

[54] HIGH SPEED ARTICLE-TURNING MECHANISM

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[51] Int. Cl. B65g 47/24

[58] Field of Search 198/33 R, 33 AA, 33 AB, 33 AC, 198/33 AD, 41, 160, 167, 165

[56] References Cited

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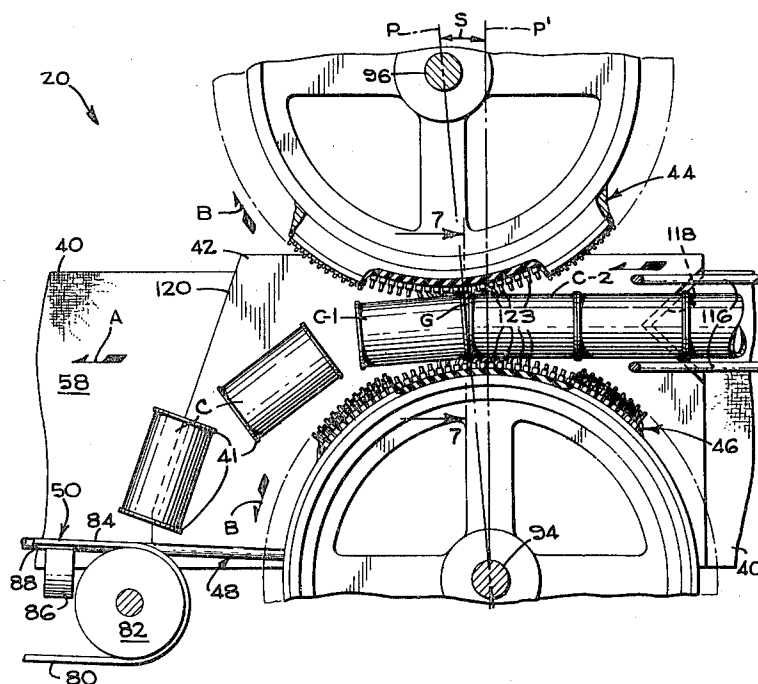
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[57] ABSTRACT

A series of ferromagnetic articles to be turned 90° are moved by an inclined conveyor along a linear path over a deadplate and between two turning drums having resilient peripheral surfaces shaped to conform to the curvature of the contacted surfaces of the articles being turned. One of the drums is driven at a higher speed than the other drum and has its axis of rotation disposed forwardly of a plane which is perpendicular to the linear path and has the axis of rotation of the other drum lying therein thereby providing an angular space or gap between one end of the article being turned and the next following article so that the resilient material on the high-speed drum will enter the space. The discharge edge of the deadplate is angled so as to be parallel to the partially turned articles causing both ends of each article to move off the deadplate onto the conveyor at the same time. A magnetic stabilizing conveyor is positioned to grip one end of each article as the article completes its turn.

18 Claims, 7 Drawing Figures



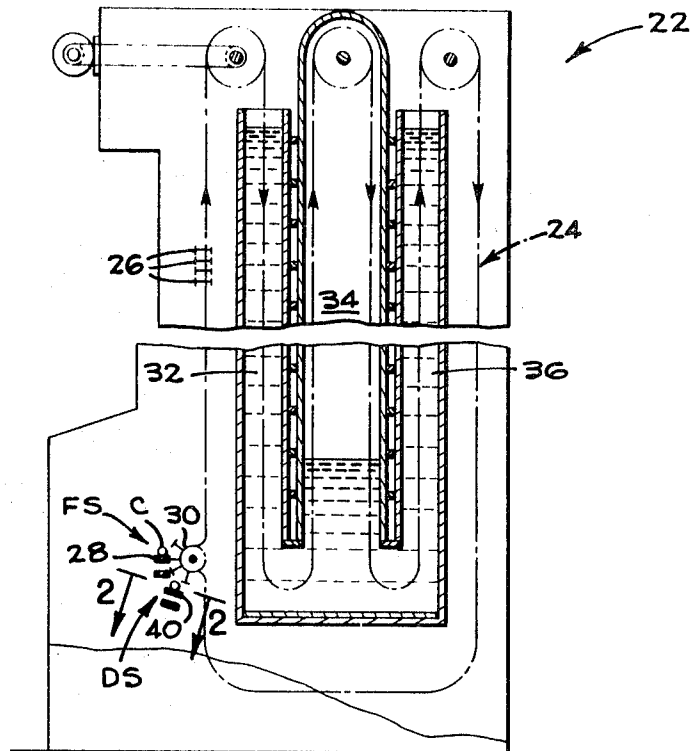


FIG. 1

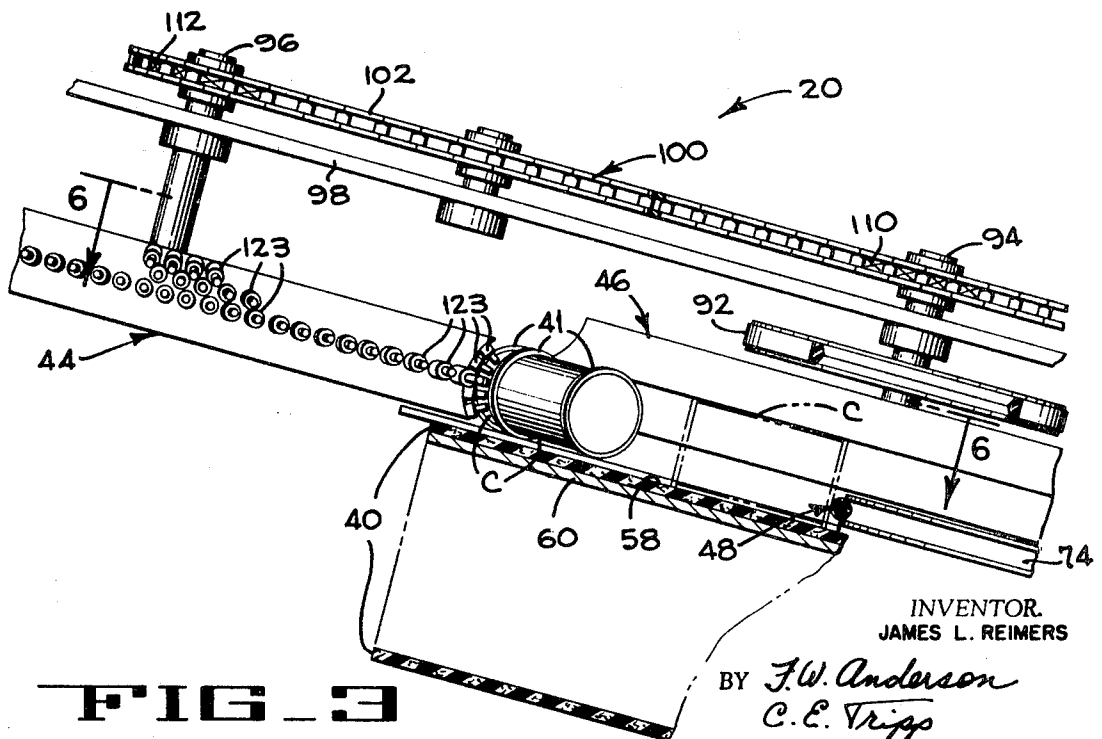


FIG. 3

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FIG-2

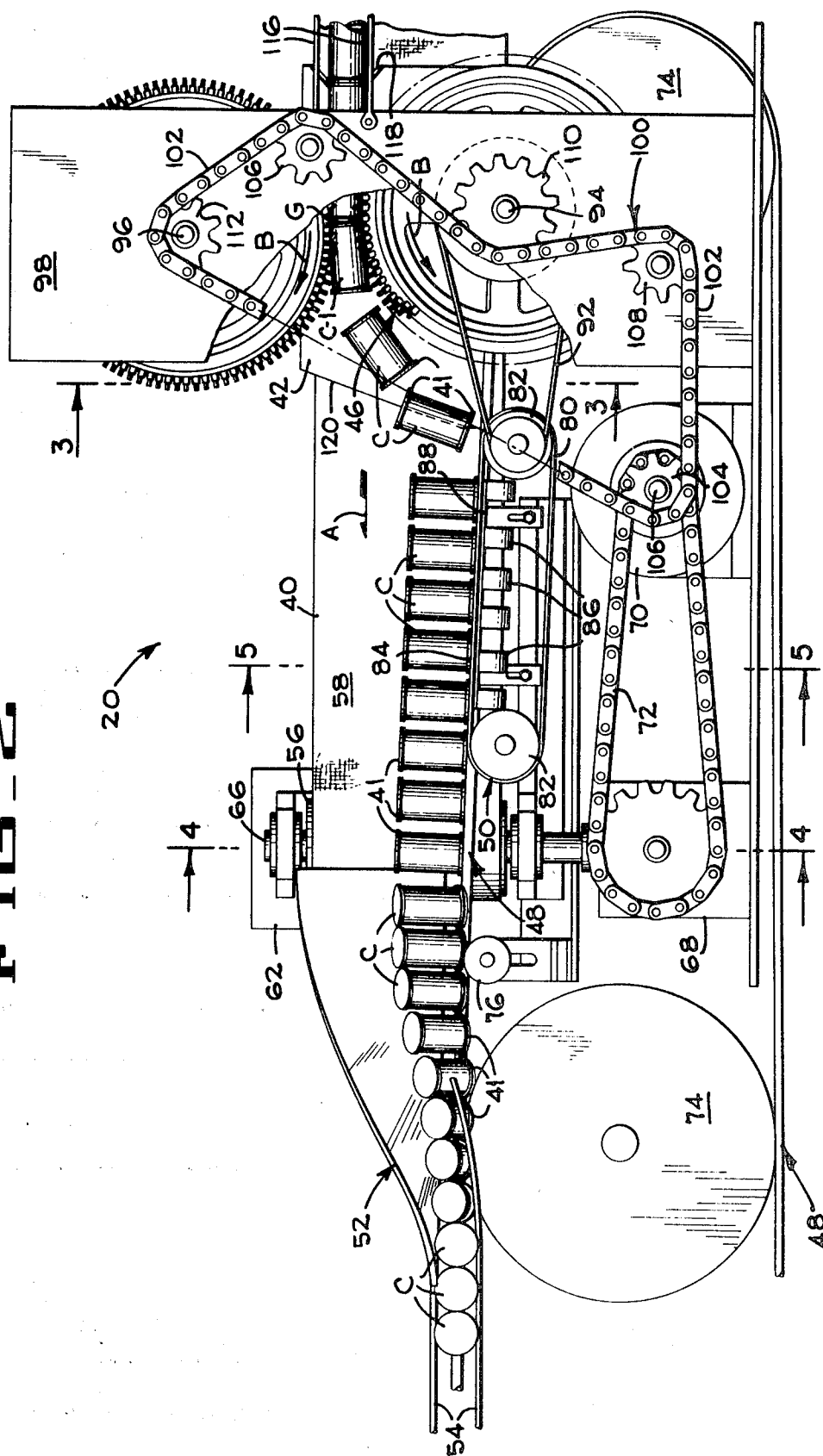


FIG 4

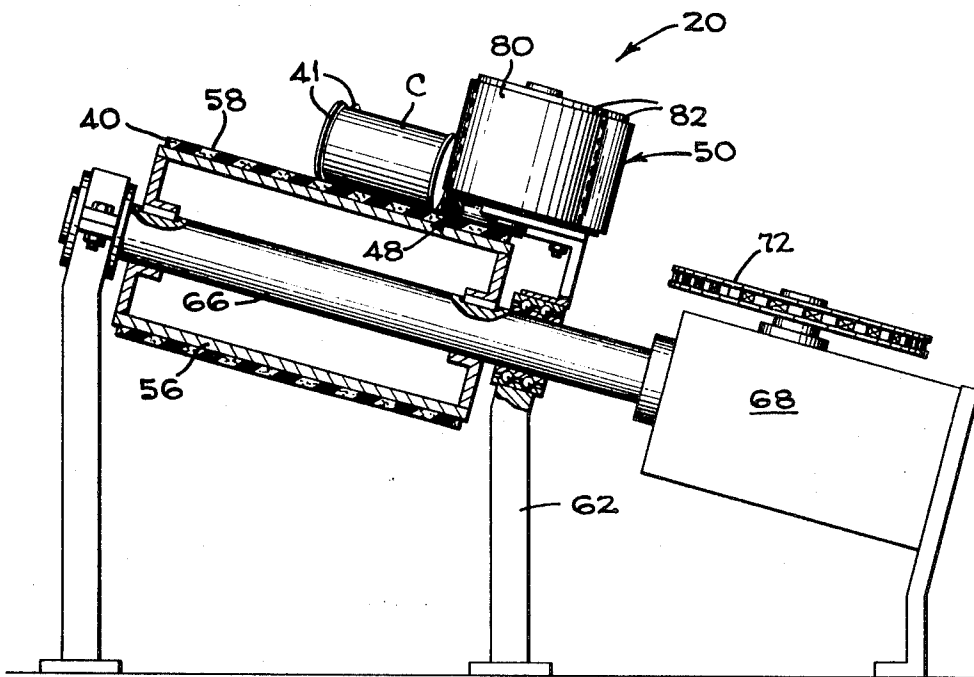


FIG 5

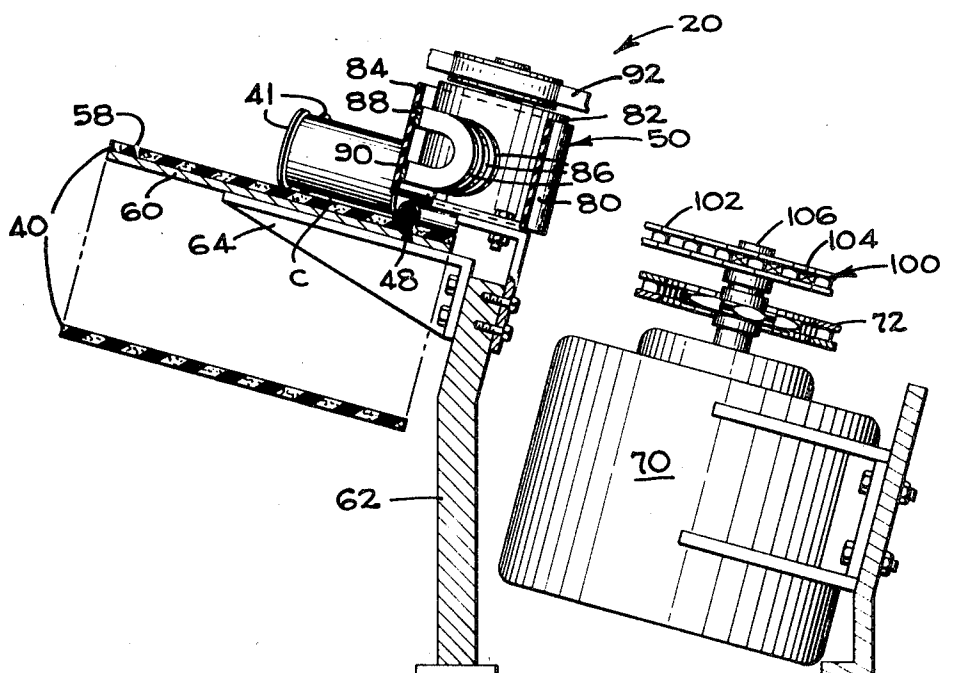


