118 and 119 have been deenergized, then the next energization will advance wiper 126 another step. As shown here, wiper 126 is normally in an off position and may advance one step to contact 127 or two steps to contact 128. Contact 127 is connected by wire 129 to bottom contact 130 of a switch. Contact 128 is connected by wire 132 to top contact 133 of the same switch. This switch has movable contact 131 connected by wire 134 to wire 87. Movable contact 131 is mechanically tied together to a bank of switch contacts, all actuated by knob 32 as indicated by dotted lines. All these switches may be set for either dual or solo play.

Before proceeding further with the circuit, the operation of the coin controlled and time controlled portion of the system so far described will be given. Under normal conditions and assuming that the main timer is open as shown, coin controlled switches 91 and 111, switches in timers 105 and 113 and relay 98 will all be in the condition shown. Assume first that a solo game is to be desired. In that case, movable contact 131 will be in the down position against fixed contact 130. Such a game will require, for example, one

coin. Upon the deposit of a coin in coin slide 34 and the operation of the slide, the following occurs. Switch 91 is closed, thus completing the circuit from line wire 86 through coin switch 91 to wire 94, lead 99, relay 98, lead 100 to line wire 37. This causes armature 101 to be pulled up against fixed contact 102. At the same time, small interval timer 105 is operated so that switch 104 is closed for a short time. Thus, a circuit from wire 86 through fuse 88, wire 90, lead 106, switch 104, lead 103, fixed contact 102, armature 101, lead 99, relay 98, lead 100 and line wire 87 is established. Therefore, the opening of coin switch 91 will have no effect on relay 98 during the closure of timer switch 104. Thus, for a small time interval of the order of about one-quarter of a minute or longer, a through connection from line 86 to wire 94 is effectively established. This is only important for dual play.

At the same time, wires 94 and 87 energize the holding portion of step-by-step switch 96. Switch 111, which has also been momentarily closed, provides a circuit from wire 109 through switch 111 to wire 118 through the advance mechanism of step-by-step switch 96 to jumper 119, and then to line wire 87. Thus, wiper 126 will be moved from its off position to contact 127. This will complete a circuit from line wire 87 through lead 134, movable contact 131, fixed contact 139, lead 129, fixed contact 127, to wiper 126.

With the same movement of coin slide 34, main timer 113 has also been actuated and timer switches 112 and 115 both closed. With timer switch 115 closed, a circuit is established from line wire 86 through fuse 88, wire 90, wire 109, wire 116, switch 115, wire 117 to wire 94. From wire 94, the circuit continues through the holding portion of step-by-step switch 96 to line wire 87. It is, thus, clear that, as long as timer switch 115 is closed, the holding circuit for switch 96 will be continuously energized. This will prevent wiper 126 from returning to the off position by virtue of the opening of small timer 105 or coin controlled switches 91 and 111. It is clear that, with a solo game selected and with one coin actuation of slide 34, wiper 126 and wire 114 will be energized for a time interval corresponding to the maximum time duration of a game, this being controlled by main timer 113.

Assume that a dual game is to be played and that the switch selection is accordingly made. In that case, switch 131 would be in the up position bearing against contact 133. With the first coin in coin slide 34, the operation will be the same as previously described. However, with only one coin, it will be evident that wiper 126 will be on a dead contact 127. With a second operation of slide 34, switches 91 and 111 will be closed again. Switch 91, however, has no effect, since small interval timer 105 is still closed from the first coin operation and keeps relay 98 closed. However, the second closure of switch 111 will cause step-by-step switch 96 to advance wiper 126 to contact 128.

It is understood that, in the tripping of main timer 113, switch 111 will be closed simultaneously with switch 91 during the operation of slide 34. Thus, the initial movement of slide 34 will open main timer 113 and switches 112 and 115, while the final movement of slide 34 will close them again and start timer 113 on a new timing cycle. With wiper 126 at contact 128, wiper 126 will be energized from line wire 87.

Wiper 126 has wire 136 connected thereto. Wires 114 and 136 are the main energy supply

wires to the game apparatus proper exclusive of timer and coin control action. Wires 114 and 136 supply transformer primary 137 whose secondary 138 may be used to actuate motor 41 for right-hand robot 24.

Secondary 138 has one terminal connected to contact 139 of what is effectively a single pole, double throw switch controlled by handle 31. In actual practice, two separate switches as shown in Figure 1 may be provided, these being adapted to be selectively closed by movement of operating handle 31 to one side or the other of the inoperative position as shown. For simplicity, however, movable contact 139 is shown as cooperating with fixed contacts 140 and 141. Contact 140 may be connected through winding 42 of motor 41, while contact 141 may be connected through winding 43 of motor 41, these two windings being connected to the other terminal of secondary 138. In the neutral position of control handle 31, motor 41 will not be energized. By throwing control handle 31 to one side, motor 41 will be energized to turn robot 24 in one direction. By reversing the control, the motor rotation will be reversed. In this way, only the direction of rotation is controlled with no attempt at controlling the speed. It is possible, however, to provide speed control means so that the speed of rotation will be a function of the amount of throw of handle 31.

Distributing wires 114 and 136 are also connected to primary 143 of a transformer, this primary cooperating with secondary 144. Secondary 144 has terminal 145 to which are connected windings 38 and 39 of motor 37 operating robot 23. Windings 38 and 39 are connected to contacts 146 and 147 respectively cooperating with movable contact 148 controlled by handle 30. Motor 37, in addition to driving robot 23, also drives actuating finger 150. Finger 150 may be driven either at the same speed as robot 23 or at a reduced speed. Finger 150 cooperates with snap switch 151 having terminals 152 and 153 connected to windings 38 and 39 respectively. Snap switch 151 has movable contact 154 adapted to connect either of contacts 152 or 153 to contacts 155. Snap switch 151, in effect, is a single pole, double throw switch. Contacts 155 are connected by lead 156 back to contact 157 of one bank of switches controlled by game selection knob 32. Contact 157 cooperates with movable contact 158 which is connected to terminal 159 of secondary 144. Movable contact 158 can also cooperate with fixed contact 160 connected to movable contact 148 operated by handle 30.

As clearly indicated, fixed contact 160 is for dual play, while fixed contact 157 is for solo play. In the case of dual play, handle 30 controls the motor driven robot 23 in the same manner as control 31. In the solo position, control 30 is inoperative. When playing solo, finger 150 operates snap switch 151 to periodically reverse the motor driving robot 23. Thus, any predetermined range of travel of robot 23 may be provided before the motor is reversed. As an example, the robot may make one complete turn and be reversed to make another complete turn. The amount of travel of the robot in one direction may be made equal to, less than, or greater than the amount of travel in the reverse direction.

Line 114 is connected to transformer primary 162 whose secondary 163 has terminals 164 and 165. Terminal 164 is connected to movable contact 166 of ball switch 80. This contact cooperates with fixed contact 167, which fixed contact

is connected to the advancing coil of step-by-step selector switch 170. Selector switch 170 may be of the same type as switch 96. The advancing coil circuit is completed by a jumper to wire 172.

Terminals 164 and 165 are connected by leads 171 and 172 to switch 170 for holding purposes. Switch 170 drives movable contact 173 over a bank of contacts whose number depends upon the maximum number of balls which may be used in a game. Assuming that the balls are projected on the field a maximum of ten times for one game, movable wiper 173 may cooperate with ten fixed contacts 174 in addition to the original off contact.

Alternate contacts 174 are connected together by wire 175, this wire going to solenoid 60. The remaining contacts are dead. Solenoid 60 has its other terminal connected by lead 176 to fixed contact 177 of a switch having movable contact 178. This switch is mechanically tied to movable contact 158, so that knob 32 actuates them together. Only the dual position of contact 178 is used. Wiper 173 is connected by lead 180 to transformer terminal 184.

Line 114 is also connected to primary 182, whose secondary 183 energizes ball feed motor 83. In order to control the energization of transformer primaries 162 and 182 and determine the maximum number of balls which may be fed for one game, the following may be provided. Wiper 185 traveling with wiper 173 is driven by step-by-step switch 170. Wiper 185 may play over a series of fixed contacts 186. An off contact or position is shown. The number of fixed contacts 186 is equal to the number of fixed contacts 174. As shown, ten are provided permitting a maximum of ten balls to a game. Cooperating with any desired one of fixed contacts 186 is connection 188 going to relay 190. This connection may be readily changed. Connection 188 is also connected to fixed forward contact 191 of the relay. Relay 190 has armature 192 connected by wire 193 to main distributing wire 136. Jumper 194 connects wiper 185 to wire 193. Relay 190 has back contact 195 connected by wire 196 to junction 197 connected to transformer primaries 162 and 182. Relay 190 is connected by wire 198 to wire 114.

Wires 114 and 136 are also connected to two scoring systems 200 and 201, only one of which is shown in detail. Thus, the wires are connected to transformer primary 202. Secondary 203 has one terminal connected through switch 204, mounted in ball return chute 46. As shown in Figure 2, switches 204 and 204' are mounted on chutes 46 and 48 respectively. Each switch has spring finger 205 extending inside the chute and actuated by a ball passing the same to close the switch momentarily. As shown in Figure 8, switch 204 is connected to step-by-step switch 206, the return circuit being made by jumper 207 and lead 208 back to secondary 203. Lead 209 cooperates with 208 for holding purposes. Wiper 210 of the selector switch is connected by lead 211 to secondary 203 and plays over fixed contacts 212. The normal rest position is marked off. Between each fixed contact 212 and return lead 213 is lamp 214. Lead 213 is connected back to secondary 203. The number of lamps 214 will depend upon the maximum number of balls to a game.

The operation of the game apparatus is as follows. Assuming that a solo game is chosen and coin slide 34 has been operated once, as pointed out previously, distributing wires 114 and 136 will

be energized. Thus, transformer primary 137 will be energized. This will permit control 31 to operate robot 24.

Transformer primary 143 will be energized and secondary 144 will energize a circuit including movable contact 158 and fixed contact 157. In the solo position of control handle 32, control 30 will be ineffective due to dead contact 159. Instead, a circuit from secondary 144 through terminal 159, movable contact 158, fixed contact 157 and wire 156 will be established to snap switch 151. Depending upon the position of this switch, windings 38 and 39 will be alternately energized. It is clear that the direction of motor rotation should be so related to the polarity of connections to switch 151 as to provide for reversal of motor operation at the end of the travel in any one direction.

Wiper 185 will be in the off position so that relay 190 will remain in the position shown in the drawing. Thus, from distributing wire 136 through wire 193 to wire 194 and wiper 185, the circuit will be dead as far as the winding of relay 190 is concerned. At the same time, however, a circuit from wire 136 through wire 193, armature 192, back contact 195, wire 196, junction 197, and thence through windings 162 and 182 in parallel will be established to distributing wire 114. With transformer primary 182 energized, ball feed motor 83 will operate and feed balls to the playing field. With each ball fed, ball switch 80 will be actuated. The actuation of ball switch 80, closing contacts 166 and 167, will actuate step-by-step switch 170 and advance wipers 173 and 185. Inasmuch as a solo game is being played, movable contact 173 will be ineffective. During an entire game, leads 171 and 172 are continuously energized for holding switch 170. However, solenoid 60 will not be energized due to dead contact 177, and all balls will be fed in the same manner through discharge opening 53.

As shown in Figure 8, when eight balls have been fed and wiper 185 completes a circuit with connection 188, relay 190 will be operated. Thus, the relay operating circuit will go from wire 136 to wire 193, thence to wire 194, to wiper 185, to connection 188, through the winding of relay 190, thence by wire 198 to wire 114. Upon energization of relay 190, armature 192 is pulled up against contact 191. A holding circuit for relay 190 is established tending to maintain the relay in a holding position throughout the remainder of that game period. This holding position circuit may be traced from wire 136 to wire 193, armature 192, contact 191, through the winding of relay 190, wire 198 to wire 114. Upon actuation of relay 190, the energizing circuit for transformer primaries 162 and 182 is broken. Thus, the ball feed motor stops. Step-by-step switch 170 will be released to return the wipers to off position. However, it should be noted that relay 190 will hold the armature against contact 191 until main timer 113 opens.

Throughout the game, transformer primary 202 of scorer 200 is energized. Secondary 203 supplies energy to the scoring system. This scoring system comprises step-by-step switch 206 which advances wiper 210 once for each time switch 204 is operated. Since switch 204 is operated once for every ball in return chute 46, it will be evident that the condition of step-by-step switch 206 will be an indication of the score for that one particular side. Each fixed contact 212 is connected to an individual scoring lamp 214. The lamp energizing circuit may be traced from secondary 203, lead 211 and wiper 210, through

whichever fixed contact 212 the wiper happens to be on, and thence through corresponding lamp 214 to common return 213 and back to secondary 203. As clearly indicated in Figure 1, each scoring lamp may illuminate a number.

It is understood that scorer 201 duplicates scorer 200 as far as circuit details are concerned. Other scoring means may be provided if desired.

Assuming that a dual game is played, the only difference in the system will be as follows. Movable contact 158 will bear against fixed contact 160. Thus, control 30 for robot 23 will be operative, and the control will be exercised in exactly the same manner as in connection with robot 24. It is clear that snap switch 151 will be inoperative under such conditions.

With dual game, movable contact 178 bears against fixed contact 177 and step-by-step switch 170 will advance wiper 173 alternately from dead to live fixed contacts 174 as balls actuate switch 80. When a live contact is encountered, the circuit from wiper 173 will be completed through solenoid 60 and return wire 176 to fixed contact 177. Upon energization of solenoid 60, shutter 55 is operated, causing a ball to go past discharge opening 53 and be discharged through opening 54. This results in the ball being discharged to the left of the median line of field 14.

The next ball will cause switch 80 to operate again and advance wiper 173 to a dead contact. This will mean that solenoid 60 will be dead and a ball will be discharged through opening 53. Thus, the balls will be alternately discharged through openings 53 and 54.

It is immaterial whether switch 80 is operated by a particular ball in time to operate the shutter for that same ball or succeeding ball. It is, of course, desirable that the operation be consistent. Successive balls will be alternately discharged through the two openings on opposite sides of the center line of the field.

If a game has been finished before timer 113 opens the circuit and a new game is desired, then coin slide 34 may be actuated to release timer 113. This deenergizes wires 114 and 136, and the various step-by-step switches will return to "off" position.

Instead of small interval timer 105, other means for holding switch 91 closed for an equivalent time may be provided. Thus, dash pot means on switch 91 may be provided for keeping this switch closed long enough to accommodate two operations of coin slide 34.

It is, of course, possible to provide a plurality of robots as a team to take the place of one robot on each side of the playing field. In such case, all the robots on one team would be moved simultaneously, either in the same direction or in different directions. Instead of rotation, they may be moved along the field for a distance and then returned.

It will be apparent that my invention makes possible the construction of a game apparatus providing considerable amusement and requiring substantial skill.

What is claimed is:

1. In a game apparatus of the kind described, a playing field having opposed playing positions and having goals beyond said positions, a rotatable robot at each playing position, each robot including a means for intercepting a ball when said robot is in proper position, electrically actuated means for supplying at least one ball on said field and initially directing the same toward a playing position, a first electric motor for

driving one robot, a second electric motor for driving the other robot, a circuit for said first motor including a first manual control so that when said circuit is energized said one robot may selectively rest or rotate in one or other direction, a circuit for said second motor, said last named circuit including a second manual control and automatic motor reversing means, said second manual control when effective during a game permitting said second robot to rest or rotate in one or other direction, said automatic reversing means when effective during a game causing said motor to turn alternately in one and other direction, means for initiating a game and energizing said ball supply means and said motor circuits, said game initiating means including manually controllable switching means having solo and dual playing positions for disabling either the second manual control or automatic reversing means respectively so that when said switching means is in condition for solo play, the manual control for the second robot is ineffective and the automatic reversing means is effective during a game and when the switching means is in condition for dual play, both manual controls are effective to control the two robots during the game with the automatic reversing means being ineffective.

2. The game apparatus according to claim 1 wherein said ball-supplying means supplies a number of balls, wherein means are provided for initially directing when operative during a game successive balls alternately toward one or the other playing positions, means interlocked with said selector switching means for energizing only one of said ball-directing means during a game, the means for directing all balls toward one playing position being operative for solo play and the means for directing successive balls alternately toward one or other position being operative during dual play.

3. In a game apparatus of the kind described, means defining a playing field having opposed playing positions and having goals beyond said playing positions, a rotatable robot at each playing position, each robot having means for intercepting a ball, an electric motor for one robot, a second electric motor for the second robot, means for controlling said motors so that said robots may be turned in one or other direction as desired, chutes communicating with each goal for receiving balls, said chutes meeting in a common discharge region and being so disposed that said balls roll toward said common discharge region, ball feeding means including a rotatable plate having a series of apertures symmetrically disposed around the center of rotation, stationary plates on opposite sides of said rotatable plate, one stationary plate having a ball intake aperture communicating with said chute discharge region and adapted to register with an aperture in said rotatable plate at periodic intervals, said other stationary plate having two discharge apertures, said apertures having cooperating means for directing balls toward said opposed playing positions respectively, shutter means cooperating with a selected discharge aperture for releasing a ball therethrough, means for controlling said shutter means so all balls during an entire game are discharged through said one aperture, means for controlling the shutter means so that during an entire game balls are discharged alternately through one or through the other discharge apertures, and manual means for initiating a game and selecting which of the two shutter control

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means shall be operative during an entire game.

4. In a game apparatus of the kind described, means defining a playing field having opposed playing positions, opposed movable robots at said playing positions, electrical means for operating said robots, manual means for controlling one-half of the robots to move the same into various playing positions, a second manual means for controlling the remaining half of the robots for moving the same into various positions, electrically controlled means for automatically moving the remaining half of the robots cyclically into various positions, manual selector means, a coin slide, switch means operatively coupled to said coin slide, a stepping switch controlled by said last named switch means, said stepping switch having off, solo and dual game positions respectively and adapted to be stepped up from an initial off position by successive coin slide movements to solo and dual game positions respectively, and means controlled by the joint action of said selector means and said stepping switch for selectively preparing operating circuits for the second manual means and automatic means respectively whereby one movement of said coin slide will advance said stepping switch to a solo game position and together with a solo selection by said manual selector means will initiate a solo game where a player will operate only the first manual means with the automatic means

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operating against the player and whereby two movements of said coin slide will advance said stepping switch to a dual game position and together with a dual game selection by said manual selector means will initiate a dual game where two players may operate said two manual means against each other, said second manual means and automatic means not being operative simultaneously during any one game.

JERRY C. KOCI.

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