United States Patent

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[54] **FORCE DETECTING TARGET FOR PINBALL MACHINES AND THE LIKE**
12 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **273/121 A,** 273/127 D, 200/61.11
[51] **Int. Cl.** **A63b 71/00**
[50] **Field of Search** ..... 273/119 A, 120 A, 121 A, 122 A, 123 A, 124 A, 125 A, 127 RD, 181, 182, 183, 184, 185, 102.1, 102.2; 200/61.11; 73/379, 380

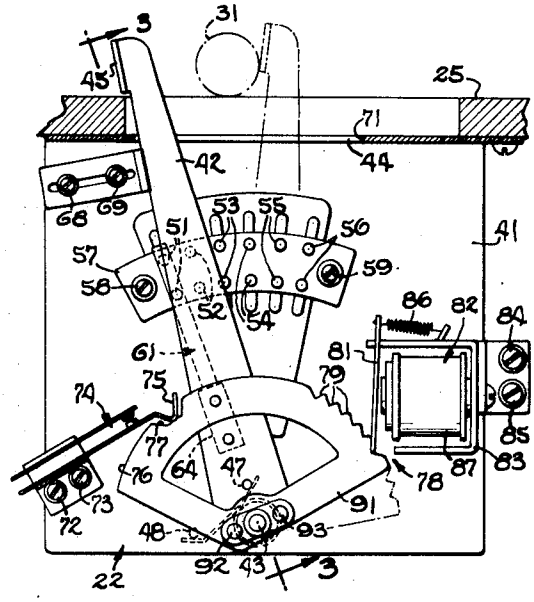
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ABSTRACT: A target mechanism for pinball machines and other target-type games which variably actuates an associated scoring mechanism to cause it to register a score representative of how directly and forcefully the target has been struck. The target mechanism has an arm which is driven from its initial position a distance dependent upon how directly and forcefully the target has been struck, and a pulse generating means for converting the distance the target arm is driven to a corresponding number of pulses which are supplied to actuate the scoring mechanism. The pulse generating means comprises a master switch which is operated to provide a predetermined number of pulses each scoring cycle and a plurality of auxiliary switches which are operated sequentially and in synchronism with the master switch such that the operation of each auxiliary switch tends to inhibit a respective one of the master switch pulses. The movement of the target arm at least a predetermined minimum distance from its initial position causes a bypass circuit to be completed around a number of such auxiliary switches corresponding to the extent of the movement so that the appropriate number of pulses are transmitted to the scoring mechanism.



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SHEET 1 OF 4

Fig. 1

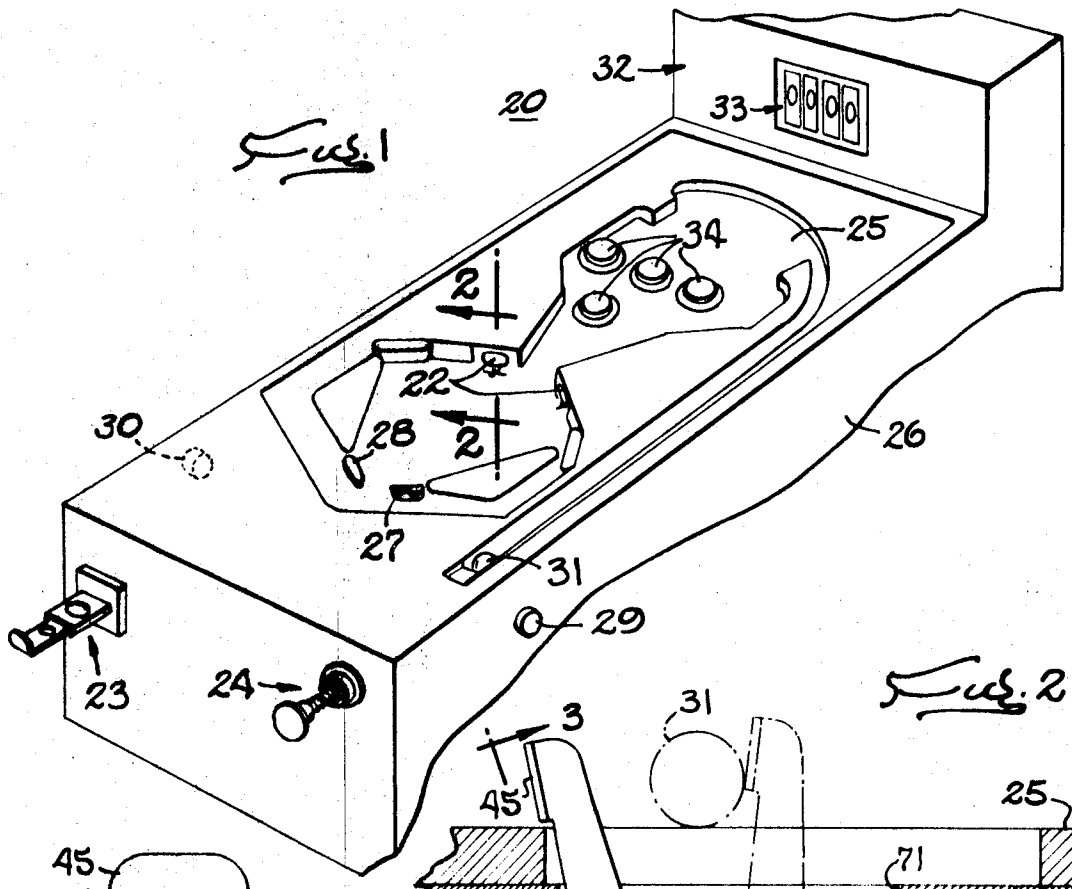


Fig. 2

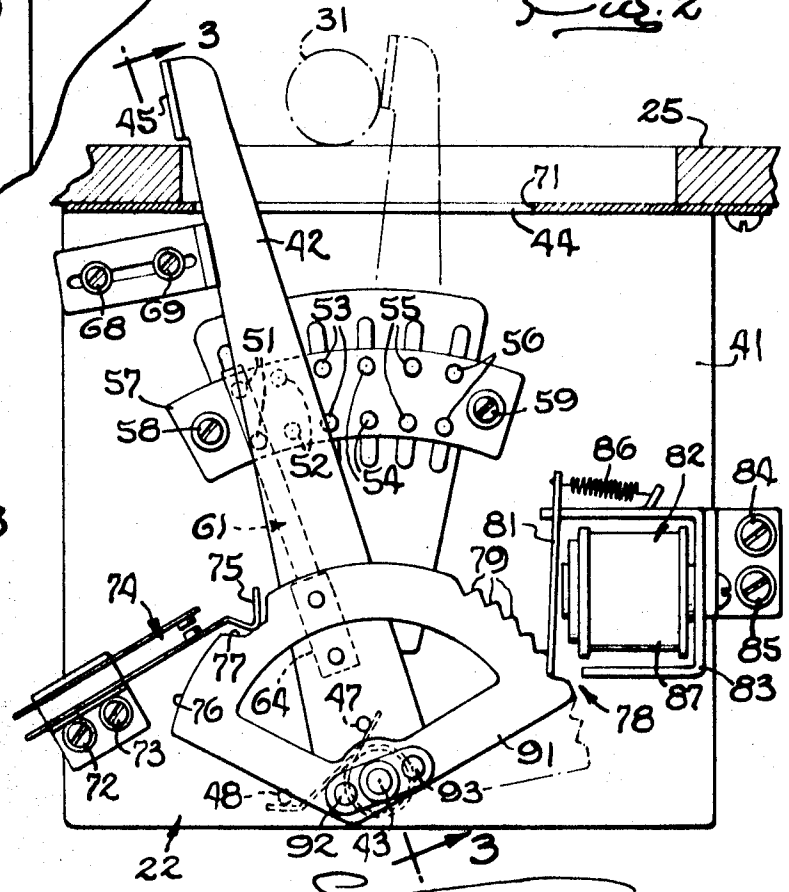
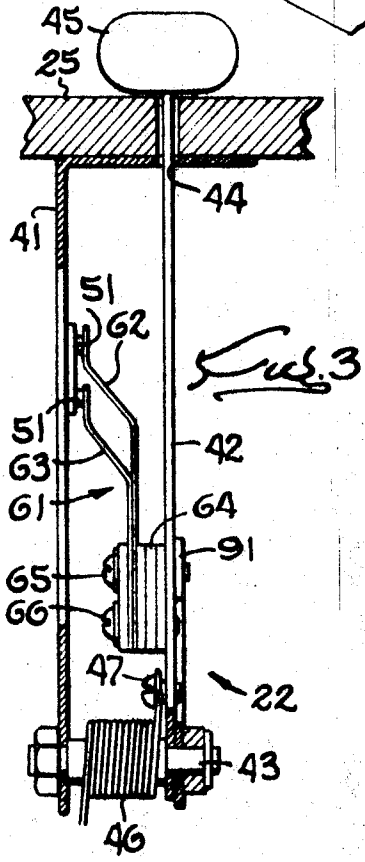


Fig. 3



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Fig. 4

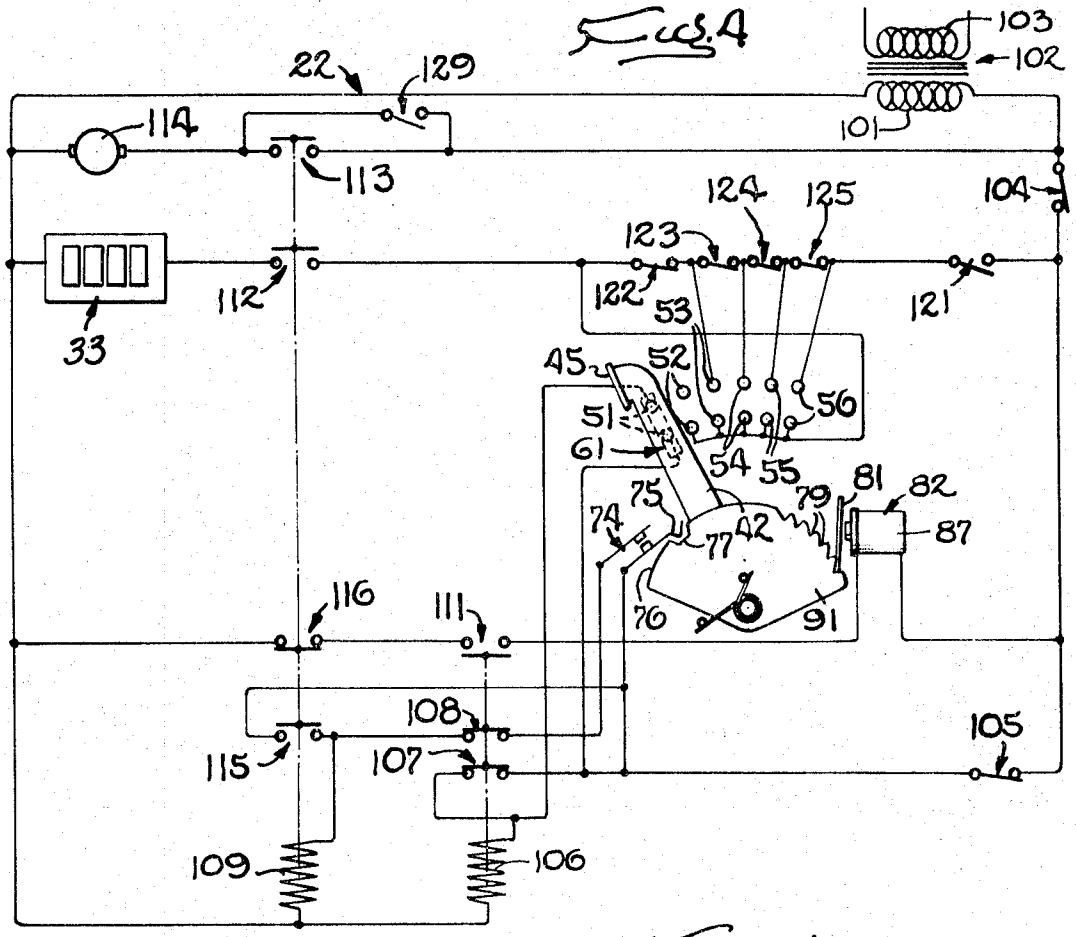


Fig. 5

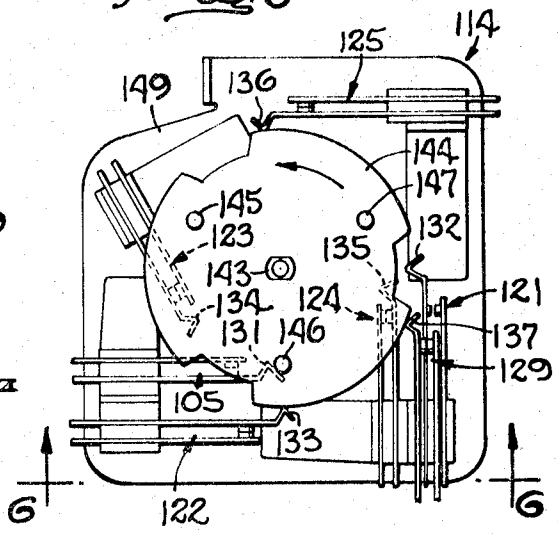
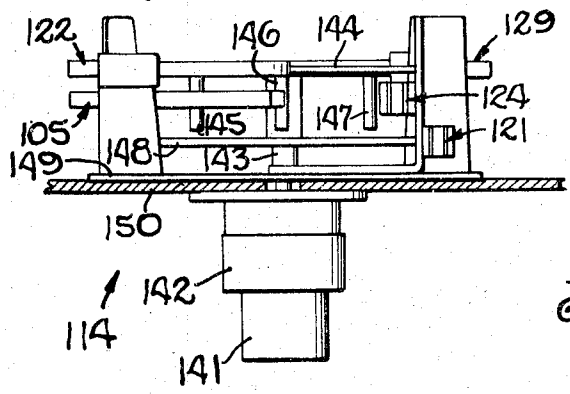


Fig. 6



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Fig. 7

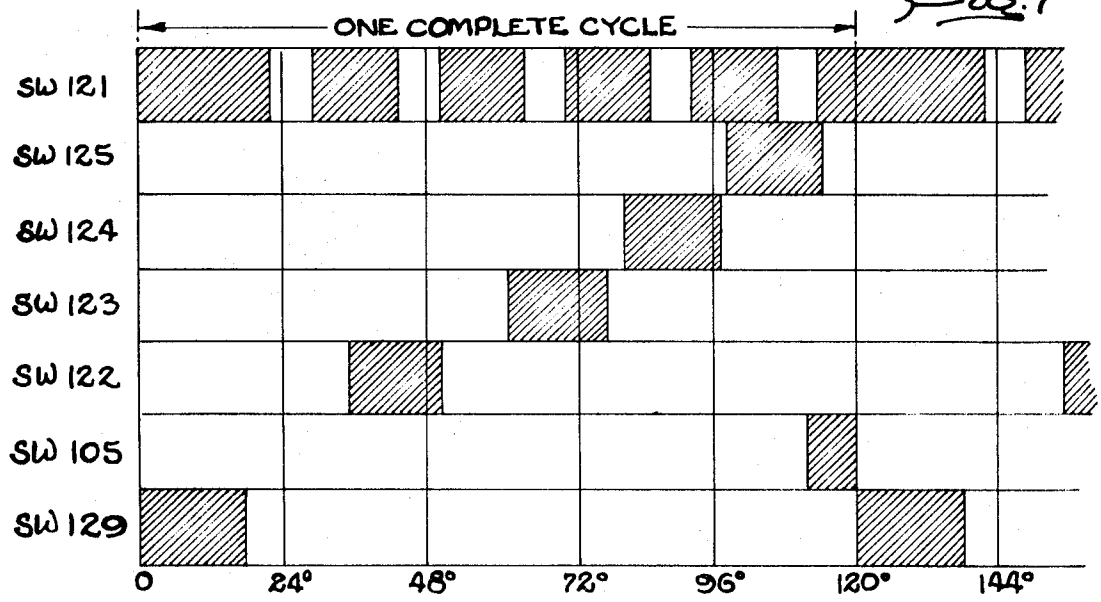


Fig. 8

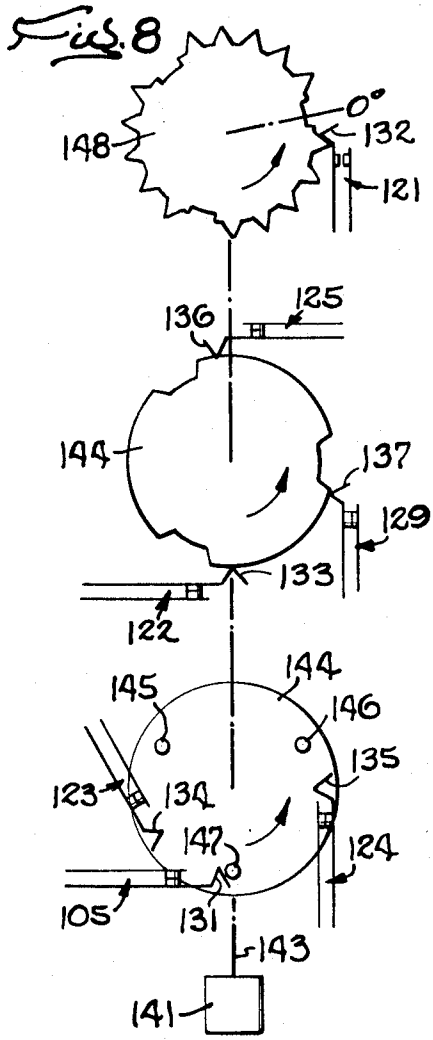
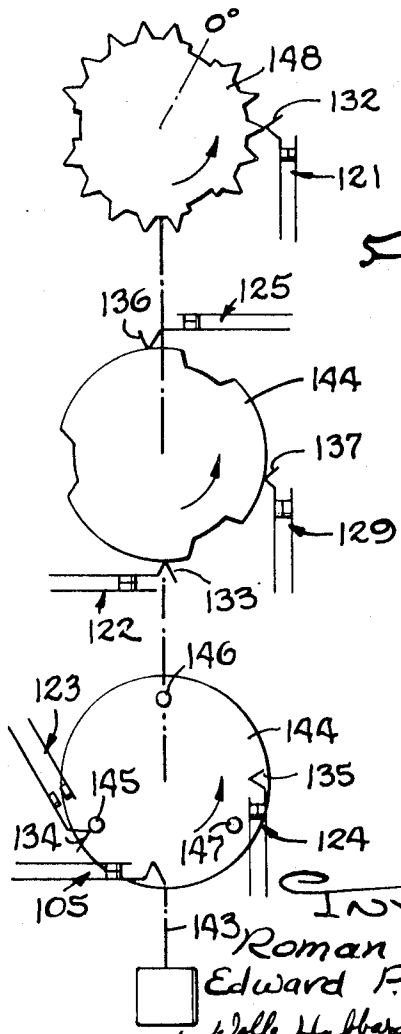
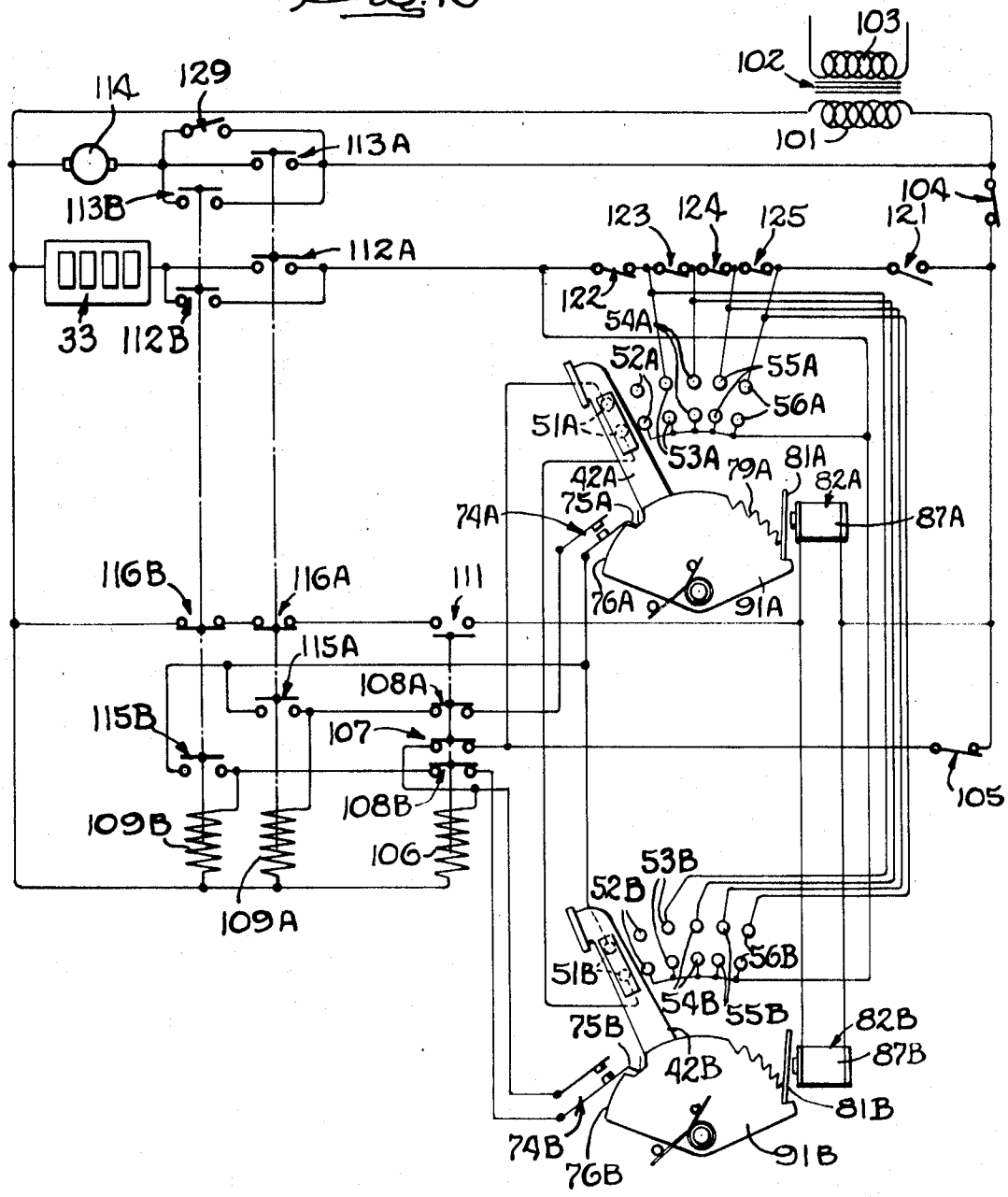


Fig. 9



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Fig. 10



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FORCE DETECTING TARGET FOR PINBALL MACHINES AND THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates to target games and more particularly to targets for pinball machines and the like.

As is well known, the usual pinball machine comprises a number of targets, such as bumper switches, each of which electrically actuates a scoring mechanism whenever it is struck or bumped by a game ball. Generally, the score awarded for hitting any particular target at a given point during the game is fixed, though provision is made in many machines of this type for a bonus feature; e.g., the point value of a particular target may be increased for a brief period or until the target has been struck a predetermined number of times. This scoring bases has existed for years, without any basic change.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a target for pinball machines and similar target games which provides a different scoring basis than heretofore employed in such games. More specifically, it is an object to provide a target that variably actuates a scoring mechanism in dependence upon how directly and forcefully the target is struck.

Another object of the present invention is to provide a target of the foregoing type that is reliable and inexpensive, and which may be easily assembled and serviced. A more detailed, related object is to provide a target of the foregoing type in which the mechanical movement is simplified, with the majority of operations necessary to variably actuate the scoring mechanism being effected by parts that are not subjected to the shock of impact of the game ball upon the target.

A further object of the invention is to provide a target of the foregoing type that is compatible with the targets and scoring mechanisms conventionally employed in pinball machines and similar target games.

Finally, it is an object of the present invention to provide a novel target that may be employed in a wide variety of new and existing target games.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will become apparent upon reading the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 is a fragmentary, simplified, perspective view of a pinball machine, which is typical of the target-type amusement devices or games in which the target mechanism of the present invention may be employed;

FIG. 2 is a vertical section taken along the line 2—2 in FIG. 1 to illustrate the mechanical features of the new target mechanism;

FIG. 3 is a cross section taken along the line 3—3 in FIG. 2 to further illustrate the mechanical features of the target mechanism;

FIG. 4 is a schematic diagram illustrating the electrical features of the target mechanism;

FIG. 5 is a top view of a motor-driven timing mechanism that may be employed to time the operation of the sequenced switches shown in FIG. 4;

FIG. 6 is a side elevation of the timing mechanism looking along the line 6—6 in FIG. 5;

FIG. 7 is a timing chart showing the sequence of operation of the sequenced switches with the hatched and unhatched areas indicating that the switches are opened and closed, respectively;

FIG. 8 is a stop motion diagram illustrating the condition of the sequenced switches and the position of the timing cams shortly after the start of a scoring cycle;

FIG. 9 is a stop motion diagram illustrating the condition of the sequenced switches and the position of the timing cams at a midpoint during a scoring cycle; and

FIG. 10 is a schematic diagram illustrating a pair of target mechanisms coupled to a single scoring mechanism.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

While the present invention is described hereinafter in detail with reference to a specific embodiment, it is to be understood that the intent is not to limit it to that embodiment. To the contrary, the intent is to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

A. Environment

Turning now to the drawings, and particularly to FIG. 1, there is shown a pinball machine, indicated generally by 21, as being typical of the target-type games with which one or more of the new target mechanisms, indicated generally by 22, may advantageously be employed. As is conventional, the pinball machine shown includes a coin-operated actuating mechanism 23 and a plunger assembly 24, together with a playfield 25, which is supported with a slight downward slope from top-to-bottom by a tablelike structure 26. Moreover, at the bottom or lower end of the playfield, there are the usual right-hand and left-hand flipper assemblies 27 and 28, which are typically actuated through the operation of respective push buttons 29 and 30.

As is also conventional, the targets are spaced about the playfield so that one or more of them may be struck by a game piece, specifically a ball 31, traversing the playfield. Further, housed within a console 32, which is generally located at the top or upper end of the machine 21, there are one or more scoring mechanisms 33 for registering and providing a visual indication of the score or scores accumulated during the course of each game.

However, unlike the usual pinball machine, the machine shown includes not only a number of conventional targets, in this instance a number of bumper switches 34, but also a pair of the new target mechanisms 22. Of course, aside from limitations of space, there is no limit to the number of the new targets that may be employed in a given pinball machine. Likewise, there is no requirement that the new targets be used in combination with conventional targets. However, the arrangement shown is an excellent example of an arrangement in which full advantage is taken of the unique ability of the new target mechanism to provide a score which is a function of how directly and forcefully the target is struck. More specifically, with this arrangement, the directness and forcefulness, in other words the effective force, with which either one of the target mechanisms 22 is struck, as well as the frequency with which either one of them is struck, depends primarily upon skillful operation of the flippers 27 and 28, since the targets 22 can be struck only by a ball 31 which has been propelled upwardly from the bottom of the playfield. Of course, by providing a premium for skillful play, the new target mechanism greatly enhances the entertainment value of the target games in which it is employed. Moreover, the new target mechanism 22 is fully compatible with the targets conventionally employed in such games. It can, therefore, be used in combination with such conventional targets to afford an imaginative challenge for both the extremely skilled and the not so skilled players.

B. Target Mechanism

In keeping with the present invention, the target mechanism 22 includes means which are effective each time the target is struck for detecting the effective force with which the target was struck, means for actuating the scoring mechanism 33 to register a corresponding score, and means for then resetting the target mechanism. Advantageously, only the detecting means need be subjected to the shock of impact of the ball upon the target. The remainder of the target mechanism may be remotely located, say within the console 32, and therefore need not be designed to withstand the impact shock. Of course, while only one scoring mechanism 33 is shown, it will

be understood that the new target mechanism, like conventional target mechanisms, can be used with appropriate transfer circuitry to actuate a selected one of a plurality of scoring mechanisms, say one for each of six players.

1. Mechanical Features

Turning first to the mechanical features of the target mechanism **22**, and specifically to FIGS. **2** and **3**, fixed to the underside of the playfield **25** there is a mounting plate **41** upon which the lower end of a target arm **42** is mounted by a pivot **43**. The target arm extents upwardly from the pivot **43** through a narrow, laterally confining slot **44** provided in the playfield **25** to an upper end which carries a target plate **45** above and adjacent the playfield in position to be struck by the ball **31**. The slot **44** affords free rotation of the arm **42** about the pivot **43**, but restricts its lateral movement to prevent the alignment of the target mechanism from being disturbed by a glancing blow.

Means are provided to bias the target arm **42** toward an initial, forward position with a force that increases as the arm is driven away therefrom. In this way, the distance of the rearward travel of the target arm, in other words the arc through which it is driven, is directly dependent upon the effective force with which the target plate **45** is struck. Thus, in the illustrated embodiment, there is a helically wound spring **46**, which is substantially concentric with the pivot **43** and which is secured at one end, suitably by a bolt **47**, to the target arm **42** and at its other end by another bolt **48** to the mounting plate **41**. Accordingly, it will be seen that there is a simple and rugged mechanical movement for detecting the effective force of the impact of the ball **31** upon the target plate **45**, while readily absorbing the shock of such impact. The force referred to herein as the "effective force" is the generally horizontal force which acts on the target arm **42** in a direction perpendicular to its axis of rotation. This effective force will, of course, be understood to be a resultant force having a magnitude which depends upon how directly and forcefully the target plate **45** is struck.

To register a score on the scoring mechanism **33** corresponding to the effective force with which the target is struck, an electrical signal indicating the distance the target arm is driven is generated. The form of this signal and the manner in which it is generated are explained in more detail hereinafter. However, it should be noted at this point that adjacent the target arm **42** and intermediate its ends there are a series of spaced contact pairs **51–56** which are carried by an insulative strip **57** which, in turn, is secured to the mounting plate **41**, suitably by a pair of bolts **58** and **59**. The first of these contact pairs, the pair **51**, defines the initial position for the target arm **42**, while the others define respective stations which are increasingly spaced from the target arm's initial position. Moreover, in alignment with the contacts **51–56** there is a wiper arm **61** comprising upper and lower wipers **62** and **63**, respectively, which are held in firm electrical contact within an insulating block **64** which, in turn, is secured to the target arm **42**, typically by a pair of bolts **65** and **66**.

To insure that the contacts **51** are bridged by the wiper arm **61** when the target arm **42** is in its initial position despite the slight variations that may occur in the production of the target mechanism, an adjustable stop **67** may be fixed to the front of the mounting plate **42**, say by a pair of bolts **68** and **69**, for limiting the forward travel of the target arm. Of course, another stop (not shown) may be mounted at the rear of the mounting plate to limit the rearward travel of the target arm, or this function may be performed simply by the rear edge **71** of the slot **44** as shown.

Provision is made for closing an electrical circuit, hereinafter described, to initiate a scoring cycle each time the target arm is moved from its initial position. To this end, in the illustrated embodiment, secured to the mounting plate **42**, suitably by still another pair of bolts **72** and **73**, there is a cam-operated switch **74**. The specific switch shown is a normally open type with a cam follower **75** which rides on an arcuate, notched cam surface **76** which, in turn, is mounted for rotation with the target arm. The notch **77** provided in the camming surface **76** permits the switch **74** to assume its normal open state when the target arm is in its initial position. However, in all other positions of the target arm, the camming surface **76** exerts sufficient force against the cam follower **75** to close the switch **74**.

Desirably, to eliminate the need for a memory or the like, provision is also made to prevent return of the target arm **42** toward its initial position until the completion of the scoring cycle. For this purpose, there is a one-way locking mechanism **78** which, as shown, includes a series of ratchet teeth, one for each of the contact pairs **51–56**, mounted for rotation with target arm **42** and a cooperating fixed pawl **81**. The ratchet teeth **79** are spaced so that the target arm **42** is locked with the wiper arm **61** bridging the most remote of the contact pairs **52–56** reached by it during the travel of the target arm **42** away from its initial position.

Preferably means are provided to automatically withdraw the pawl **81** upon the completion of the scoring cycle, so that the target arm is then returned to its initial position. This is very simply and effectively accomplished in the illustrated embodiment through the use of a relay **82**. As shown, the relay is mounted within a housing **83** which is secured to the mounting plate **42**, typically by a pair of bolts **84** and **85**, and the pawl **81** is simply the relay armature. To bias the lower end of the armature-pawl into engagement with the ratchet teeth **79** there is a spring **86** connected between the upper end of the armature and a point on the housing **83**. This bias is overcome by energization of the relay coil **87** and the target arm **42** is then free to return to its initial position under the influence of the bias spring **46**.

