Sept. 22, 1959 G. D. HORGAN 2,905,319

DEFECTIVE ARTICLE REJECTOR

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FIG. 4

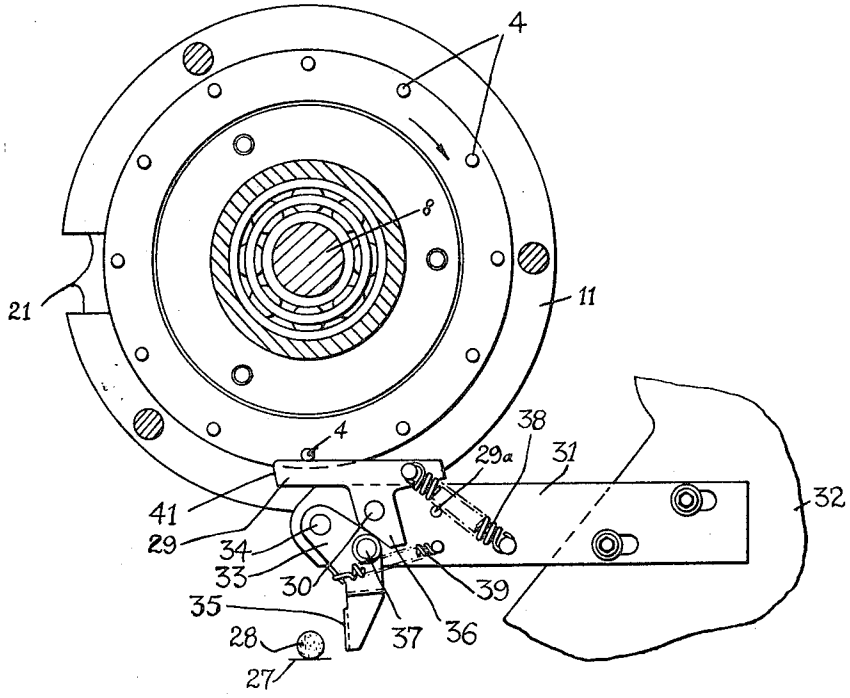
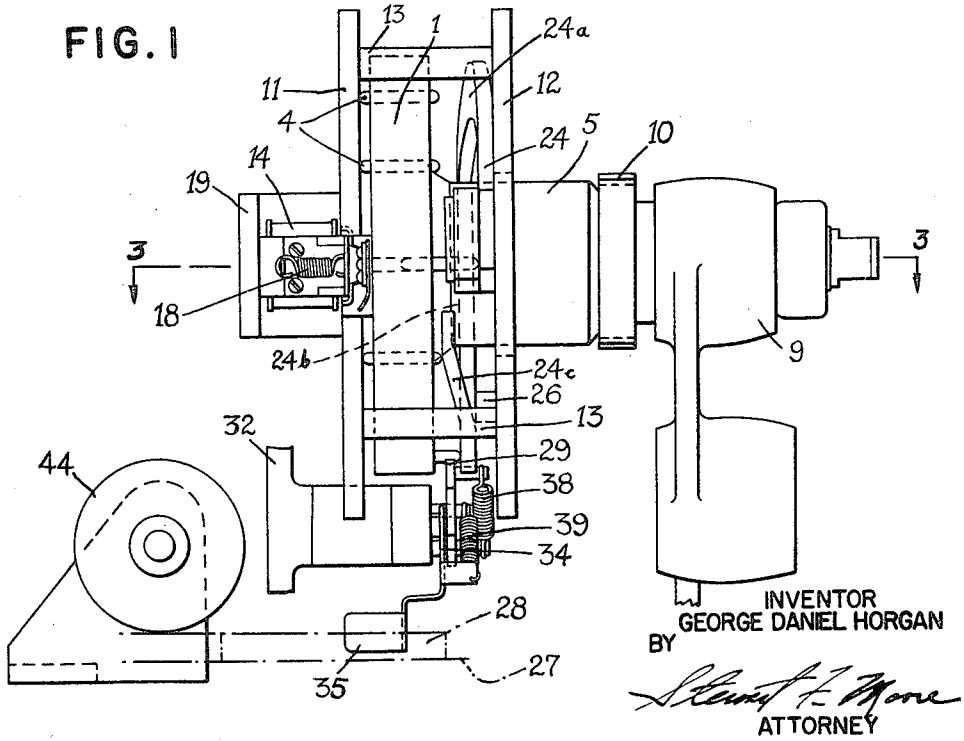


FIG. 1



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DEFECTIVE ARTICLE REJECTOR

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FIG. 3

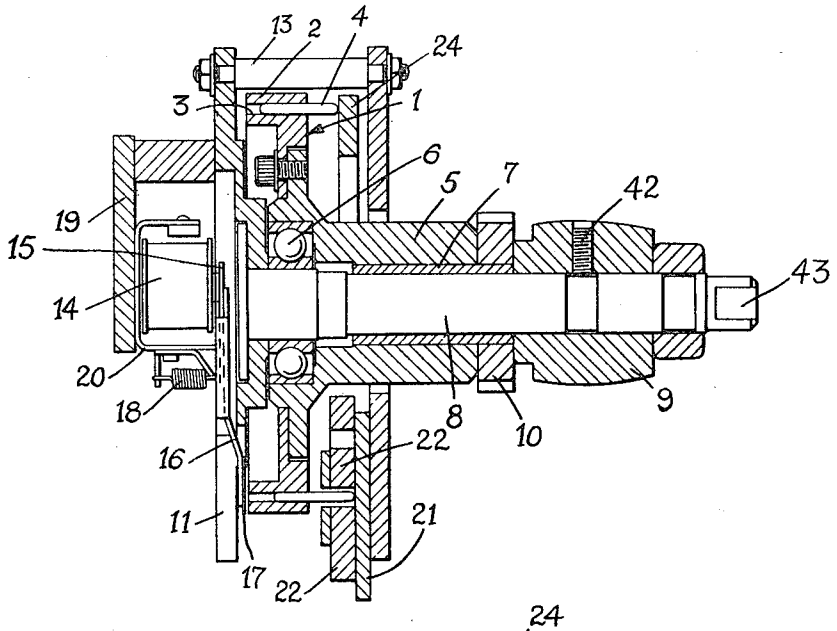
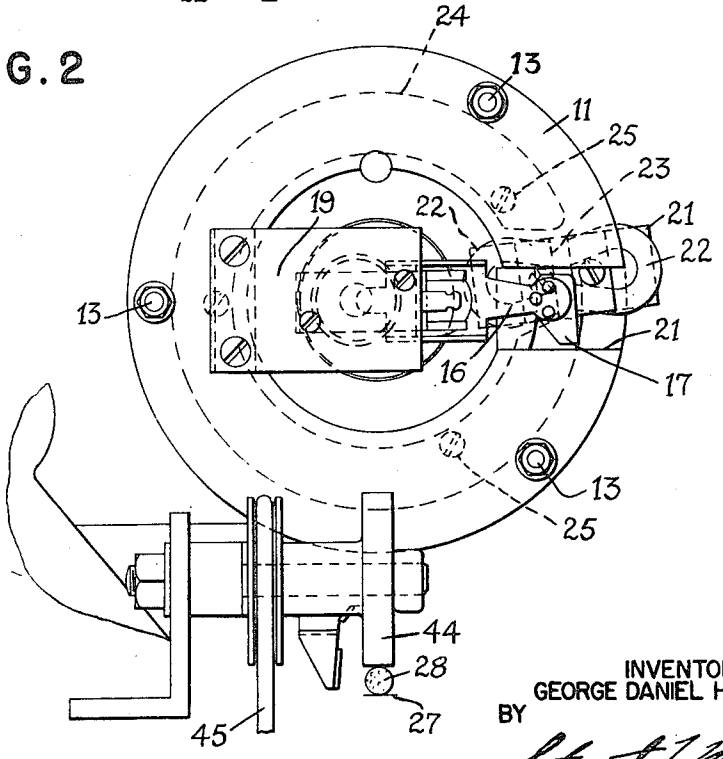


FIG. 2



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DEFECTIVE ARTICLE REJECTOR

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Claims priority, application Great Britain December 23, 1954

4 Claims. (Cl. 209—74)

This invention relates to means for causing the rejection, or segregation, of articles such as cigarettes from a succession thereof in accordance with a detected or measured property of such articles. The invention may be applied with particular advantage to cigarettes produced by a continuous rod cigarette making machine where it is required to detect and to reject any cigarettes which do not conform to a predetermined standard or range of properties, e.g. those which are subject to irregularities or faults such as undesired variations in tobacco content or density. However, the invention is not restricted to such applications but may be employed for segregating or classifying other articles in accordance with one or more detected properties or range of properties of such articles.

It has been proposed in connection with continuous rod cigarette making machines to operate a rejecting means for faulty cigarettes through the medium of a timing device or so-called memory wheel consisting of a rotating disc carrying a number of fixed and magnetizable steel pins uniformly spaced near its periphery, the movement of the pins being synchronized with that of the cigarettes delivered by the machine. The pins are passed in succession between the poles of a magnetizing coil which is energized under the control of a detecting means when the latter detects a faulty cigarette and the pin passing the coil at that time becomes magnetized. The magnetized pin subsequently passes betwen the poles of a pick-up or generating coil to generate a relay, and the latter effects or causes operation of a device which diverts or displaces the faulty cigarette from its normal path and effects rejection thereof. The pins afterwards pass between the poles of a demagnetizing coil which restores any magnetized pins to their initial or unmagnetized condition ready for a further operation.

It is the main object of the present invention to provide an improved arrangement for effecting rejection or segregation of articles from a succession thereof in accordance with a measured or detected property, which arrangement is simpler and less expensive than that described in the preceding paragraph. A further object is to provide simplified means for the above purpose capable of operation at high speeds and without interrupting the feed or advance of the articles, and which can be readily adjusted to effect the rejection or segregation of articles at different predetermined positions relative to the position of detection.

The invention comprises a carrier for displaceably mounted members movable in an orbital path in synchronism with the travel of the articles and individually displaceable against a stop under the control of a detecting or measuring device to a position for actuating a member to cause displacement and hence rejection or segregation of an article, means for preventing rebound or return of the members when displaced, and guide means for subsequently returning displaced members to their initial position ready for a further operation.

The invention also comprises an arrangement according to the preceding paragraph in which the carrier is a rotatably mounted wheel or disc and the displaceable members are steel pins freely slidable in axial bores uniformly spaced near the periphery thereof, the stop being afforded by a plate or another surface disposed on one side of the wheel or disc and parallel thereto and having associated therewith permanent or other magnets arranged to create a magnetic field through which the end of the displaced pins pass whereby they are arrested and prevented from rebounding from the stop.

According to a further feature of the invention, axial displacement of the pins is effected by an electromagnetic device or relay, the movable armature of which carries or actuates a deflecting plate which, when actuated, strikes the end of the rapidly travelling pin and causes the latter to be propelled into the magnetic field.

According to a further feature of the invention the axially displaced pins are returned to their initial position, after actuation of the rejecting or segregating means, by a fixed cam shaped guiding surface or ramp. Preferably said guiding surface is arranged to effect a partial return of the pin to a position for actuation of the aforesaid member which effects displacement of the desired article for rejection or segregation purposes. In a preferred arrangement the displaced pin engages a pawl or trip lever for actuating a displacing lever or kicker arranged to displace the desired article sideways out of an advancing line of articles. In an application to continuous rod cigarette making machines, the kicker acts on the cigarettes advancing lengthwise on a conveyer band and displaces the faulty cigarettes to a parallel running conveyer band or, alternatively, into a suitable receptacle.

In a preferred arrangement according to the invention the rotary disc or wheel carrying the displaceable pins is mounted above and with its axis parallel to a conveyer band upon which cigarettes or other articles are advanced, and the displacing or rejecting mechanism is arranged between the disc or wheel and the conveyer band.

Any desired mechanism or device can be employed to measure or detect the required property of the cigarettes or other articles which determines their rejection or segregation. Preferably such mechanism or device includes an electrical or an electronic circuit which provides an electrical pulse for actuating the desired magnetizable member or pin.

A further feature of the invention comprises the mounting of the actuating means for the displaceable magnetizing members and of magnetic arresting means for angular adjustment about an axis of the orbital path or of the rotary wheel or disc for timing purposes and to enable the number of articles between the point of detection or measurement and the point of rejection or displacement to be varied.

In the accompanying drawings:

Figure 1 is a side elevation of an apparatus for rejecting faulty cigarettes, arranged and constructed in accordance with the invention;

Figure 2 is an end view of the apparatus of Figure 1;

Figure 3 is a sectional view taken on the 3—3 of Figure 1.

Figure 4 is an end view of Figure 1 with certain parts removed.

In carrying the invention into effect according to one convenient mode as applied by way of example to mechanism for rejecting faulty cigarettes produced by a continuous rod cigarette making machine, there is provided, as shown in Fig. 3, a carrier for displaceably mounted magnetizable members movable in an orbital path consisting of a rotatably mounted disc 1, the peripheral portion of which is axially thickened at 2 and is formed with

a series of uniformly spaced bores 3 parallel with its axis. These bores carry freely slidable steel pins 4 of preferably not more than ⅛ inch diameter, in order to reduce inertia, and somewhat longer than the bores.

The disc 1 is secured to a hub 5 rotatably mounted on ball and journal bearings 6 and 7 on a fixed spindle or stub shaft 8 carried by a stationary support 9. A gear wheel 10 secured to the hub 5 enables the disc 1 to be driven through suitable gearing (not shown). The number of pins 4 is chosen to be in excess of the number of cigarettes between a detecting or measuring point and the point at which faulty cigarettes are rejected by displacing them from the line of cigarettes delivered from the machine. The disc is driven at a speed such that the pins are displaced in a circular path in synchronism with the travel of the cigarettes from the machine.

A fixed member such as a disc 11 is secured to one end of the fixed spindle 8 and to it a second member, preferably a disc 12, is attached by distance studs 13, the two discs 11 and 12 being parallel to the rotatable disc 1 which lies between them. The fixed disc 11 carries an electromagnetic device or relay having a coil 14 and a movable armature 15 having an extension 16 to which is attached a deflecting plate 17. The armature 15 is resiliently (or pivotally) mounted to have a small displacement and is loaded by a spring 18 so that it returns to inoperative position when the coil 14 is de-energized. The coil is carried by a bracket 19 secured to the disc 11, and the armature 15 is carried by a subsidiary bracket 20. The extension 16 and the deflecting plate 17 are accommodated in a suitable gap or channel in the disc 11. The arrangement is such that when the armature 15 is energized the deflecting plate 17 is moved to strike the projecting end of a pin 4 passing the deflecting plate at that instant. The disc 12 carries a stop pad or plate 21 of vulcanized fibre or other suitable shock absorbing material located opposite the deflecting plate 17 and arranged to receive and arrest a pin which has been propelled outwardly by operation of the armature. Also mounted on or adjacent to the stop plate 21 are a pair of magnets 22 arranged to create a magnetic field extending across the path of a pin which has been displaced outwardly as described above.

As shown in Figures 2 and 3, a pair of horseshoe permanent magnets are bolted or otherwise secured against the stop pad 21 and between the latter and the rotatable disc 1, the magnet poles being oppositely disposed and spaced on opposite sides of the circular path taken by the pins so as to afford a slot 23 (see Figure 2) through which displaced pins can pass. The arrangement is such that when a pin 4 is displaced and propelled at high speed through its bore 3 by operation of the deflecting plate 17, its forward end enters the magnetic field which acts to arrest the entering pin and prevents it from rebounding back when it strikes the stop pad 21, which would otherwise occur.

An arcuately disposed guiding surface or ramp 24 is provided adjacent to the magnet assembly and is shaped to effect first a partial return and subsequently a complete return of a displaced pin to its initial position. This ramp comprises an arcuate metal strip extending over somewhat less than 360° and secured to the disc 12 by screws 25 including distance pieces, one of which is shown at 26 in Figure 1, the interrupted portion of the strip accommodating the permanent magnet assembly 22. From the latter the ramp affords a surface 24*a* (Figure 1) gently inclined to effect a partial return of a displaced pin, followed by a surface 24*b* lying in a plane perpendicular to the disc axis and leading to the trip or displacing member, to be later described, situated at the lowest point of the disc. Following the said lowest point, the ramp provides an inclined surface 24*c* for returning the pin to its initial position in the disc 1.

The apparatus is mounted with the axis of the rotary disc 1 above and parallel to a conveyer 27 upon which the cigarettes 28 are advanced end to end. A pawl or trip lever 29 is pivoted at 30 on a bracket 31 secured to a stationary part 32. A kicker lever 33 is pivoted at 34 on the bracket 31, and has its lower end disposed at right angles to constitute a plate 35 which ordinarily lies alongside the line of cigarettes on the conveyer 27. The pawl lever 29 has a downwardly extending arm 36 which can engage a rubber covered pin 37 extending laterally from the kicker lever 33. The pawl lever 29 is ordinarily held by a strong loading spring 38 against a stop 29*a*. The kicker lever is loaded by a light spring 39 and is held by the pawl lever in an inoperative position as described above. Pins 4 in the rotary disc 1 which have not been displaced pass by the pawl lever 29, but a displaced pin engages the trip lever as seen in Figure 4 and displaces it counter-clockwise against the action of the spring 38, permitting the kicker lever to move counter-clockwise under the action of the light spring 39. As soon as the pin 4 leaves the nose 41 of the pawl lever 29 the latter is rapidly returned by its spring 38 taking with it the kicker lever 33 which is thereby sharply propelled or kicked in a clockwise direction and flies out against the pull of its light loading spring 39 so that the plate 35 is moved to displace a cigarette then opposite said plate and cause the cigarette to leave the conveyer sideways.

The position of the parts in Figure 4 shows the pawl lever 29 displaced by a pin 4 and just before it is released to propel the kicker lever as described above. The cigarette so displaced can be received directly by a waste receptacle or it can be transferred to another conveyer. The pin 4 which has just operated the trip lever is then returned to its initial position in the rotary disc 1 by the inclined ramp portion 24*c* as previously described. The arrangement is such that the number of pins 4 in the disc 1 is in excess of the number of cigarettes between the point of detection or measurement and the point of lateral ejection by the kicker lever, and the speed of rotation of the disc 1 is such that when a faulty cigarette has been detected the electromagnetic device is actuated to displace a pin which subsequently causes the ejection of the faulty cigarette when opposite the kicker arm plate 35.

The fixed spindle 8 carrying the electromagnetic device for pin displacement and the permanent magnet assembly is mounted for angular adjustment. For this purpose the shaft is secured in a bore in its support 9 by one or more set screws 42 and has a square socket end 43 for adjustment purposes. A levelling wheel 44 driven by a belt 45 may be arranged to engage the cigarettes as shown in Figures 1 and 2.

Any desired form of detector or measuring device can be employed for detecting faulty cigarettes and includes an electrical or electronic circuit capable of giving an electrical pulse, when a faulty cigarette is detected, to operate the pin displacing device or relay. The angular position of the said device, and of the stop pad and permanent magnet assembly, is adjusted so that the pin displaced upon detection of a faulty cigarette will subsequently operate the trip lever to displace and reject such cigarette.

The partial return of displaced pins before they operate the trip device is not essential but may be advantageous where a small amount of rebound may occur occasionally. It is necessary, however, that the pins should not be moving axially while operating the trip, and for this purpose the guide surface or ramp lies in a plane perpendicular to the rotary disc axis at this point.

It will be seen that the invention provides a means for the purpose described which is capable of reliable operation at high speeds and which enables the displaceable members or pins of the timing or memory device to effect direct operation of the ejecting mechanism without the complication of further electrical circuits. Also, the apparatus can be adjusted for different distances between the detecting and ejecting points or stations in an extremely simple and convenient manner. The invention

is not restricted to the example described above since the structural form and arrangement of the various elements can be varied, and also the arrangement can be adapted to deal with articles other than cigarettes.

I claim:

1. A defective article rejector for rejecting or segregating articles from a succession thereof in accordance with a detected property of such articles comprising a rotatably mounted disc having a plurality of axial bores uniformly spaced near the periphery thereof, each of said bores having a freely slidable pin disposed therein, said disc being adapted to move said pins in an orbital path in synchronism with the travel of the articles to be rejected, a stop plate disposed adjacent one side of the disc and parallel thereto, a relay operative in response to a signal from a detecting device and having an armature adapted when actuated, to displace said pins laterally against said stop plate, magnetic means for generating a magnetic field having pole pieces positioned adjacent the orbital path of travel of said displaced pins, said pole pieces being spaced to provide an air gap with magnetic flux flowing therebetween through which said pins pass during their lateral movement toward said stop plate, whereby said magnetic flux arrest the motion of said pins when displaced to prevent rebound thereof, guide means for subsequently returning said displaced pins to their initial position, and means actuated by each displaced pin for removing an article out of an advancing line of articles.

2. A defective article rejector for rejecting or segregating articles from a succession thereof in accordance with a detected or measured property of such articles comprising a rotatably mounted disc having a plurality of axial bores uniformly spaced near the periphery thereof, each of said bores having a freely slidable pin disposed therein, said disc being adapted to move said pins in an orbital path in synchronism with the travel of the articles to be rejected, a stop plate disposed adjacent one side of the disc and parallel thereto, a relay operative in response to a signal from a detecting device mounted adjacent the other side of said disc and having a movable armature, a deflecting plate secured to said armature and positioned opposite said stop plate and operative when actuated to displace said pins laterally against said stop plate, magnetic means mounted on said stop plate and opposite to said deflecting plate, said magnetic means having pole pieces of opposite polarity mounted in a spaced relationship on opposite sides of the orbital path described by said pins to define a slot through which said moving pins pass, said pole pieces having magnetic flux flowing therebetween across said slot and operative to prevent rebound of the pins when displaced, guide means for subsequently returning said displaced pins to their initial position, and means actuated by each displaced pin for removing an article out of an advancing line of articles.

3. A defective article rejector for rejecting or segregating articles from a succession thereof in accordance with a detected or measured property of such articles comprising a rotatably mounted disc having a plurality of axial bores uniformly spaced near the periphery thereof, each of said bores having a freely slidable pin disposed therein, said disc being adapted to move said pins in an orbital path in synchronism with the travel of the articles to be rejected, a stop plate disposed adjacent one side of the disc and parallel thereto, a relay operative in response to a signal from a detecting device and having

an armature adapted when actuated, to displace said pins laterally against said stop plate, magnetic means for generating a magnetic field having pole pieces positioned adjacent the orbital path of travel of said displaced pins, said pole pieces being spaced to provide an air gap with magnetic flux flowing therebetween through which said pins pass during their lateral movement toward said stop plate whereby said magnetic flux retards the motion of said pins when displaced to prevent rebound thereof, guide means for subsequently returning said displaced pins to their initial position and means actuated by each displaced pin for removing an article out of an advancing line of articles, said guide means including an arcuate ramp disposed adjacent substantially the entire orbital path of travel of said pins and having a surface in engagement with an end of each of said displaced, orbitally moving pins, said ramp having a first inclined portion for effecting partial return of said displaced pin, a flat portion disposed parallel to said disc and adjacent said article removing means to prevent axial movement of said pins during actuation of said article removing means and a second inclined portion terminating said ramp for returning said pins to their initial re-set position.

4. A defective article rejector for rejecting or segregating articles from a succession thereof in accordance with a detected or measured property of such articles comprising a rotatably mounted disc having a plurality of axial bores uniformly spaced near the periphery thereof, each of said bores having a freely slidable pin disposed therein, said disc being adapted to move said pins in an orbital path in synchronism with the travel of the articles to be rejected, a stop plate disposed adjacent one side of the disc and parallel thereto, a relay operative in response to a signal from a detecting device mounted adjacent the other side of said disc and having a movable armature, a deflecting plate secured to said armature and positioned opposite said stop plate and operative when actuated to displace said pins laterally against said stop plate, magnetic means mounted on said stop plate and opposite to said deflecting plate, said magnetic means having pole pieces of opposite polarity mounted in a spaced relationship on opposite sides of the orbital path described by said pins to define a slot through which said moving pins pass, said pole pieces having magnetic flux flowing therebetween across said slot and operative to prevent rebound of the pins when displaced, guide means for subsequently returning said displaced pins to their initial position, means actuated by each displaced pin for removing an article out of an advancing line of articles, said guide means including an arcuate ramp disposed adjacent substantially the entire orbital path of travel of said pins and having a surface in engagement with an end of each of said displaced, orbitally moving pins, said ramp having a first inclined portion for effecting partial return of said displaced pin, a flat portion disposed parallel to said disc and adjacent said article removing means to prevent axial movement of said pins during actuation of said article removing means and a second inclined portion terminating said ramp for returning said pins to their initial re-set position.

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