Dec. 24, 1957 D. P. SANFORD 2,817,528

BOWLING PIN HANDLING MECHANISM

Filed Feb. 18, 1955 3 Sheets-Sheet 1

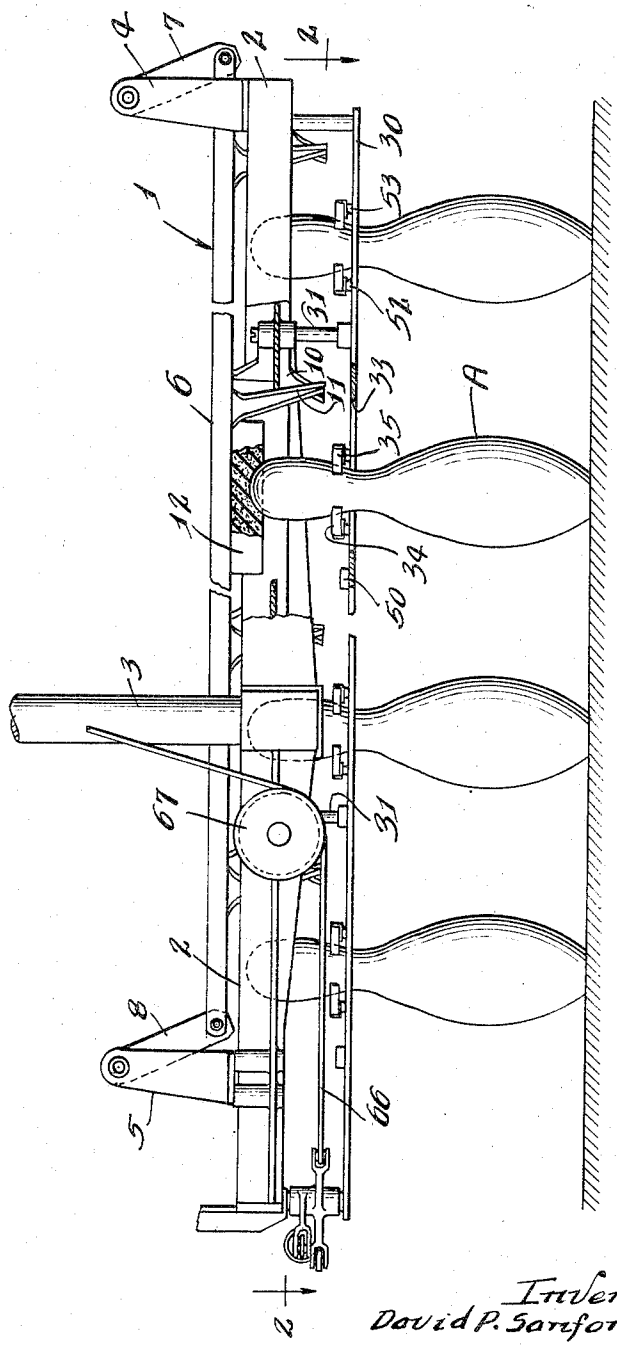

Fig. 1.

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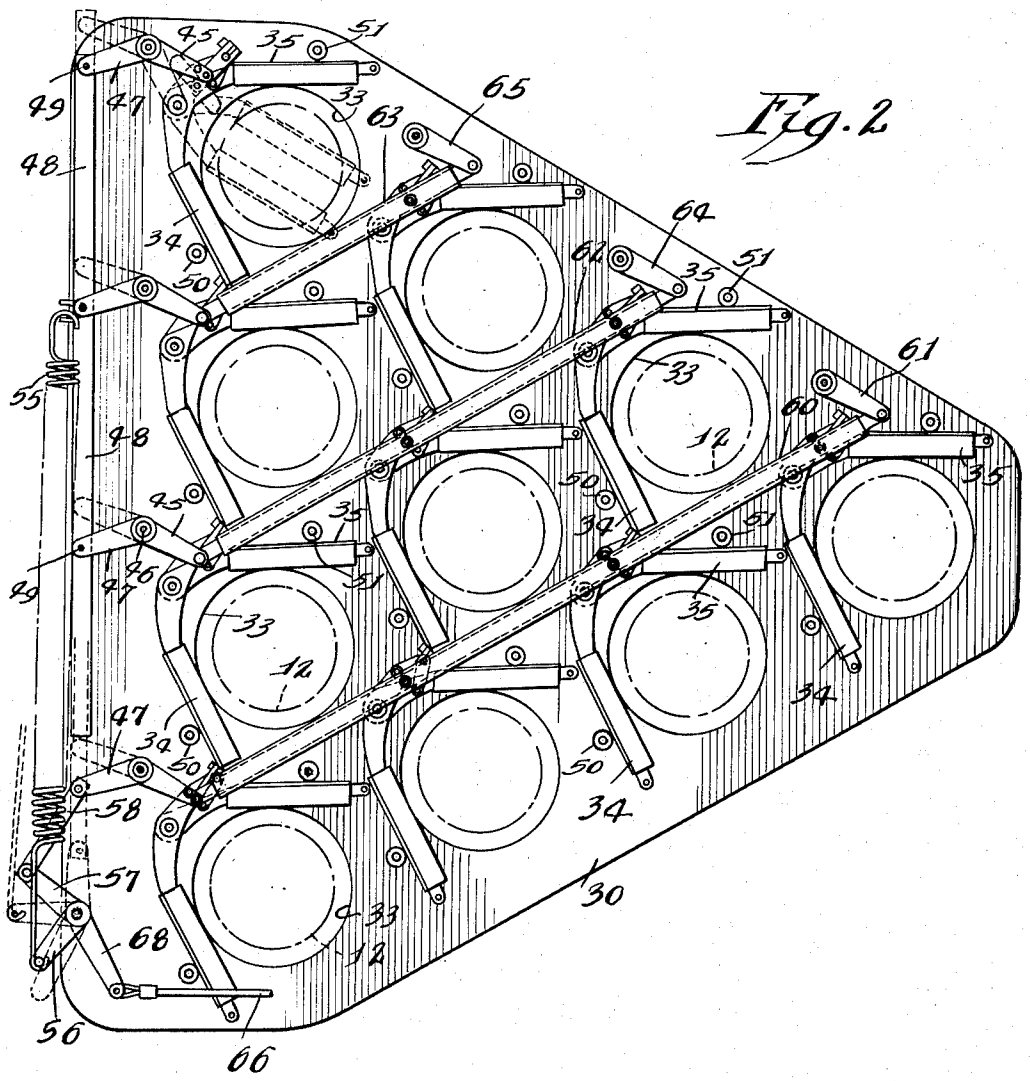

Fig. 2

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Fig. 3

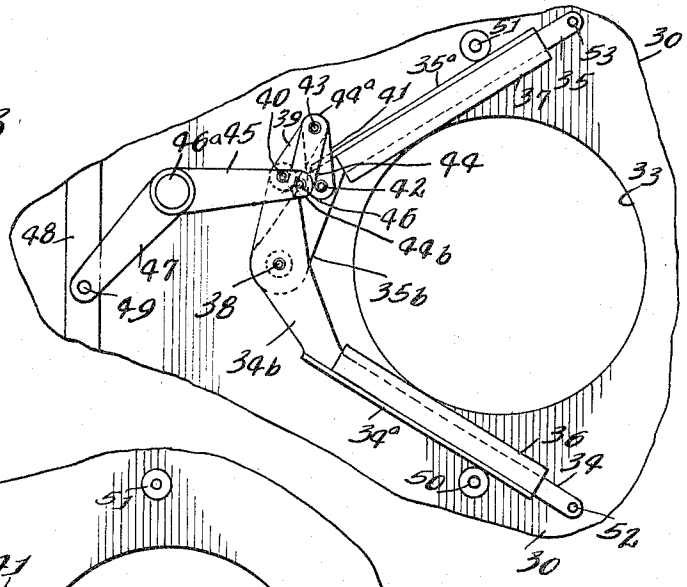


Fig. 4

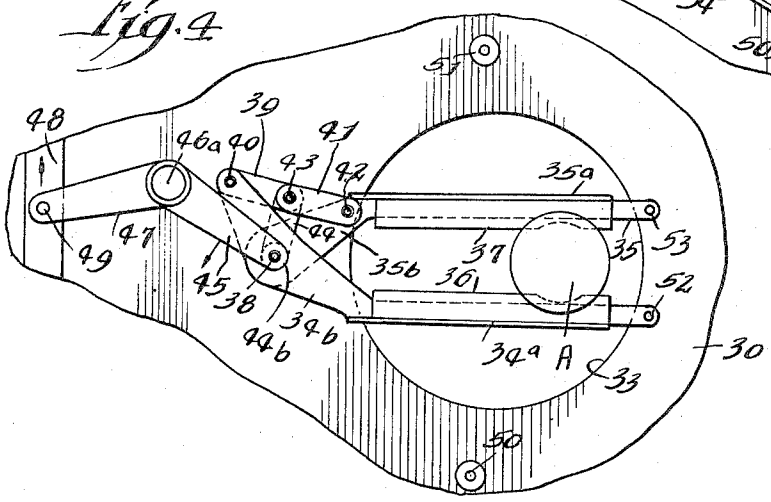
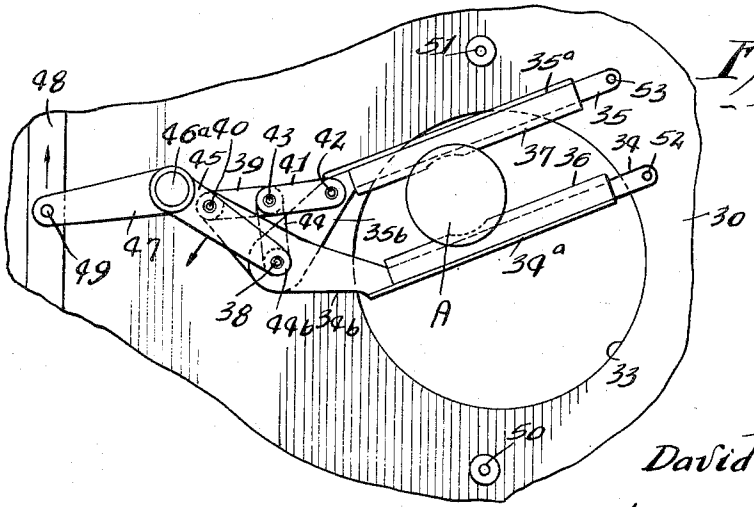


Fig. 5



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United States Patent Office 2,817,528
Patented Dec. 24, 1957

2,817,528

BOWLING PIN HANDLING MECHANISM

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Application February 18, 1955, Serial No. 489,107

3 Claims. (Cl. 273—42)

This invention relates to bowling pin handling mechanism and, more particularly, to bowling pin pickup mechanism of the scissors type having toggle mechanisms to cause movement thereof.

An object of this invention is to provide new and improved scissors-type bowling pin handling mechanism.

A further object is to provide bowling pin handling mechanism of the scissors-type wherein each pair of pin handling members have toggle mechanism associated therewith for causing opening and closing movement thereof for handling either on-spot or off-spot pins.

Another object of this invention is to provide a deck structure for a bowling pinsetter having a plurality of pin pickup arms movably mounted thereon, there being at least one pair of arms arranged to engage and pickup each pin standing in on-spot or off-spot position on the bowling alley and means including toggle mechanisms for moving the pin pickup arms of each pair toward each other to engage and hold a pin disposed therebetween and to subsequently release the pin in its on-spot or off-spot position.

Another object of the invention is to provide pin pickup mechanism for a bowling pinsetter including a plurality of pairs of pin pickup arms, the arms of each pair being pivotally mounted for rotation about an axis normal to the alley bed for movement toward and away from each other in a scissors-type action, a link associated with each of said arms and pivotally connected thereto, the other end of said links being pivotally connected together and pivotally connected to one end of a drag link, the other end of the drag link being pivotally connected to an operating arm, a plurality of interconnected actuating rods pivotally connected to the free ends of said operating arms whereby movement of the rods causes simultaneous movement of the pickup arms, and means for shifting the actuating rods to shift the operating arms and drag links to positions to straighten and place in line the pivoted toggle links connected to the pairs of pin pickup arms and place said other ends of the drag links over the pivot axes of said pin pickup arms with the result that the pin pickup arms of each pair are moved to an approximately parallel position in a range of positions about their pivotal axes whereby to engage pins positioned between pairs of arms in either an on-spot or off-spot position.

The objects of the invention generally set forth, together with other ancillary advantages, are attained by the construction and arrangement shown by way of illustration in the accompanying drawing, in which:

Fig. 1 is a side elevational view of a bowling pinsetter deck structure partly in section showing the deck structure in pin pickup position with parts in section;

Fig. 2 is a horizontal section taken generally along the line 2—2 in Fig. 1;

Fig. 3 is a diagrammatic plan view of the pin pickup mechanism for either the number 7 or number 10 pin as shown in Fig. 2;

Fig. 4 is a plan view similar to Fig. 3 but showing the pin pickup arms in position to pickup an off-spot pin; and,

Fig. 5 is a plan view similar to Fig. 3 showing the pin pickup arms in position to pickup a pin in an off-spot position different from that in Fig. 4.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail an illustrative embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

In the embodiment illustrated, a generally triangular deck structure, indicated generally at **1**, has a main intermediate deck **2** having upstanding rods at opposite sides thereof, one of these rods being indicated at **3**, which connect the deck structure to movable mechanism (not shown) for obtaining up and down movement of the deck structure.

The intermediate deck **2** has a forward upstanding bracket **4** and a pair of upstanding brackets located at the rear corners thereof, one of them being indicated at **5**, to support a generally triangular moving deck **6** for forward and rearward movement parallel to the intermediate deck **2** by means of links **7** and **8** pivoted to the brackets **4** and **5** and moving deck **6**.

The intermediate deck **2** carries fixed setting shoes **10** which cooperate with movable setting shoes **11** which may be grooved at the lower end to receive the lower end of a fixed shoe **10**. A pair of shoes **10** and **11** are associated with each other and ten pairs are arranged similarly to the arrangement of pins on an alley bed. The shoes **11** are mounted on the moving deck **6** to form with the fixed shoes **10** openings for receiving pins from a magazine (not shown) disposed above the deck structure and for subsequently setting pins on the alley bed. When the moving deck is in its forward position, the shoes **10** and **11** will be closely adjacent each other and when it is desired to receive pins therebetween, the moving deck **6** will be moved rearwardly to form an opening between the pairs of shoes **10** and **11** of a size to receive and hold a pin and a pin may be then positioned therebetween. When it is desired to set pins, the deck **1** is placed adjacent the alley and the shoes are opened further apart to release the pins.

Also carried on the underside of the moving deck **6** are a plurality of pressure pads arranged similarly to the spots on the alley bed which may be formed of resilient material, one of these pressure pads being designated at **12**. These pads function to engage the tops of standing bowling pins A when the deck **1** is in its pin pickup position. When the setting shoes **10** and **11** move apart to receive a pin, the pressure pads **12** will be moved rearwardly and out of vertical alignment with the pin spots on the alley bed.

The movable deck may be actuated by suitable mechanism which forms no part of the present invention.

The intermediate deck **2** has a generally triangular scissors deck **30** suspended therebeneath by rods **31** which is provided with ten openings **33** arranged similarly to the spot arrangement on an alley bed, as shown in Fig. 2.

A pair of pin pickup arms of what may be generally termed a scissors-type is associated with each of these openings **33**. The corresponding arm in each pair is alike and the corresponding arms are designated at **34** and **35**, respectively. The description and operation of these arms may be more clearly understood by reference to Figs. 3 to 5 of the drawings. The detailed description of one pair of arms **34**, **35** and actuating mechanism is

believed sufficient since the actuating mechanism is also the same for all pairs of arms. Each of the arms **34** and **35** has an elongated pin-engaging portion **34***a*, **35***a* receiving a piece of resilient material fastened thereto, indicated at **36** and **37**, respectively, and each arm has a mounting portion **34***b*, **35***b* extending at an angle to the pin engaging portions **34***a* and **35***a*.

The mounting portion **34***b* of arm **34** is pivoted intermediate its ends to a fixed pin **38** extending upwardly from and secured to the scissors deck and the mounting portion **35***b* of arm **35** is pivoted at one of its ends to this pin **38**. One end of portion **34***b* of the arm **34** has a link **39** pivoted thereto at one of its ends by a pin **40**, and the mounting portion **35***b* of arm **35** has one end of a link **41** pivoted thereto by a pin **42** a short distance from its end mounted on the fixed pin **38**. The links **39** and **41** are pivotally connected together at their other ends, by a pin **43**. A drag link **44** disposed above toggle links **39** and **41** is pivotally connected at one end **44***a* to the pivot pin **43** which pivotally connects the links **39** and **41** and at its other end **44***b* to an operating arm **45** by a pin **46**. The operating arm **45** is pivotally mounted on the scissors deck **30** by a pin **46***a* secured to the scissors deck and has an arm **47** forming therewith a bell crank, the other end of the arm **47** being pivotally connected to an actuating rod **48** by a pin **49**.

