

[54] **CAN SORTER**

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[52] U.S. Cl. .... **209/74 R, 209/111.7**

[51] Int. Cl. .... **B07c 3/02**

[58] Field of Search ..... **209/74 R, 111.8, 111.7, 209/72**

[56] **References Cited**

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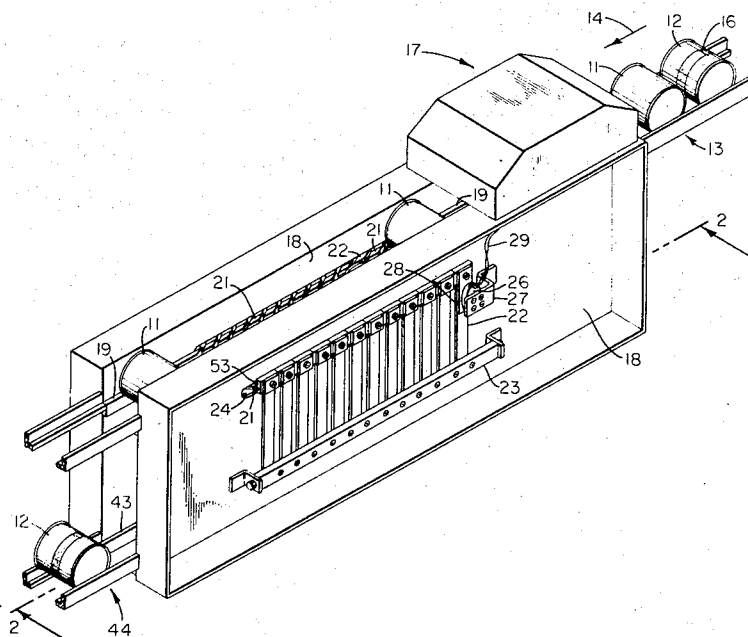
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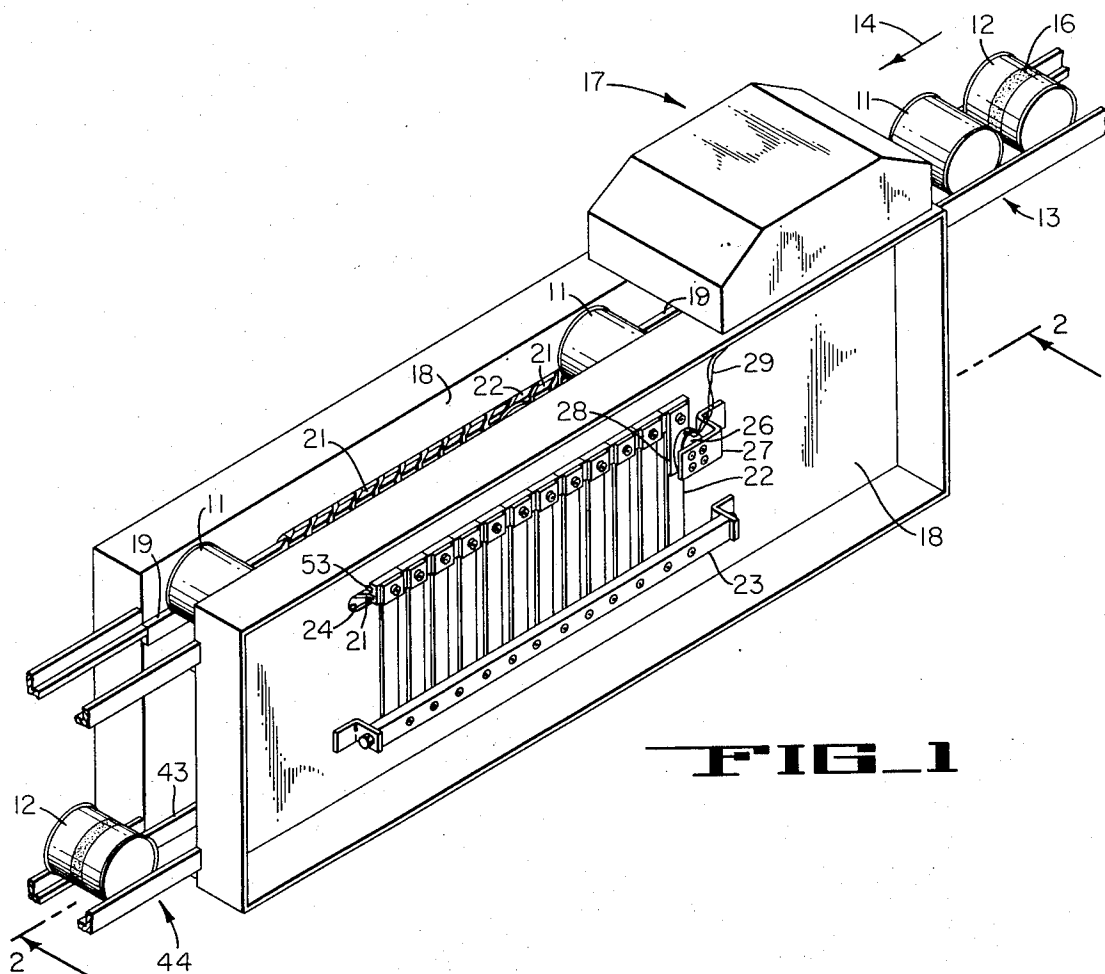
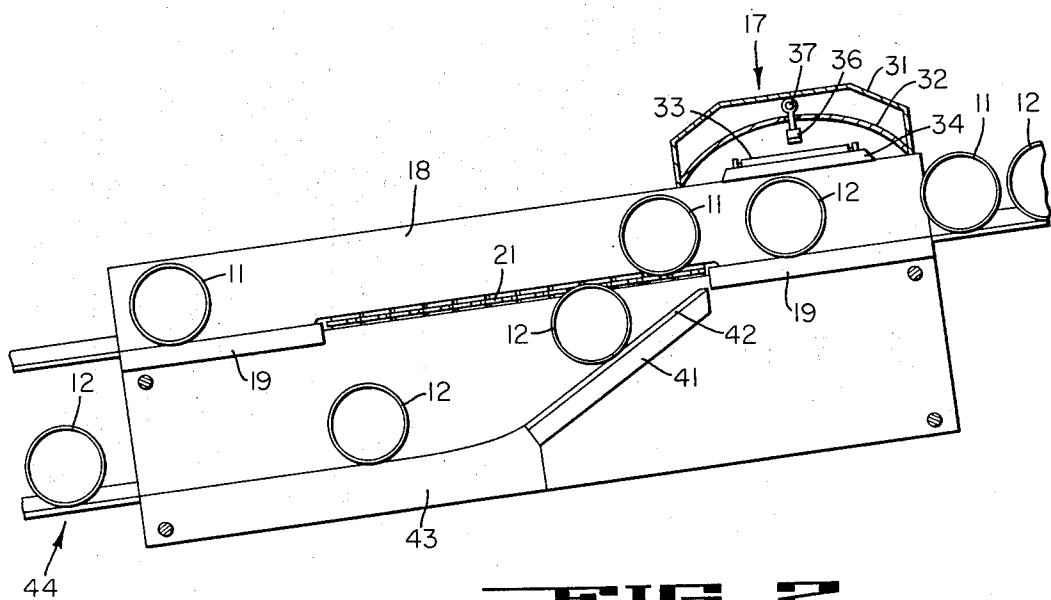
[57] **ABSTRACT**

Cans rolling on a track are inspected by photoelectric means for the presence or absence of a circumferential marking band, and in accordance with the sensing made, are either permitted to continue rolling on the track, or are dropped through to a lower track. To carry out the drop, the upper track is formed with a number of discrete segments displaceable outboardly, the upstream pair of segments being operated by electromagnets under the control of the inspection means to initiate the drop, and the upstream sides of the segments having cam surfaces engageable by a can that has already begun to drop to cause full displacement of the segment and a continuation of the drop. Each segment is shorter than the radius of a can so that it closes in behind a dropping can before the next following can arrives.

**6 Claims, 4 Drawing Figures**



SHEET 1 OF 2



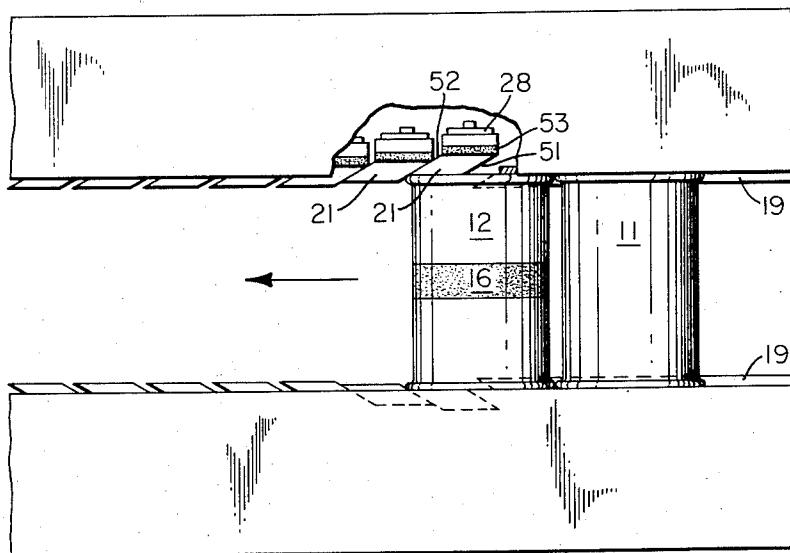


**FIG. 3**

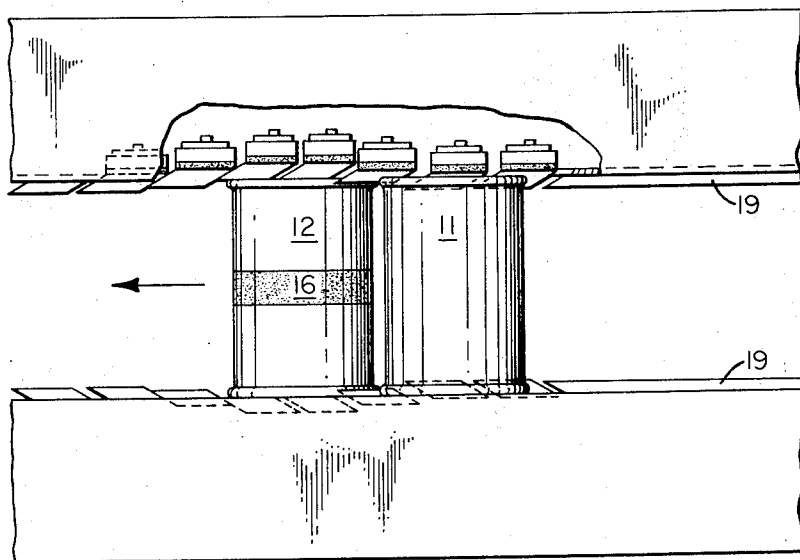


**FIG. 4**

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## CAN SORTER

### BACKGROUND OF THE INVENTION

The present invention relates to the sorting of cans, and particularly to the sorting of cans rolling on a track by dropping some of the cans through the track.

Previously the drop sorting of cans rolling on a track has been accomplished by displacing a section of the track long enough for the desired can to drop through. However, when such a can is closely followed by another, the latter drops through also whether intended to or not, or at least begins to drop through and jams up the drop gate. Attempts have been made to use lengths of link pin chain for the displaceable track section with the hope that portions of the link chain section can be made to close in behind each can immediately after passage, but this structure is not well adapted for constant or frequent use and the link pins both wear out and become gummed up.

Accordingly, it is an object of the present invention to provide means for drop-sorting rolling cans without malfunction, even when the cans follow one another immediately.

It is another object of the invention to provide means as above described that is simple to manufacture and operate, and does not wear in such a way as to malfunction, and does not jam up.

### SUMMARY OF THE INVENTION

Cans rolling on a track are inspected by photoelectric means for the presence or absence of a circumferential marking band, and in accordance with the sensing made, are either permitted to continue rolling on the track, or are dropped through to a lower track. To carry out the drop, the upper track is formed with a number of discrete segments displaceable outboardly, the upstream pair of segments being operated by electromagnets under the control of the inspection means to initiate the drop, and the upstream sides of the segments having cam surfaces engageable by a can that has already begun to drop to cause full displacement of the segment and a continuation of the drop. Each segment is shorter than the radius of a can so that it closes in behind a dropping can before the next following can arrives.

### DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of apparatus embodying the invention;

FIG. 2 is a cross-sectional elevation of the apparatus of FIG. 1, taken on the plane of lines 2-2 of FIG. 1;

FIG. 3 is an enlarged fragmentary plan view of a portion of the apparatus of FIGS. 1 and 2, showing cans in a different position; and

FIG. 4 is a view similar to that of FIG. 3 but showing some cans in the same position as in FIG. 2.

### DETAILED DESCRIPTION OF THE DRAWINGS

As shown in FIG. 1, a number of cans 11, 12 are shown rolling on a track 13 in an upstream to downstream direction as shown by arrow 14. It is desired to separate cans of the type 11, having no identifying markings thereon, from cans of the type 12 that have a printed circumferential marking band 16 thereon at a predetermined axial position on the can, i.e., in the

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illustrated case, midway between the ends of the can. For this purpose, a photoelectric inspection apparatus 17 is provided, and is mounted on the top of a pair of flanged sidewalls 18 that define a continuation of the side flanges of the track 13. The bottom flanges of the track 13 are continued beyond the walls 18 by means of a pair of parallel rail members 19 mounted on the respective confronting sides of the walls 18; and also by means of a number of outboardly displaceable track segments 21, for dropping through cans that are marked with bands 16. Each segment 21 is mounted on the upper end of a flexible leaf spring 22 that is mounted on the outboard side of respective wall 18 as by means of a bracket 23 to which the lower end of each leaf spring is affixed. The segment 21 then protrudes through a slit 24 to its undisplaced in continuation of the rails 19; and each of the leaf springs 22 are loaded so as to maintain or return the segment to undisplaced position whenever there is no displacing force operating thereon. To cause outboard displacement of the most upstream pair of the segments 21, there are provided a pair of electromagnets 26 suitably mounted on brackets 27 on the outboard side of the walls 18. In FIG. 1, only one of these electromagnets is shown, but it will be understood that there is another electromagnet mounted on the outboard side of the other wall 18 in a mirror image relation. A bearing leaf 28 is especially provided for attraction to and engagement by the electromagnet, and is attached at the upper end of the leaf spring 22, to prevent magnetization of the leaf spring. The electromagnets 26 are controlled by the photoelectric sensing apparatus 17 through electrical wires 29 so as to cause retraction of the most upstream pair of segments 21 whenever a can having a band 16 is detected by the apparatus 17 and approaches the array of segments 21.

Referring now to FIG. 2, the construction of the apparatus 17 is shown. Within a housing 31, there is formed a concavely curved reflecting surface 32 for directing light to the cans below from a source consisting of a pair of light bulbs 33 mounted at the sides and masked by means of a shield 34 from directly illuminating cans. A photoelectric sensing probe 36 of a type previously known in the art, is mounted above the path of the cans in a position for inspecting a narrow zone of the path of approximately the width of the bands 16. The probe 36 is mounted on a worm gear type positioning rod 37 so as to be positionable at any position between the ends of a can to inspect for a band at such a location. Upon sensing a band 16 on a can, the apparatus 17 initiates after a suitable time delay, which depends upon the known rolling speed of the cans, the retraction of the most upstream pair of segments 21, so that they will be retracted at precisely the time the can with the band 16 arrives at the most upstream segments. As the can drops through the array of segments, it encounters and rolls down an incline ramp 41, that has an upper rail surface consisting of a rail of rubber 42 to deaden clatter; and at the bottom of the ramp 41, the can continues rolling upon a pair of lower rails 43 that are continued beyond the walls 18 by the rails of a lower track 44. It will be noted that the entire assembly is tilted about 7½° from the horizontal to induce and maintain the tendency of the cans to roll.

The construction and operation of the segments 21 is more clearly illustrated in relation to FIGS. 3 and 4. Each segment is arranged to have a cam surface 51

formed on the upstream side thereof and inclined so that the surfaces of opposite pairs of segments incline toward one another and downstream so that a can encountering one of these surfaces after the can has begun to drop, causes the full outward displacement of the segment; and the segment remains displaced until the can has passed far enough downstream to clear the downstream end of the segment. However, unless a can has already begun to drop, the cam surface 51 can not be reached by any portion of the can, because the downstream portion of the adjacent upstream segment has a mating surface 52, and the adjacent upstream segment therefore masks a segment downstream therefrom against engagement by a can.

It will also be noted that the segments are spaced apart in the direction of the track length by a dimension that is substantially the same as the distance between the undisplaced position and a half-displaced position, so that when an upstream segment is fully displaced, the segment downstream from it is displaced halfway, and the next downstream segment is not displaced at all. This arrangement insures that the can will have less work to do when it encounters a segment that must be displaced. In any event, some spacing is required, because otherwise when the upstream pair of segments is displaced by the electromagnets, all of the other segments are displaced at the same time, and a can that was not meant to be dropped, and had proceeded already downstream from the dropping point, but had not yet cleared the array of segments, would accidentally be dropped.

For return of the segments to displaced position, and to damp the impact of the returning segment against the wall 18, each segment has a rubber cushion 53 mounted above the level of the slot 24. An important feature of the return arrangement, is that each segment has a length in the direction of track length that is substantially less than the radius of the can, so that as each dropping can clears a displaced segment, it returns immediately to the displaced position before the next can can possibly arrive if the latter has not already begun to drop.

The general sequence of dropping and sorting is illustrated beginning in FIG. 3, in which a can 12 is rolling downstream, immediately followed by can 11 which is not to be dropped. The can 12, having a band 16, has already been sensed by the apparatus 17, and the upper most pair of segments 21 have been displaced by the electromagnets, and the can 12 in FIG. 3 has already begun to drop, so that the leading edge of the beaded portion of the can is at the downstream end of the most upstream segments 21, and the can 12 is just beginning to encounter and displace outwardly the second pair of segments, which are already half-displaced by the first pair upstream. The following can 11 is still rolling on the rails 19.

In FIG. 4, the leading can 12 has proceeded further downstream until the leading edge is near the downstream end of the fifth pair of segments, which are fully retracted, as are the fourth pair upstream therefrom. However, the third pair upstream from the fourth pair have already been cleared by the can 12, and are returning to undisplaced position. The second pair upstream therefrom have already returned to fully undisplaced position, as have the first, and the can 11 is riding on the second pair of segments. This is the same as the position of these two cans as shown in FIG. 2, and

from a comparison of the two FIGURES it may be seen precisely how the segments are displaced and are cleared to return, with consequent positive separation of the two types of cans without any possibility of malfunction.

Thus, there has been described an apparatus in which cans rolling on a track are inspected by photoelectric means for the presence or absence of a circumferential marking band, and in accordance with the sensing made, are either permitted to continue rolling on the track, or are dropped through to a lower track. To carry out the drop, the upper track is formed with a number of discrete segments displaceable outboardly, the upstream pair of segments being operated by electromagnets under the control of the inspection means to initiate the drop, and the upstream sides of the segments having cam surfaces engageable by a can that has already begun to drop to cause full displacement of the segment and a continuation of the drop. Each segment is shorter than the radius of a can so that it closes in behind a dropping can before the next following can arrives.

In the claims:

1. A can sorter of the type in which cans rolling on a track are inspected for a selected characteristic, and are then permitted to continue rolling on the track or are dropped through the track in accordance with the characteristic, comprising in combination:

a displaceably segmented track for receiving cans to be sorted;

means for displacing at least one segment of said track for initiating the dropping of a can;

means for returning each track segment to an undisplaced position forming a portion of the track when no displacing force is acting on the respective track segment;

inspection means responsive to sensing of the selected characteristic for controlling the displacing means;

each of the track segments not directly displaceable by the displacing means having a cam surface facing upstream with respect to direction of can roll for engagement by a can that has already begun to drop,

said cam surface normally being masked by the next adjacent upstream track segment to prevent engagement by a can unless the adjacent upstream track segment is in displaced position; and

each of the displaceable track segments further having a length in the direction of can roll substantially less than the can radius, to permit return of the segment to an undisplaced position before being engaged by an immediately following can that is not to be dropped.

2. The can sorter of claim 1, wherein the downstream portion of each track segment is shaped to mask the cam surface on the upstream side of the adjacent segment when said segments are in their undisplaced position.

3. The can sorter of claim 2, wherein

the displaceable track segments are spaced apart along the direction of the track, so that any one segment may be at least partly displaced without causing any displacement of the adjacent downstream segment.

4. The can sorter of claim 3, wherein the spacing of said track segments in the direction of can roll is such

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that each segment is at least partly but not fully displaced at the time the adjacent upstream segment is fully displaced by a can.

5. The can sorter of claim 2, wherein:

the track includes two parallel side walls spaced apart 5  
for closely confining and guiding the ends of the cans;

each of said side walls supporting a rail member  
mounted on respective confronting sides of said  
walls for supporting the beaded end portions of the 10  
cans;

the side walls have parallel slots formed therein at the  
rail level in the zone of the displaceable track seg-  
ments; and

the segments are mounted in the undisplaced posi- 15  
tion to protrude through the slots to the inboard

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space between said side walls, so as to define con-  
tinuations of the rail members in the slot and seg-  
ment zone.

6. The can sorter of claim 5, wherein:

each displaceable track segment is detachably  
mounted at the upper end of a vertically disposed  
leaf spring, the lower end of the spring being  
mounted on the outboard side of the corresponding  
side wall so as to be loaded to bear at the upper end  
against the side wall and to continuously urge the  
segment toward the undisplaced position; and

an electromagnet is mounted outboard from each of  
the most upstream opposing segments for displac-  
ing said most upstream opposing segments out-  
boardly under the control of the inspection means.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,800,941 Dated April 2, 1974

Inventor(s) JOHN L. POWELL

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

The Assignee, "Mandrel Industries, Inc.," is corrected to read  
--Petty-Ray Geophysical, Inc.,--.

In the Application No., "328,173" is corrected to read  
--326,173--.

In the Specification:

Col. 3, line 32, "displaced" is corrected to read  
--undisplaced--.

Col. 3, line 40, "displaced" is corrected to read  
--undisplaced--.

Signed and sealed this 8th day of October 1974.

(SEAL)  
Attest:

McCOY M. GIBSON JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents