

[54] METHOD AND APPARATUS FOR
AUTOMATIC BOWLING PIN SETTING

[75] Inventors: August Schmid, Schwerzenbach,
Switzerland; Georges Goens,
Heverlee, Belgium

[73] Assignee: Serania AG Patentverwertungs-und
Finanzierungsgesellschaft, Glarus,
Switzerland

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[58] Field of Search..... 273/42 R, 42 A, 43 R, 43 A

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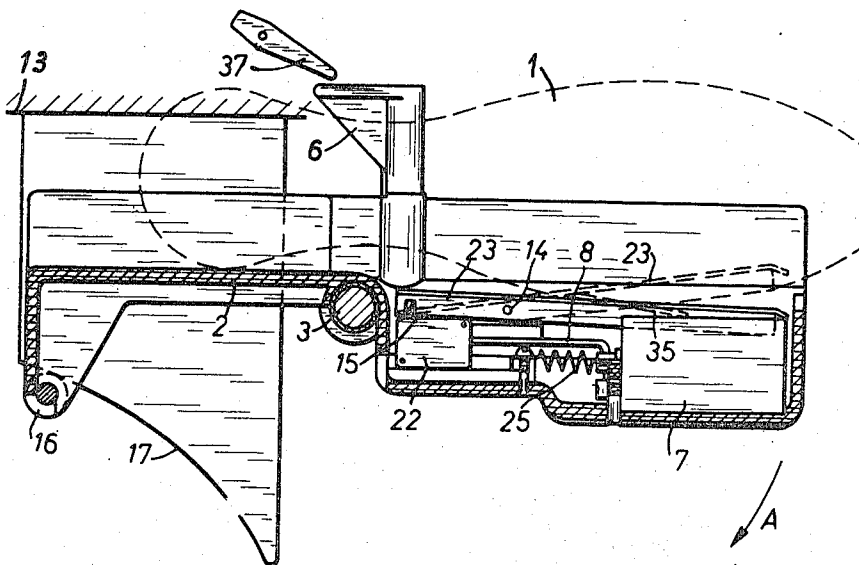
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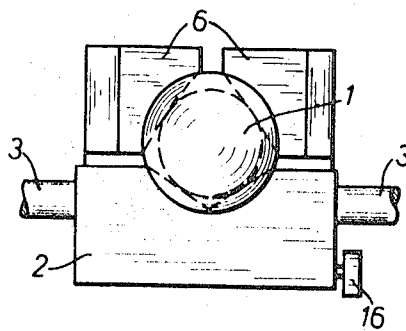
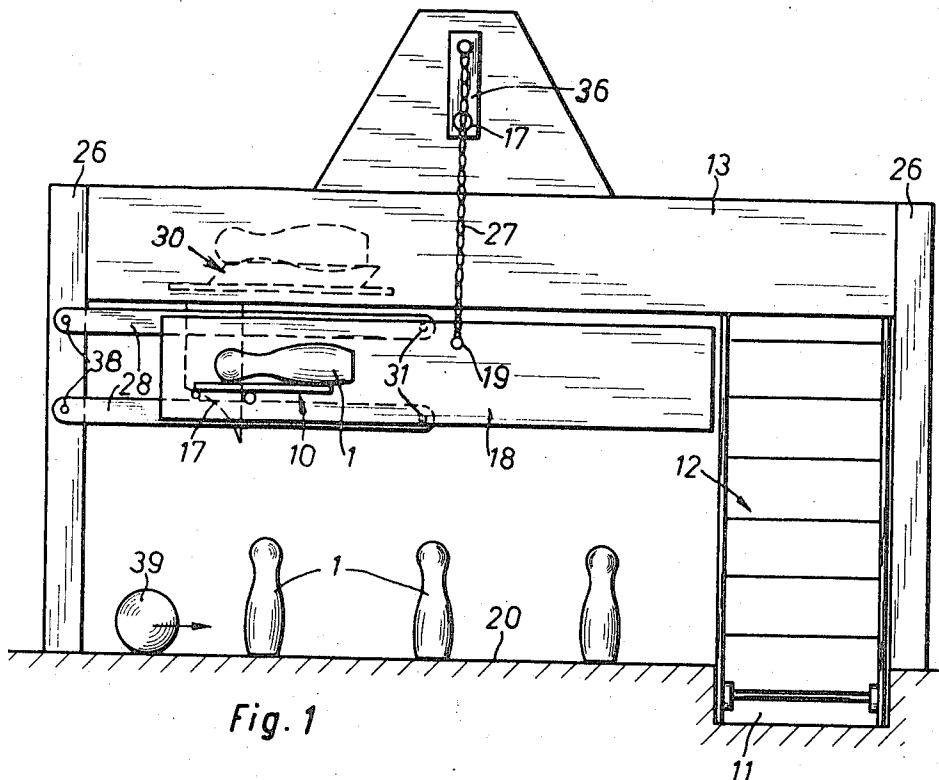
Primary Examiner—Anton O. Oechsle
Attorney, Agent, or Firm—Flynn & Frishauf

[57] ABSTRACT

To reset, automatically, all the bowling pins for one game of bowling, or only those which have not been knocked over by a bowled ball, a frame is provided which is supplied with tipping baskets, each one adapted to hold a bowling pin and having electromagnetically operated flaps engaging over the neck of the bowling pin. The frame, with the baskets upright and the flaps open can be lowered to pick up the pins which have been left standing, the frame raised, and empty baskets are, selectively, filled with pins; the frame is then again lowered, and the flaps opened to release all the pins which were in baskets.

10 Claims, 2 Drawing Figures





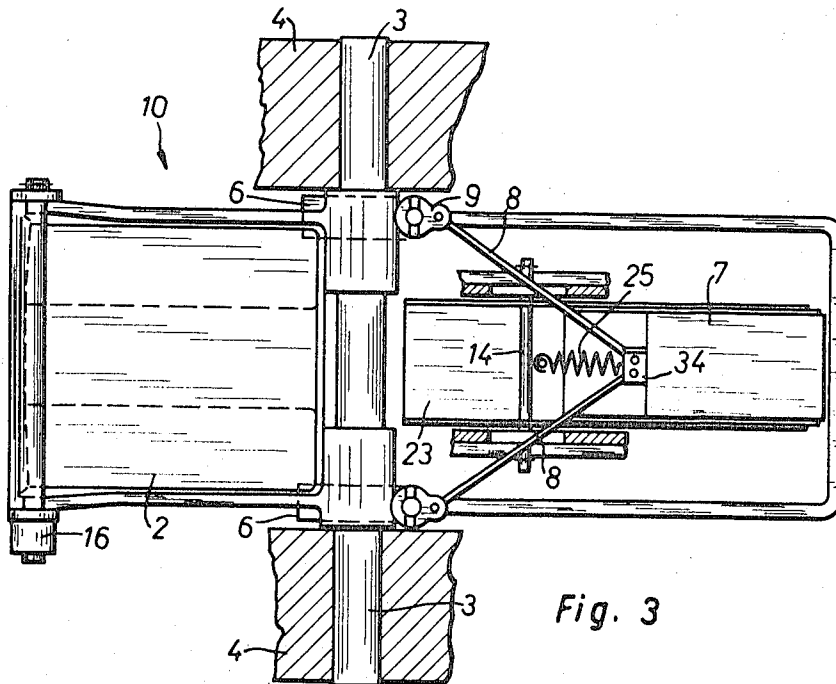


Fig. 3

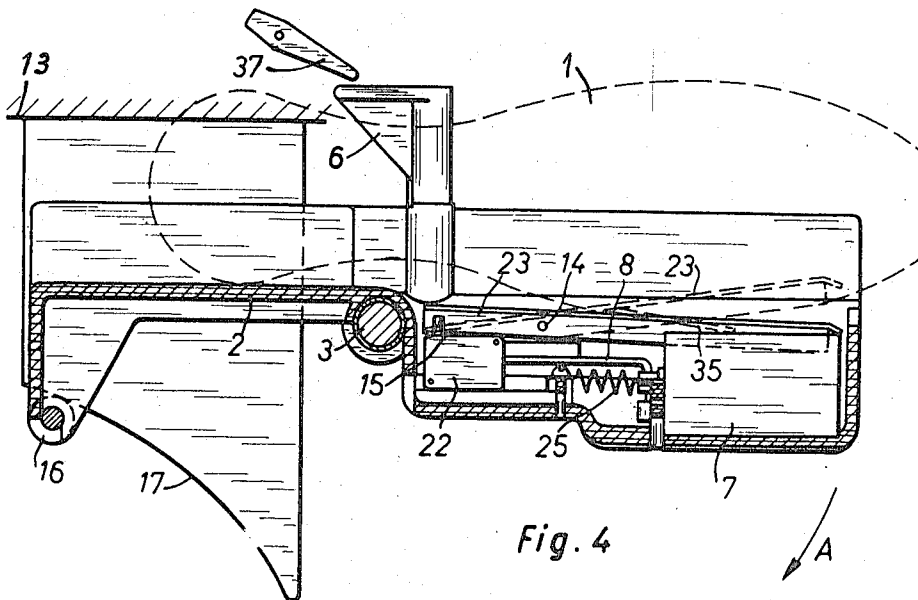


Fig. 4

METHOD AND APPARATUS FOR AUTOMATIC BOWLING PIN SETTING

CROSS REFERENCE TO RELATED APPLICATIONS

U.S. Ser. No. 290,533, filed Sept. 20, 1972

U.S. Ser. No. 290,547, filed Sept. 20, 1972.

The invention relates to a method, and a mechanism in an automatic bowling pin setting installation for setting up the bowling pins in a bowling alley, for cord-less pin setting. A plurality of tipping baskets is provided, one basket each for the reception of one bowling pin. The baskets are so mounted that each can tilt about a horizontal axis, to release a pin. They are mounted on a common frame which can be raised and lowered.

In cordless pin setting installations — i.e. in installations in which the bowling pins are not attached to cords — mechanism must be provided to ensure that the several bowling pins can be set up in their proper places on the floor of the bowling alley. To this end, a frame is provided which can be raised and lowered. At the same time facilities must be available to set up only some of the pins to permit different variants of the game to be played, for instance games in which pins left standing after rolling a first bowl may be knocked down by a second or third bowl.

The difficulties involved in removing the fallen bowling pins from in-between the pins that have been left standing, by purely mechanical means, are nearly insuperable. Thus it has already been proposed to remove all the pins from the alley from after each bowl has been rolled and by control means to ensure that only those pins are set up again which had not been knocked down. However, this procedure has the drawback of requiring a relatively large number of bowling pins to be in circulation, thus throwing a considerable load on the system besides subjecting the pins to considerable wear.

It is an object of the invention to provide a mechanism which is simple, and capable of lifting the bowling pins that have been left standing and for then selectably setting up either all the pins or only particular pins.

SUBJECT MATTER OF THE INVENTION

Briefly the pins that have been left standing are lifted, and replacements are provided, when necessary, only for the pins that have been knocked down. When the bowling pins that had been left standing have been lifted the fallen pins are removed and swept by a clearing device into the pin pit whence they are reintroduced into the circulating system. A mechanism is provided which has tipping baskets, each to carry a pin; each basket has at least one holder for gripping the neck of a bowling pin; electromagnetic means, e.g. a solenoid, is located on the basket to operate the holder under the control of an electrical control system.

In accordance with a feature of the invention, the method comprises lowering the frame carrying the tipping baskets each time a bowling ball has been rolled, securing the bowling pins that are still standing in the baskets so that they are lifted when the frame ascends, and in raised position of the frame refilling the empty baskets, if desired, with bowling pins before the frame is relowered and sets up the pins on the floor of the alley again.

The apparatus is simple and easy to construct; the mechanism and procedure permit standing pins to be picked up, lifted, and a full complement or only some pins relowered and set up on the floor of the alley.

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

FIG. 1 is a schematic general view of an automatic pin setting installation,

FIG. 2 is a cross section of a single tipping basket containing a bowling pin,

FIG. 3 is a view of a tipping basket from below after activation of the solenoid, and

FIG. 4 is a longitudinal section of a tipping basket with the flaps open.

Bowling pins 1 which have been knocked over are first collected in a pin pit 11 (see cross referenced application, Ser. No. 290,533) whence they are conveyed on a belt conveyor and then by an elevator 12 to a pin distributor contained in a fixed part 13 of a frame supported from the ground on uprights 26 (see cross referenced application, Ser. No. 290,547). The pin distributor delivers the individual pins 1 into bins 30 in which they remain in a "ready" position. Below part 13 of the frame is a further frame 18 which can be lowered and raised, and which contains a number of tipping baskets 10 at least equal in number to the number of pins used in the game. The frame 18 can be lowered and raised by a motor-driven crank 36 and a chain 27 fastened to the free end of the crank remote from its axis of rotation 17. The bottom end of the chain is attached to a bolt 19 on the frame 18. Horizontality of the frame 18 is ensured by a parallelogram linkage 28 having parallel links hinged to pins 38 on one of the uprights 26 and to pins 31 on the frame 18.

The bowling pins 1 selectively drop out of the bins 30 in part 13 of the frame into the baskets 10 on the movable frame 18 (see aforementioned application, Ser. No. 290,547). For ninepin bowling there will therefore be nine such baskets; for tenpin bowling ten baskets 10 will be provided. The baskets 10 are each independently tiltable about a horizontal axis out of a horizontal into a vertical upright position. In order to avoid complicating the drawing only one bin 30 and one basket 10 are shown in FIG. 1.

Each basket 10 is fitted with a pin holder formed as two hingeable deflectable flaps 6. The purpose of these flaps is to embrace the neck of a bowling pin 1. When the baskets 10 have been tilted into an upright position and the frame 18 has been lowered, the bowling pins 1 are deposited on the floor of the bowling alley 20 at the precise spot where each pin 1 is intended to stand. The flaps 6 are then opened and release the pin 1 which they hold. The empty baskets 10 rise together with the frame 18 for the reception of a fresh set of pins.

Since all the tipping baskets 10 are of identical design only one basket mechanism will be described in detail. The tipping basket 10 has a main body 2 in the form of a metal casting or a plastics moulding. A pivot pin 3 of which the ends swing in bearings 4 in the frame 18 is fitted into the body 2 of the basket. Two flaps 6 which project from the top of the body 2 of the basket are hingeably deflectable through angles of about 90°. These two flaps 6 can turn about relatively spaced hinge pins and their purpose is to grip the neck of a bowling pin when they close. The flaps 6 are simultaneously turned in opposite directions through angles of

about 90° by the activation of a solenoid 7 mounted on the body 2 of the basket and thus tip with the basket. The transmission of the movement of the plunger 34 of the solenoid 7 to the flaps 6 is effected by rods 8 arranged in the form of a letter V. The rods are attached to eccentrics 9 which are motion-coupled to the flaps 6 by Cotter pins or the like. A spring 25 is biased to restore the plunger to its position of rest. The body 2 of the basket also carries a microswitch 22 which cooperates with a pivoted feeler lever 23. The feeler lever 23 has two arms and it is adapted to tilt about a horizontal pivot 14. One end of the feeler lever 23 which is loaded by a weak leaf spring 35 depresses the contact button 15 of the microswitch 22 when the basket carries no bowling pin. The other end of the feeler lever 23 is adapted to cooperate with the body of a bowling pin resting on the basket. Hence the position of the microswitch 22 depends upon the presence or absence of a bowling pin 1 on the tipping basket 10.

The deflection of the tipping basket 10 from its roughly horizontal position shown in FIG. 4 into a vertical position in which the bowling pin 1 is set up on the floor of the bowling alley is effected by a cam 17 which cooperates with a follower roller 16 on the end of body 2 of the basket. When the frame 18 including the several tipping baskets 10, which it carries, is lowered, cam follower roller 16 rides along the edge of the cam 17 which allows the basket by virtue of its weight and that of a bowling pin 1 which it may carry to tip as indicated by an arrow A (FIG. 4) until finally the longitudinal axis of the bowling pin is in the vertical. The frame 18 continues to descend until the bowling pins make contact with the surface of the bowling alley 20. A control means now energises the solenoids 7, causing solenoid plunger 34 to pull on rods 8, thus causing the flaps 6 to swing open and to release the neck of the pins. The frame 18 carrying the empty tipping baskets 10 is raised again and the baskets 10 are tilted back into the horizontal by virtue of the cam follower rollers riding up the cams 17.

The flaps 6 remain open to permit the bowling pins 1 resting in the bins 30 of the pin distributor to drop into the empty baskets 10 (see application, Ser. 290,533). When a bowling pin 1 drops into a basket it simultaneously deflects the feeler lever 23 and causes the microswitch 22 to de-energise the solenoid 7, permitting the flaps 6 to be pulled into the positions in which they grip the neck of the bowling pin.

In case a different type of game is desired to be played, that is, one in which bowling pins are not replaced and reset, but pins which have been left standing by a ball are to be picked up again, the control means can be set to de-energise the solenoid 7 so that the flaps 6 will swing shut before the upward motion of the frame 18, thus simulating presence of a pin in the basket 10, although no pin is actually present therein. This is easily accomplished by placing a single pole, single throw, normally closed switch in series with microswitch 22, the normally closed switch being opened upon the upward movement of frame 18 so that all flaps will be closed, regardless of whether there are pins in the basket or not.

The release of bowling pins from the boxes 30 is triggered by the operation of a releasing member 37 in a locking mechanism by the open flaps 6 when the frame 18 ascends and approaches its upper end position. The bowling pins are thereby allowed to fall out of the

boxes into the empty tipping baskets 10 below. However, should the flaps 6 be closed during the ascent of the frame — and this will be the case if the basket 10 carries or simulates carrying a bowling pin — then the bin 30 will not be opened because the closed flaps 6 cannot operate the release 37 of the locking mechanism.

When the ball 39 knocks down some of the pins 1 the motor for lowering the frame 18 is set in motion. If empty baskets 10 — having tipped into an upright position — make contact with pins 1 that are still standing, then these pins will operate the feeler levers 23 which are deflectable by very slight contacting forces. This results firstly in the number of bowling pins still left standing in the alley 20 being indicated on a visual display board. Continued downward motion of the frame 18 causes the head of the standing pin to push its way between the two flaps 6 which without assistance from the solenoid first yield to the pressure, then reclose by virtue of the pull of the spring 25 and finally grip the neck of the pin 1. When the frame 18 starts its ascent it will therefore simultaneously lift all the bowling pins 1 that had not fallen. Only the empty baskets 10 will then be refilled with bowling pins 1 from the bins 30 (unless electrically inhibited). This permits the total numbers of bowling pins that must be circulated through the system to be substantially reduced, wear of the bowling pins to be minimized and the number of balls that can be rolled per hour to be raised to over 200. As soon as the frame has been lifted the alley is swept clear by a mechanical clearing device (see application, Ser. No. 290,533) which sweeps them into the pin pit 11 whence they are lifted by the elevator 12 as already described. The frame 18 is then lowered again and the bowling pins set up on the floor of the alley 20. If it is not desired that empty baskets 10 receive fresh pins from the bins 30 when the frame 18 is raised again, either the flaps 6 may be automatically closed by the electrical control system energizing the solenoids 7, or the frame 18 may not be lifted into its extreme upper end position.

The electrical control system permits the flaps 6 to be so controlled that either all the pins are set up or only some, for instance those that had been left standing by the preceding roll of the ball. The electrical control system may be controlled by a manual keyboard at the delivery end of the bowling ball return way such that any desired bowling pin can be set up on the floor at the end of the alley.

Various changes and modifications may be made within the inventive concepts.

We claim:

1. Automatic pin setting apparatus for setting up bowling pins in a bowling alley comprising a common frame (18);

means (28, 31, 38) guiding the frame for vertical movement;

operating means (17, 19, 27, 36) moving the frame vertically;

a plurality of baskets (10) each adapted to hold a bowling pin (1), said baskets being swingably mounted on said frame (18) to tip about a essentially horizontal axis (3);

hinged flap means (6) movably mounted on each of the baskets and adapted to engage the neck of a pin in the basket and prevent release of the pin from

5

the basket upon tipping of the basket from essentially horizontal to essentially vertical position; and electromagnetic means (7, 8, 9) mounted on each basket and connected to said hinged flap means to swing the flap about its hinge and open the flaps, upon change of energization and permit release of a pin from the basket.

2. Apparatus according to claim 1 wherein said flap means comprises

a pair of hinged flaps connected to be jointly operable by the electromagnetic operating means (7, 8, 9) and mounted to swing towards or away from each other and located on a basket jointly to engage the neck of a bowling pin (1) resting on the basket between the hinged mounting means of said flaps.

3. Apparatus according to claim 1 wherein camming surfaces (17) are located at a fixed location with respect to the frame and adjacent to each basket;

the baskets each include a cam follower (16) engaging a respective cam surface (17);

and tipping of the baskets is controlled by camming movement of a cam follower (16) with respect to a respective camming surface (17).

4. Apparatus according to claim 1 further comprising feeler means (23) located on the baskets in interfering position with bowling pins to be placed in the baskets;

switch means (22) operated by said feeler means (23) and changing switching state upon sensing presence of a pin in the basket.

5. Apparatus according to claim 4 wherein the force necessary to operate said switching means is small with respect to the weight of the pin so that presence of a pin in the basket will be sensed also when the basket is in vertical position and straddles a pin.

6. Apparatus according to claim 4 wherein said feeler means (23) located on the basket comprises a biased lever swingable about an essentially horizontal shaft (14), swinging movement of the lever being controlled by the presence of a pin in the basket regardless of whether said basket is in horizontal or vertical position, so that said lever will operate said switch to sense presence of a pin in the basket when the basket is in essentially horizontal position, as well as presence of a pin straddled by a basket, when the basket is lowered over a still standing pin, in vertical position.

7. Apparatus according to claim 1 wherein basket is

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hinged to the frame to tilt about horizontal, the flap means comprising rotatable flaps rotating about an axis essentially perpendicular to the axis of tilt of the basket;

the tilt axis of the basket and the axis of rotation of the flaps being closely adjacent to each other.

8. Apparatus according to claim 1 wherein the flap means comprises hinged flaps (6);

a spring (25) is provided normally maintaining the hinged flaps in closed, oppositely facing position, the hinged flaps being resiliently deflectable against said spring by the head of the bowling pin standing upright on the bowling alley;

the electromagnetic operating means engaging said hinged flaps to open said flaps against the force of the spring when energized.

9. Apparatus according to claim 1 further comprising a pin release lever (37) located above the frame when the frame is in its uppermost position and operable to release a fresh bowling pin to the basket;

said release lever (37) being located above the basket in interfering position with respect to the holding means when the holding means are open and when the basket is horizontal so that new pins are supplied to the basket if and only if:

- the basket is horizontal and
- the holding means are open.

10. Method of setting pins for a bowling alley in which tipping baskets (10) are provided located on a vertically movable frame (18), the baskets (10) having resiliently deflectable gripping means (6) to grip bowling pins and controllably, releasably retaining the pins therein, said method comprising

lowering the frame with the baskets empty and, upon such lowering deflecting the gripping means and, introducing pins left standing into the basket; gripping the still standing pins in the baskets by redeflection of the gripping means;

raising the frame (18) with empty and filled baskets;

filling empty baskets after the frame has been raised;

sweeping fallen pins from the alley surface;

lowering the frame to the alley surface and releasing pins in the baskets;

and raising the frame.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,809,398 Dated May 7, 1974

Inventor(s) August Schmid et al

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

Claim 7, lines 1 and 2, cancel "basket is hinged to the frame to tilt about horizontal".

Signed and sealed this 10th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents