Nov. 21, 1950 E. BOURLAND 2,530,419

CAN UNSCRAMBLER

Filed May 10, 1946 4 Sheets-Sheet 1

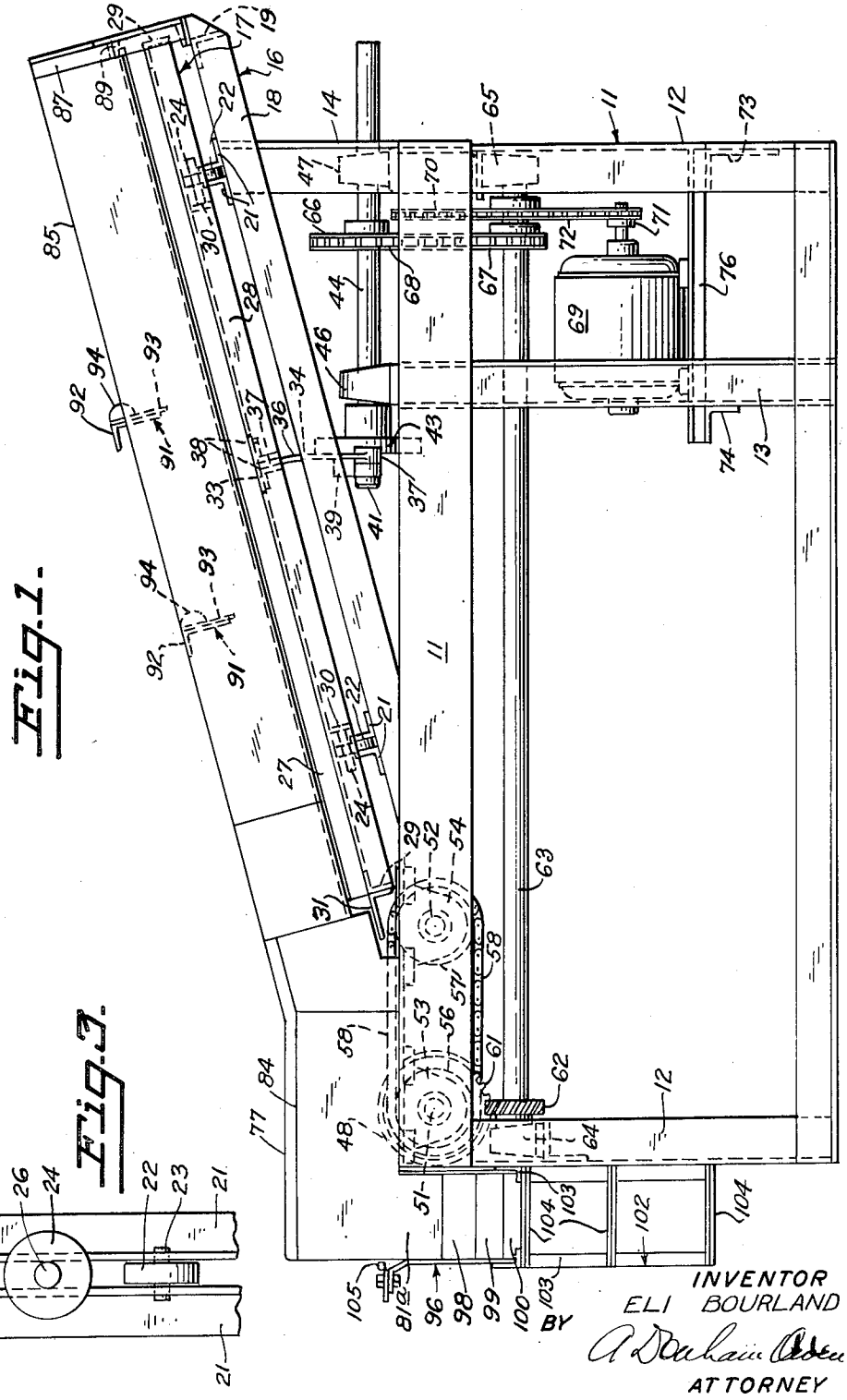


Fig. 1.

Fig. 2.

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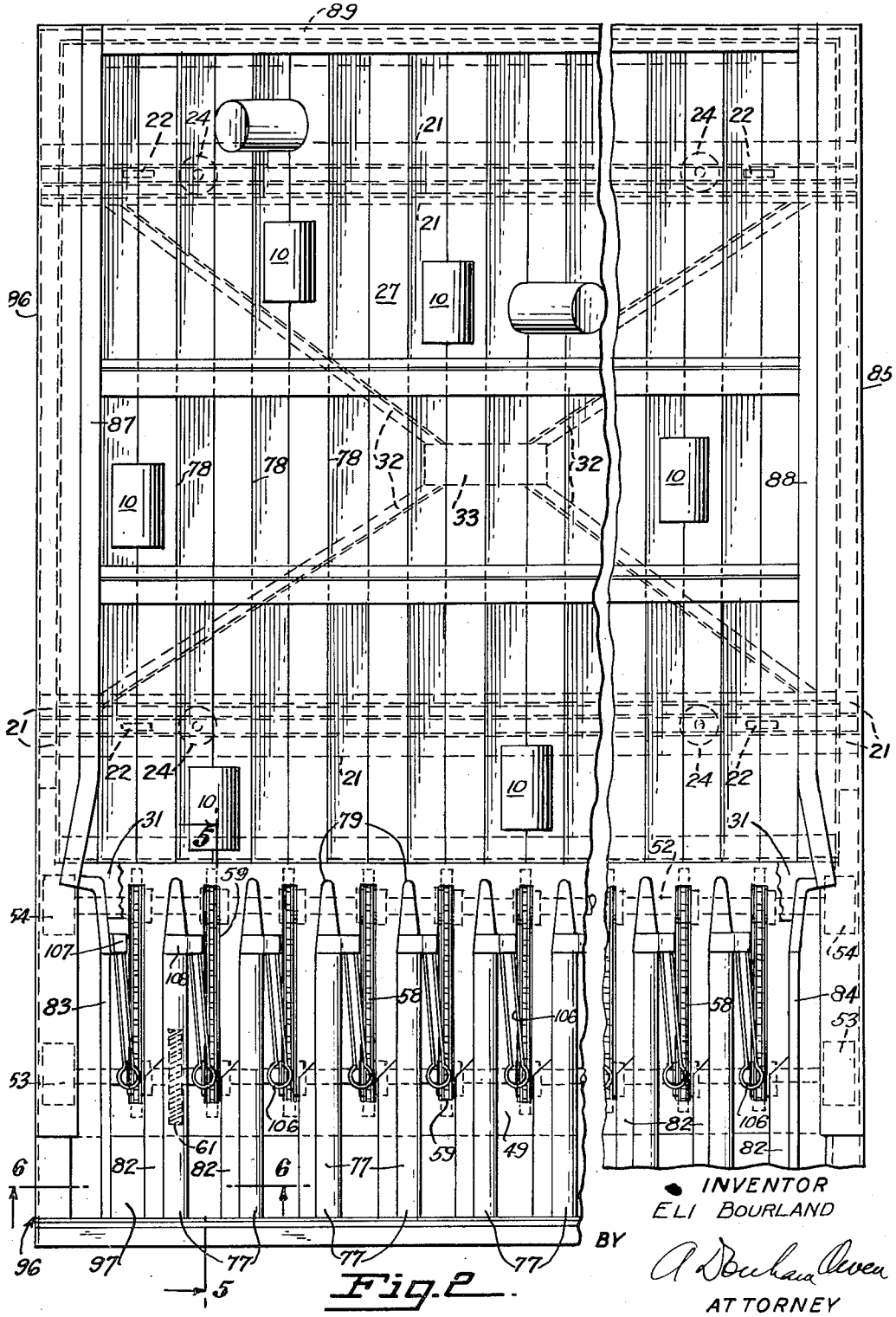


Fig. 2

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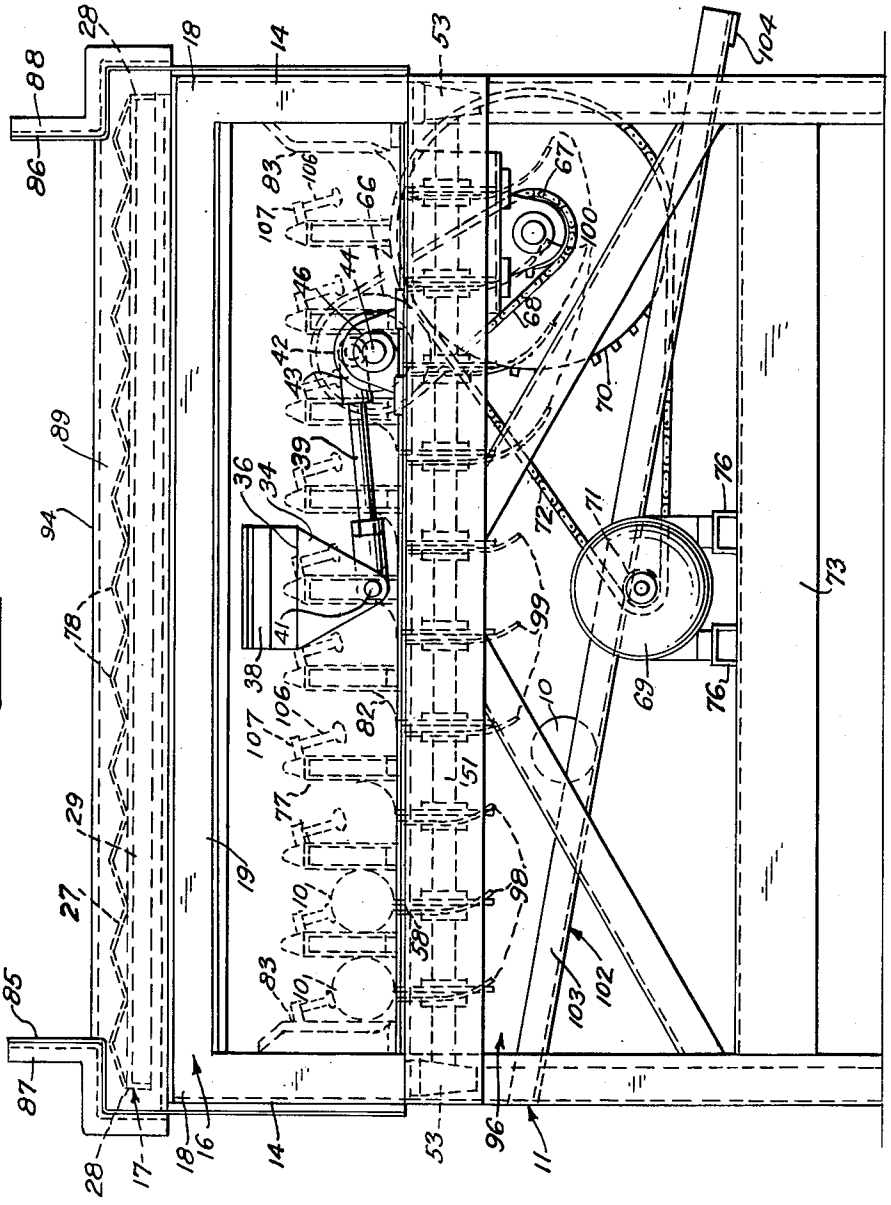


Fig. 4.

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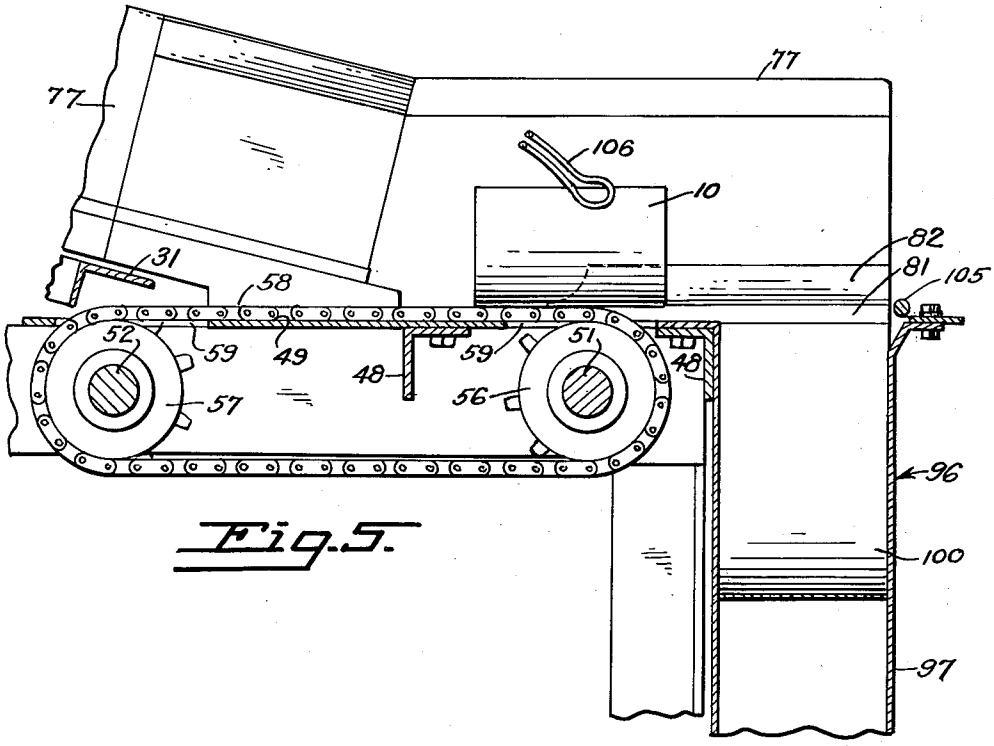
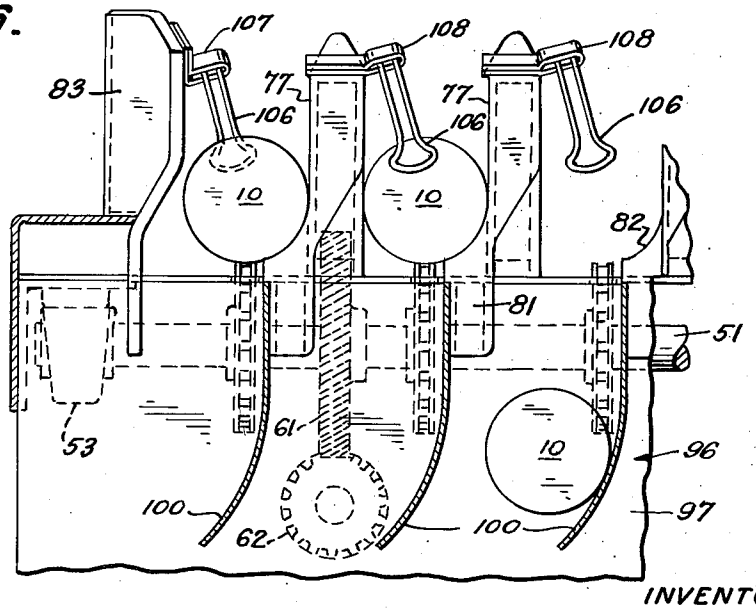


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE

2,530,419

CAN UNSCRAMBLER

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4 Claims. (Cl. 198—30)

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This invention relates to can machinery and particularly to can aligning machines adapted to receive a scrambled supply of cans, unscramble them, and deliver them to a runway along which they can roll freely to a labeling machine, packing machine, or other device for performing some operation upon the cans or their contents.

In the procedure of filling, capping, labeling, and packing cans, it is common practice at certain stages in the procedure for the cans, particularly filled cans, to be placed in baskets or other containers without being uniformly arranged, so that they assume random positions with respect to each other. Thereafter it is necessary to remove the cans and place them in cartons or the like, or on conveying equipment moving toward a subsequent step in the procedure. In most instances, this requires that the scrambled cans be unscrambled and delivered in some sort of uniform alignment for efficient handling. The principal object of the present invention is to provide a machine for performing this unscrambling and aligning operation completely automatically in a manner such that the cans are finally delivered for subsequent handling from an inclined runway down which the cans roll freely one by one in a substantially continuous stream so long as cans to be sorted are supplied to the machine.

The general type of machine to which the invention relates is one employing a vibrating can receiving and aligning table that slopes in the direction of a chute and that is provided with a plurality of parallel, similarly sloping troughs or channels for arranging the cans in a plurality of parallel rows of axially aligned cans moving in the direction of their axes down the slope of the table. In particular, it is an object of this invention to provide improved machinery for receiving the cans from each of the plurality of rows and dropping them sequentially down the chute with their axes substantially horizontal while spinning them about their axes and accelerating them in the direction they are to roll down the chute so that they will land on the sloping runway below the chute in proper alignment for rolling freely, and without substantial delay, down the runway to any suitable receiving apparatus.

The invention is illustrated, by way of example, in the accompanying drawings in which:

Fig. 1 is a side elevational view of a machine embodying the present invention, in which the vibrating can receiving and aligning table and

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the chute into which aligned cans are to be dropped are disposed in horizontally spaced apart relation with the improved mechanism for transferring the aligned cans from the sloping table to the chute positioned therebetween;

Fig. 2 is a plan view of the machine shown in Fig. 1;

Fig. 3 is a plan view of a portion of the structure of Figures 1 and 2 and shows on an enlarged scale a roller mechanism by means of which the sloping table may be supported so as to permit lateral reciprocating movement thereof;

Fig. 4 is an end or rear elevational view of the machine in Figures 1 and 2 and shows particularly the disposition of mechanism for causing the table to reciprocate horizontally and for supplying power to drive the mechanism for transferring aligned cans from the sloping table to the chute;

Fig. 5 is a fragmentary, vertical sectional view of the machine, the plane of the section being indicated by the line 5—5 in Fig. 2; and

Fig. 6 is another fragmentary, vertical sectional view of the machine, the plane of the section being indicated by the line 6—6 in Fig. 2.

The machine embodying this invention may be mounted on any suitable, generally box-shaped, supporting frame 11, which frame may comprise four legs 12 disposed at the corners of the supporting frame as viewed in plan, and two intermediate legs 13 that are associated with two of the corner legs 12 for supporting certain power applying mechanism described hereinafter, the six legs being joined to form a rigid structure by any suitable arrangement of horizontal and diagonal bracing elements that need not be described in detail. Two extensions 14, that project vertically from the upper ends of the two corners legs 12 that are associated with the intermediate legs 13, may be mounted on the supporting frame 11 for supporting one end of a sloping frame 16 upon which a similarly sloping table 17 may be mounted for limited, horizontal, reciprocating movement. The sloping frame 16 may comprise two sloping side braces 18 rigidly secured at their lower ends to the supporting frame 11, connected at their upper ends by a horizontal cross-brace 19, and supported adjacent their upper ends on the vertical leg extensions 14. Two pairs of angle braces 21 may extend transversely of the sloping frame 16 and be rigidly secured thereto for adding stiffness to the sloping frame and for carrying a roller arrangement that in turn carries the sloping

table 17 and permits the desired reciprocating movement thereof.

The roller arrangement may comprise four sets of two rollers each, two of the sets being respectively mounted adjacent opposite ends of one of the pairs of angle braces 21, and two being respectively mounted adjacent opposite ends of the other pair of angle braces 21. As shown most clearly in Fig. 3, each set of two rollers preferably includes a primary load carrying roller 22 that is free to turn on a shaft 23 extending in a direction parallel to the slope of the sloping frame 16 and spanning the associated pair of angle braces 21, to which it is suitably secured; and a secondary load carrying and/or table guiding roller 24 that is free to turn on a shaft 26 suitably secured between the associated pair of angle braces 21 with its axis extending in a direction normal to the slope of the sloping frame 16.

The sloping table 17 may comprise an angularly corrugated, rectangular piece of sheet metal 27 that may be welded, or otherwise secured, to a rectangular frame formed by a pair of side angle bars 28 and a pair of end angle bars 29 welded together at their meeting ends, the sloping table being disposed with its corrugations extending in the direction of its slope. Two angle bars 30 that extend across the bottom side of the table, transversely to the slope thereof, and are secured at their opposite ends to the side angle bars 28, may be disposed so that one of them cooperates with the two lower sets of rollers 22 and 24 on the sloping frame 16 and the other cooperates with the two upper sets of rollers 22 and 24 for transferring the weight of the table onto the rollers and for guiding movement of the table. The primary load carrying rollers 22 roll on the inside of one flange of the cooperating angle bars 30 for resisting a major component of the weight of the table acting normal to the slope thereof, and the secondary load carrying rollers 24 roll on the inside of the other flange of the cooperating angle bars 30, whereby the table is supported against sliding down the slope of the frame 16 while being free to move horizontally in a direction transverse to the slope thereof.

A skirt, that may comprise an L-shaped bar 31, is preferably secured along the lower edge of the sloping table with the narrow flange thereof bolted or welded to the adjacent end angle bar 29 and with the wide flange thereof extending down the slope of the table so as to form a flat extension of the lower end of the table. Four diagonal angle bars 32 may be welded to the bottom of the corrugated sheet 27 in a converging array, the diagonal angle bars extending from the four corners of the sloping table to the corners of a centrally disposed, rectangular plate 33, that may also be secured to the bottom of the corrugated sheet by welding. This arrangement gives the necessary degree of rigidity to the corrugated sheet, and the rectangular plate 33 provides a rigid area at the center of the corrugated sheet to which the force required to drive the table may conveniently be applied. A generally vertically disposed plate 34, having a bend 36 adjacent its upper end and an apertured boss 37 at its lower end, may be secured at its upper end to the lower surface of the rectangular plate 33 by means of a pair of short angle bars 38 that may be welded to the rectangular plate and to the upper end of the vertically disposed plate 34. A connecting rod 39 may be pivotally connected at one of its ends to the boss 37 by means of a

pin 41, and at its opposite end to an eccentric pin 42 on a driving wheel 43, whereby rotation of the driving wheel will cause the sloping table 17 to move horizontally back and forth along a short path (of the order of two inches in length) in a direction normal to the slope of the table.

The driving wheel 43 may be mounted on a relatively short drive shaft 44 so as to rotate therewith, and the shaft may be mounted for rotation in two bearings 46 and 47 mounted on the frame 11, one between the upper ends of the two intermediate legs 13 and the other between the two corner legs 12 closest thereto for supporting certain power applying mechanism of which the shaft 44 constitutes a part.

A horizontally disposed plate is rigidly mounted on the frame 11 by means of a pair of transversely extending angle bars 48 so as to form a stationary, horizontal table 49 extending laterally the full width of the sloping table 17 and longitudinally for a substantial distance outwardly from the skirt 31 of the sloping table to one edge of a chute to be described hereinafter. Thus, cans that slide down the sloping table will be discharged therefrom onto the horizontal table 49. Below the horizontal table, two transversely extending shafts 51 and 52 are mounted on the supporting frame 11 in respective pairs of bearings 53 and 54 suitably mounted on the sides of the supporting frame. The shaft 51 carries, in uniformly spaced apart relation along its length, a plurality of driving sprockets 56 corresponding in number to the number of troughs formed by the corrugations in the top of the sloping table. The driving sprockets 56 are secured on the shaft 51 for rotation therewith and are respectively aligned with the mean positions of the bottoms of the troughs as the sloping table reciprocates in the manner described above. The shaft 52 carries, in identically spaced apart relation along its length, a corresponding plurality of idler sprockets 57 respectively adapted to be driven by a corresponding plurality of chain conveyors 58. Each chain conveyor 58 passes along the upper surface of the horizontal table 49 between the associated driving sprocket 56 and idler sprocket 57 and passes around these sprockets and between them again below the table 49. Slots 59 are cut in the table 49 where the driving sprockets 56 project upwardly therethrough.

As best shown in Figs. 1 and 6, a spiral gear 61 is mounted on the conveyor driving shaft 51 for driving the same, the gear extending upwardly through an appropriate slot in the table 49 and into a hollow space within one of a number of hollow partitions 77 (described hereinafter) so as not to project into one of the alleys defined by these partitions. This spiral gear 61 is in engagement with a spiral pinion 62 adapted to drive the former. The spiral pinion 62 is mounted on a long drive shaft 63 for rotation therewith, which shaft is mounted at its opposite ends for rotation in bearings 64 and 65 suitably carried by the supporting frame 11. The short drive shaft 44 and the long drive shaft 63 have a pair of aligned sprockets 66 and 67 respectively mounted thereon for rotation therewith, the sprockets being connected by means of a chain 68, whereby rotation of the long drive shaft 63 for operating the chain conveyor system will cause rotation of the short drive shaft 44 for effecting reciprocation of the sloping table 17 in the manner described above. Rotation of the long drive shaft 63 is accomplished by means of another chain drive acting between the shaft 63

and the shaft of an electric motor 69 and comprising a large sprocket 70 on the shaft 63, a small sprocket 71 on the motor shaft, and a connecting chain 72. The motor 69 may be mounted in any suitable manner on the supporting frame 11, as by means of transversely extending braces 73 and 74 and a pair of inverted channels 76 spanning the braces 73 and 74.

Between each adjacent pair of chain conveyors associated with the horizontal table 49, is a partition 77 that is preferably in the form of a hollow metal casting that may be welded or otherwise rigidly secured to the horizontal table 49. The several partitions 77 are respectively aligned with the mean positions of the crests 78 between the several troughs formed by the corrugations in the sheet metal top 27 of the sloping table 17, so that each adjacent pair of partitions defines an alley containing the upper reach of one of the conveyor chains 58 and through which a can discharged from the lower end of the aligned trough may pass with the axis of the can disposed horizontally and aligned with its path of travel. The conveyor chains are driven so that their upper reaches move away from the sloping table 17 for moving cans discharged therefrom along the alleys between the alley defining partitions 77.

Each partition 77 includes an upwardly tapered, sloping, rounded end portion 79 that extends with vertical clearance over part of the width of the skirt 31 of the sloping table 17 so that only a small space is left between the rounded end portion 79 and the lower end of the opposite crest 78 on the sloping table, whereby cans will be guided smoothly from the various troughs into the aligned alleys. Each partition 77 also includes one laterally projecting portion 81 formed integrally therewith and provided with a cylindrical surface 82 conforming to the cylindrical sidewall contour of the cans to be passed through the machine for guiding the cans as they move beyond the conveyor chains 58 until they are in positions to roll off the cylindrical surfaces and drop down a chute, still to be described.

Two outside guide plates 83 and 84 are disposed beyond the two outermost partitions 77 to form sidewalls for the two outermost alleys, and the inside surface of each of these plates is appropriately shaped to give the outermost alleys the same contour as the others. One of the outermost guide plates 84 is also provided with a laterally projecting, integral portion 81*a* that is identical in shape with the corresponding portions of the partitions 77 for performing the same can guiding function.

A pair of suitable, complementary, outside wall structures 85 and 86 are respectively mounted along opposite sides of the sloping table 17 for preventing cans moving down the sloping table from falling off either side thereof. These outside wall structures are respectively connected adjacent the lower end of the sloping table to the upper ends of the outside guide plates 83 and 84 and adjacent the upper end of the sloping table to a pair of complementary supporting brackets 87 and 88. The brackets 87 and 88 are appropriately shaped to clear the side edges of the sloping table 17 and are respectively secured to opposite ends of a channel member 89 that is mounted on the cross-brace 19 of the stationary sloping frame 16.

Two knockdown bars 91, each comprising an angle bar 92 and a metal strip 93 extending transversely across the sloping table 17, are secured at their opposite ends to the outside wall structures 85 and 86 at elevations above the corrugated surface of the sloping table such that the bars will cause any cans standing on end on the table to fall flat thereon as they pass under the bars. A wooden, half-round strip 94 is secured adjacent the upper edge of each metal strip 93 and extends the full length thereof to act as a guard or pad to prevent scratching or otherwise damaging the cans that are knocked down. The knockdown bars 91 insure that all of the cans arriving at the bottom of the sloping table 17 are lying on their sides in one of the troughs of the table.

A chute structure 96, that defines a chute 97, extends along the full length of the end of the horizontal table 49 that projects beyond the conveyor system, and the chute structure is suitably supported beyond the adjacent end of the frame 11. The upper end of the chute 97 lies in the plane of the upper surface of the horizontal table and slightly below the uppermost level of the chain conveyors 58, so that cans moved beyond the conveyors may fall down the chute. As best shown in Figs. 4 and 6, a plurality of sets of curved, sheet metal, chute baffles 98, 99 and 100 of progressively increasing lengths are secured to the chute structure 96 and depend down the chute 97 from the laterally projecting portions 81 of the partitions 77 and from the laterally projecting portion 81*a* of the outside guide plate 84. A sloping, open framework runway 102, that is secured to a similarly sloping, lower, open end of the chute structure 96, extends along the lower end of the chute 97 from an uppermost level adjacent and below the shortest chute baffles 98 to a lowermost level adjacent and below the longest chute baffles 100. The runway 102 comprises a pair of spaced-apart angle bars 103 having inwardly directed flanges on which the ends of the cans may roll and vertical flanges that are welded or otherwise secured to the lower side edges of the chute structure 96. Three cross-braces 104 span and are secured to the angle bars 103 for maintaining a uniform spacing thereof along their lengths. With such a runway construction, any cans that do not properly fall down the chute with their axes horizontal and normal to the path of the runway will drop between the angle bars 103 and not jam the runway.

The speed of the conveyor chains 58 is such that cans sliding onto the chains from the troughs of the sloping table 17 are quickly accelerated axially in a horizontal direction and are carried along the alleys at such a rate that they will slide beyond the horizontal table 49 to positions from which they may drop down the chute 97. When they reach their dropping positions, their horizontal travel is stopped by contact of the leading ends of the cans against a bumper bar 105 that is secured to and extends along one side of the chute structure 96. The cans must roll off the cylindrical surfaces 82 in order to drop down the chute 97, as illustrated in Fig. 6, and their contact with the bumper bar 105 not only stops their horizontal travel, but, in doing so, also retards the drop of the leading ends of the cans just enough to correct a tendency of the cans to "nose dive" down the chute, thus causing the axes of the cans to remain substantially horizontal as the cans drop and roll down the baffles 98, 99, and 100 to fall ultimately on the runway 102.

In order to prevent panel interlocking of successive cans traveling along any one of the sev-

eral alleys adjacent the discharge ends thereof, each alley is provided with a can retarding arm 106, preferably made of spring steel wire or the like. The several can retarding arms 106 should be long enough to have considerable flexibility, and they may be secured at one end to the alley partitions 77, or the outside guide plate 83 in one instance, on the opposite sides of the alleys from the cylindrical, can guiding surfaces 82. Any suitable form of brackets 107 or 108, that may be welded or otherwise secured to the partitions 77, or the outside guide plate 83 in one instance, may be employed for this purpose. The free ends of the arms 106 normally extend slightly into the paths of cans moving along the alleys, the flexibility of the arms being sufficient to permit the ends of the arms to ride over the leading edges of the successive cans into light, bearing engagement with the side walls thereof, while only slightly delaying the progress of the cans along the alleys. The positions of the free ends of the can retarding arms 106 along the lengths of the alleys should be such that they will ride off the trailing ends of the cans just before the cans move forwardly out of contact with the conveyor chains 58. Each can will be given a final accelerating push by the conveyor chain on which it was riding after the arm 106 has slid off the trailing end thereof and while the arm is slightly retarding the progress of a succeeding can in the same alley that might have been following too closely. Sufficient spacing of successive cans moving along each of the alleys will be maintained in that manner so that panel interlocking of successive cans cannot interfere with the freedom of the cans to roll off the cylindrical surfaces 82 when they reach positions for dropping down the chute 97. In addition to effecting a desired spacing of successive cans in each alley, the arms 106 serve to hold the cans in accurately aligned positions against the cylindrical surfaces 82, thereby assisting materially in maintaining the axes of the cans horizontal until the cans reach positions for dropping down the chute 97.

Referring now to the mode of operation of the machine as a whole, cans to be unscrambled may be dumped at random on the upper surface of the sloping table 17 adjacent the upper edge thereof. With the motor 69 operating to cause reciprocating movement of the sloping table in the manner described above, the cans will be caused to slide down the table while being aligned in the troughs thereof with their axes parallel to the slope of the table. Any cans that may initially be standing more or less on end, as by leaning against an adjacent can, will be toppled over by one of the knockdown bars 91 as they pass thereunder.

Operation of the motor 69 also serves to drive the conveyor chains 58, as described above, so that the upper reaches of the conveyor chains are moving in a direction away from the sloping table 17 toward the chute 97. When a cam arrives at the lower edge of the sloping table, it will slide over the skirt 31 thereon, and its leading end will be contacted by a conveyor chain 58 in an alley generally aligned with the particular trough from which the can was discharged. On being contacted by this conveyor chain, the can will be accelerated axially in a horizontal direction toward the chute 97. After the can has moved along the conveyor chain sufficiently to contact the adjacent cylindrical guiding surface 82, it will also contact the cooperating can retarding arm 106, and its progress will be decelerated slightly while the free end of the arm 106 is riding over the leading edge of the can to a position bearing yieldably against the sidewall thereof. Thereafter, the can will continue to move at approximately the speed of the conveying chain by which it is being propelled until the free end of the can retarding arm has slid over the trailing edge of the can into position to act upon a succeeding can and until the released can has moved forward completely beyond the conveyor chain by which it was propelled.

The speed of the conveyor chains 58 is set at such a rate that cans discharged from the forward ends thereof will have acquired sufficient momentum to slide freely along the remainder of the length of their adjacent cylindrical guiding surfaces 82 until their horizontal travel is stopped by contact of the leading ends of the cans against the bumper bar 105. Should the leading ends of the cans tend to drop first over the lower edges of their respective cylindrical guiding surfaces 82 before they contact the bumper bar 105, thus tilting the axes of the cans out of their horizontal alignment, the bumper bar will retard the drop of the leading ends of the cans sufficiently to correct such misalignment, and the cans will continue their descent with their axes returned substantially to their former horizontal alignment.

As the cans roll over the lower edges of the cylindrical guiding surfaces 82, they are given a rotational acceleration about their axes in the direction they must subsequently rotate to roll down the sloping runway 102 therebelow. After dropping along the straight portions of the chute baffles 98, 99, and 100, the cans are deflected by the curved portions of the chute baffles so as to impart to them a velocity component in the direction they will subsequently travel along the runway 102 and so as to increase their speed of rotation about their axes. As a result of the rotation and the horizontal velocities acquired by the cans while dropping down the chute 97, they move quickly down the runway 102 immediately upon landing thereon without the delay that would otherwise be required to accelerate them. If a can falling on the runway should in some manner have its axis misaligned so that it does not strike the runway properly, it will fall between the runway angle bars 103 and not obstruct the passage of other cans therealong.

For a more clear understanding of the manner in which cans travel through the machine, a number of cans 10 have been illustrated in certain figures of the drawings in various typical positions assumed thereby during their travel.

While the present invention has been illustrated herein by the disclosure of one specific embodiment thereof, it will be appreciated by those skilled in the art that numerous modifications of that embodiment may be made without departing from the basic features constituting the invention. It is intended that all such modifications as fall within the reasonable scope of the following claims be embraced thereby.

I claim:

1. A can aligning machine comprising a substantially horizontal table, a chute having an upper open end extending along one edge of said table, means for feeding a plurality of parallel rows of cylindrical cans axially aligned within each row across the table toward positions above the upper open end of said chute, and a corresponding plurality of cylindrical can guiding surfaces respectively positioned along said paths to

provide lateral guiding support on one side of the rows of cans passing thereby, said can guiding surfaces extending across the upper open end of the chute and being so disposed that cans guided thereby may roll therefrom under the influence of gravity alone and drop down the chute.

2. A can aligning machine comprising a substantially horizontal table, a chute having an upper open end extending along one edge of said table, means for feeding a plurality of parallel rows of cylindrical cans axially aligned within each row across the table toward positions above the upper open end of said chute, a corresponding plurality of cylindrical can guiding surfaces respectively positioned along said paths to provide lateral guiding support on one side of the rows of cans passing thereby, said can guiding surfaces extending across a portion of said table and across the upper open end of the chute and being so disposed that cans guided thereby may roll therefrom under the influence of gravity alone and drop down the chute, and a corresponding plurality of yieldable can controlling elements respectively associated with said can guiding surfaces for urging cans passing thereby toward said surfaces prior to reaching positions for dropping down the chute.

3. A can aligning machine comprising a substantially horizontal table, a chute having an upper open end extending along one edge of said table, means for feeding a plurality of parallel rows of cylindrical cans axially aligned within each row across the table toward positions above the upper open end of said chute, a corresponding plurality of cylindrical can guiding surfaces respectively positioned along said paths to provide lateral guiding support on one side of the rows of cans passing thereby, said can guiding surfaces extending across a portion of said table and across the upper open end of the chute and being so disposed that cans guided thereby may

roll therefrom under the influence of gravity alone and drop down the chute, and a corresponding plurality of spring elements respectively associated with said can guiding surfaces for urging cans passing thereby toward said surfaces prior to reaching positions for dropping down the chute.

4. A can aligning machine comprising a substantially horizontal table, a chute having an upper open end extending along one edge of said table, means for feeding a plurality of parallel rows of cylindrical cans axially aligned within each row across the table toward positions above the upper open end of said chute, a corresponding plurality of cylindrical can guiding surfaces respectively positioned along said paths to provide lateral guiding support on one side only of the rows of cans passing thereby, and a corresponding plurality of yieldable can controlling elements respectively associated with said can guiding surfaces for urging cans passing thereby toward said surfaces, said can controlling elements being normally yieldably held in the paths of cans passing along the respectively associated guiding surfaces for striking the forward ends of the cans and momentarily delaying the travel thereof.

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