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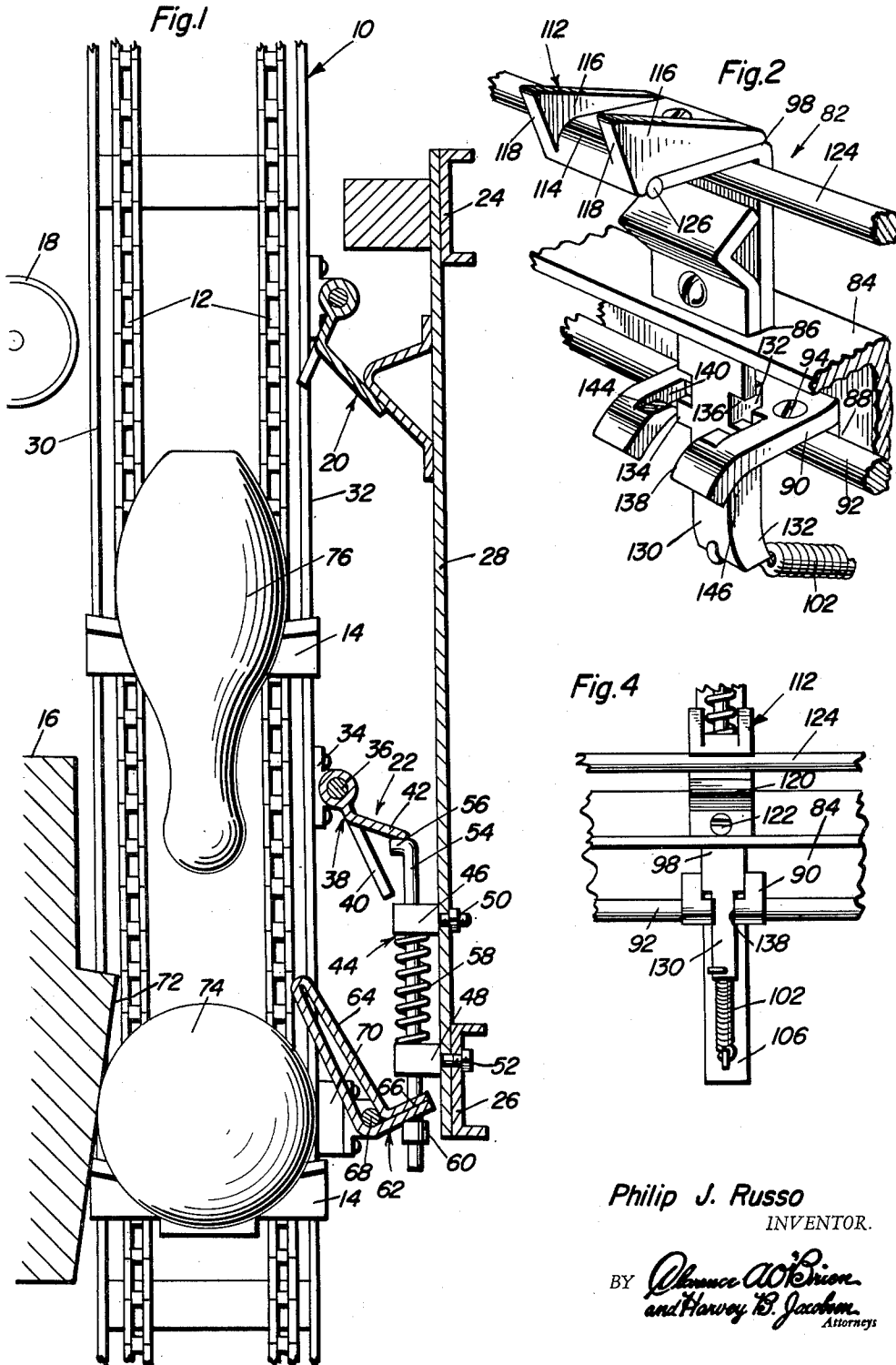
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3,064,973

BALL EJECTOR ATTACHMENT FOR PIN SETTING MACHINE

Filed March 19, 1959

3 Sheets-Sheet 1



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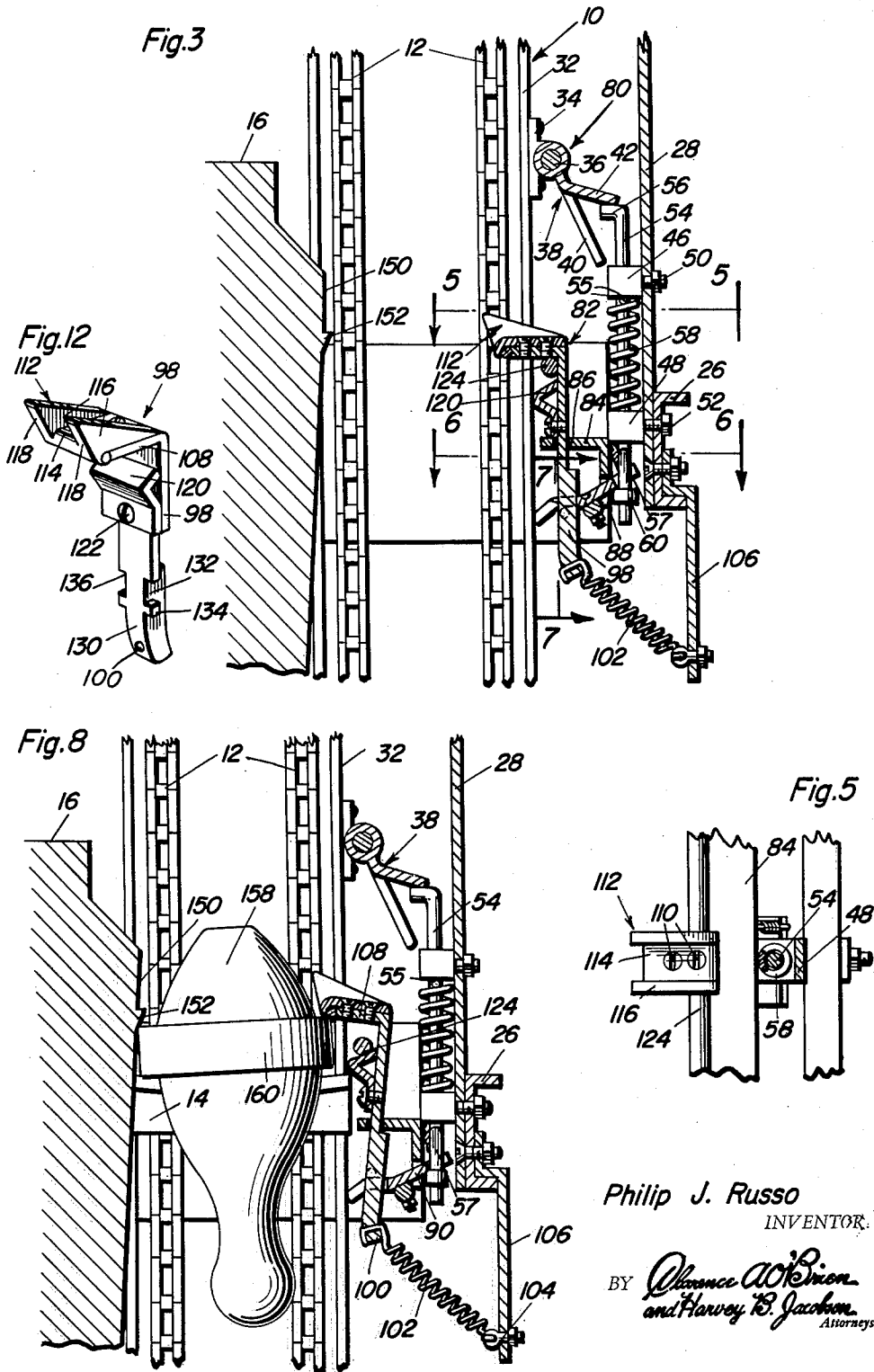
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BALL EJECTOR ATTACHMENT FOR PIN SETTING MACHINE

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3 Sheets-Sheet 2



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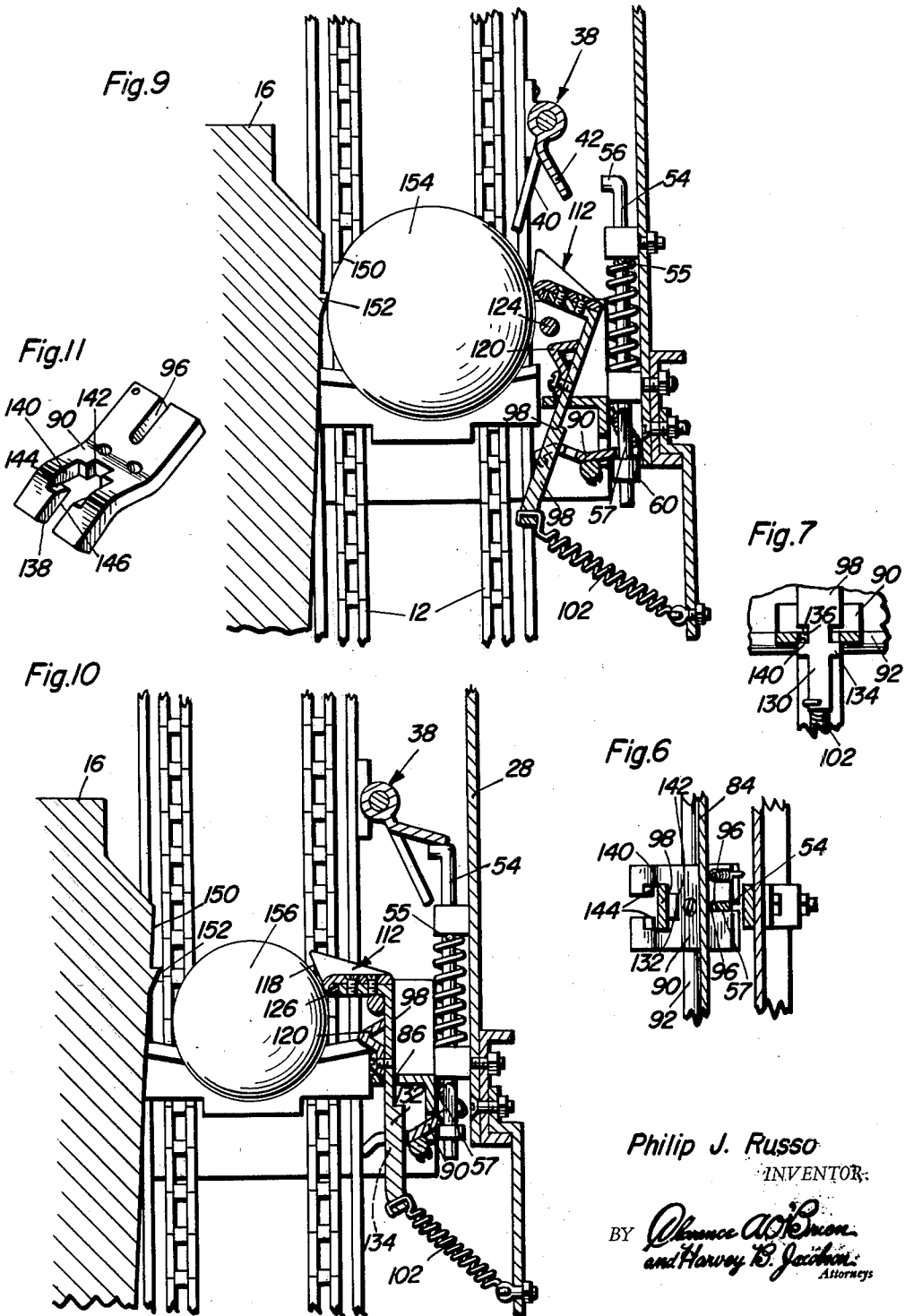
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BALL EJECTOR ATTACHMENT FOR PIN SETTING MACHINE

Filed March 19, 1959

3 Sheets-Sheet 3



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3,064,973

BALL EJECTOR ATTACHMENT FOR PIN SETTING MACHINE

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This invention comprises a novel and useful ball ejector attachment for pin setting machines and constitutes an improvement over the invention disclosed and claimed in my prior co-pending application Serial No. 760,432, filed September 11, 1958, for Device for Ejection of Bowling Balls.

In my prior co-pending application Serial No. 760,432, there is disclosed a device adapted for attachment to the automatic pin setter elevator of an automatic pin setting machine such as the Sherman Automatic Pin Setter, whereby pins and balls are elevated from the pit of a bowling alley, the balls are ejected for return to the bowler while the pins are discharged to a conveyor for delivery to a pin magazine. It has been found, however, that while the device of my prior application performs satisfactorily for the usual standard-type of duckpin, in view of the slight difference in the maximum diameter of the pin and of the bowling ball which enables the ejecting mechanism to selectively eject the bowling ball only, at the ball return station, it is not effective when rubber-banded duckpins having a somewhat greater diameter than the usual duckpins are employed. Efforts have been made heretofore to adapt the conventional Sherman Automatic Pin Setter and its ball and pin elevator to enable the conventional structure of the elevator to operate equally satisfactory with rubber-banded pins. To the best of my knowledge such efforts have not been completely successful.

It is therefore the primary object of this invention to provide a device operable in conjunction with a conventional automatic pin setter elevator for selectively ejecting the bowling balls lifted by the elevator at a bowling ball return chute, and which will not be actuated by passage of a rubber-banded pin through the ball detecting and ejecting mechanisms; and which will enable the pin, even though of a greater diameter than the ball to remain upon the elevator until it is automatically ejected at the pin ejecting station of the elevating apparatus.

A further object of the invention is to provide an improved ejecting mechanism for use in conjunction with the elevator of an automatic pin setter which will detect and respond to the difference in the shape and size of a pin and a bowling ball for ejecting the bowling ball and which will remain inoperative during the passage of a pin thereby.

A more specific object of the invention is to provide an ejecting mechanism in accordance with the foregoing objects which will detect the difference in size and the difference in the curvature or shape of a bowling ball and a bowling pin whereby it will remain inoperative when engaged by a bowling pin carried by the elevator there past, but will be rendered operative to actuate an ejecting mechanism when engaged by a bowling ball passing thereby.

Yet another object of the invention is to provide an automatic ball ejecting mechanism in accordance with the preceding objects which will detect the difference in contour of a bowling pin and a bowling ball and while permitting passage of the bowling pin thereby without operating the ejecting mechanism will respond to the presence of a bowling ball regardless of whether the same is of a diameter greater than that of or less than that of a bowling pin for ejecting the ball from the elevator and to a ball return chute.

These together with other objects and advantages which

will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is an enlarged fragmentary view in vertical section, parts being shown in elevation, of a portion of the elevator mechanism of an automatic pin setter and having applied thereto the device for ejecting bowling balls in accordance with my prior co-pending application;

FIGURE 2 is a perspective view of the ball detecting and triggering mechanism for the latch element of the ball ejector in accordance with this invention;

FIGURE 3 is a view in vertical section, parts being shown in elevation of a portion of the elevator chain and showing the attachment of the present invention operatively associated therewith and in position for operation;

FIGURE 4 is a fragmentary view of the detecting and triggering mechanism of FIGURE 2;

FIGURE 5 is a view in horizontal section taken substantially upon the plane indicated by the section line 5-5 of FIGURE 3;

FIGURE 6 is a further detail view in horizontal section, taken substantially upon the plane indicated by the section line 6-6 of FIGURE 3;

FIGURE 7 is a detail view in vertical section taken substantially upon the plane indicated by the section line 7-7 of FIGURE 3;

FIGURE 8 is a view similar to FIGURE 3 but showing the manner in which the attachment of the present invention responds to the passage of a rubber-banded duck pin passing thereby without triggering the ejector mechanism;

FIGURE 9 is a view similar to FIGURE 8 but showing the manner in which a passage of bowling ball by the detector mechanism triggers the same to release the latch of the ejecting mechanism;

FIGURE 10 is a view similar to FIGURE 9 but showing the manner in which a smaller bowling ball is still effective to operate the detecting and triggering mechanism for releasing the latch of the ejector; and

FIGURES 11 and 12 are perspective views of elements of the triggering and detecting mechanism of this invention.

Reference is made first to FIGURE 1 which is identical with FIGURE 2 of my above identified co-pending application in order to understand the general operation of the elevator in lifting balls and pins from the pit of a bowling alley and selectively discharging the same at the ball return chute and at the pin receiving station of the elevator and in order to derive a better understanding of the difficulties in the operation of such a device which are overcome by the present invention when applied in the same environment.

In FIGURE 1 there is disclosed an elevator system of the type now employed in the well-known Sherman Automatic Pin Setter, which is almost universally employed for the automatic setting of duckpins in bowling alleys, the elevator assembly being referred to in general by the reference numeral 10. The elevator includes two pairs of endless chains 12 which are rotatably mounted upon sprockets carried by horizontally extending upper and lower shafts for each pair of chains, not shown. One such pair of chains is shown in FIGURE 1, it being understood that there is provided a second pair at a laterally spaced parallel relation thereto. Extending between the endless chains 12 of each pair of such chains are supports 14 of an appropriate shape and size to receive thereon and between the chains either a bowling ball or pin.

In this well-known form of elevator, the balls and pins which fall into the pit at the target end of the bowling alley are automatically conveyed to the bottom of the

elevator 10 and the balls and pins are lifted by the supports along the vertical travel of the elevator until they reach a ball discharge station, such as that indicated at 16 or a horizontally travelling conveyor 18 at which the pins are discharged, this conveyor delivering the pins to a pin magazine from whence the pin setting device is automatically supplied.

Indicated generally by the numeral 20 is a pin ejecting device whose construction has been fully set forth in my above identified co-pending application and which serves to automatically eject the bowling pins from the supports 14 and with a snap-action onto the conveyor 18. Since the details of construction of this pin ejecting mechanism are in no way important to an understanding of the ball ejecting mechanism forming the subject matter of this invention, and since such details have been fully disclosed in my co-pending application, a detailed description of the same in the present application has been omitted as being unnecessary.

Indicated generally by the numeral 22 is a ball ejecting mechanism in accordance with my prior co-pending application. Inasmuch as the improved ball ejecting mechanism claimed herein includes certain elements of my prior ejecting assembly, a description will now be given of the mounting, construction operation of the ejecting mechanism 22.

The support frame of the conventional elevator with which this invention is concerned includes a pair of horizontally extending side frame members 24 and 26 disposed in parallel vertically spaced relation and upon which is mounted a vertically extending bar 28. This bar is disposed between the two pairs of conveyor chains 12 and in substantially the same vertical plane as that through which the supports 14 pass, and serves to support in proper position certain elements of the pin ejector 20 and the ball ejector 22. Extending upon opposite sides of the two sets of conveyor chains 12 are vertical walls 30 and 32, the latter serving to mount and support certain elements of the pin ejecting mechanism 20 and of the ball ejecting mechanism 22 as hereinafter set forth.

Mounted upon the wall 32 is a journalling means 34 in which is mounted a shaft 36. Rotatably journalled on the shaft 36 is a bowling ball ejecting member which is referred to in general by the reference numeral 38.

The ejecting member 38 including relatively straight actuating fingers 40 together with an angularly and rearwardly projecting ejecting finger 42.

As disclosed in detail in my co-pending application, the ejecting member 38 is so placed that normally under the influence of gravity it will assume a position in which the actuating fingers 40 will overlies and be positioned in the path of upward travel of the supports 14 so as to be engaged and lifted by those supports during upward travel of the supports whereby there will result a clockwise rotation of the ejecting member 38 about its shaft 36. The pair of actuating fingers 40 will rest upon and be lifted by the two supports 14 of the two pair of chains, while the ejecting finger 42 will be positioned and will move in the space between these two supports.

It will thus be understood that the actual ejection of the ball from the supports on the elevator chains is effected by engagement and operation of the actuating members upon these supports so that the elevator chain itself supplies the force necessary to effect ejection of the balls by the ejecting member.

A latch means is provided for retaining the ejecting member in an inoperative position, and this latch means is in turn engaged by a trigger element which is operative in response to engagement by a bowling ball passing the same.

The latch mechanism is designated generally by the numeral 44 and includes a pair of vertically aligned guides 46 and 48 secured to the vertical bar 28 as by a fastener 50 and to the vertical bar and to the lower horizontal support member 26 as by a fastener 52. Vertically and slidably mounted in the guides 46 and 48 is a latch

member 54 having a latch element 56 thereon which is engageable with and disposed within the path of oscillatory travel of the ejecting finger 42 for yieldingly urging the latter upwardly to the position shown in FIGURE 1 to retain the ejecting member in its idle position. A latch spring in the form of a coil spring 58 engages the lower guide 48 and is secured to the latch member 54 as by a pin 55, see FIGURE 3, to thereby yieldingly urge the latch member into its uppermost position. The lower end of the latch member 54 is provided with a stop 60, this stop member serving as means to trigger or release the latch as set forth hereinafter.

The ball ejecting mechanism 22 also includes a latch trigger or release means referred to in general by the reference numeral 62. This trigger comprises a bell crank having an actuating arm 64 and an actuated arm 66, and is journalled upon a pin 68 carried by a support assembly 70 mounted upon the wall 32.

The end of the actuated arm 66 is preferably bifurcated, straddling flattened portions 57 of the latch member 54, see FIGURES 3, 8-10, and abutting against the stop member 60, while the actuating arms 64 is positioned to extend into the path of travel of a bowling ball for actuation thereby. At this point it will be observed that there is provided a cam surface 72 which is stationary and is so positioned that when a bowling ball 74 or a bowling pin 76 passes the same, the ball or pin will be cammed or urged over towards the latch release means 62 to thereby insure actuation of the latch means by the pressure of the bowling ball thereagainst as the ball passes the latch means. However, since the conventional bowling pin 76 is of slightly less diameter than the usual bowling ball 74, it will fail to actuate the member 62 during its passage thereby and thus will not energize the ball ejector.

The operation is such that when a ball, however, engages and is displaced by the cam surface 72, it will by its greater diameter engage the end of the member 62, rock the same about the pivot 68, and cause the actuated arm 66 by its engagement upon the stop member 60 to lower or retract the latch element 54 against the spring 58, thereby permitting the ejecting member 22 to drop or swing by gravity into its operative position. Thereafter, as previously mentioned, as the ball carried by its holder 14 continues to ascend, the holder will engage the fingers 40 and rock the ejector upwardly into a position lying transverse the path of travel of the ball so that eventually this upward travel will cause the finger to lift and eject the ball from its holder 14 onto the ball receiving station 16.

It will be noted that in the ball ejecting mechanism 22 just described, and which is disclosed in detail and claimed in my co-pending application, the successful operation thereof depends upon the condition that the maximum width transversely of the ball 74 shall be greater than the maximum width transversely of the pin 76 in order that the greater diameter of the ball shall actuate the latch release mechanism while the lesser diameter of the pin will not activate this release mechanism. However, when rubber-banded pins are employed, their maximum diameter is sometimes greater than that of the ball. For example the maximum diameter of a rubber banded pin is about $4\frac{20}{32}$ " while a ball's maximum diameter must not exceed 5" and may range down to $4\frac{1}{2}$ " or even less. When the maximum diameter of a pin exceeds that of the ball, it would, in this mechanism, necessarily actuate the release means 62 by passage of the pin thereby and thus defeat the purposes of this mechanism. Further, in some instances bowling balls are used which are slightly smaller than the diameter of the pin 76 so that if the device is so arranged that the member 62 will be actuated by passage of the ball thereby, it will also be actuated by passage of the pin thereby.

In other words, the basic principle of my prior co-pending application in that difference in diameters of the

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ball and pin is utilized to cause a detection of the passage of a ball and actuating the ejecting mechanism by virtue of the larger diameter of the ball is satisfactory only when standard pins are employed; and when the balls are of a greater diameter than the pins.

It is the purpose and intent of the present invention to provide an improved ejecting mechanism which may be readily substituted for the mechanism 22 in the same conventional type of automatic pin setter elevator and which will respond to different conditions for selectively ejecting balls but permitting passage of the pins thereby, and this despite the fact that the diameter of the pin may be larger than that of the ball either because the pin is rubber-banded in type or because an unusually small bowling ball is being employed.

In the construction and operation of the ejecting mechanism in accordance with the invention claimed herein, and as illustrated in FIGURES 2-12, it is to be understood that the same arrangement and construction of the elevator 10, of the ball discharge station 16, and the pin discharge station 18, the same camming surface 72, and the same pin ejecting mechanism 20 as previously described and as disclosed in my prior co-pending application are all employed. The essence of the present invention resides in an alteration of and in an improvement upon the construction and the operation of the ball ejecting mechanism 22, in which certain components thereof, are to be replaced by modified constructions to be described specifically hereinafter and claimed herein.

The form of the ball ejecting mechanism in accordance with this invention is shown in FIGURE 3 and is designated generally by the numeral 80 and includes the members 34, 36, 38, 40 and 42 as mentioned in connection with and as forming a part of the ball ejector 22 of my prior co-pending application. There is also included the same latch member construction consisting of the members 46, 48, 50, 52, 54, 56, 58 and 60 as previously described.

Designated generally by the numeral 82 is the latch release means in accordance with this invention. This consists of a bracket 84 in the form of an L-shaped member which is suitably supported as by the wall 32 and which is provided with slots 86 and a notch 88 in its horizontal and vertical flanges respectively. Extending through the notch 88 is a latch release lever 90, see FIGURE 11, which at its mid-portion is fixedly secured to a pivot pin 92 as by suitable fasteners, 94, see FIGURE 2. One end of the release lever is bifurcated or notched as at 96 for embracing the latch member 54 about its flats 57, see FIGURE 6, and abutting against the stop means 60 thereon. The other end of the latch release lever as shown best in FIGURE 2 in conjunction with FIGURES 4, 6, 7 and 11, is of a special construction for engagement by and coaxial with a slidable and swingable actuator 98, see FIGURES 2 and 12. The latter is slidably and swingably movable in the previously mentioned slot 86 of the support bracket 84.

The actuator 98 comprises an elongated bar or strip of metal whose mid-portion is slidably and swingably received in the slot 86, whose lower end is apertured at 100, see FIGURE 8, for engagement by a spring 102 whose other end is fastened as at 104 to a supporting bracket 106 which may be carried by the lower frame member 26. The spring serves to bias the latch release lever in a counterclockwise direction of rotation with respect to its bearing engagement in the slot 86.

At its upper end the actuator has a generally perpendicular outturned flange 108 upon which is secured as by fasteners 110, see FIGURE 5, a detector finger indicated generally by the numeral 112.

As shown best in FIGURE 12, the detector finger 112 includes a central flat web 114 together with a pair of triangular side members 116 whose vertical edges

118 are inclined sharply upwardly and outwardly from the actuator and which constitute detectors as set forth hereinafter. In some instances it may be preferred to connect the edges 118 by a continuous plane surface disposed at the same inclination as the surfaces 118.

