Jan. 20, 1959 D. COHN 2,870,279

BALL-OPERATED COUNTING DEVICE

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Fig. 1.

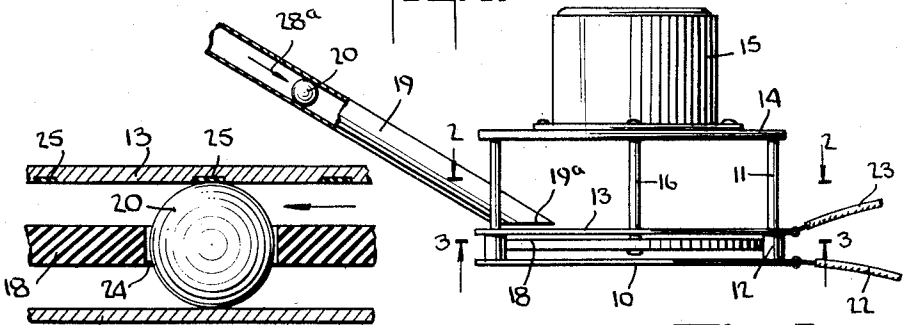


Fig. 7.

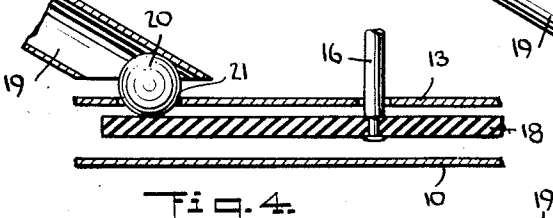


Fig. 4.

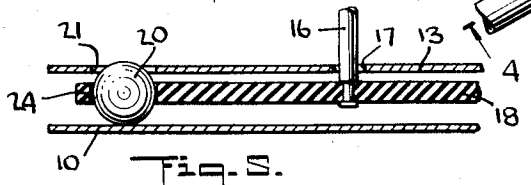


Fig. 5.

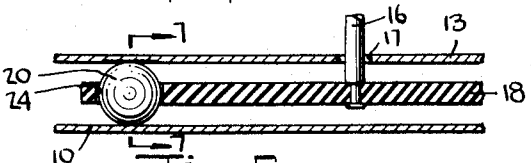


Fig. 6.

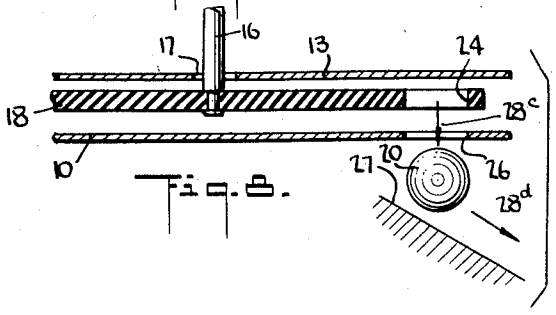


Fig. 8.

Fig. 2.

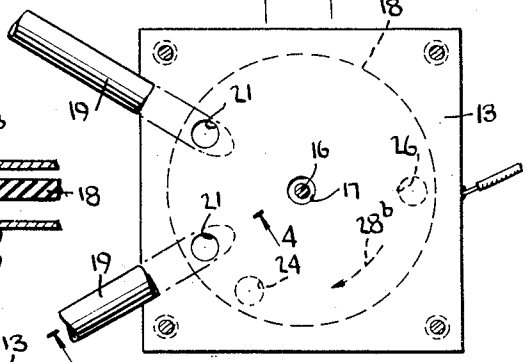
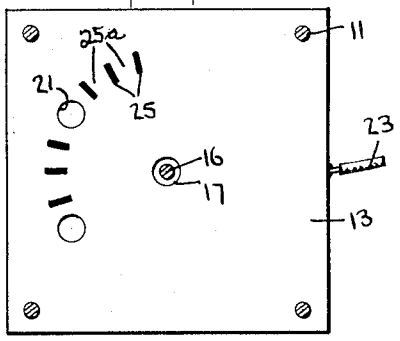


Fig. 3.



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Fig. 9.

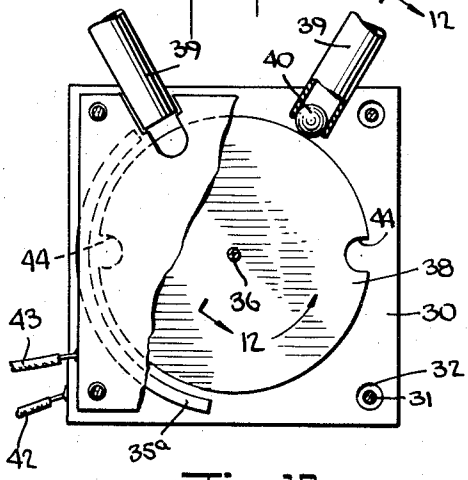


Fig. 10.

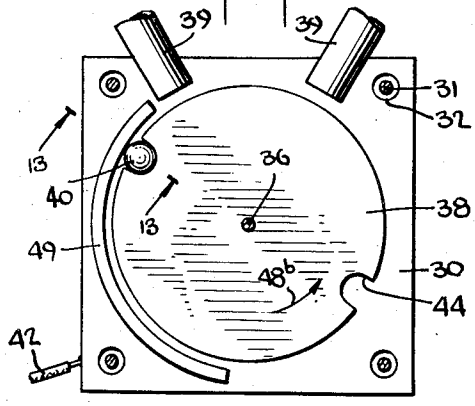


Fig. 11.

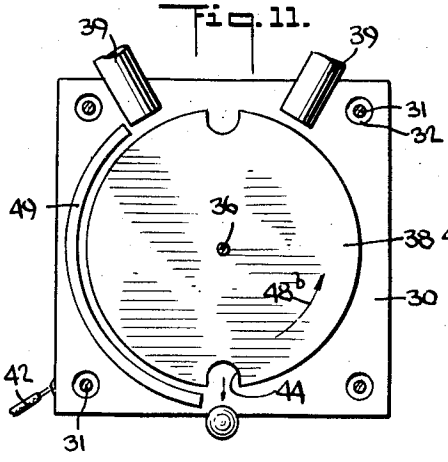


Fig. 12.

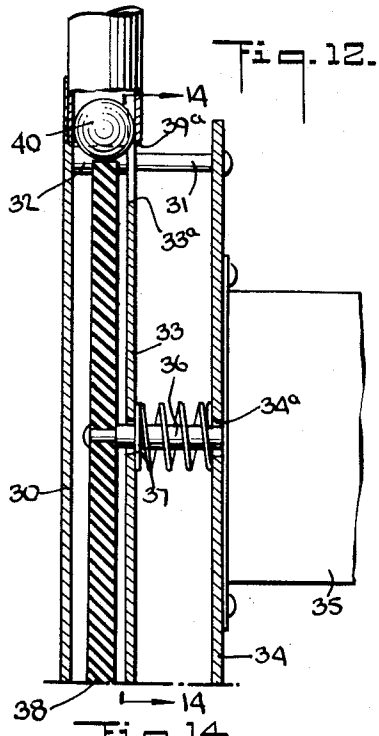


Fig. 14.

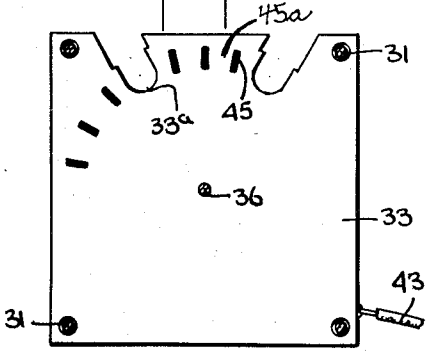
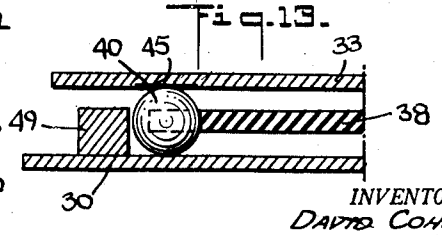


Fig. 13.



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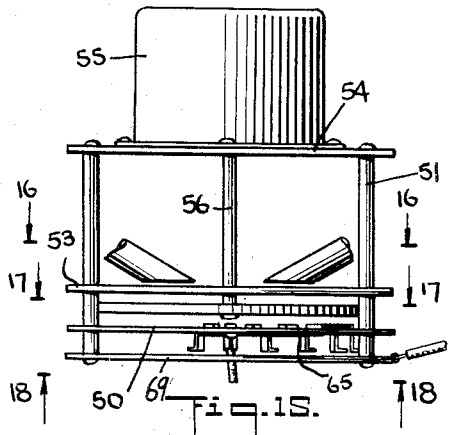
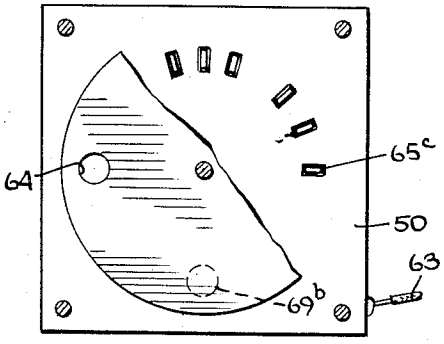


Fig. 15.

Fig. 17.



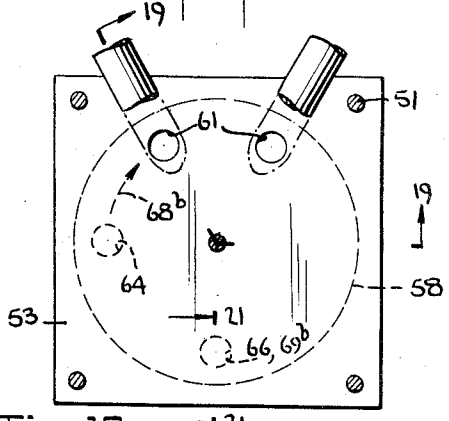
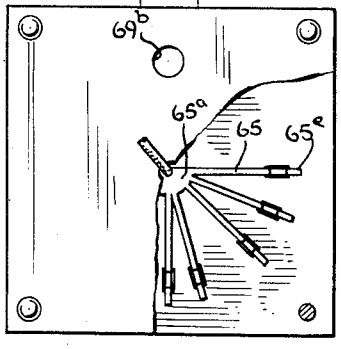


Fig. 16.

Fig. 18.



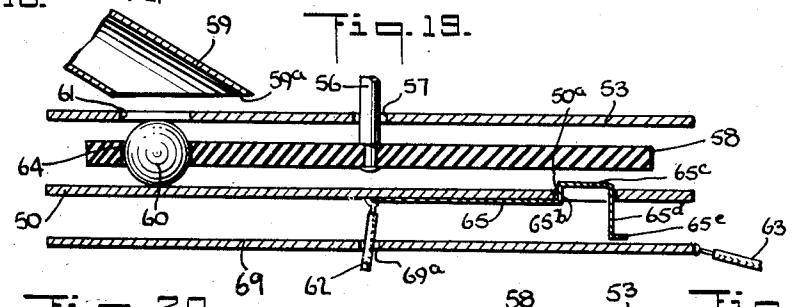


Fig. 19.

Fig. 20.

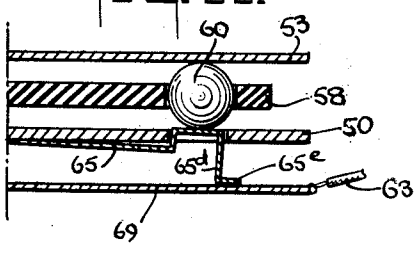
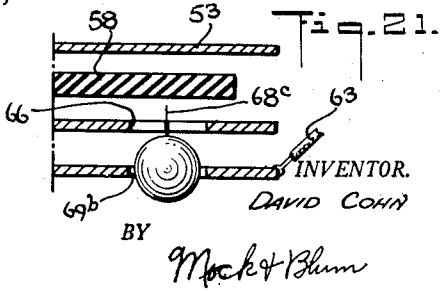


Fig. 21.



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Fig. 25.

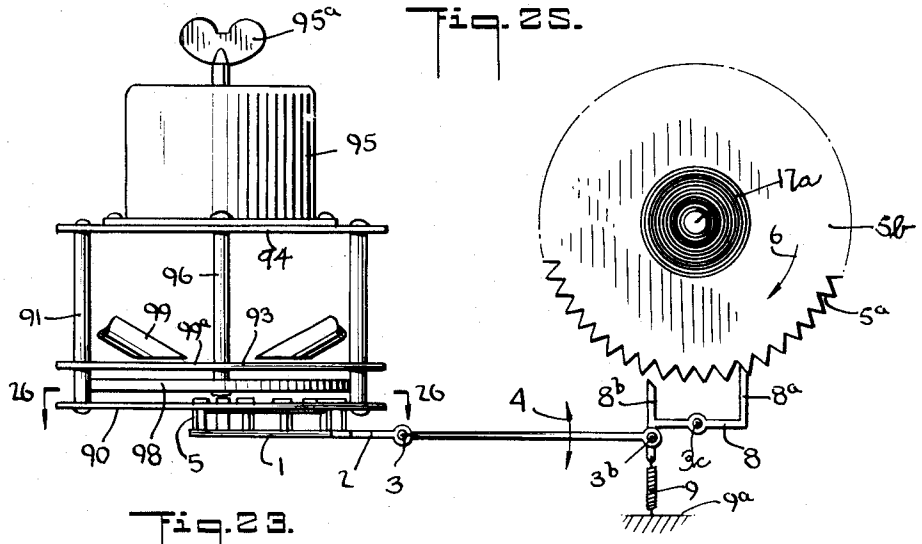


Fig. 23.

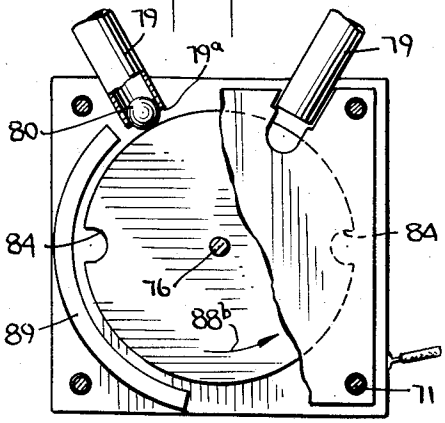


Fig. 26.

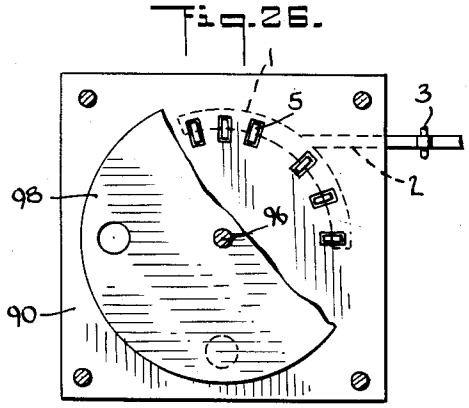


Fig. 22.

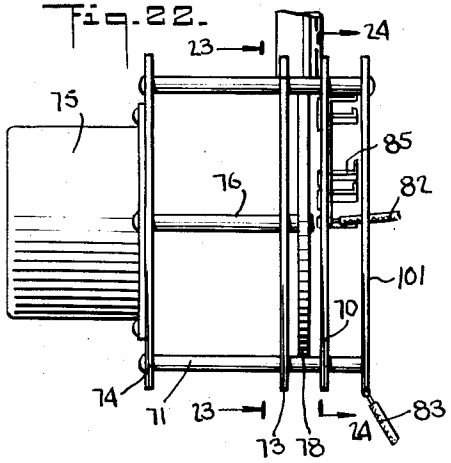
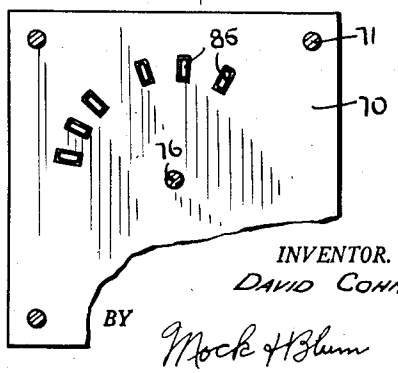


Fig. 24.



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United States Patent Office 2,870,279 Patented Jan. 20, 1959

2,870,279

BALL-OPERATED COUNTING DEVICE

David Cohn, Brooklyn, N. Y., assignor to T. Cohn Incorporated, Brooklyn, N. Y., a corporation of New York

Application October 26, 1956, Serial No. 618,572

12 Claims. (Cl. 200—61.11)

This invention relates to improvements in ball-actuated counting devices.

The invention has particular application to game toys involving the propulsion of a ball, wherein it is desired to obtain a score based upon the ball striking a target or moving to a selected location of the like.

Within the field of game toys involving the propulsion of balls, my invention has further particular application to games employing balls which are light in weight. Thus, in conventional pinball games, a relatively heavy ball often is employed, which is directly capable by its own weight of striking and closing a series of switches so as to actuate appropriate recording or indicating devices. However, in many games, such as target propulsion games, the ball is too light to close switches directly with a sufficient degree of reliability.

Accordingly, an important object of this invention is to provide a counting device which may be actuated and controlled by the movement of a ball, but which employs auxiliary force to move the ball.

In accordance with my invention, I provide a ball counting device having a ball entrance and a ball exit. Optionally, a shute leads from a selected part of the game area to this entrance. As an important feature of the invention, the ball counting device includes a continuously moving conveyor which engages an entrant ball and carries it in a positive manner in a selected path through the device and then automatically discharges the ball through the exit. As a further important feature of the invention, during its travel through the counting device, the ball passes intermittently and frictionally against successive spaced switch contacts or levers.

For example, in certain embodiments, the ball travels between spaced parallel first and second plates. The second plate carries resilient levers. The ball passes successively frictionally between the first plate and the levers and in each instance moves the lever. Optionally, the lever thereby momentarily closes electric switch contacts in an electric circuit which may include any suitable recording or indicating device. In one embodiment, the levers control a mechanical indicating device. In any event, the number of levers which are depressed determine a score value corresponding to said selected part of the game area. By the provision of two or more entrance chutes, with a different number of levers corresponding to each chute, the scoring of a relatively complex game is made possible.

The important consideration is that the ball is too light in itself to move the levers. This is made possible by the provision of the conveyor and by confining the ball to movement frictionally between the levers and a plate.

In still further embodiments, the two plates are made of metal and serve as switch contacts in the electric circuit of a recording or indicating device. In these embodiments, the ball is also made of metal and serves as the switch-closing means. The plates are urged toward

each other to ensure the desired frictional movement of the ball between the plates. Spaced insulators are fixed to the inner face of one of the plates, and the ball alternately makes contact with an insulator and with the metal plate itself. Accordingly, the switch is opened and closed a number of times corresponding to the number of insulators.

It will be apparent that the fundamental principles of all embodiments are the same. Each embodiment is economical to manufacture and substantially fool-proof in operation.

Other objects and advantages of my invention will become apparent from the following description, in conjunction with the annexed drawings, in which preferred embodiments of the invention are disclosed.

In the drawings,

A first embodiment of the invention is shown in Figs. 1–8.

Fig. 1 is a side elevation of the improved counting device in accordance with this embodiment. Fig. 1 shows a ball travelling down a chute from a game or the like (not shown) to the counting device.

Fig. 2 is a section on line 2—2 of Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary section on line 4—4 of Fig. 2 drawn to an enlarged scale. Fig. 4 shows the ball after it has reached the bottom of the chute and after it has entered the entrance hole of the device in the upper movable plate.

Fig. 5 is a view similar to Fig. 4, but showing the ball after it has entered a hole in the turnable or rotatable plate of the device.

Fig. 6 is a view similar to Fig. 5, but showing the ball after it has advanced from its position of Fig. 5 so as to raise the movable plate. Fig. 6 illustrates the breaking of contact between the upper vertically movable plate and the lower fixed plate when the ball passes under one of the insulators on the lower face of the vertically movable plate.

Fig. 7 is a fragmentary section on line 7—7 of Fig. 6.

Fig. 8 is a view similar to Fig. 6, but showing the ball after it has passed through the ejection hole in the bottom fixed plate of the device.

A second embodiment of the invention is shown in Figs. 9–14 of the drawing. The counting device of this embodiment is similar to the first embodiment except that it is modified to permit the plates thereof to be held in a vertical position instead of a horizontal position.

Fig. 9 is a front elevation of the counting device of this embodiment and is partly broken away. Fig. 9 shows the ball at the bottom of an entrance chute of the device.

Fig. 10 is a view similar to Fig. 9, but showing one of the plates of the device removed and showing the ball after it has advanced into a notch of the rotatable plate.

Fig. 11 is a view similar to Fig. 10 but showing the ball after it has been ejected from the counting device.

Fig. 12 is a fragmentary section on line 12—12 of Fig. 9 and is drawn to an enlarged scale.

Fig. 13 is a fragmentary section on line 13—13 of Fig. 10, and is drawn to an enlarged scale.

Fig. 14 is a section on line 14—14 of Fig. 12.

A third embodiment of the invention is shown in Figs. 15–21 of the drawing. This embodiment is somewhat similar to the first embodiment, except that the construction of the switch elements is somewhat modified.

Fig. 15 is a side elevation of the counting device according to this embodiment.

Fig. 16 is a section on line 16—16 of Fig. 15.

Fig. 17 is a section on line 17—17 of Fig. 15 and is partly broken away.

Fig. 18 is a bottom plan view of the device taken on line 18—18 of Fig. 15.

Fig. 19 is an enlarged detailed section on line 19—19 of Fig. 16 and shows the ball after it has first entered the counting device.

Fig. 20 is a fragmentary detail of Fig. 19 and shows the ball after it has depressed one of the switch levers of the device.

Fig. 21 is a fragmentary detailed section on line 21—21 of Fig. 16 and shows the ball as it is being ejected from the counting device.

A fourth embodiment of the invention is shown in Figs. 22–24 of the drawing. This embodiment incorporates certain features of the second and third embodiments.

Fig. 22 is a side elevation of the device according to this embodiment.

Fig. 23 is a section on line 23—23 of Fig. 22 and is partly broken away.

Fig. 24 is a section on line 24—24 of Fig. 22.

A fifth embodiment of the invention is shown in Figs. 25 and 26 of the drawing. In this embodiment, the counting device is entirely mechanical.

Fig. 25 is a front elevation of the device according to this embodiment, and is somewhat diagrammatical in nature.

Fig. 26 is a section on line 26—26 of Fig. 25.

FIRST EMBODIMENT

Figs. 1–8

The device according to this embodiment includes a lower fixed metal plate **10**. This plate **10** is optionally generally square in shape. In this embodiment, it is preferred to maintain plate **10** in a generally horizontal position.

Corner posts **11** extend upwardly from plate **10**. Short spacer sleeves **12** are mounted upon the respective posts **11** at the bottom thereof. A vertically movable top plate **13** of the counting device is optionally generally square in shape and has appropriate corner holes through which the posts **11** respectively extend slidably. Said plate **13** normally rests upon the tops of the spacer sleeves **12**.

Platform **14**, which is optionally generally square in shape, is fixedly mounted upon the tops of posts **11** by any suitable means. Motor **15** is fixed to the top of platform **14**. The output or driven rotary shaft **16** of motor **15** extends vertically downwardly from motor **15**, through an appropriate opening in platform **14** and also through opening **17** in plate **13**. The lower end of shaft **16** is positioned between the two plates **10** and **13**. Rotary plate **18**, which is optionally made of insulating material and circular in shape, is mounted upon the lower end of shaft **16** between said plates **10** and **13**.

Said motor **15** may be of any suitable rotary type and may be electrical or mechanical in nature.

As is particularly shown in Figs. **1**, **2** and **4**, one or more chutes **19** may be employed for feeding a ball **20** to the counting device. Illustratively, two such chutes **19** are shown in the drawing, these chutes being shown somewhat diagrammatically. The chutes **19** are upwardly and outwardly inclined relative to upper plate **13**, and the output mouths **19***a* of the chutes are disposed clearingly slightly above the vertically movable plate **13**. Optionally, each chute **19** may lead from a separate scoring compartment of any suitable ballgame, but the invention is not limited to this particular application of the counting device. The output mouth **19***a* of the chutes **19** are spaced circumferentially a selected distance relative to the periphery of the rotatable plate **18** and are also located radially inwardly of the outer periphery of said plate **18**.