FIG 6

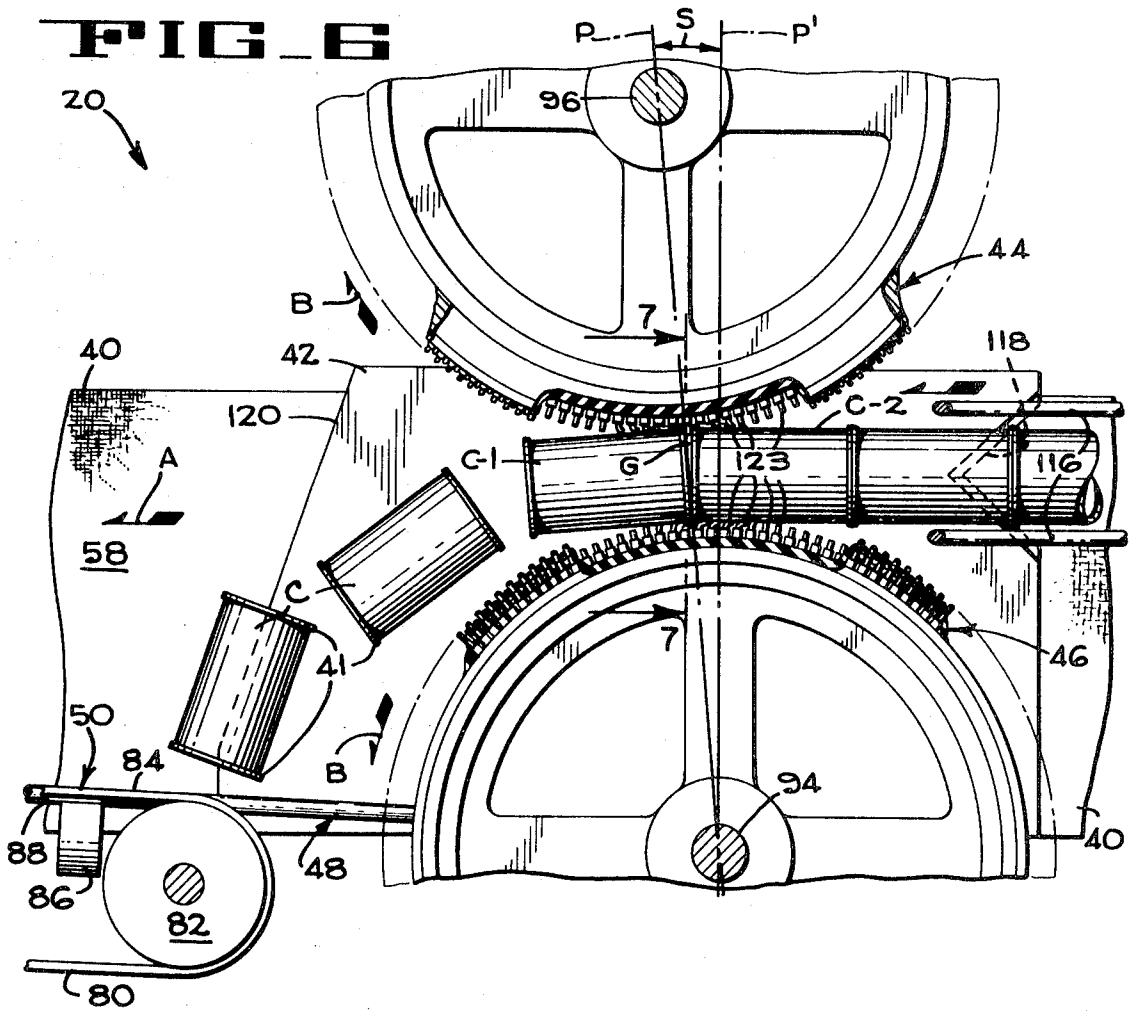
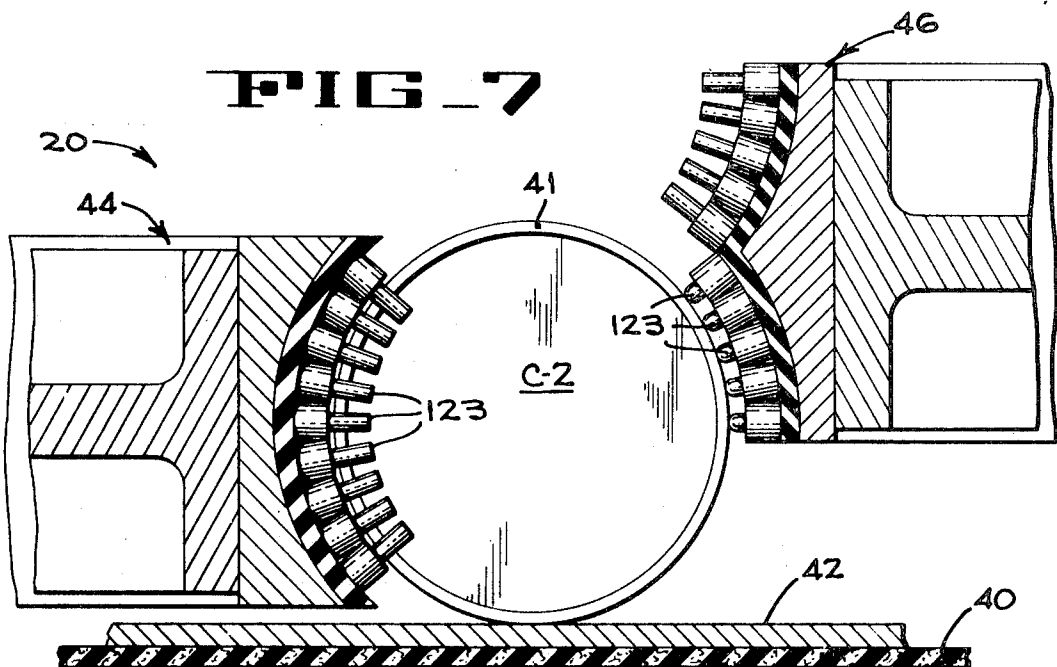