A pair of stops **50** and **51** upstanding from the scissors deck **30** are provided for limiting the opening movement of the pin pickup arms **34** and **35**, respectively. The outer ends of the arms **34** and **35** may be provided with buttons **52** and **53** of low frictional properties to slidably support the outer ends of the arms on the scissors deck **30**.

The pin pickup arms are normally urged to a pin pickup position wherein they extend generally parallel by a spring **55** which acts through a bell crank having arms **56** and **57** to shift a link **58** to cause movement of one of the bell crank arms **47**, as shown in Fig. 2.

The series of bell crank arms **47** extending across the rear of the deck structure are interconnected by the actuating rod **48** which extends across the rear of the deck structure and actuates the pin pickup arms **34** and **35** for the 8, 9 and 10 pins.

The pin pickup arms for the 1, 2, and 4 pins are operated by an actuating rod **60** which is connected to the inner end of the arm **45** associated with the pickup mechanism for the 7 pin and is pivotally connected at its forward end to an arm **61** pivotally mounted on the scissors deck **30**. Similar actuating rods **62** and **63** are provided for actuating the pin pickup apparatus associated with the 3 and 5 pins and with the 6 pin. The forward ends of these rods are supported by arms **64** and **65** pivotally mounted on the scissor deck.

The movement of the pin pickup arms **34** and **35** under the urging of the spring **55** is controlled by a cable **66** which extends around a groove in a pulley **67** mounted on the intermediate deck frame **2** and upward to a cam follower (not shown) which may move in response to highs and lows on a rotatable cam in the control mechanism. The lower end of the cable **66** is fastened around an arm **68** which is fixed for rotation with the arms **56** and **57** so that as cable **66** is paid out under cam control when the deck structure is in pin pickup position, the spring **55** becomes operative to move the pin pickup arms **34** and **35** in each pair toward each other. As the cable is taken in, the spring is tensioned and the pairs of pin pickup arms **34** and **35** are moved away from each other.

The withdrawn position of the pin pickup arms **34** and **35** is shown in Figs. 2 and 3. The pin pickup position of the arms is shown in Figs. 4 and 5 where the arms have contacted pins in different off-spot positions.

In Fig. 4, the position of the arms illustrated is that where a pin which is on-spot would be picked up since the pin is only off-set in a direction which is in line with the pivot point **38** for the arms **34** and **35** and the on-spot position for a pin. In the position of Fig. 4, the arm **45** has caused movement of the drag link **44** to place the end **44***b* of the drag link over the pivot pin **38** for the pickup arms **34**, **35** and move the links **39** and **41** into a straight-line position to make the toggle to scissor the arms to pin engaging position. The pin will be engaged at any point along the length of the pin pickup arms.

In Fig. 5, movement of the arm **45** has caused movement of the drag link **44** and because of the off-spot condition of the pin, the arm **35** has traveled only a short distance until it engages a pin which prevents further movement of the arm **35**. Continued movement of the drag link will carry the link **39** to produce continued movement of the arm **34** as well as causing pivoting of the link **41** about its pivot **42** until the end **44***b* of the drag link is over the pivot pin **38** for the pin pickup arms and the arm **34** engages the pin and the toggle is made.

The drag link **44** is utilized to apply a force to the toggle links at their point of pivotal connection together. For this purpose the drag link may be considered a floating force applying member in that it need not occupy any particular position nor exert a force along any particular line in order to operate the mechanism. Thus it will be seen that in Figure 4 the drag link **44** is in approximately the "seven o'clock" position while in Figure 5 it is in a "five o'clock" position. The important feature is that a force applying member such as the drag link **44** be provided to make and break the toggle which is not constrained to movement or operation along any prescribed or predetermined path, in other words that it be "floating."

It will be seen that the entire assembly is centered about the rotational axis pin **38** of the scissors arms and no force is exerted which can move the assembly from the position which it occupies. The pin will be held engaged by the pair of pin pickup arms until the deck has ascended to permit sweeping and the deck has again descended to place the pins again on the alley bed. The cable **66** will then be taken in to tension the spring **55** and reverse the movement of the drag links **44** to break the toggles and move the pin pickup arms **34** and **35** to their withdrawn position.

It will be seen from the foregoing that scissors-type pin pickup mechanism has been provided, all of which are simultaneously mechanically operated by a control mechanism at a remote source and without the movement in a vertical direction of pressure plates or other members which are contacted by pins as the deck descends to its pin pickup position.

I claim:

1. In a bowling pin handling mechanism for picking up and replacing bowling pins in their on-spot or off-spot positions on an alley bed comprising, in combination, a generally triangular intermediate deck, means connected to the intermediate deck for effecting movement thereof toward and away from the alley bed, a generally triangular scissors deck supported beneath the intermediate deck and rigidly secured thereto, means defining a plurality of pin openings in said scissors deck arranged similarly to the spot positions on a alley bed, a third deck disposed above and mounted to the intermediate deck, a plurality of pressure plates mounted on the underside of said upper deck for engaging the tops of pins standing on the alley bed, there being one of said pressure plates disposed above each of said openings in said scissors deck, a plurality of pairs of scissors-type pin pickup arms disposed immediately above said scissors deck for movement between diverging positions and generally parallel pin engaging positions, the first pin pickup arm of a pair being pivotally mounted at its end to the scissors deck and the second arm being pivotally mounted to the scissors deck on a common pivot axis a short distance from its end so as to provide an operating end, there being one pair of pickup arms associated with each of said openings, the pivot mounting for the pair of arms being disposed adjacent the associated opening and the arms being of a length to extend substantially

across the scissors openings through the entire pivoting movement thereof, a first link having one of its ends pivotally connected intermediate the ends of the first arm, a second link pivotally connected at one of its ends to the operating end of said second arm, said first and second links having their other ends pivotally connected together, a drag link pivotally connected at one end to said first and second links at their pivotal connection to each other, the first and second links forming a toggle which is broken when the pin pickup arms of a pair are in their diverging positions and which is made when the pin pickup arms of a pair are in their generally parallel pin engaging position, and means connected to the other ends of said drag links for moving all of said drag links in a direction to place said other end of each of the drag links over the pivotal connection between the associated pair of arms to make the toggle when it is desired to engage pins in on-spot or off-spot positions by the pin pickup arms and for moving the drag links in a reverse direction when it is desired to release pins engaged by the pin pickup arms.

2. A bowling pin pickup mechanism comprising, first and second pin pickup arms each having an elongated portion and a mounting portion extending at an angle to the elongated portion, the mounting portion of the first arm extending a greater distance than that of the second arm to form an operating end, means for pivotally interconnecting the first arm at a point inwardly of its operating end to the second arm adjacent its end for movement of the elongated portions of the arms toward and away from each other between diverging and parallel positions, toggle links connected between the operating end of the first arm and the mounting portion of the second arm inwardly of its pivotally mounted end, a drag link having one end pivotally connected to the toggle links and of a length sufficient to have its other end overlie the pivotal connection between the first and second arms when the

toggle links are in straight end to end position and the pin engaging arms are disposed parallel to each other, and means for moving the drag link in one direction to make the toggle and in the other direction to break the toggle.

3. A bowling pin pickup mechanism comprising, first and second elongated arms forming a pair of pin pickup arms, means pivotally connecting the arms together for pivoting movement about a common axis in a common plane between generally parallel pin gripping positions, and positions in which the arms diverge from the common axis, one of said arms having a portion extending beyond the point of pivotal connection, and mechanism for pivoting the pin pickup arms from the diverging positions either equal or unequal distances to parallel positions to close on either an on-spot pin or an off-spot pin and for pivoting the arms from parallel positions to the diverging positions including, a pair of toggle links, one having one end pivotally connected to said portion of said one arm and the other having one end pivotally connected to the other arm at a point spaced from said point of pivotal connection, said links being pivotally connected together at their other ends, a floating force applying member pivotally connected to the toggle links at their pivotal connection together and means for applying a force to said member for making the toggle to pivot the arms to parallel positions and for breaking the toggle to pivot the arms toward the diverging positions.

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