The upper plate **13** is provided with a hole **21** under each chute mouth **19***a*. Each hole **21** is sized to permit ball **20** to drop downwardly through said hole, in the manner shown in Fig. 4.

Plates **13** and **10** are preferably conducting plates made of metal, and leads **22** and **23** are respectively connected to plates **10** and **13**. Plate **18** is optionally an insulating plate, but it can also be a metal plate if desired.

The rotary plate **18** is provided with at least one hole **24** large enough for ball **20** to extend therethrough. As shown in Fig. 5, said hole **24** is positioned so that in the course of rotation of plate **18**, said hole **24** registers with the chute mouth **19***a* in which ball **20** is located, so that ball **20** can drop through the registering holes **21** and **24** to rest upon plate **10**. This is shown in Fig. 5.

Said ball **20** then acts as a cam upon the vertically movable plate **13**, and as the result of the continued rotation of plate **18**, said ball **20** raises plate **13** and travels frictionally slidably between the two plates **13** and **10**. This is clearly shown in Fig. 6. In this way, ball **20** is able to establish electrical contact between plates **10** and **13** and thereby acts as a switch element to close contact between the two leads **22** and **23**.

As is clearly shown in Figs. 3, 6 and 7, a plurality of insulating members **25** are mounted upon the lower face of the upper, vertically movable plate **13**. Each said insulator **25** extends radially relative to shaft **16** and is radially elongated. These insulators **25** are circumferentially alined with the holes **21** in plate **13**, and are spaced circumferentially a selected distance. A selected number of the insulators **25** are disposed between the two holes **21** shown in the drawing and a selected number of insulators **25** are located beyond the holes **21** in the direction of travel of ball **20**.

The width of the metal segments **25***a* between the insulators **25** correspond to the diameter of ball **20**, and the length of each insulator **25** also corresponds to the diameter of ball **20**. As a result, the electrical contact between the two plates **13** and **10** is intermittent, being closed when ball **20** is located between a pair of successive insulators **25**, against a segment **25***a*, and being opened when ball **20** passes under an insulator **25**. The leads **22** and **23** may lead to any appropriate counting device or the like, which is conventional and is accordingly not shown. For example, the counting device to which leads **22** and **23** lead may be solenoid operated. Accordingly, it receives a succession of electrical impulses, depending upon the number of segments **25***a* which ball **20** crosses during its travel.

The fixed bottom plate **10** has an exit hole **26** which is spaced circumferentially from the holes **21** but which is positioned to register with hole **24** in one turned position of the turnable plate **18**. When the holes **24** and **26** register, ball **20** drops through these two holes and leaves the counting device, as shown in Fig. 8.

Fig. 8 shows schematically an exit ramp **27** down which ball **20** may travel after leaving the device.

The operation of the counting device in accordance with this embodiment is as follows:

Ball **20** enters one of the chutes **19** from the game or the like in the direction of arrow **28***a*. Ball **20** travels out of the chute **19**, enters hole **21** of plate **13** and rests upon plate **18**. Plate **18** turns or rotates continuously. When plate **18** turns so that hole **24** registers vertically with hole **21**, ball **20** drops downwardly through hole **24** to rest upon the bottom fixed plate **10**, as shown in Fig. 5. During continued rotation of plate **18**, in the direction of arrow **28***b*, ball **20** travels between plates **13** and **10**, and electrical contacts between the two plates are intermittently closed and opened, as the result of the passage of ball **20** successively under the spaced insulators **25**. Before ball **20** can begin a second revolution, it exits through the then regitsering holes **24** and **26**, in the direction of arrow **28***c* and rolls down ramp **27** in the direction of arrow **28***d*. It will be apparent from the foregoing that the number of intermittent electrical contacts made between the two plates **10** and **13**

depends upon which chute 19 ball 20 enters, so that a score differential can be established depending upon which chute the ball enters.

It will be apparent that in this embodiment, chute mouth 19*a* and hole 21 serve as the ball entrance of the device, and hole 26 serves as the ball exit. Rotary plate 18 and motor 15 serve as a conveyor effective to receive metal ball 20 from entrance 19*a*, 21 and to carry said ball 20 along a selected path to exit 26. The device also has ball-sensing means including paired opposed and spaced members positioned along the path of movement of ball 20. Plate 10 serves as one of the opposed members. Each segment 25*a* serves as an opposed member paired with plate 10, and is movable relative thereto. The distance between plate 10 and segment 25*a* is normally less than the diameter of ball 20. Ball 20 slides frictionally between plate 10 and segment 25*a*, thereby establishing in a positive manner an electrical connection between them, with segment 25*a* moving away from plate 10 to permit this movement of ball 20.

The drawing of the device according to this embodiment has been somewhat simplified in order to clarify the basic principles of the invention. However, it will be apparent that more than two chutes 19 may be provided. Also, the rotatable plate 18 may be provided with more than one hole 24. For example, plate 18 may optionally have two holes 24 which are spaced diametrically apart so as to reduce any possible waiting period before ball 20 can assume its position of Fig. 5 preparatory to the start of the actual counting operation.

In addition, optionally, more than one set of insulators 25 may be provided, and these sets of insulators 25 may be spaced at varying radial distances from shaft 16. This makes it possible to accommodate even more chutes 19 and to provide for greater differences in scoring.

SECOND EMBODIMENT

Figs. 9–14

The device according to this embodiment includes front fixed metal plate 30, which is optionally generally square in shape. In this embodiment, it is preferred to maintain plate 30 in a generally vertical position.

Corner posts 31 extend rearwardly from plate 30. Short spacer sleeves 32 are mounted upon the respective posts 31 at the front thereof. Movable rear plate 33 is optionally generally square in shape and has appropriate corner holes through which posts 31 respectively extend slidably.

Platform 34, which is optionally generally square in shape, is fixed to the rear ends of posts 31 by any suitable means. Motor 35, which may be similar to motor 15, is fixed to the rear of platform 34. The output or driven shaft 36 of motor 35 extends horizontally forwardly from motor 35, through central opening 34*a* in platform 34 and also through central opening 37 in plate 33. Coil spring 36*a* extends around shaft 36 and extends between platform 34 and plate 33. Spring 36*a* normally maintains plate 33 against the spacer sleeves 32.

The front end of shaft 36 is positioned between plates 30 and 33. Rotary plate 38, which is optionally circular in shape, is mounted upon the front end of shaft 36 between plates 30 and 33.

Two ball feed chutes 39 are shown in the drawing. These chutes 39 are disposed in the vertical plane of plate 38, as shown in Fig. 12. Chutes 39 are inclined to the vertical and extend radially relative to shaft 36, as shown in Figs. 9–11. The output mouths 39*a* of chutes 39 are positioned slightly outwardly of plate 33. Plate 33 has notches 33*a* adjacent each chute mouth 39*a*.

Plates 30 and 33 are conducting metal plates, and leads 42 and 43 are respectively connected thereto. Plate 38 is optionally an insulating plate.

Plate 38 is provided with at least one peripheral notch 44 sized and shaped to receive a ball 40 from a chute 39. Notch 33*a* and notch 44 are of the same size and shape. Two such notches 44, which are diametrically opposed, are shown in the drawing. When plate 38 rotates so that notch 44 registers with chute mouth 39*a*, ball 40 drops into notch 44 and the adjacent notch 33*a*. Notch 33*a* serves as a clearance notch. As shown in Fig. 10, ball 40 travels in notch 44 in the direction of arrow 48*b*. An arcuate guide 49 is fixed to the rear face of plate 30, by any suitable means. This guide 49 is positioned beyond chutes 39, as taken in the direction of arrow 48*b*, and close to the periphery of plate 38. Guide 49 prevents ball 40 from falling out of notch 44 until ball 40 reaches the end of guide 49, as shown in Fig. 11.

As shown in Fig. 13, ball 40 travels frictionally slidably between plates 30 and 33, against the action of spring 37. The front face of plate 30 is provided with insulators 45 which correspond to the insulators 25 of the first embodiment, in size, shape, spacing and location.

It will be apparent that the operation of the second embodiment is quite similar to that of the first embodiment, and that the number of intermittent electrical contacts made by ball 40 between plates 30 and 33 depends upon which chute 39 is entered by ball 40.

In this embodiment, chute mouth 39*a* serves as the entrance, and the lower end of guide 49 serves as the exit. Plate 38 and motor 35 serve as the conveyor. Plate 30 serves as one opposed member and the segment 45*a* between successive insulators 45 as the other opposed member of the ball-sensing means.

THIRD EMBODIMENT

Figs. 15–21

This embodiment represents a modification of the first embodiment. In particular, in the third embodiment, instead of the ball acting directly to close a pair of switch contacts, the ball operates a switch lever.

The device according to this embodiment includes a lower fixed metal plate 69. This plate is optionally generally square in shape and is preferably maintained in a generally horizontal position.

Corner posts 51 extend upwardly from plate 69. A further plate 50 is fixedly mounted upon posts 51, by any suitable means, a selected distance above plate 69. This plate 50 is optionally made of metal and is optionally generally square in shape. A top plate 53 of the counting device is also optionally generally square in shape and is fixed to the corner posts 51 by any suitable means. Platform 54, which is optionally generally square in shape, is fixedly mounted upon the tops of posts 11 by any suitable means. Motor 55 is fixed to the top of platform 54. The output or driven shaft 56 of motor 55 extends vertically downwardly from motor 55, through an appropriate opening in platform 54 and also opening 57 in plate 53. The lower end of shaft 56 is positioned between the two plates 50 and 53. Rotary plate 58, which is optionally circular in shape, and which is optionally made of insulated material, is mounted upon the lower end of shaft 56 between plates 50 and 53.

The device according to this embodiment has feed chutes 59 with mouths 59*a* corresponding to the chutes 19 of the first embodiment. Said chutes 59 are adapted to feed ball 60 to the counting device.

Upper plate 53 has an entrance hole 61 under each chute mouth 59*a* corresponding to the holes 51 of the first embodiment. The rotary plate 58 has at least one hole 64 corresponding to the hole 24 of the first embodiment. Thus, when ball 60 drops through holes 61 upon plate 58, and ultimately drops through hole 64 to rest upon plate 50, ball 60 travels between the plates 50 and 53 during the continued turning of plate 58. However, in this embodiment, ball 60 does not ordinarily move frictionally between the two plates 50 and 53.

As is clearly shown in the drawing, a plurality of elongated resilient metal fingers 65 are located at the lower face of plate 50. These fingers 65 extend radially

from a central disc-like member 65*a* which is fixed to the center of the lower face of plate 50 by any suitable means. A lead 62 is fixed to said disc member 65*a* and extends downwardly through a hole 69*a* in plate 69. A further lead 63 is connected to plate 69.

Each said finger 65 is formed near its outer end with an upwardly extending leg 65*b* which protrudes upwardly through a respective opening 50*a* in plate 50. The upper end of this leg 65*b* connects with an outwardly extending arm 65*c* which serves as an off-set extension of finger 65. As shown in Fig. 19, this off-set arm 65*c* is normally located slightly above the upper face of plate 50. The outer end of arm 65*c* connects with a depending leg 65*d* which is located adjacent the outer edge of opening 50*a*. Finally, the lower end of leg 65*d* connects with a radially outwardly extending contact arm 65*e*. This arm 65*e* is normally located slightly above plate 69, as shown in Fig. 19.

As shown in Figs. 17 and 18, the arms 65*c* are circumferentially spaced and are located in the path of travel of ball 60, as represented by arrow 68*b*. For convenience, the direction of travel of ball 60 is shown as the reverse of the direction of the arrow of the ball of the first embodiment. Similarly to the first embodiment, certain of the arms 65*c* are disposed between the two illustratively shown chutes 59. It will be apparent, that the number of arms 65*c* which are successively depressed by ball 60, depends upon which chute 59 it enters.

As shown in Fig. 20, when ball 60 reaches a respective arm 65*c*, the ball acts as a cam and extends frictionally between plate 53 and arms 65*c* so as to depress said arm 65*c*. This brings the contact arm 65*e* into contact with plate 69, and accordingly closes the electrical circuit between leads 62 and 63.

Plate 50 has an exit hole 66 corresponding to the exit hole 26 of the first embodiment. Ball 60 leaves the device through hole 66 in the direction of arrow 68*c*, after the various contacts have been closed.

Plate 69 has a further hole 69*b* which registers with hole 66, so as to permit the ball to drop completely clear of the device.

It will be apparent that the mode of operation of the third embodiment is entirely similar to the mode of operation of the first embodiment, except that instead of ball 60 acting directly to close a pair of switch contacts, it acts indirectly to depress a switch lever into switch contact closing position.

In the third embodiment, chute mouth 59*a* and hole 61 serve as the entrance. Holes 66 and 69*b* serve as the exit. Plate 58 and motor 55 serve as the conveyor. Plate 58 serves as one opposed member and switch portion 65*c* as the other opposed member of the ball-sensing means.

FOURTH EMBODIMENT

Figs. 22–24

This embodiment is similar to the second embodiment in the general arrangement of the parts, but corresponds to the third embodiment in the type of switch mechanism employed.

The device according to the fourth embodiment includes front fixed plate 101, which is preferably made of metal and which is optionally generally square in shape. Preferably, plate 101 is maintained in a generally vertical position. Corner posts 71 extend rearwardly from plate 101. Plate 70 is fixedly mounted upon said posts 71, rearwardly of plate 101. Rear plate 73 is fixedly mounted upon posts 71 a selected distance behind plate 70. These plates 70 and 73 are optionally generally square in shape. Platform 74 which is also optionally generally square in shape, is fixed to the rear ends of posts 71 by any suitable means. Motor 75 is fixed to the rear of platform 74. The output or driven shaft 76 of motor 75 extends horizontally forwardly from motor 75, through appropriate openings in platform 74 and in rear plate 73. The front end of shaft 76 is positioned between plates 70 and 73. Rotary plate 78, which is optionally made of insulating material and circular in shape, is mounted upon the front end of shaft 76 between said plates 70 and 73.

Two ball chutes 79 are shown in the drawing and have output mouths 79*a*. These chutes 79 are quite similar to the chutes 39 of the second embodiment. The device also includes a guide 89 which is quite similar to guide 49 of the second embodiment. Plate 78 has peripheral notches 84 which are quite similar to the notches 44 of the second embodiment.

Hence with plate 78 turning in the direction of arrow 88*b*, ball 80 is adapted to be carried within notch 84 quite similarly to the second embodiment.

A plurality of resilient metal spring levers or fingers 85 are mounted upon the front face of plate 70, and are entirely similar to the levers 65 of the third embodiment, with the sole exception that the levers 85 are mounted upon the vertical plate 70 instead of upon a horizontal plate. Accordingly, these levers 85 will not be described in detail. It is sufficient to state the levers 85 are connected to the common lead 82, and that levers 85 are located circumferentially in positions corresponding to the insulating members 45 of the second embodiment. Also, plate 101 is connected to lead 83. As ball 80 travels between plates 70 and 73 and successively engages levers 85, it moves said levers 85 into contact with plates 101, thereby successively closing the electrical circuit between leads 82 and 83. Accordingly, as in the previous embodiment, the number of times that the circuit between leads 82 and 83 is closed depends upon which chute 79 ball 80 enters.

FIFTH EMBODIMENT

Figs. 25–26

This embodiment corresponds generally to the third embodiment. However, instead of the resilient metal fingers closing an electrical circuit, said fingers actuate a mechanical indicating device in the fifth embodiment.

The device according to the fifth embodiment has a bottom fixed plate 90 which is optionally generally square in shape. Corner posts 91 extend upwardly from plate 90. Plate 93 is fixed to the posts 91 a selected distance above plate 90, and is also optionally generally square in shape.

Platform 94, which is generally square in shape, is fixedly mounted upon the tops of posts 91 by any suitable means. Motor 95 is fiexd to the top of platform 94. Illustratively, in this embodiment, motor 95 is a spring-operated mechanical motor and has a conventional winding key 95*e*. The output or driven shaft of motor 95 extends downwardly from motor 95 through appropriate openings in platform 94 and in plate 93. The lower end of shaft 96 is positioned between the two plates 90 and 93. Rotary plate 98, which is optionally circular in shape, is mounted upon the lower end of shaft 96 between plates 90 and 93.

The chutes 99 with output mouths 99*a* of this embodiment correspond to the chutes 19 of the first embodiment. Resilient fingers 5 are mounted upon the lower face of plate 90, and correspond in shape and method of mounting to the fingers 65 of the third embodiment. Accordingly, the fingers 5 are adapted to be successively depressed by the ball as it travels between the two plates 90 and 93. The plates 90, 93 and 98 have entrance and exit holes corresponding to the first and third embodiments. Therefore, as thus far described, the fifth embodiment is quite similar to the first and third embodiments, and need not be described in full detail. However, instead of the fingers 5 successively closing an electrical contact, said fingers 5 are adapted to successively actuate a mechanical indicating device, which is shown somewhat diagrammatically in the drawing.

As shown in the drawing, the lower outer ends of fingers 5, corresponding to the contact elements 65*e* of the third

embodiment, are connected by an arcuate arm 1. This arm 1 is in turn connected to a lateral lever 2. Said lever 2 has a pivot pin 3 intermediate its ends, and this pivot pin 3 is adapted to be pivotally connected (by means not shown) to frame 9*a*. Said frame 9*a* is conventional and is not shown in detail. Said lever 2 extends generally horizontally. It can rock in the directions of arrow 4.

A further generally vertically extending lever 8*b* is pivotally connected intermediate its ends to the outer end of lever 2 by means of a pivot pin 3*b*. The lower end of lever 8*b* is coupled by spring 9 to frame 9*a*, and this spring 9 normally tends to lower said lever 8*b*. Said lever 8*b* is fixedly connected to a further laterally and generally horizontally extending lever 8. This lever 8 extends outwardly from lever 8*b* starting at a point slightly above pivot 3*b*. Said lever 8 is pivotally connected intermediate its ends to frame 9*a* by means of a pivot pin 3*c*. Arm 8*a* extends upwardly from the outer end of lever 8. Said lever 8, with its arms 8*a* and 8*b*, together serve as an ordinary rocker. The arms 8*a* and 8*b* of the rocker extend above lever 8 by unequal amounts.

A gear disc 5*b* is mounted for rotation upon frame 9*a*, by any suitable means (not shown), so as to be turnable in the direction of arrow 6. The usual wind-up main spring 17*a* urges gear 5*b* in the direction of arrow 6.

The operation of this embodiment is as follows:

Normally, spring 9 maintains the rocker element with rocker arm 8*a* engaging between a pair of successive teeth 5*a* of gear 5*b*. Rocker arm 8*b* is then out of engagement between the teeth. Said arms 8*a* and 8*b* are out of phase by an amount equal to half the distance between successive gear teeth 5*a*. When the rocker arm 8*b* is raised as the result of the ball depressing one of the lever elements 5, rocker arm 8*a* clears the gear teeth 5*a* and rocker arm 8*b* engages between successive gear teeth 5*a*, permitting gear 5*b* to advance half the distance between successive teeth 5*a*.

When the ball clears the lever element 5, rocker arm 8*a* is again raised and rocker arm 8*b* is again lowered as the result of the action of the return spring 9. Arm 8*a* thereby engages between the next pair of successive gear teeth 5*a*. Accordingly, in a manner which is well known and does not require extended disclosure, every time that a lever 5 is depressed by the ball and then released, gear 5*b* turns in the direction of arrow 6 a distance equal to the spacing between successive gear teeth 5*a*. Said gear 5*b* may be coupled to any suitable recording or indicating device (not shown). The number of counts which will be made depends upon which chute 99 the ball enters.

While I have disclosed preferred embodiments of my invention, and have indicated various changes, omissions and additions which may be made therein, it will be apparent that various other changes, omissions and additions may be made in the invention, without departing from the scope and spirit thereof.

I claim:

1. A counting device comprising first and second opposing and parallel plates, said device having an entrance for a ball into the space between said plates and an exit for a ball out of the space between said plates, a third plate mounted between said first and second plates and being turnable about a transverse axis, means continuously turning said third plate, said third plate being adapted to normally block said ball from movement from said entrance to said space between said first and second plates, said third plate having a ball receptor adapted to register with the entrance and to thereby receive the ball in one turned position of said third plate, said third plate being then adapted to carry said ball between said first and second plates, said third plate having a further turned position in which said ball receptor registers with the exit for removal of said ball from the space between said first and second plates, and ball-sensing means positioned along the path of movement of said ball between said first and second plates, said ball-sensing means including opposed and spaced members, the distance between said members being normally less than the diameter of said ball, at least one of said members being movable toward and away from the other, said ball being adapted to slide frictionally between said members to establish contact therebetween and to move them apart.

2. A counting device according to claim 1, said plates being generally horizontally with said first plate uppermost, said first plate having a first hole which serves as said entrance, said second plate having a second hole which serves as said exit, said third plate having a third hole which serves as said ball receptor.

3. A counting device according to claim 2, said second plate being made of metal and serving as one of the opposed members of said ball-sensing means, said first plate having a plurality of spaced insulators on its lower face, the segments between said insulators being conducting and serving as the other of said opposed members of said ball-sensing means, said first plate being vertically movable.

4. A counting device according to claim 2, said counting device also comprising a plurality of spaced spring levers mounted upon the lower face of said second plate, said second plate having further holes and said levers having portions which respectively extend through said holes into the space between said first and second plates, said first plate serving as one of the opposed members of said ball-sensing means, said levers serving as the other of the opposed members of said ball-sensing means.

5. A counting device according to claim 4, said first plate being made of metal, said device also comprising a further plate mounted below said second plate and made of metal, said levers being adapted to be depressed into contact with said further plate by said ball.

6. A counting device according to claim 4, said device also comprising an escapement, and further lever means operatively coupling said first-mentioned levers to said escapement and adapted to produce action of said escapement corresponding to the depression of a lever by said ball.

7. A counting device according to claim 1, said plates being generally vertical, said device also comprising a ball chute with a terminal mouth positioned slightly radially outwardly of the periphery of said third plate at the upper part of the device, said chute mouth serving as said entrance, said third plate having a peripheral notch which serves as said ball receptor, and a guide member positioned radially outwardly of said third plate and adapted to hold the ball in said notch as the ball travels to the lower part of the device, said guide member having a terminal end at the lower part of the device which serves as said exit.

8. A counting device according to claim 7, said second plate being made of metal and serving as one of the opposed members of said ball-sensing means, said first plate having a plurality of spaced insulators on its inner face, the segments between said insulators being conducting and serving as the other of said opposed members of said ball-sensing means, said counting device also comprising spring means urging said first plate toward said second plate.

9. A counting device according to claim 7, said counting device also comprising a plurality of spaced spring levers mounted upon the outer face of said second plate, said second plate having further holes and said levers having portions which respectively extend through said holes into the space between said first and second plates, said first plate serving as one of the opposed members of said ball-sensing means, said levers serving as the other of the opposed members of said ball-sensing means.

10. A counting device according to claim 1, said second plate being made of metal and serving as one of the opposed members of said ball-sensing means, said first plate having a plurality of spaced insulators on the face thereof which is proximate to said second plate,

the segments between said insulators being conducting and serving as the other of said opposed members of said ball-sensing means, said first plate being movable toward and away from said second plate.

11. A counting device according to claim 1, said counting device also comprising a plurality of spaced spring levers mounted upon the face of said second plate which is remote from said first plate, said second plate having further holes and said levers having portions which respectively extend through said holes into the space between said first and second plates, said first plate serving as one of the opposed members of said ball-sensing means, said levers serving as the other of the opposed members of said ball-sensing means.

12. A counting device comprising first and second opposing and parallel plates, said counting device having an entrance for a ball into the space between said plates, and an exit for a ball out of the space between said plates, conveyor means movably mounted between said plates, said conveyor means having a ball receptor adapted to register with said entrance and to thereby receive the ball in a first position of said conveyor means, said conveyor means being then adapted to carry said ball between said first and second plates, said conveyor means having a second position in which said ball receptor registers wtih said exit for removal of said ball from the space between said plates, drive means for said conveyor means, and ball-sensing means positioned between said plates along the path of movement of said ball between said entrance and said exit, said ball-sensing means including opposed and spaced members, the distance between said members being normally less than the diameter of said ball, at least one of said members being movable toward and away from the other, said ball being adapted to slide frictionally between said members to establish contact therebetween and to move them apart.

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