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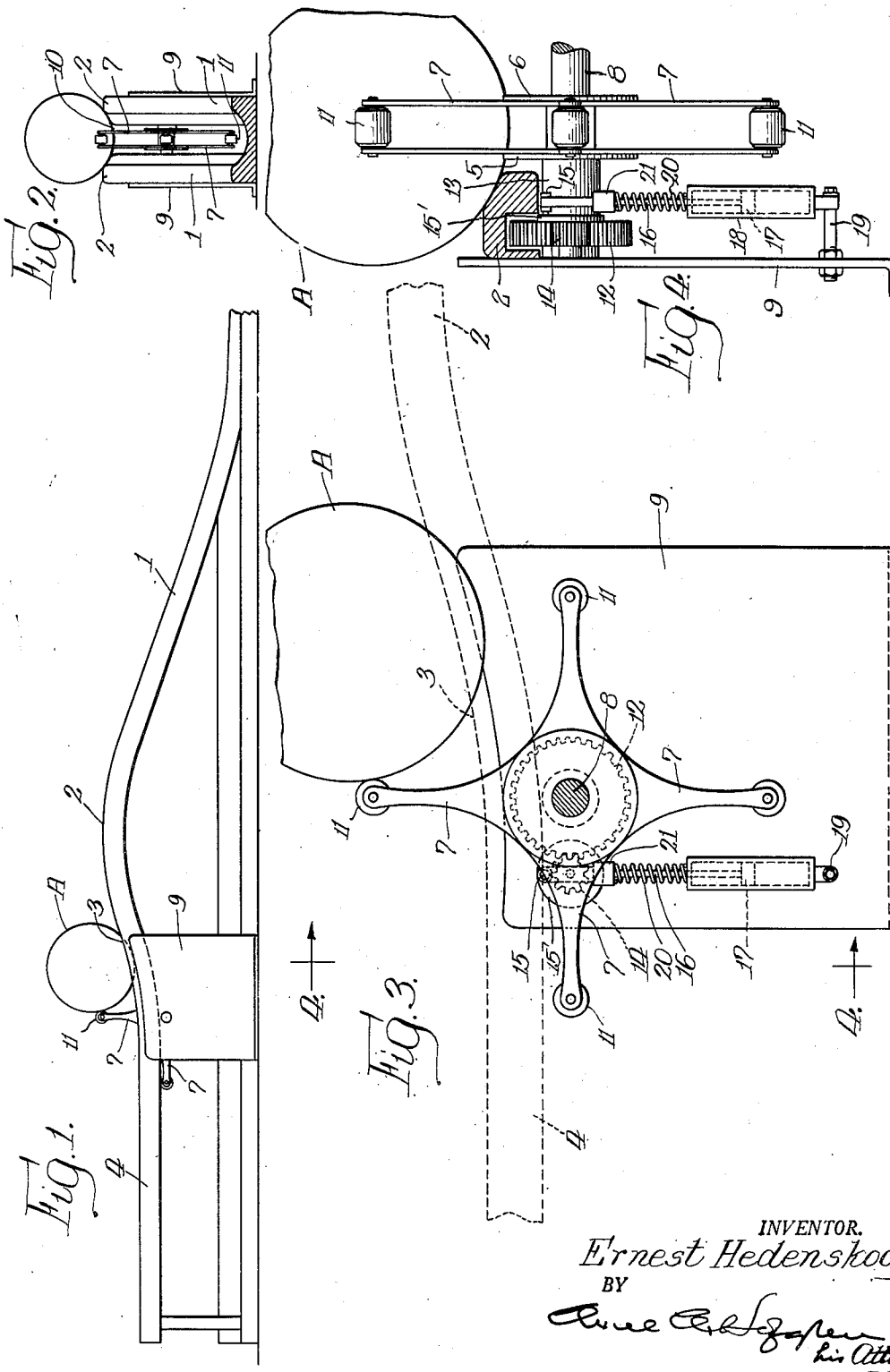
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BOWLING BALL RETARDING DEVICE FOR BOWLING ALLEY RUNWAYS

Filed March 5, 1945

3 Sheets-Sheet 1



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Nov. 21, 1950

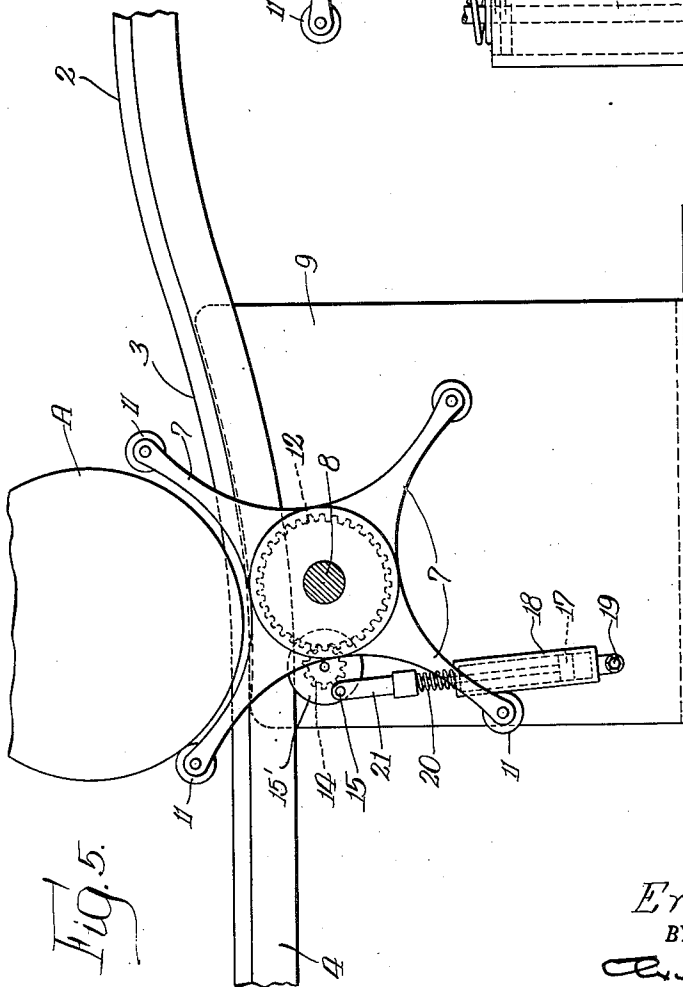
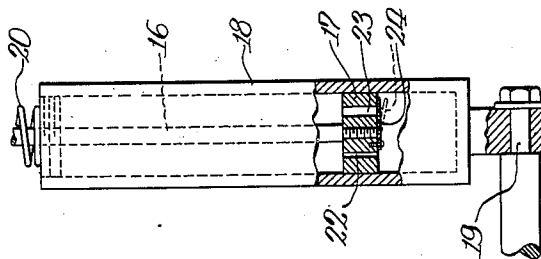
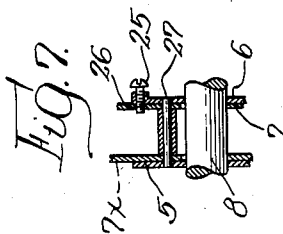
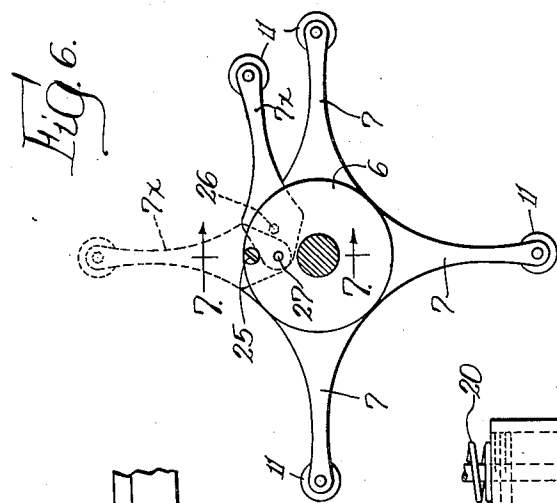
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BOWLING BALL RETARDING DEVICE FOR BOWLING ALLEY RUNWAYS

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3 Sheets-Sheet 2



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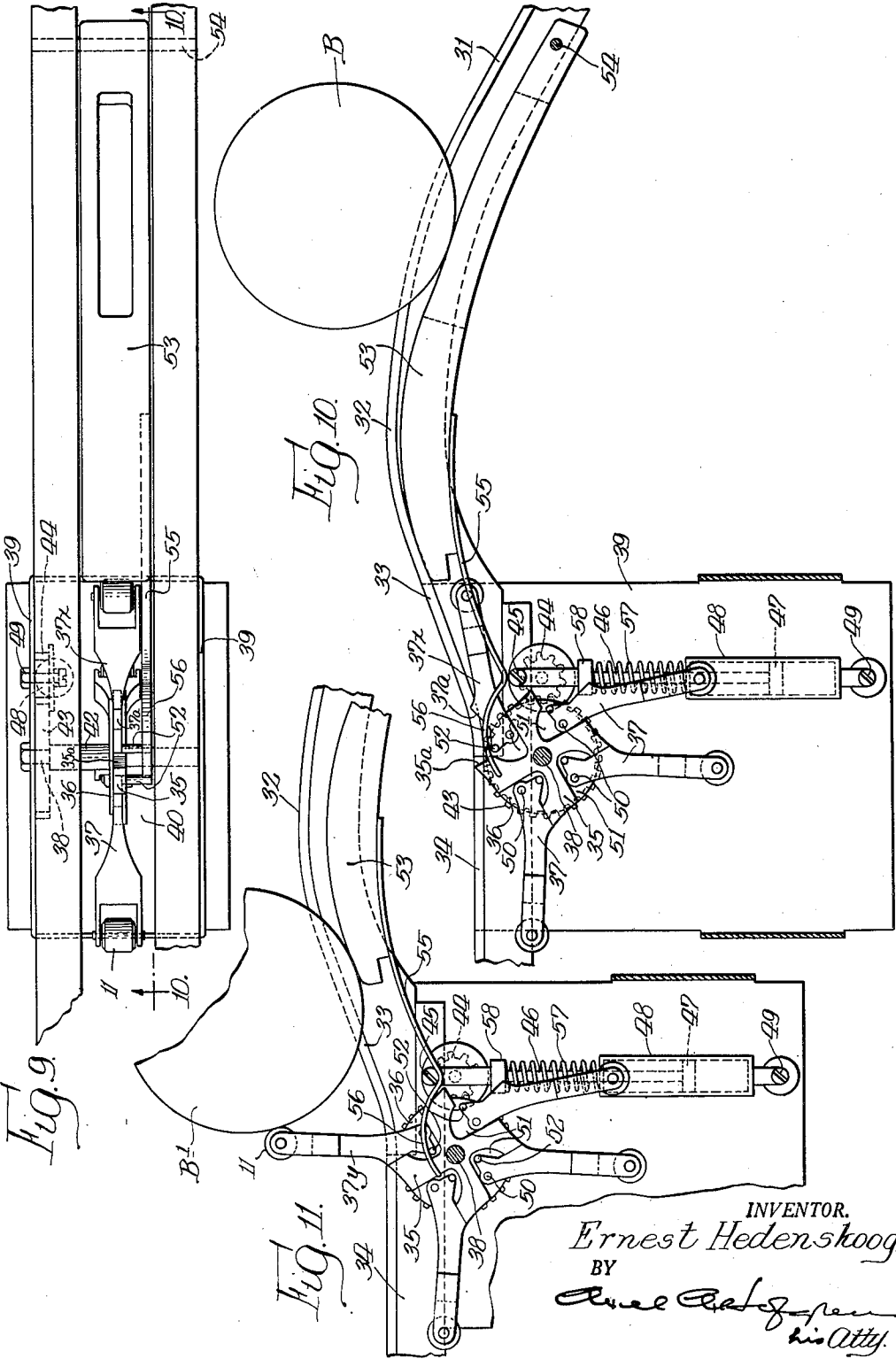
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BOWLING BALL RETARDING DEVICE FOR BOWLING ALLEY RUNWAYS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,530,429

BOWLING BALL RETARDING DEVICE FOR
BOWLING ALLEY RUNWAYSErnest Hedenskoog, Muskegon, Mich., assignor to
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Application March 5, 1945, Serial No. 530,999

9 Claims. (Cl. 273-47)

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This invention relates to bowling alleys and is particularly concerned with means for retarding the movement of bowling balls on the return runway of a bowling alley.

One object of the invention is to provide a new and improved ball retarding device. Another object of the invention is to provide a ball retarder having a plurality of ball engaging members adapted to be positioned successively in active relation to the return runway and to be automatically shifted into and out of active position by the passage of a ball along the runway. A further object of the invention is to provide a ball retarding device having a plurality of ball engaging members which are automatically and successively brought into operative position to provide for handling a plurality of balls arriving in rapid succession. More specifically the invention involves the provision of a rotatable device having a plurality of arms extending radially at equal intervals and adapted to be projected successively into the space between the ball supporting rails constituting the return runway, together with braking means on the device to retard or stop a ball as it encounters one of said arms, and to permit the ball, due to its weight and stored energy, to rotate the device through an angle sufficient to swing one arm to release the ball and to bring the next arm into ball encountering position.

In accordance with one form of the invention, at least one of the arms of the rotatable device is adjustably connected to the hub of the mechanism so that when desired it can be swung out of ball obstructing position, the object of this feature being to permit the use of the runway in a game employing a smaller ball for which a retarding mechanism is not necessary.

An additional form of the invention is designed with the object of keeping the ball obstructing arm or member normally lowered below the surface of the runway and out of sight until just prior to the arrival of a ball, the mechanism including means whereby the ball itself throws the obstructing arm into active position in which it absorbs the momentum of the ball and then yields to permit the ball to pass along the runway to the rack portion thereof.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawings, in which:

Fig. 1 is a side elevation of the terminal portion of a return runway of a bowling alley with a retarding device embodying this invention associated therewith.

Fig. 2 is an end elevation of the same.

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Fig. 3 is a side elevation of the retarding device taken on a larger scale with the position of the runway indicated in dotted outline.

Fig. 4 is an end elevation of the structure shown in Fig. 3 and with part of the runway in section.

Fig. 5 is a view similar to Fig. 3 showing the retarding device in operation.

Fig. 6 is a detail side elevation showing an optional construction of the retarder.

Fig. 7 is a detail section taken as indicated at line 7-7 on Fig. 6.

Fig. 8 is an enlarged side elevation of the dash pot cylinder, with parts shown in section.

Fig. 9 is a plan view of a modified form of retarding device embodying this invention.

Fig. 10 is a vertical section, as indicated at line 10-10 on Fig. 9, and shows most of the mechanism in elevation.

Fig. 11 is a view similar to Fig. 10 showing the mechanism in active ball retarding position.

The invention is susceptible of various modifications and alternative constructions and it is herein shown and described in more than one embodiment, but it is not intended that the invention be understood as limited to the specific forms disclosed but rather that it embraces all modifications and alternative constructions falling within the spirit and scope of the appended claims.

In a standard bowling alley the ball is returned to the player, from the pit, by way of a runway extending at one side of the alley and terminating adjacent the approach end of the alley so that the ball shall be conveniently at hand for the next play. As shown in Fig. 1 the terminal portion of the return runway preferably includes an upwardly inclined track 1 reaching its maximum elevation at the hump 2, from which point a downwardly inclined section 3 connects with the final horizontal portion 4 sometimes termed the "rack." It is desirable to retard the ball as it approaches the rack 4 so that it shall not arrive with so much force as to be dislodged therefrom or to strike other balls on the rack in a manner tending to injure them. For this purpose the present invention provides a rotatable device comprising a hub composed of plates 5 and 6 from which there extend radially disposed arms 7 arranged at equal angular intervals around the axis of the hub, as clearly seen in Fig. 3. This structure is carried by a shaft 8 which is journaled on suitable supporting side walls 9, 9 at an axis disposed below the downwardly inclined portion 3 of the return runway. This portion of the runway is composed of a pair of rails or track members providing a

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space 10 between them, and one of the arms 7 normally projects upwardly into and through this space 10. By rotative adjustment of the retarding device each of the arms 7 may be successively brought into this ball engaging position. Preferably the outer end of each arm carries a rotatably mounted rubber roller 11 to avoid injury to a bowling ball upon contact therewith and to eliminate any tendency of the ball to ride up on the arm.

As shown, there are four arms 7 disposed at 90-degree intervals around the axis of the shaft 8. A gear wheel 12 is rigidly connected with the hub of the rotatable device as by a sleeve 13 extending from one of the hub plates 5 to the gear 12. This gear meshes with a smaller gear 14. As shown, the ratio between the gears 12 and 14 is 4 to 1; thus a quarter turn of the gear 12 effects one complete revolution of the gear 14. A crankpin 15 is carried eccentrically on a flange 15' on the gear 14 and is connected to a piston rod 16 having a piston 17 disposed in a cylinder 18, and the cylinder 18 is pivotally supported on a fixed pivot 19 extending from one of the side walls 9. The rotation of the gear 14 thus causes reciprocation of the piston 17 in its cylinder 18, and this structure is employed as a dash pot or braking device serving to resist rotation of the projecting arm 7 when a bowling ball A encounters it, as indicated in Fig. 1.

The resistance of the dash pot structure is supplemented by a spring 20 disposed about the piston rod 16 and reacting between the upper end of the cylinder 18 and a terminal head 21 on the piston rod. Rotation of the retarding device in a counter-clockwise direction (as viewed in Fig. 3) initially requires the spring 20 to be compressed as the piston 17 is driven downwardly in its cylinder 18. It may be understood that the strength of the spring 20 and the resistance offered by the dashpot device are so adjusted that the horizontal component of the weight of a ball disposed at A on the downwardly inclined portion 3' of the runway is sufficient to overcome the spring and the resistance of the dashpot, and normally the ball will have some momentum at this point to supplement its weight. The cylinder 18 preferably contains a quantity of fluid, such as oil. The confined fluid is forced to pass through a restricted port 22 in the piston 17 as the piston descends in the cylinder 18.

When the arm 7 has been swung through an angle of about 45 degrees, the gear 14 will have been rotated through a half turn, bringing its crankpin 15 from its initial position above the center of the gear to a position directly below the center. At this point the spring 20 will be under maximum compression and thereafter further rotation of the arm 7 will be accompanied by upward travel of the crankpin 15 and expansion of the spring 20. The energy stored in the spring in compressing it will thus assist in completing a single rotation of the gear 14 to bring the crankpin 15 back to its initial position above the center of the gear even though the ball may be removed before it passes entirely over the arm it engages. Such a full rotation when completed will cause the arm 7 which was encountered by the ball A to be swung to a horizontal position below the level of the runway, while the adjacent arm 7 of the device will be swung from its original horizontal position to vertical position ready for encounter with the next ball arriving on the runway section 3.

During the upward travel of the crankpin 15

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the piston 17 will be drawn upward in its cylinder 18, requiring the fluid therein above the piston to be transferred to the space in the cylinder below the piston. To facilitate the final portion of the movement of the device a supplemental port 23 may be provided in the piston 17 having a larger capacity than the restricted port 22, and a check valve 24 may be arranged to close the supplemental port during the downward movement of the piston and to open it automatically during the upward movement thereof. With this arrangement the dashpot will operate principally during the initial portion of the rotation of the retarding arm 7, while the spring 20 will insure the completion of the movement of the arm so as to release the ball to the rack portion 4 of the track and bring the retarding device into ready position to receive the next ball.

Fig. 6 illustrates a special construction which may be provided in the rotatable retarding device if the alley is sometimes employed in playing a game in which a ball which is too small to operate the retarding device is used. For this purpose one arm 7x of the device is pivotally mounted between the hub plates 5 and 6 and is locked in its normal radially extending position by means of a pin 25 having a threaded shank engaged in a threaded hole in the flange 6 of the hub and in a hole 26 in the arm. When the pin 25 is partially unscrewed from the flange, as shown in Fig. 6, the arm 7x may be swung about its pivot 27 into a position at which it will lie below the track 3 so that the mechanism will not be operated by balls rolling along this track.

It may be preferable, from the standpoint of appearance, to arrange all the arms of the device so that normally the arm which is to obstruct the passage of a ball will be swung below the surface of the runway and will remain out of sight until just before the arrival of a ball which is to be arrested. Such an arrangement is shown in Figs. 9, 10 and 11 in which the upwardly inclined portion of the runway is indicated at 31 with the highest portion or crest of the rise at 32, a downwardly inclined section at 33, and a final horizontal section, of which a portion is shown, at 34. The rotatable retarding device includes a hub member 35 with a circular flange or plate 36 rigidly associated therewith and with a plurality of ball obstructing arms 37 attached to this hub at equal angular intervals around its axis. The hub is carried by a shaft or axle 38 supported in side walls 39, 39 directly below the part of the runway at which the downwardly inclined portion 33 joins the horizontal portion 34. As in the structure already described, the runway is composed of a pair of rails or track members providing a space between them, indicated at 40 in Fig. 9, and the hub 35 with its arms 37 is mounted for rotation in this space. Preferably the outer end of each arm is provided with a cushioning roller 41 for contact with the bowling ball.

The hub structure 35, 36 has rigidly connected to it a sleeve 42 extending to a gear 43 which is rigidly connected to the hub for rotation therewith. As in the form previously described there are four of the ball obstructing arms 37 connected to the hub and at each operation of the device the hub is designed to turn through an angle of 90 degrees. The gear 43 therefore meshes with a pinion 44 so dimensioned that the ratio of the two gears is 4 to 1 causing a quarter turn of the gear 43 to effect a complete revolution of the pinion 44. A crank pin 45 on the

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pinion engages a piston rod 46 having a piston 47 disposed in a cylinder 48, the cylinder being supported on a fixed pivot 49 secured to one of the side walls 39. The cylinder 48 preferably contains oil so that the structure may be employed as a dashpot or braking device to yieldingly resist rotation of the pinion 44, gear 43 and hub structure 35, 36.

Each of the arms 37 is attached to the plate 36 of the hub by a pivot 50 and the inner end portion of the arm 37 is accommodated in a notch or recess 51 formed in the hub member 35. The recess 51 is shaped to provide clearance which permits the arm 37 to swing through an angle of approximately 90 degrees about its pivot and each arm carries a crank pin 52 disposed at a relatively short distance from its pivot 50 and extending laterally beyond the face of the hub 35, as seen in Fig. 9.

As the bowling ball, indicated at B in Fig. 10, travels up the inclined portion 31 of the runway, it encounters a lever arm or treadle 53 carried on a pivot 54 and disposed in the space between the rails of the runway. The free end of the arm 53 is thus depressed by the weight of the ball and swings downwardly to the position shown in Fig. 11. The lever arm carries a metallic extension 55 having an arched terminal portion 56 which overlies and carries downward with it the crank pin 52 of the arm shown at 37x in Fig. 10, causing said arm to be swung suddenly about its pivot 50 into upstanding position, as seen at 37y in Fig. 11. Because the distance between the pivot 50 and the crank pin 52, which is the effective crank arm, is relatively short as compared with the length of the arm 37 and as compared with the dimensions of the lever 53 and its extension 55, a rather small angular movement of the lever 53 is sufficient to shift the arm 37 quickly from its inoperative or inactive position at 37x to its obstructing position 37y and this movement is completed before the ball passes the end of the lever arm 53 itself.

As the ball, indicated at B¹ in Fig. 11, strikes the upstanding arm 37y it starts the rotation of the arm and its hub 35, 36 about the axle 32, turning the gear 43 and actuating the pinion 44 to move the piston 47 in the dashpot cylinder 48. Even if the momentum of the ball has been almost absorbed in its travel up the incline 31, the fact that the ball is on the downwardly inclined part 33 of the runway when it reaches the arm 37y insures that the component of its weight acting along the runway will be sufficient to move the arm 37y gradually away from its obstructing position.

It may be understood that the construction of the piston is similar to that shown in Fig. 8 including a restricted port through which the liquid in the cylinder 48 is forced to pass as the piston moves downwardly therein. This arrangement permits the arm 37y to yield slowly to the impact of the ball and to swing gradually downward, finally reaching a position below the track where it is clear of the ball and permits the latter to travel onto the horizontal rack portion 34 of the runway.

The latter portion of this movement of the obstructing arm will be assisted by a spring 57 coiled around the piston rod 46 and reacting between the end of the cylinder 48 and a head 58 on the piston rod, like the spring 29 in the structure previously described and shown in Figs. 3, 4 and 5. Thus the rotation of the hub and its arms 37 operates in the same manner as the ro-

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tation of the corresponding structure including the arms 7 of the first form of the invention herein described. But in this modified form the arm which is to obstruct the passage of the ball beyond the inclined runway 33 is kept normally out of sight and below the surface of the runway until the arrival of the ball operates to raise the arm into obstructing position. The force required to actuate the lever 53 and its extension 55 for swinging the arm from the position 37x to the position 37y is readily provided by the weight of a standard bowling ball, but a smaller ball, such as the four inch ball commonly used in the game of duck pins, is not heavy enough to actuate these parts; hence the runway remains automatically unobstructed for the small ball for which no retarding device is considered necessary.

It will be seen that in both forms of the retarding device herein described the provision of a rotatable hub with a plurality of arms attached thereto at intervals and adapted for obstructing the ball makes it possible to have the device rotate always in the same direction in step by step fashion so that as the force exerted by the ball overcomes the braking resistance and swings the obstructing arm out of the way, this movement automatically brings the next arm to that point in its rotation at which it becomes the ball obstructing element. This point may be termed the "ball obstructing station"; in the form of a device shown in Figs. 1 to 5 each arm is actually in ball obstructing position as it arrives at this station because all the arms are rigidly connected to the hub and extend radially therefrom. In the form shown in Figs. 9 to 11 the arm is not in ball obstructing position when it first arrives at its ball obstructing station but is raised to operative position by the approach of the ball and becomes, for the time being, rigidly engaged with the hub as the shoulder 37a of the arm contacts the abutment shoulder 35a of the hub.

I claim as my invention:

1. In combination with the ball return runway of a bowling alley, a ball retarder comprising a rotatable device rotating in one direction only journaled at an axis adjacent the runway and including a plurality of arms extending at equal angular intervals outwardly from said axis in position to project successively into the path of a ball as the device is rotatably adjusted about its axis, an adjustment equal to the angular interval between said arms serving to carry one arm from a position obstructing the path of the ball on the runway to a position clear of said path and to carry the next arm into ball obstructing position, a crank geared to said rotatable device at a ratio causing one rotation of said crank for each movement of the device through the angular interval between its arms, and spring means connected to said crank adapted to be stressed by the first half revolution thereof and to release its stored energy during the final half revolution to assist the crank in said final half turn.

2. In combination with the ball return runway of a bowling alley, a ball retarder comprising a rotatable device rotating in one direction only journaled at an axis adjacent the runway and including a plurality of arms extending at equal angular intervals outwardly from said axis in position to project successively into the path of a ball as the device is rotatably adjusted about its axis, an adjustment equal to the angular interval between said arms serving to carry one arm

from a position obstructing the path of the ball on the runway to a position clear of said path and to carry the next arm into ball obstructing position, a crank geared to said rotatable device at a ratio causing one rotation of said crank for each movement of the device through the angular interval between its arms, a dash-pot device comprising a cylinder and a piston reciprocable therein with means operatively connecting said piston to the crank, said piston having a restricted port causing it to yieldingly resist movement of the crank through its first half revolution when actuated by said rotatable device, said piston having also a larger port and a valve associated therewith, means for opening said valve upon reverse movement of the piston during the next half turn of the crank, together with spring means operatively connected to said crank and adapted to be stressed by said first half revolution thereof and to release stored energy to assist the crank in its next half turn.

3. In combination with the ball return runway of a bowling alley, a ball retarder comprising a rotatable device rotating in one direction only journaled at an axis adjacent the runway and including a plurality of arms extending at equal angular intervals outwardly from said axis in position to project successively into the path of a ball as the device is rotatably adjusted about its axis, an adjustment equal to the angular interval between said arms serving to carry one arm from a position obstructing the path of the ball on the runway to a position clear of said path and to carry the next arm into ball obstructing position, a crank geared to said rotatable device at a ratio causing one rotation of said crank for each movement of the device through the angular interval between its arms, a dash-pot device comprising a cylinder and a piston reciprocable therein with means connecting said piston to the crank, said piston having a restricted port causing it to yieldingly resist movement of the crank through its first half revolution when actuated by said rotatable device, said piston having also a larger port and a valve associated therewith, means for opening said valve upon reverse movement of the piston during the next half turn of the crank, together with a spring reacting between the crank and the adjacent end of said cylinder whereby said spring is compressed during the first half revolution of the crank and expands to release stored energy assisting the crank in its next half turn.

4. In combination with the ball return runway of a bowling alley, a ball retarder which includes a hub journaled at an axis adjacent the runway, an arm pivotally connected to said hub at an axis parallel to that of the hub, said arm being adjustable about its pivot to extend in substantially radial relation to the hub and in ball obstructing relation to the runway to be connected by a ball rolling along the runway but being normally disposed in approximately tangential relation to the hub and clear of the path of a ball on the runway, a crank pin extending laterally from said arm at a short distance from its pivot, a treadle device in the path of a ball on the runway approaching the retarder, said treadle having a part overlying said crank pin whereby depression of the treadle by the weight of an approaching ball actuates the crank pin and swings the retarder arm into its radial, ball-obstructing position in driving engagement with its hub, and means connected to the hub yieldingly resisting rotation

of the hub to retard the motion of the ball rolling along the runway.

5. In combination with the ball return runway of a bowling alley, a ball retarder comprising a rotatable device journaled at an axis adjacent the runway and including a hub with a plurality of arms pivotally connected thereto at equal angular intervals, said arms being moved successively to a ball obstructing station as the device is rotatably adjusted about its axis, each arm being adjustable about its pivot to extend in substantially radial relation to the hub and in ball obstructing relation to the runway when the arm is disposed at said station but being normally positioned in approximately tangential relation to the hub and clear of the path of a ball on the runway, means actuated by the approach of a ball and operating to swing the arm at the ball obstructing station to its obstructing position, said hub having an abutment which the arm encounters in said position for effecting driving engagement between the arm and the hub, braking means yieldingly resisting rotation of the hub but adapted to be overcome by force supplied by a ball in contact with the obstructing arm, permitting said arm to be moved by the ball away from its obstructing position and effecting an adjustment of the rotatable device equal to the angular interval between adjacent arms, thereby carrying the one arm from obstructing position to a position clear of the path of the ball and carrying the next arm to the ball obstructing station.

6. In the combination defined in claim 5, said yielding means comprising a dash pot device resisting the initial portion of movement of the device through said angular interval, together with spring means stressed by such initial portion of the movement and reacting to complete the movement through said angular interval.

7. In combination with the ball return runway of a bowling alley, a ball retarder comprising a rotatable device journaled at an axis adjacent the runway and including a plurality of arms extending at equal angular intervals outwardly from said axis in position to project successively into the path of a ball as the device is rotatably adjusted about its axis, an adjustment equal to the angular interval between said arms serving to carry one arm from a position obstructing the path of the ball on the runway to a position clear of said path and to carry the next arm into ball obstructing position and means yieldingly holding the device normally with one arm in ball obstructing position, one arm of said rotatable device being adjustable about a pivot adjacent the axis of rotation whereby said arm may be swung from a position upstanding in the path of a ball to a position wholly below the runway, together with means releasable at will for holding said arm in its upstanding active position.

8. In combination with the ball return runway of a bowling alley, a ball retarder comprising a rotatable device rotating in one direction only journaled at an axis adjacent the runway and including a plurality of arms extending at equal angular intervals outwardly from said axis in position to project successively into the path of a ball as the device is rotatably adjusted about its axis, an adjustment equal to the angular interval between said arms serving to carry one arm from a position obstructing the path of the ball on the runway to a position clear of said path and to carry the next arm into ball obstructing position, said runway being provided with a hump includ-

ing an inclined portion immediately before the ball retarder to absorb a portion of the speed of the ball and cause the retarder to be operated principally by the weight of the ball rolling down the inclined portion, a crank geared to said rotatable device at a ratio causing one rotation of said crank for each movement of the device through the angular interval between its arms, a dash-pot device comprising a cylinder and a piston reciprocable therein with means connecting said piston to the crank, said piston having a restricted port causing it to yieldingly resist movement of the crank through its first half revolution when actuated by said rotatable device, said piston having also a larger port and a valve associated therewith, means for opening said valve upon reverse movement of the piston during the next half turn of the crank, together with a spring reacting between the crank and the adjacent end of said cylinder whereby said spring is compressed during the first half revolution of the crank and expands to release energy assisting the crank in its next half turn.

9. In combination with the ball return runway of a bowling alley, said runway having a raised portion over which the ball rolls, a ball retarder comprising a rotatable device rotating in one direction only journaled at an axis adjacent the base of the downwardly inclined part of the raised portion of the runway and including a plurality of arms extending at equal angular intervals outwardly from said axis in position to project successively into the path of a ball as the device is rotatably adjusted about its axis, an adjustment equal to the angular interval between said arms

serving to carry one arm from a position obstructing the path of the ball on the runway to a position clear of said path and to carry the next arm into ball obstructing position, said ball rolling down said downwardly-inclined part to contact an arm, a dash-pot retarder means operably connected to the rotatable device through a mechanical linkage transferring rotational movement of said rotatable device to reciprocal movement of the dash-pot retarder means, said dash-pot retarder means being movable in one direction for controlling the initial portion only of a movement of the device through said angular interval and being movable in the other direction during the final movement of the device through said angular interval, and spring means stressed by such initial portion of the movement and reacting during the final portion of the movement in said one direction through said angular interval.

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