Upon its upper portion and underlying the flange 108 the face of the actuator 98 is provided with a cam member 120 secured thereto as by a fastener 122. As will be most readily apparent from a comparison of FIGURES 2, 3, 8-10, the cam member 120 is spaced below the flange 108 and with this flange straddles an abutment rod 124 which is fixedly mounted in any desired manner as upon the wall 32. The arrangement is such that as the actuator is caused to slide or move upwardly vertically in the slot 86 in a manner to be subsequently apparent, the upper surface of the cam member 120 will engage the abutment 124 and cause tilting in a clockwise direction of the actuator in the slot 86 against the resistance of the return spring 102, this tilting movement being readily apparent from FIGURE 8.

At this point it should be noted that the outer edge of the web 114 of the finger 112 is turned or curled downwardly over and in spaced relation to the edge of the flange 108 of the actuator 98 in order to provide a pocket which receives therein and retains an anti-friction roller 126, see FIGURES 2 and 10, for a purpose to be likewise subsequently apparent.

Referring particularly to FIGURE 12 it will be observed that at its lower end the actuator has an end portion 130 which is narrowed in the direction of the width of the upper portion, thus providing the narrowed surface shown in FIGURES 2 and 12, and is thickened in the direction of the thickness of the upper portion to provide thickened or widened surfaces 132. Projecting from the surfaces 132 and flush with the surface 130 are laterally projecting pins 134 which may be rectangular in cross-section, these pins being spaced from the lateral shoulders 136 which are formed by the junction of the surfaces 132 with the central or main portion of the actuator.

The elements 130, 132, 134 and 136 constitute an actuating engagement with the latch lever 90 in the following manner.

The adjacent end of the latch release lever 90 is longitudinally slotted being provided with a relatively narrow end slot 138 of such width that the surfaces 132 of the narrowed portion 130 of the actuator may snugly slide therethrough, but which will prevent passage of the pins 134 therethrough this relationship being apparent from the consideration of FIGURES 2 and 6 in conjunction with FIGURES 11 and 12. Inwardly of the end or inlet slot 138, this opening is widened to provide a laterally enlarged recess 140, of sufficient width to permit vertical sliding and passage of the pins 134 therethrough, as suggested in FIGURES 7 and 2. Finally, at its inward end, the slot terminates in a relatively narrow recess 142 which is of substantially the same width as that of the inlet slot 138 and which receives and slidably and guidingly engages the thickened surfaces 132 to center the lower end of the actuator 98 in the opening of the latch release lever, and which is engaged by the shoulders 136 to limit downward travel of the actuator in the slot 86.

There are further provided curving or inclined guide surfaces 144 of the same width as the laterally enlarged recess 140 and which extends from the underside of the latch release lever 90 to the top side of the same upon opposite sides of the inlet slot 138 as will be apparent from FIGURE 2, and FIGURE 11. These surfaces 144 are adapted to be engaged by and support the pins 134 so that these pins may ride up and over these guide surfaces in one condition of operation of the device for a purpose to be subsequently apparent. The underside of the two end furcations of the lever 90

are downwardly curved to provide cam surfaces 146 which may engage the upper sides of the pins 134.

The complex functioning of the above described structure of the latch release lever 90 and of the actuator 98 will be set forth in detail hereinafter.

It has been previously mentioned that the attachment of the present invention makes use of a cam surface corresponding to the cam surface 72 disclosed in my prior application. However, this cam surface is slightly modified as will be apparent from a comparison of FIGURES 8 and 10 with that of FIGURE 1. Thus, whereas the cam surface 72 consisting of a plain surface disposed at a relatively sharp inclination with respect to the direction of travel of the elevator chains 12, there is provided a cam surface 150 which is inclined at a somewhat lesser angle or inclination than that of the surface 72, but is provided with a projecting rib, lip or cam 152 disposed opposite the actuator finger 112 and which operates with the latter in a manner to be now set forth. It is believed that the cooperative relationship between the various elements and mechanisms of this invention will be more readily understood from the description of the operation of the same as follows:

Shown in FIGURE 9 is a conventional bowling ball 154 such as the ball 74 previously referred, while shown in FIGURE 10 at 156 is a ball somewhat smaller than the usual ball and which is of a size smaller than the maximum diameter of a conventional bowling pin 76 previously described, and thus incapable of effecting actuation of the member 62 of the mechanism referred to in my prior co-pending application. The numeral 158 designates a rubber-banded duckpin, this pin being of the same size as the pin 76 previously mentioned, but having a rubber band 160 disposed about its equatorial portion. The diameter of the rubber band is therefore considerably in excess of even the largest bowling ball employed, such as the ball 154 or the ball 74 previously mentioned. If a pin of this type were to be lifted by the elevator of my prior construction disclosed in FIGURE 1, it obviously, virtue of its greater diameter would necessarily actuate the member 62 and cause the ejector 22 to operate, thus ejecting the pin at the ball receiving station and thereby or otherwise seriously interfere with the automatic operation of the automatic pin setter. By the ball ejecting attachment of the present invention, however, such pins can be handled and although of a larger size than either a standard or a smaller ball 154 or 156, will not cause the release mechanism to activate the ejector 82 so that such a pin will pass the ball ejecting station to be ultimately ejected by the pin ejector 20 previously described.

For this purpose, use is made of both the previously mentioned cam surface or rib 15 on the cam surface 150, the annular flat surface on the rubber band 160, and the detector finger 112 to detect and sense the non-symmetrical contour of the rubber-banded pin as compared to the spherical contour of a bowling ball and in response to such detection operate to allow the latch mechanism to remain engaged.

It will be understood that the spring 102 will hold the actuator 98 in a substantially vertical position as shown in FIGURE 2 with the flange 108 and the detector finger 112 overlying the path of travel of the balls and the rubber bands of the pins which are lifted by the elevator chains for engagement thereby.

The coaction of the actuator in the slot 86 and in the slotted end of the release lever 90 is such that if a direct upward thrust is applied to the actuator, the same is free to lift vertically in the slotted end of the release lever with the actuator pins 134 travelling upwardly through the lateral recess portions 140 of the slot and with a thickened portion 134 of the actuator being guided in and seated in the rearward notch 142 of the slot. There will thus be no pivoting action imparted by the actuator to

the release lever during such travel. When the actuator has achieved a sufficient vertical travel to cause the upper cam surface of the cam member 120 to engage the underside of the abutment rod 124, further upward travel of the actuator will cause the upper end of the same to be cammed laterally outwardly thus producing a clockwise tilting movement of the actuator in the slotted end of the release lever. However, since the pins 134 have now lifted sufficiently to clear the end walls of the laterally recessed portion 140, they will now ride upon the top of the cam surfaces 144 thereby causing the narrow lower end of the actuator and its side surfaces 132 to travel outwardly through the open end 138 of the slot. At the same time, this upward travel and tilting will cause a clockwise swinging of the detector finger 112 until eventually the same disengages from the pin rubber band 160 disposed therebeneath and travelling upward by movement of the elevator chains. When the lifting element has passed, spring 102 will resiliently urge the latch element downwardly and also into its vertical position so that the pins may again enter the slot and the actuator restored to its original position.

This upward travel of the actuator with the initial portion of this travel being in a substantially vertical direction whereby to prevent tilting of the release lever 90 is effected by the engagement of the annular flat surface at the uppermost side of the rubber band 160 beneath the anti-friction roller 126 of the detector finger. Since this annular surface normally has a direct upward travel, it will in turn impart a direct upward thrust to the actuator resulting in the above-mentioned action whereby the actuator is operatively disengaged from the release lever. However, although the inclined camming surface 150 urged the pin and the ball towards the detector finger, the further cam projection 152 momentarily halts upward travel of the contacting side of the rubber band 160 causing the pin upon continued upward movement of the support 14 to tend to slightly tilt about the obstruction formed by the cam 152, as shown in exaggerated form in FIGURE 8. This upward tilting of the pin and of the annular rubber band 160 thus imparts not merely a vertical thrust to the detector finger, but a thrust which is inclined outwardly therefrom. This thrust insures that the actuator will not be tilted in a clockwise direction during its upward travel, and thus will not disengage from the annular flat surface of the rubber band 160. It should be noted that the rubber band does not pass the cam projection 152 until the actuator has risen to a position whereby the pins 134 will be positioned to ride upon the top of the cam or guide surfaces 144. At this time, the cam member 120 has struck the abutment bar 124 as shown in FIGURE 8 and the latch begins now to tilt in a clockwise direction causing the anti-friction roller 126 to gradually ride off of the annular surface of the rubber band, until this band after passing the projection 152 slides out from under the detector finger. The pin now continues its upward travel to the pin ejecting means 20, while the actuator under the spring 102 now returns to its original position. Thus, a rubber-banded pin although a greater diameter than that of the conventional bowling ball will lift and tilt the actuator of the latch release lever and thereby avoid tilting the release lever and avoid effecting withdrawal of the latch and thereby prevent operation of the automatic ejector member 38.

Considering now FIGURE 9 it will be observed that when a bowling ball 154 reaches this same position, the cam surfaces 152 will push this ball firmly over and against the detector finger. At the same time, the round curving surface of the ball will engage the outer edge of the detector finger rather than underneath the same so that there is no tendency to lift or an insufficient tendency to lift the actuator along a vertical path of travel and thus there results a clockwise tilting of the actuator. During this tilting of the actuator with no vertical lifting of the same, it is evident that the pins 134 will not be

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lifted up through the laterally widened recess 140 and thereby will move along the underside of the end of the release lever, beneath the cam surfaces 146 from the bottom end thereof, and through the camming action thereon will tilt or rotate the release lever in a clockwise direction, thus causing the end of the same to withdraw the latch member 54 and permit ejector member 38 to drop by gravity, or by spring means, if the additional assistance of the same is desired, into operative position for automatically ejecting the ball from the elevator at the ball delivery station 16.

Even if a smaller ball than usual such as the ball 156 is employed, so that its diameter is less than that normally existing between the projection 152 and the adjacent edge of the detector web 114, the inclined detecting surface 118 will still engage the surface of the ball and in turn will actuate the edvice in the same manner shown in connection with FIGURE 9.

It is to be understood that the foregoing description and the attached illustration represents one adequate form of apparatus for carrying out the principle of this invention and separately ejecting balls from the elevator chains of an automatic pin setter. Basically, however, the concept of this invention embraces the provision of any means which will detect, gauge or sense the difference in contour between a bowling ball and a bowling pin, and will be effected by the contour of the bowling ball to energize the ejecting mechanism, and will not be effected by the contour of the bowling pin thereby leaving the ejecting mechanism inoperative.

In some instances the same elevator employed to lift standard duckpins may also be used to elevate rubber-banded pins. Generally, however, in the latter instance, an elevator having holders of a slightly larger size and with the chains placed slightly further apart will be preferred to accommodate the slightly larger diameters of the rubber bands upon the pins. This is turn will usually result in employing ejectors 20 and 22 of slightly greater width for cooperation with the larger holders. In view of the variance in the maximum diameters of the pins and balls there will also be a slight change in the shape and dimension of the camming surfaces 72 and 150, 152. However, the arrangement and principle of operation is identical, the only difference involved being a slight change in dimensions.

It is therefore the intent of this invention to cover this concept broadly since obviously various other sensing and detecting means could be provided in lieu of the mechanical means herein shown and illustrated.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In a bowling ball and pin elevator, a support frame, vertically moving elevating means mounted on said supporting frame, vertically spaced pairs of horizontally spaced supports on said elevating means for supporting thereon and therebetween bowling balls or bowling pins, vertically spaced ball and pins stations at which balls and pins are to be respectively ejected from said elevating means, an ejecting mechanism disposed adjacent said ball station and including an ejector means, support means mounting said ejector means adjacent said elevator for movement towards and from said ball station through said supports between an ejecting position disposed in the path of travel of both balls and pins carried by said supports and an idle position displaced from said path of travel and in which idle position said ejector means will not obstruct movement of balls or pins past said ejecting mechanism, actuating means connected to said

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ejector means and positioned for engagement by both balls and pins passing said ejector means, said actuating means being actuated by engagement with the rubber band of a rubber-banded pin to prevent operation of said ejector means and being actuated when engaged by a bowling ball for locating said ejector means in its ejecting position.

2. The combination of claim 1 wherein said actuating means includes an actuator member, means mounting said actuator member for separate swinging and sliding motions when engaged by either the rubber band on a rubber-banded pin or by a bowling ball, connecting means engaging said actuator member and said ejector means and operable by one only of said actuator member motions to effect ejection of a ball by said ejector means.

3. The combination of claim 1 wherein said actuating means includes a lever, means mounting said lever for pivoting or sliding motions when engaged by a bowling ball or the rubber band on a rubber-banded pin, means connecting said lever to said ejector means for controlling the position of the latter, said connecting means being operative in response to one of said lever motions to prevent operation of said ejector means when said lever is engaged by the rubber band of a rubber-banded pin.

4. The combination of claim 1 wherein said actuating means includes a level and means connecting said lever to said ejector means for controlling operation of the ejector means from said lever, means mounting said lever for swinging motion when engaged by one of a ball and rubber-banded pin and for sliding motion when engaged by the other of a ball and rubber-banded pin, said connecting means being operative in response to one of said motions of said lever to render said ejector means effective to eject only when said lever is engaged by a bowling ball.

5. The combination of claim 1 wherein said actuating means includes a member mounted for displacement in directions transversely of and generally parallel to said path of travel, said member being displaced in one of said directions when engaged by a ball and being displaced in the other of said directions when engaged by the rubber-band of a rubber-banded pin, means connecting said member to said ejector and responsive to displacement of said member in one of said directions for rendering said ejector means effective to eject a ball and responsive to displacement of said member in the other of said directions for rendering said ejector means ineffective to eject a pin.

6. The combination of claim 1 wherein said actuating means includes a member and connecting means operatively connecting said member to said ejector means, said connecting means including lost motion means, said connecting means being responsive to engagement of said member by the rubber-band of a rubber-banded pin for preventing operation of said ejector means.

7. The combination of claim 1 wherein said actuating means includes a member, means mounting said member for separate movement in two directions in an operating stroke and an idle stroke in response to selective engagement by a bowling ball and the rubber-band of a rubber-banded pin, means connecting said members to said ejector means for rendering the ejector means operable to eject when said member is moved in its operating stroke and rendering said ejector means ineffective to eject when said member is moved in its idle stroke.

8. The combination of claim 7 wherein said ejector means comprises a pivotally mounted lever, said actuating means including an actuator, a latch engageable with said lever for retaining it in one of said positions and connecting means for said actuator and latch.

9. The combination of claim 1 wherein said actuating means includes a member, means mounting said member for movement in one direction when engaged by a bowling ball and for movement in a different direction when en-

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gaged by the rubber band of a rubber-banded pin, means connecting said member to said ejector means and effective to render the latter operative to eject when said member is displaced in said one direction and inoperative to eject when said member is displaced in said other direction.

10. In a bowling ball and pin elevator, a support frame, vertically moving elevating means mounted on said support frame, vertically spaced pairs of horizontally spaced supports on said elevating means for supporting thereon and therebetween bowling balls or bowling pins, vertically spaced ball and pin stations at which balls and pins are to be respectively ejected from said elevating means, an ejecting mechanism disposed adjacent said ball station and including a ejector means, support means mounting said ejector means adjacent said elevator for movement towards and from said ball station through said supports between an ejecting position disposed in the path of travel of both balls and pins carried by said supports and an idle position displaced from said path of travel and in which idle position it will not obstruct movement of balls or pins past said ejector means, latch means releasably engageable with said ejector means for normally retaining said ejector means in one of said positions, a movable detector means connected to said latch means and extending between said supports into the path of travel of balls and pins carried of said supports and engageable by both balls and pin during their movement past said detector means, said detector means being responsive to and actuated by engagement with the rubber band of a rubber-banded pin to control said latch means to thereby prevent operation of said ejector means, said detector

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means being actuated by engagement with a bowling ball to control said latch means to effect ejection of a bowling ball.

11. The combination of claim 10 wherein said detector means comprises a member mounted for swinging motion when engaged by one of a bowling ball, and rubber-banded pin and for sliding motion when engaged by the other of said bowling ball and rubber-banded pin.

12. The combination of claim 10 wherein said detector means includes a member mounted for displacement in different directions transversely of and generally parallel to said path of travel when engaged by a bowling ball and by the rubber-band of a rubber-banded pin respectively, said member being responsive to displacement in one of said directions for rendering said ejector means effective to eject and responsive to displacement of said member in the other of said directions for rendering said ejector means ineffective to eject.

13. The combination of claim 10 wherein said detector means includes a member mounted for separate movements in two directions in an operating stroke and in an idle stroke in response to respective engagement by a bowling ball and by the rubber band of a rubber-banded pin.

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