July 20, 1954 K. HOLSTEBRO 2,684,147

CAN UNSCRAMBLING MACHINE

Filed May 15, 1951 3 Sheets-Sheet 1

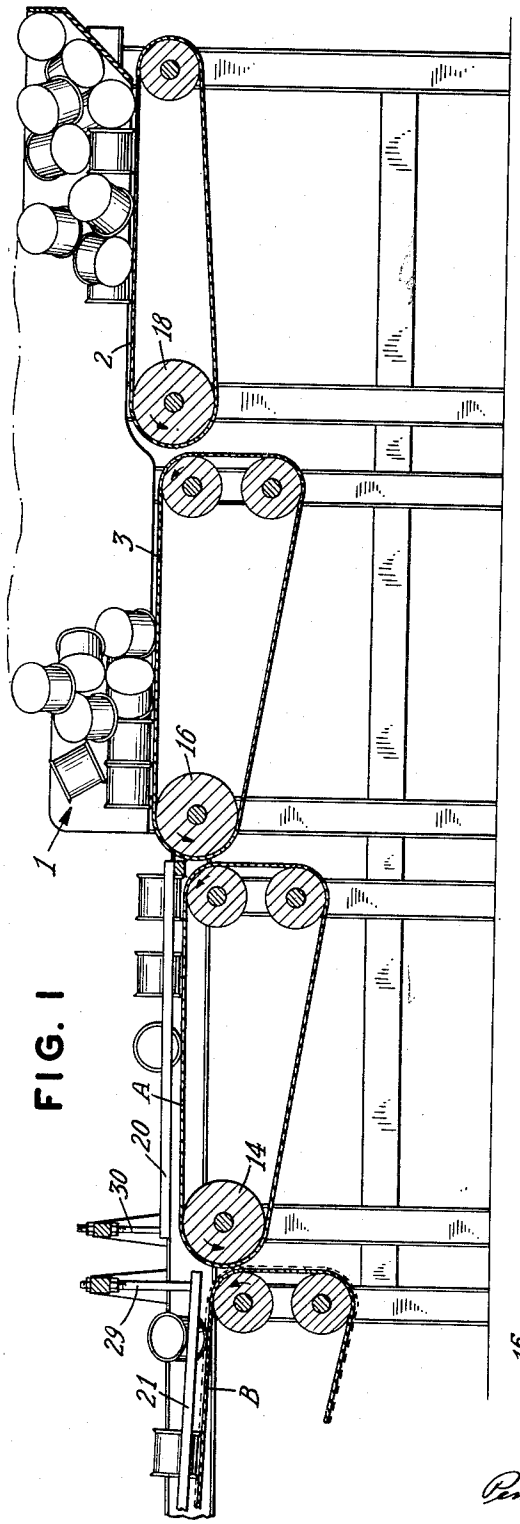


FIG. 1

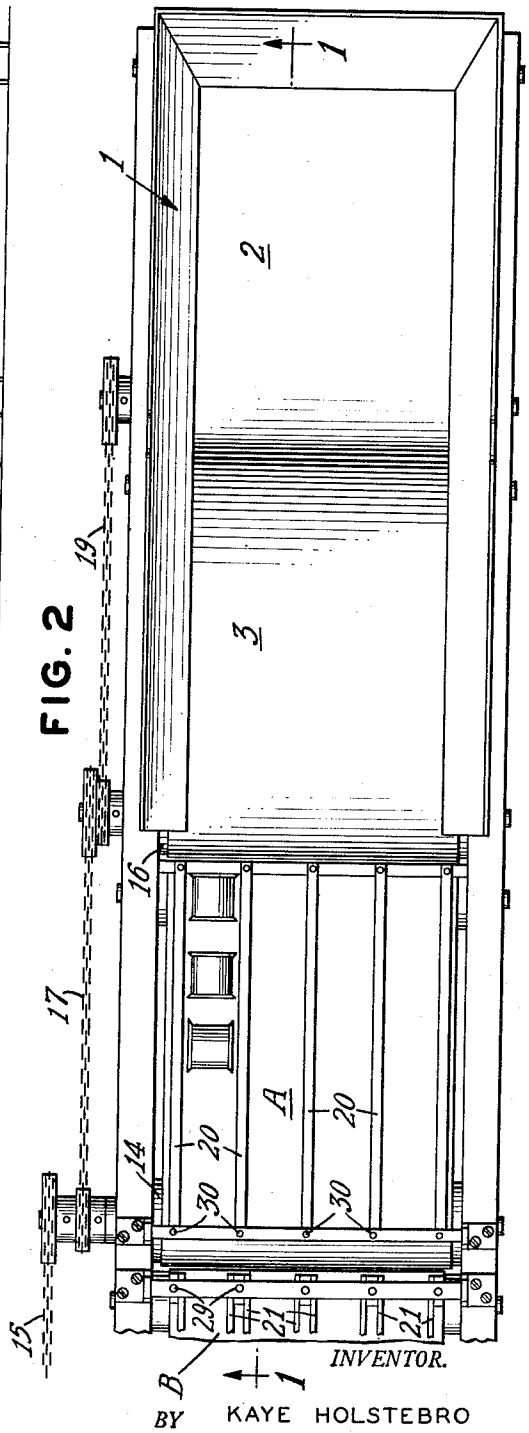


FIG. 2

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CAN UNSCRAMBLING MACHINE

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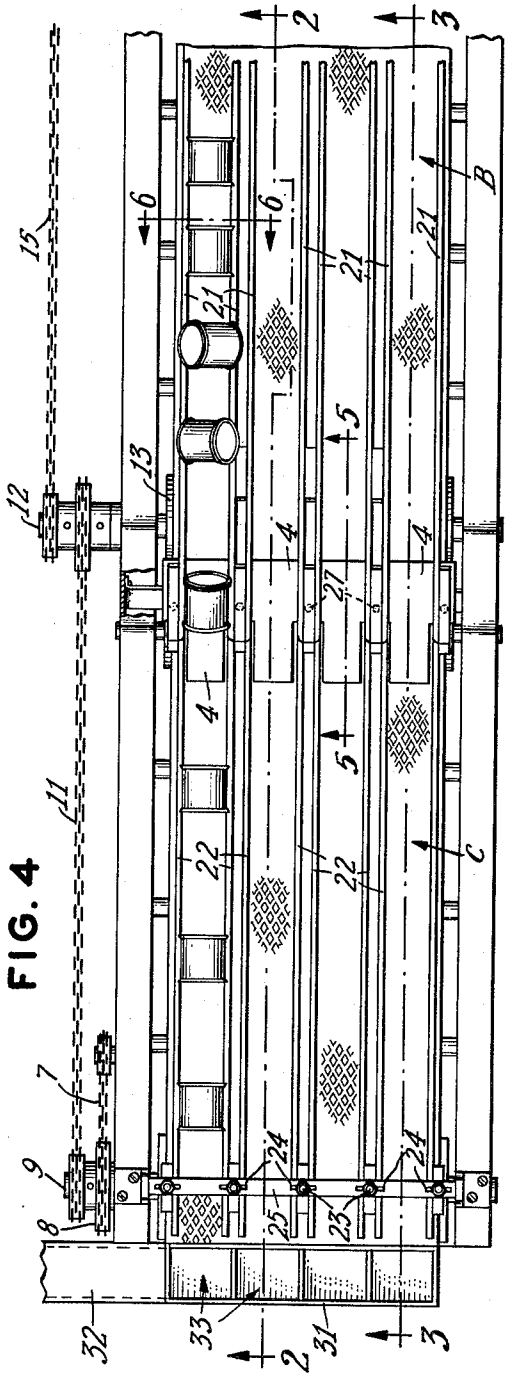


FIG. 4

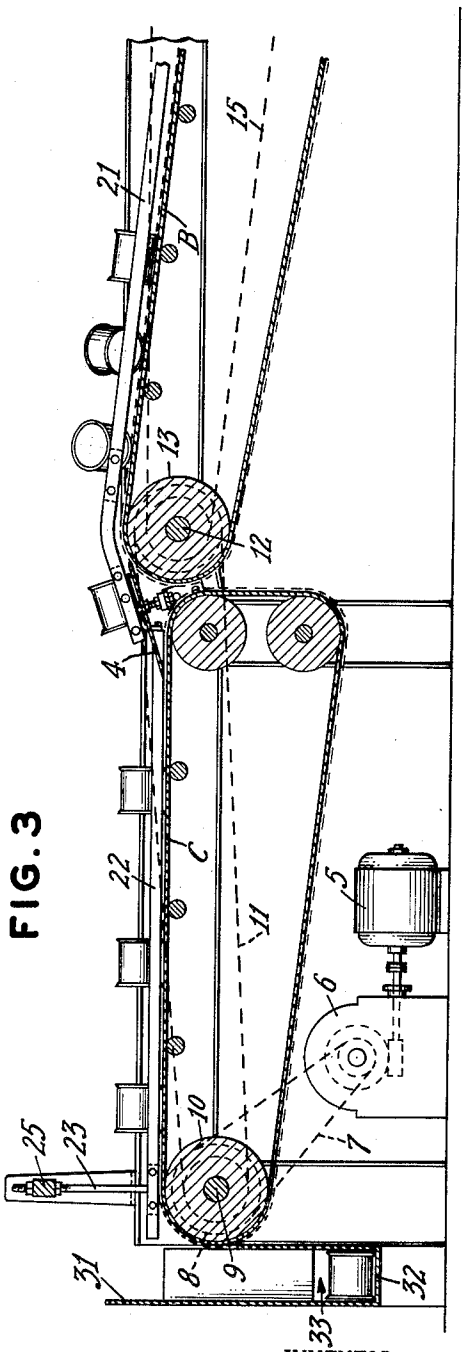


FIG. 3

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CAN UNSCRAMBLING MACHINE

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FIG. 5

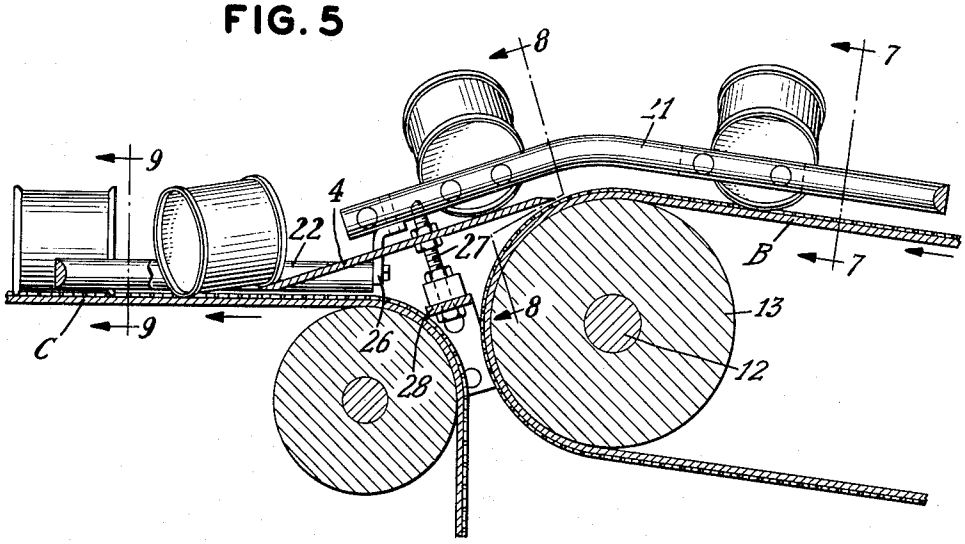


FIG. 6

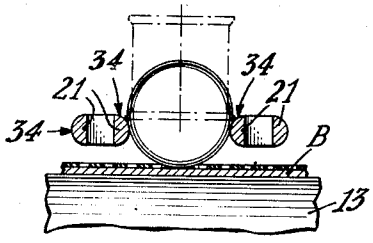


FIG. 7

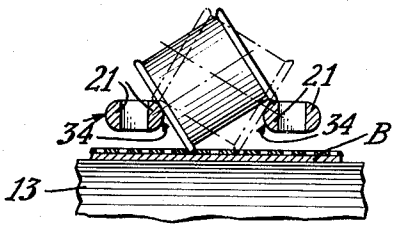


FIG. 8

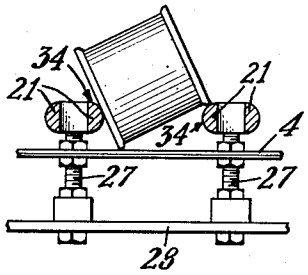
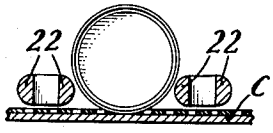


FIG. 9



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2,684,147

UNITED STATES PATENT OFFICE

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CAN UNSCRAMBLING MACHINE

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Application May 15, 1951, Serial No. 226,511

7 Claims. (Cl. 198—30)

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This invention relates to article-handling machinery and more especially to apparatus constructed to arrange in orderly alignment cylindrical articles, such as food containers or cans, which are being advanced on a conveyer. The invention has to do particularly with the arranging of cans having approximately the same height and diameter and which are received in bulk from a steam processing apparatus.

In the preserving of food stuffs in cans, it is usual to heat-process the cans after they are filled and closed and to handle such cans during the cooking operation in large metal crates or baskets holding one hundred or more cans. In removing the cans from such crates after the cooking has been completed, the crates are usually transported by an overhead conveyer to the can-arranging machine, by means of which the cans from the helter-skelter mass or pile resulting from the dumping of the crates are arranged into a single line with all the cans rolling on their sides. In such condition, the cans are readily conveyed by gravity to the labeling machine, packing machine or other destination.

Such arrangement of cans which are of about the same height as diameter presents a challenge, although apparatus such as that disclosed and claimed in U. S. Patent No. 1,972,489 of Arthur E. Rideout and John H. Mosley and which is owned by the same assignee as the present application has been commercially used with success. The problem is to turn the cans quickly on their sides, and although the patented apparatus has been commercially successful, the object of the present invention is to provide an apparatus which will arrange cans having substantially the same height as diameter, or cans whose height is somewhat less or somewhat greater than their diameter, more quickly and hence operate at a higher rate of speed or capacity of cans per hour.

In the accompanying drawings, there is illustrated by way of example the preferred embodiment of the invention in a machine for arranging tin cans containing a food product.

In these drawings:

Fig. 1 is a longitudinal vertical section showing the righthand portion of the machine, the section being taken on line 1—1 of Fig. 2, and a charge of cans having been dumped upon the receiving end of the machine from a processing crate;

Fig. 2 is a plan view of the portion of the machine shown in Fig. 1 with certain parts omitted at the left;

Fig. 3 is a view similar to Fig. 1 but drawn to

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a somewhat enlarged scale showing the lefthand portion of the machine, the section being taken on line 2—2 of Fig. 4;

Fig. 4 is a plan view of the portion of the machine shown in Fig. 3;

Fig. 5 is a considerably enlarged vertical section of the central portion of the apparatus shown in Fig. 3;

Fig. 6 is a detailed transverse section taken on line 6—6 of Fig. 4;

Fig. 7 is a similar section taken on line 7—7 of Fig. 5;

Fig. 8 is a similar section taken on line 8—8 of Fig. 5; and

Fig. 9 is a similar section taken on line 9—9 of Fig. 5.

Referring now to these drawings, the machine comprises a hopper 1, the floor of which comprises two endless conveyer belts 2 and 3. To the left of hopper 1 and conveyer 3 are three endless conveyers A, B and C, and it is with these three conveyers and the parts directly associated therewith that the present invention is concerned. Hopper conveyers 2, 3 and can-arranging conveyers A, B and C are mounted in end-to-end relation upon suitable driving and driven rollers or drums which are journaled in a frame appropriately constructed of steel members arranged to give adequate rigidity and ruggedness to the apparatus. It is not important to the invention whether a single endless conveyer is arranged as the floor of receiving hopper 1 or two belts as shown.

It is preferred to have all of the conveyers of the apparatus level, but certain of the conveyers may be inclined upwardly, and others downwardly if desired, in order to meet the requirements as to elevation of the receiving and discharge ends of the apparatus for any particular installation. It is desirable, however, to have hopper conveyer 3 at a lower elevation than conveyer 2 and it is essential to have conveyer A lower at its intake end than the discharge end of conveyer 3. Also it is essential that the intake end of conveyer B shall be lower than the discharge end of conveyer A, and it is particularly essential that the intake end of conveyer C be arranged at a lower elevation than the discharge end of conveyer B in order that a downwardly inclined scuff plate 4 may bridge the gap between the ends of these conveyers. In the apparatus shown the intake end of conveyer B and the discharge end of conveyer C are at about the same elevation; consequently, since it is preferred to have conveyer C level, conveyer B is up-

wardly inclined in order that scuff plate 4 may be downwardly inclined.

It will be understood that all of the conveyers of the series operate at progressively higher speeds, and with this in view they are driven by suitable sprocket and chain connections from any suitable source of power; such, for example, as electric motor 5. This motor drives the input shaft of a speed-reducer 6. The output shaft of this mechanism is connected by means of an endless chain 7 to drive a sprocket 8 on shaft 9 which supports the driving drum or roller 10 for endless conveyer C.

A second sprocket on shaft 9 drives a chain 11 which in turn drives shaft 12 for the drive roller 13 of conveyer B. In like manner, driving roller 14 for endless conveyer A is driven by means of an endless chain 15, and driving roller 16 for conveyer 3 by chain 17, conveyer 2 being driven by driving roller 18 and chain 19.

As previously mentioned, the present invention has to do particularly with the three can-arranging conveyers, A, B and C and the parts directly associated with them, one such part being the inclined scuff plate 4. Other such parts are the can guides 20 for guiding in rows the cans which are advanced on conveyer A, the guides 21 for guiding the cans on conveyer B and over scuff plate 4, and the guides 22 which direct the cans along conveyer C. The invention relates particularly to the spacing of the guides of these several sets and the elevation of the guides relative to their respective conveyers A, B and C and the inclined scuff plate 4.

The guides consist of rigid bars or rails (Fig. 3), and all are mounted in fixed stationary position by means of suitable brackets, or otherwise, on the frame of the apparatus. Since the elevation and spacing of these guides with respect to surfaces of the respective conveyers is important, the mountings for the guides and also for scuff plate 4 are made adjustable. This may be accomplished in any suitable or convenient manner. For example, the lefthand ends of guide rails 22 are usually fixed to the lower ends of hanger rods 23 which are threaded at their upper ends and pass through slotted apertures 24 in a cross bar 25, which is mounted at its opposite ends in upright members which are in turn mounted on the machine frame.

The righthand ends of guides 22 are supported by bracket members 26 which are attached to the ends of guide rails 21 (Fig. 5). A vertically adjustable connection (not shown) is preferably provided for mounting the ends of rails 22 in brackets 26 so that these rails can be adjusted independently of rails 21. The lefthand end of each of bars 21 are supported by the upper end of a bolt 27, the lower end of which is secured in a cross bracket 28 secured to the frame. Scuff plate 4 is held in position by means of locknuts as shown on these several bolts 27. This arrangement provides for freedom of adjustment of all of these parts. It will be understood that bars 21 and 20 are adjustably supported by hanger rods 29 and 30 which are similar to the arrangement of rods 23.

The can guide bars 20 over belt A are spaced from each other a greater distance than the maximum dimension of the can so as to serve merely to guide the cans in parallel rows but permitting free access of the cans to conveyer A, whereas the spacing of can guides 21 over conveyer B is somewhat less than the diameter of the cans and these guides are disposed at an elevation above this conveyer which is somewhat less than the can diameter (Fig. 6) which permits cans arranged lengthwise by the guides to contact the conveyer so as to be carried along bodily in the same manner in which they were carried by conveyer A. However, such spacing or guide bars 21 also causes crosswise arranged cans to be supported in part by the guides and in part by the conveyer (Fig. 7). Crosswise cans, consequently, are also advanced by rails 21 and carried along with the longitudinally arranged cans by the conveyer to its discharge end. Can guides 20 are placed at whatever elevation above belt A which best serves to direct the cans, but the elevation of guides 21 over belt B is critical.

At the discharge end of conveyer B (Figs. 3 and 4) the longitudinally arranged cans pass along rails 21 (Fig. 6), over scuff plate 4, and continue along conveyer C as before. The crosswise cans, however, are turned to the same longitudinal or lengthwise position as the other cans. This takes place as they descend across scuff plate 4 and contact the surface of conveyer C, as will be described in greater detail presently. On conveyer C the cans have all been turned into lengthwise or longitudinal arrangement, their axes all being parallel with the direction of travel. As the cans reach the left end of conveyer C, they are thrown against the vertical wall 31 of the discharge conveyer 32 by the speed of belt C, and the cans drop through a series of converging chutes 33, one for each of the parallel rows of cans. It will be understood that the walls of chutes 33 converge and curve downwardly towards the discharge conveyer 32, so that all of the cans from the several rows mix together and roll along the discharge conveyer in a single line.

Assuming that a crate of cans from the steam cooker has been discharged onto the hopper 1 so that the cans lie in a heap in helter-skelter arrangement, the hopper conveyers 2 and 3 moving comparatively slowly carry forward the cans from the bottom of the pile and stretch out the heap lengthwise. As the cans are discharged by hopper conveyer 3 onto the widely separated guide bars 20, the cans distribute themselves over the several rows on conveyer A, some of them being dropped between the bars 20 into the desired longitudinal arrangement and others either standing on end or lying crosswise as shown in Figs. 1 and 2.

The speed of conveyer A being greater than that of hopper conveyer 3, these cans will be separated to some extent as the cans are discharged from conveyer A onto conveyer B. While the closer spacing of can guides 21 is not too close to prevent any cans which assume a longitudinal arrangement from being carried bodily by conveyer B, the construction and arrangement of guides 21 prevents any of the cans from standing in upright position on the conveyer or on the guides. This may be seen from a consideration of Fig. 6 where guides 21 will be seen to have side surfaces which converge from the top down to the center of the guides, which have round, and in fact, substantially hemispherical side surfaces 34.

The spacing of these guides being slightly less than the diameter of the cans, should a can attempt to assume an upright position as shown by the dot and dash lines in this figure, it will be in unstable equilibrium and cannot remain upright. Consequently, it will either turn over to the desired lengthwise arrangement as shown by the full lines in this figure or it will assume a cross-

wise position as shown, for example, in Fig. 7. In case the can should turn to lengthwise position, the spacing and elevation of guide bars 21 are such with respect to the diameter of the can that the can will not be supported out of contact with conveyer B but will be carried along by it (Fig. 6).

It will be understood that many of the cans will directly assume crosswise positions as soon as they are discharged onto conveyer B. Crosswise cans, as shown in Fig. 7, may have their axes directed upwardly to the right as shown in full lines, or directed upwardly to the left as shown in dot and dash lines. The spacing of rails 21 and their elevation (somewhat below can center) are such as to permit the lower edge or corner of a crosswise can to engage the surface of conveyer B, so that such cans, as well as lengthwise cans, will be carried forward by the conveyer.

As the cans reach the end of conveyer B and descend over the inclined scuff plate 4, the longitudinal cans slide forward over the scuff plate and proceed along the surface of conveyer C. Crosswise cans as they move from one conveyer to the other slide along one guide 21 and roll along the other and roll down the scuff plate, maintaining the same position which they had on conveyer B. This is shown by comparison of Fig. 8 with Fig. 7, Fig. 8 showing the support of a crosswise arranged can at about the same position with respect to can guides 21 as in Fig. 7. In other words, the only change is that the lower edge of the can is supported by scuff plate 4, instead of by belt B, but it is noteworthy that the guide spacing and elevation are arranged to cause the lower edge of the can to be supported by belt or plate at a point at one side of the center of mass of the can, i. e., off-center. When, therefore, the lower edge of the can strikes the surface of conveyer C, the can is jerked around into longitudinal position by the frictional force applied to the corner of the can by the moving belt, inasmuch as belt C travels at a linear speed which is different from and preferably greater than the speed of the cans as they move down the scuff plate. If the belt speed is greater than the can speed, the cans will be turned in one direction; if less, in the opposite.

The spacing and elevation of can guides 21 is about the same over scuff plate 4 as over conveyer B, but can guides 22 are lower—close to the surface of conveyer C as shown in Fig. 9—although their spacing is substantially the same as guides 21. This enables the lengthwise arranged cans to be wholly supported on belt C, the guides merely serving to maintain the cans in the respective rows or lanes.

Preferably, though not necessarily, all of the several conveyer belts are of the rough top type, that is to say, these belts are made of flexible material, usually a rubber impregnated fabric, and are faced with a friction material such as rubber compound, the surface of which is formed with suitably molded projections in any desired shape, a diamond shape being shown. These projections enable conveyer C, particularly, to grip the seam or bead of the can and exert a more positive turning action upon it.

It has been stated that the belts as shown are operated at progressively higher speeds. As an example of the preferred operating speeds, it may be said that the discharge conveyer 3 from the hopper may operate at about 15 feet per minute, conveyer 2 being at the same or a somewhat lower speed. The speed of conveyer A may be about 60–65 feet per minute or some four times that of hopper belt 3. Conveyer B may operate at about twice the speed of belt A, that is, 120–130 feet per minute, and conveyer C, from 180–260 feet per minute or from 1½ to 2 times the speed of conveyer B.

In the can-arranging machine of the present invention, what may be described as a dynamic turning of the cans from a crosswise to a lengthwise position is provided, that is to say, a substantial force which is derived from the power that drives the machine is applied to the crosswise cans, and they are thus forcibly rearranged in lengthwise position. The cans are conditioned for the application of this force by conveyer B and its can guides which compel all cans which do not fall into lengthwise position to assume an angular crosswise position. While the can axis may be directed either to the left or right, that is of no significance, since the turning force of conveyer C is applied equally well with the cans in either position.

The machine shown and described is intended to operate on cans having a diameter of $3\frac{7}{16}$ inches and a height of $3\frac{9}{16}$ inches, known as 307 x 306 cans. It will be understood that the machine can be modified to operate on cans of any desired size and somewhat different proportions without exceeding the scope of the invention as set forth in the appended claims; also that the term "cans" as used in these claims is intended to include other cylindrical articles. It will also be understood that other changes can be made in construction and arrangement in the various parts of the machine without departing from the invention as set forth in these claims.

I claim:

1. In a machine of the class described, two can conveyers operating at different speeds, the discharge end of the first conveyer being higher than the receiving end of the second, an inclined scuff plate bridging the gap between said conveyers, stationary guides above said conveyers and scuff plate, the guides over said first conveyer and scuff plate being spaced apart less than the diameter of the cans and disposed at an elevation above said first conveyer and scuff plate which causes cans arranged crosswise of the guides to be supported in part by the guides and with the lower edges of said cans making off-center engagement successively with said first conveyer, said scuff plate and said second conveyer, whereby upon reaching said second conveyer the cans are turned to lengthwise position.

2. A machine as set forth in claim 1 in which the second conveyer operates at a higher speed than the first conveyer.

3. A machine as set forth in claim 1 in which the second conveyer operates at a lower speed than the first conveyer.

4. In a machine of the class described, a conveyer on which cans are carried in parallel rows, and mechanism for aligning the cans of each row lengthwise comprising a second conveyer, spaced stationary guide bars thereabove to maintain the cans in rows, said guides being spaced apart less than the diameter of the cans and disposed at an elevation above said conveyer which permits cans arranged lengthwise between the guides to contact said second conveyer so as to be carried bodily thereby, the spacing and elevation of said guides also being such that the crosswise cans are supported in part by said guides and in part by said conveyer whereby said crosswise cans also are advanced by said second conveyer, a third

conveyer the receiving end of which is lower than the discharge end of said second conveyer, and an inclined scuff plate for conveying cans between said conveyers, the guides of said second conveyer being continued across said scuff plate, the spacing of said guides and their elevation being such that the lower ends of the crosswise cans upon reaching said third conveyer make off-center engagement therewith so that they are swung into lengthwise position, the speed of said conveyer being different from that of the cans on said scuff plate.

5. A machine as set forth in claim 4 in which the third conveyer operates at a higher speed than the second conveyer.

6. A machine as set forth in claim 4 in which the third conveyer operates at a lower speed than the second conveyer.

7. A machine as set forth in claim 4 wherein the guide bars above the second conveyer are provided with downwardly converging upper edges so as to support in unstable equilibrium cans received in upright position from the first conveyer and thereby cause said cans to be turned either lengthwise or crosswise.

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