Of course, it will be appreciated that the camming surface **76** and the ratchet teeth **79** may be carried by separate members (not shown), both secured to the target arm **42**. However, it is somewhat simpler to have both the camming surface and the ratchet teeth carried by a common member, and they are, therefore shown, as forming distinct portions of a segment wheel **91**. The segment wheel **91** is fixed for rotation with the target arm **42**, typically by yet another pair of bolts **92** and **93**.

2. Electrical Features

With the mechanical features firmly in mind, more specific attention is now directed to the electrical features of the new target mechanism. Referring for that purpose to FIG. **4**, it can be seen that the target mechanism **22** and the scoring mechanism **33** are connected across the secondary winding **101** of an input transformer **102**, which has its primary winding **103** coupled to a suitable power source (not shown), say a 120 v., 60 cycle, wall outlet. In keeping with the general practice in the art, to prevent unauthorized play, a main switch **104** may be connected in series with the secondary winding **101**. Typically, the main switch is closed at the outset of each game through operation of the actuating mechanism **23** and then reopened to end the game after a predetermined number of balls have been shot. The means for effecting this switch operation are well known and need not be described here. For present purposes, it suffices to assume that the main switch **104** is closed.

While the principles of the present invention are applicable to use with a wide variety of new and existing scoring mechanisms, the particular embodiment here shown is particularly adapted for use with a conventional pulse actuated-type scoring mechanism. There are several scoring mechanisms of this type, with a number of peculiar characteristics. For instance, the registered score may increase or decrease in response to each pulse applied thereto, and the change provided on each pulse may be fixed or it may vary from pulse-to-pulse. However, all pulse actuated scoring mechanisms share the common characteristic of providing an incremental change in the registered score in response to each pulse applied thereto. Accordingly, the circuitry of the illustrated embodiment is adapted to convert the distance or arc through which the target arm **42** is driven by the effective force imparted thereto by the game ball **31** to a related

number of pulses which, in turn, actuate the scoring mechanism 33 to cause it to register a score corresponding to the effective force.

More particularly, to set the target mechanism for the initiation of a scoring cycle upon the completion of the previous scoring cycle and after the target arm 42 has been reset to its initial position, a timer-operated switch 105 is closed, thereby energizing a relay 106 by circuit flow through a series circuit including the contacts 51, which at this point are bridged by the wiper arm 61. The energization of the relay 106 completes a parallel relay holding circuit by closing a normally open contact 107. It also sets the target mechanism for the next scoring cycle by closing a normally open contact 108, which is connected in series between the starting switch 74 and a second relay 109, and by opening a normally closed contact 111, which is connected in series with the reset relay 82.

Now, when the target arm 42 is moved from its initial position, the starting switch 74 is closed to initiate a new scoring cycle. To this end, the starting switch 74 is connected in series between the switch 105 and the relay 109 so that current to energize the relay 109 is provided as soon as the starting switch is closed. When energized, the relay 109 closes normally open switches 112 and 113 which are connected in series with the scoring mechanism 33 and a timing means 114, respectively. Thus, at the very outset of the scoring cycle, the scoring mechanism is enabled and the timing means is actuated. As shown, energization of the relay 109 also closes a relay holding circuit by closing a normally open contact 115, which is connected in parallel with the starting switch 74 and opens another normally closed contact 116, which is connected in series with the reset relay 82. The holding circuit assures continued energization of the relay 109 despite possible chattering of the switch 74 as the target arm 42 moves, while the contact 116 simply provides a back up for the other series connected contact 111 to prevent premature energization of the reset relay 82.

As previously mentioned, the illustrated embodiment of the present invention is particularly adapted to use with a pulse-actuated scoring mechanism. Accordingly, to carry out the invention, the target mechanism 22 includes a pulse generating means which is activated in response to the movement of the target arm 42 from its initial position to supply the specific number of pulses required for actuating the scoring mechanism 33 to register a score representative of the distance the target arm 42 has moved from its initial position. In other words, the pulse generating means supplies the number of pulses required to actuate the scoring mechanism to register a score representative of the effective force with which the target plate 45 has been struck by the ball 31.

A suitable pulse generating means to accomplish the desired end is shown as including a master switch 121 and a plurality of auxiliary switches 122–125, all of which are connected in series and automatically operated in precisely timed sequence by the timing means 114. More particularly, as best shown in FIG. 7, the master switch is closed a predetermined number of times each scoring cycle, say five times, and tends to provide a corresponding number of actuating pulses. In the specific embodiment illustrated, the first of these pulses is permitted to pass to the scoring mechanism 33 whenever the target arm 42 is moved from its initial position and regardless of the effective force with which the target plate 45 was struck. However, each of the remaining pulses is inhibited by the operation of a respective one of the sequentially opened auxiliary switches 122–125.

Accordingly, to supply the additional pulses (i.e., any pulses in addition to the first pulse) required for proper actuation of the scoring mechanism 33, provision is made to bypass one or more of the auxiliary switches 122–125, the precise number of switches being bypassed, and therefore the number of additional pulses provided, directly depending upon the distance the target arm 42 has been driven from its initial position. For this purpose, as shown, one contact of each of the contact pairs 53–56 is connected to the input of the scoring mechanism 33 and the other contact of each pair is connected to a respective one of the auxiliary switches 122–125 at the end thereof most remote from the scoring mechanism 33. In this way, each contact pair 53–56 forms a normally open bypass circuit which is closed for the duration of a scoring cycle whenever the target arm 42 is locked against return to its initial position with the wiper arm 61 bridging the particular contact pair. Moreover, it will be seen that each successive one of the contact pairs is effective when bridged by the wiper arm 61 to bypass one more auxiliary switch than is bypassed by the contact pair next closer to the initial position of the target arm 42. Therefore, the further the target arm is driven from its initial position, the greater the number of auxiliary switches bypassed. For example, say the target is struck with sufficient effective force to drive the target arm back only far enough to cause the wiper arm 61 to bridge the contact pair 53. In that event, the auxiliary switch 122 is bypassed and pulses will be supplied to the scoring mechanism the first two times the master switch 121 is closed. However, the last three times the master switch 121 is closed, the pulses will be inhibited by the successive opening of the auxiliary switches 123–125. As a further example, if the target is struck with much more effective force and the target arm 42 is driven back far enough to bring the wiper arm 61 into bridging contact with the contact pairs 56, all of the auxiliary switches 122–125 will be bypassed and a pulse will be supplied to the scoring mechanism 33 each time the master switch 121 is closed.

From the foregoing, it will be appreciated that the master switch 121, the auxiliary switch 122–125, the contact pairs 53–56 and the wiper arm 61 form a pulse generator suitable for providing precisely the number of pulses required during a scoring cycle for actuating the scoring mechanism 33 to register a score representative of the effective force with which the target was struck. Of course, it will be understood that an auxiliary switch may be provided to inhibit the first pulse provided each scoring cycle if it is desired, for example, to demand that the target be struck with at least a predetermined minimum effective force to register any score. Moreover, the master switch 121 can be operated any predetermined number of times each scoring cycle and any number of individual contact pairs and auxiliary switches can be used.

As shown in FIG. 7, to terminate the scoring cycle and to reset the target mechanism for the next scoring cycle, the switch 105 is opened shortly after the master switch 121 has been closed for the final time. When the switch 105 is opened, the relays 106 and 109 are deenergized, thereby permitting their associated contacts 107, 108, 111 and 112, 113, 115, 116, respectively, to return to their normal conditions. The return of the contacts 111 and 116 to their normal closed conditions, in turn, closes the energization circuit for the reset relay 82, thereby permitting the target arm 42 to return to its initial position. To enable the timing means 114 to complete its cycle despite the return of the contact 113 to its normal open state, a runout switch 129, which is closed shortly after the initiation of a scoring cycle and opened only at the completion of the scoring cycle and after the target mechanism has been reset, is connected in parallel with the contact 113.

3. Timing

The aforedescribed operation of the sequenced switches 105, 121–125 and 129 may be coordinated in a variety of ways, both electronically and mechanically. However, the target mechanism is preferably designed to provide fairly large timing tolerances so that the primary emphasis in selecting the timing means 114 may be placed on its durability, ease of maintenance, and low cost. For instance, as illustrated by FIGS. 5 and 6 each of the timed switches 105, 121–125 and 129 may be provided with respective cam followers 131–137, thereby permitting the use of a simple motor driven cam-type timer. Thus, the timer shown includes a motor 141, which is coupled through appropriate reduction gearing 142 to a cam drive shaft 143 which, in turn, mounts the cams 144–148 pro-

vided to operate the switches **105**, **121–125** and **129**. The switches are mounted on a frame **149** and are held in predetermined positions for operation at the appropriate time during each scoring cycle. Typically, for ease of access and maintenance, the motor **141** and the reduction gearing **142** may be mounted on one side of a support panel **150**, and the remainder of the timer may be mounted on the opposite side. The panel **150** may suitably be either a part of the console **32** or housed therein.

As will be appreciated, there is nothing particularly critical about the profile or type of cams used, other than that they coordinate and sequence the operation of the switches **105**, **121–125** and **129** in the manner illustrated in FIG. **7**. A wide variety of cam combinations might be employed for this purpose. For example, each of the switches **105**, **122–125** and **129** is opened for only a relatively short portion of each scoring cycle. They, therefore, may be normally open switches that are closed by a cam such as the slotted camming wheel **144** or, alternatively, they may be normally closed contacts that are opened by a cam such as the camming studs **145–147**. To illustrate this, a combination of the two different types of cam and switch combinations are shown. Thus, the switches **121**, **122** and **125** are shown as being normally open types that are mounted on the frame **149** at the level of the slotted camming wheel **144**, while the switches **105**, **123** and **125** are shown as being normally closed types that are mounted on the frame **149** at the level of the camming studs **145–147**. Unlike the other timed switches, the master switch **121** is operated a number of times each scoring cycle. Accordingly, it is shown as being a normally open type which is mounted on the frame **149** at the level of the lower camming wheel **148**, and the camming wheel **148** is shown as being toothed.

Preferably, to reduce the wear and tear and to enable the timer **114** to be as compact as possible, the reduction gearing **142** is selected to afford as little movement of the cams as possible consistent with proper sequencing of the timed switches. For this reason, in the exemplary embodiment, the reduction gearing **142** is designed to provide 120° of cam rotation each scoring cycle, the camming wheels **144** and **148** are provided with three identical 120° segments, and the camming studs are spaced at 120° intervals.

The timing of the operation of the switches **105**, **121–125** and **129** using the cam-type timer **114** can best be understood by reference to the stop motion diagrams of FIGS. **8** and **9**. As there shown, the switch **105** is positioned relative to the camming studs **145–147** so that it is closed at the completion of the previous scoring cycle. On the other hand, the switches **121** and **129** are positioned and their cams **148** and **149**, respectively, are profiled so that these switches are then open. Now, shortly after the scoring cycle is initiated the cam wheel **148** has been advanced sufficiently to close the master switch **121** for the first time. At about the same time, the cam wheel **144** also has been advanced sufficiently to close the runout switch **129**. However, as the scoring cycle continues and the cams **144–148** advance further, first the switch **122** opens in coordination with the closure of the master switch **121** for the second time and then the switch **123** opens in coordination with the closure of the master switch **121** for the third time, and so on throughout the scoring cycle. Finally, shortly after the master switch **121** has been closed for the last time, the cam **144** has advanced sufficiently to bring one of the camming studs **145–147** into engagement with the cam follower **131** of the switch **105**, and the switch **105** is then opened. This is followed by further advance of the cams until the point is reacted at which the runout switch **129** is reopened and the switch **105** is reclosed. The scoring cycle is then completed.

4. Multiple Target Mechanisms

As previously mentioned, any number of the new target mechanisms may be used in a single pinball machine. To illustrate suitable circuitry for a multiple target game, a pair of the new target mechanisms are shown in FIG. **10** as being connected to actuate the same scoring mechanism **33**. Corresponding components of the two target mechanisms shown are identified by identical reference numerals followed by the distinguishing letter designations A and B.

As is apparent, the foregoing explanation of a single target mechanism applies equally as well to the multiple target arrangement shown, since the corresponding components of the two targets are simply connected in parallel with the result that the actuation of either target mechanism will initiate a scoring cycle exactly identical to the scoring cycle previously described. Of course, it will be understood that more than two target mechanisms can be connected in parallel in the same manner as illustrated in FIG. **10** without any change in the mode of operation.

CONCLUSION

From the foregoing, it will now be understood that a new target mechanism, which affords a unique scoring basis and which may advantageously be employed in pinball machines and similar target games, has been provided. Moreover, it will be understood that the new target mechanism is relatively simple, rugged and inexpensive and, nevertheless, is able to actuate a scoring mechanism to register a score representative of the effective force with which the target has been struck. Finally, it will be appreciated that the new target mechanism may be used with or without conventional targets, and any number of them may be employed in a single game.

We claim as our invention:

1. A target mechanism for target-type games to variably actuate an electrically actuated scoring mechanism to register a score thereon which is representative of the effective force with which a target is struck, said target mechanism comprising the combination of a movable arm fixed to said target, bias means coupled to said movable arm for urging it toward an initial position with a force that increases as said arm is driven away therefrom, a locking mechanism coupled to said movable arm for releasably locking it against movement toward said initial position whereby when said arm is struck it is driven to and held in a final position which is spaced from said initial position a distance dependent on the force of the strike, and means associated with said moveable arm to provide an electrical actuating signal for said scoring mechanism which depends upon the distance said arm is driven from its initial position and for automatically releasing said locking mechanism after said scoring mechanism has been actuated whereby said movable arm is then permitted to return to its initial position.

2. The target mechanism of claim **1** wherein said last mentioned means is a pulse generating means whereby said target mechanism is particularly adapted for use with a pulse actuated-type scoring mechanism.

3. The target mechanism of claim **2** wherein said arm is movable along a predetermined path; said pulse generating means includes a timer means, a master switch connected for operation by said timer means a predetermined number of times each scoring cycle whereby a corresponding number of scoring pulses tend to be provided, and a plurality of auxiliary switches coupled to said master switch and connected for sequential operation by said timer means in coordination with the operation of said master switch whereby each of said auxiliary switches tends to inhibit a respective one of said pulses; and said target mechanism further includes a plurality of normally open contact pairs each having one contact connected to a respective one of said auxiliary switches and its other contact connected to the other contact of the other contact pairs, mounting means for supporting said contact pairs adjacent the path of movement of said movable arm at respective progressively more remote distances from the initial position of said target arm in ordered relationship corresponding to the sequence of operation of the auxiliary switches connected thereto, a wiper arm carried by said movable arm for bridging successive ones of said contact pairs as said movable arm is driven from its initial position, and locking mechanisms associated with said movable arm for locking it against return

toward its initial position with said wiper arm bridging the most remote of the contact pairs reached by it during the movement of said movable arm away from its initial position whereby the number of scoring pulses provided depends upon the effective force with which said target is struck.

4. The target mechanisms of claim 3 wherein said master switch and said auxiliary switches are connected in series.

5. For use with a pinball machine and the like of the type having an electrically actuated scoring mechanism, and a playfield which is traversed by a game piece; a target mechanism comprising the combination of a movable target arm, a bias means fixed to said target arm for urging it toward an initial position with a force that increases as said target arm is driven away from said initial position, a locking mechanism coupled to said target arm for permitting movement thereof away from its initial position along a predetermined path while preventing return thereof toward said initial position whereby when said target arm is struck by said game piece it is moved to and held in a final position that is spaced from said initial position a distance representative of the effective force of the strike, electrical signal generating means coupled to said target arm for actuating said scoring mechanism to register a score representative of the effective force of said strike and means coupled between said signal generating means and said locking mechanism for automatically releasing said target arm to return to its initial position after the score has been registered.

6. The target mechanism of claim 5 wherein said target arm is pivotally mounted, and wherein said locking mechanism includes a stationary pawllike member and a sector wheel fixed to said target arm and carrying a plurality of ratchetlike teeth successive ones of which are engaged by said pawllike member as said target arm is driven further away from its initial position whereby a plurality of stations each representative of a strike of different effective force are defined.

7. The target mechanism of claim 6 wherein said signal generating means includes circuit means for initiating a scoring cycle in response to the movement of said target arm from its initial position, a timer means energized by said circuit means for said scoring cycle, a master switch connected for operation by said timer means a predetermined number of times each scoring cycle thereby tending to provide a corresponding number of scoring pulses, a plurality of auxiliary switches coupled in series with said master switch and connected for sequential operation by said timing means to inhibit successive ones of said pulses, a plurality of contact pairs each having one contact connected to an input side of a respective one of said auxiliary switches and another contact connected to the other contact of each of the other contact pairs whereby said contact pairs are each effective when closed to provide a bypass circuit around its respective auxiliary switch as well as all previously operated ones of said auxiliary switches, mounting means for supporting said contact pairs adjacent the path of movement of said target arm at respective progressively more remote distances from the initial position of said target arm and in ordered relationship corresponding to the sequence of operation of the respective auxiliary switches connected thereto, and a wiper arm carried by said target arm for closing the contact pair adjacent the station to which said target arm is moved upon being struck by said game piece whereby the number of scoring pulses provided during said scoring cycle is representative of the effective force with which said target was struck.

8. The target mechanism of claim 7 wherein said master switch and each of said auxiliary switches are respective cam-operated switches, and said timing means includes a drive motor and a plurality of cam means which are driven by said motor.

9. The target mechanism of claim 7 wherein said circuit means includes a normally open cam-operated switch, a camming surface carried by said target arm for closing said normally open switch upon movement of said target arm from its initial position to thereby energize said timing means, and a normally closed switch coupled to be opened by said timing means at the end of each scoring cycle for deenergizing said timing means.

10. The target mechanism of claim 7 wherein said pawllike member is an armature of a reset relay, and further including circuit means coupled for energizing said reset relay at the end of each scoring cycle to disengage said armature from said ratchetlike teeth whereby said target arm is then permitted to return to its initial position.

11. For a pinball machine and the like of the type that has a game piece which traverses a playfield and a pulse-actuated scoring mechanism, a target mechanism for variably actuating said scoring mechanism to register a score thereon representative of the effective force with which the target is struck by said game piece, said target mechanism comprising the combination of a target, bias means coupled to said target for urging it toward an initial position with a force that increases as said target is driven away therefrom, means coupled to said target for locking it for a predetermined fixed time period against movement toward said initial position whereby when said target is struck it is driven to and held for said period in a final position which is spaced from said initial position a distance dependent on the force of the strike, said means coupled to said target automatically releasing said target for movement toward said initial position upon expiration of said time period, and pulse generating means responsive to the distance said target is driven from its initial position for applying to said scoring mechanism a number of pulses representative of the effective force with which said target is struck by said game piece.

12. The target mechanism of claim 11 wherein said pulse generating means includes a timer means which is energized for a scoring cycle in response to the movement of said target from its initial position, a master switch operated by said timer means a predetermined number of times each scoring cycle thereby tending to provide a corresponding number of pulses, a plurality of auxiliary switches sequentially operated by said timer means whereby each auxiliary switch tends to inhibit a successive one of said pulses, a plurality of normally open bypass circuits each connected to provide an alternative path around a respective one of said auxiliary switches as well as all previously operated ones of said auxiliary switches, and means responsive to the distance said target is moved from its initial position for closing the one of said bypass circuits that permits the uninhibited passage of the number of pulses representative of the effective force with which said target is struck by said game piece.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,627,318 Dated December 14, 1971

Inventor(s) Roman F. Garbark; Edward P. Krynski

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

[72] Inventors (shown as) Roman F. Garbary

should be; Roman F. Garbark

Signed and sealed this 6th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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