FIG 7



HIGH-SPEED ARTICLE-TURNING MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to article orienting mechanisms and more particularly relates to a high speed can turning mechanism for shifting cans received from a hydrostatic cooker between a position in axial alignment and a position wherein the cans are each supported on one end.

2. Description of Prior Art

The present invention is an improvement over the prior art devices disclosed in U.S. Pat. No. 3,403,770 which issued to Boyce et al. on Oct. 1, 1968 and U.S. Pat. No. 3,403,771 which issued to Gardiner et al. on Oct. 1, 1968, both patents being assigned to the assignee of the present invention. These prior art devices include an endless feed containers for supporting a row of containers and moving the containers between two turning drums driven at different speeds. The drums include resilient fingers on their peripheral surfaces which engage and pivot the containers about 90° when they are moving at the rate of about 600 to 1,000 cans per minute. When using these prior art devices over long periods of time, it was discovered that since the turning of the containers occurred while the containers were supported on the moving upper surface of the feed conveyor, that the amount of turn was not the same for each container. This was attributed, in part, to the fact that the coefficient of friction of the surface of the conveyor varied considerably throughout the length of the conveyor. It was also attributed to the fact that fingers on the drums would not reliably grip the containers and, accordingly, some of the containers would be given a greater turning moment than others. Thus, all of the containers were not turned the same amount and certain of the containers would not reach the 90° position or would turn beyond the desired 90° position and would fall over on their sides.

SUMMARY OF THE INVENTION

The article-turning mechanism of the present invention moves the containers onto a deadplate having a low coefficient of friction prior to engaging the containers with the turning drums. The axis of the outside turning drum is positioned forwardly of the other drum relative to the direction of movement of the containers so that the adjacent end faces of the container being turned and the next following container will be spaced from each other at the outside of the turn and will allow some of the resilient fingers of the outside drum to project between these container faces. In order to insure a better grip upon the containers, both the outside and inside turning drums have concave container-engaging surfaces which conform to the curvature of the containers. The discharge edge of the deadplate is angled so as to be substantially parallel to the axis of the container being turned so that both ends of that container will move off the deadplate and onto the conveyor at the same time.

The mechanism also includes a cable transport conveyor and a magnetic stabilizing conveyor. The stabilizing conveyor receives the turned containers and magnetically attracts one end of the containers thus preventing the containers from falling over on their sides in the event they are turned too much or too little.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic vertical central section of a hydrostatic cooker which employs the article turning mechanism of the present invention.

FIG. 2 is an enlarged top view of the turning mechanism taken looking in the direction of arrows 2—2 of FIG. 1.

FIG. 3 is an enlarged section taken along lines 3—3 of FIG. 2.

FIG. 4 is an enlarged vertical section taken along lines 4—4 of FIG. 2 illustrating the relationship of the feed conveyor, the cable transport conveyor, and the stabilizing conveyor.

FIG. 5 is an enlarged vertical section taken along lines 5—5 of FIG. 2.

FIG. 6 is an enlarged operational view in section taken along lines 6—6 of FIG. 3 illustrating the manner in which the resilient turning drum fingers grip the containers, certain parts being cut away.

FIG. 7 is an enlarged section taken along lines 7—7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The high speed article-turning mechanism 20 (FIGS. 2 to 7) of the present invention is associated with the discharge system of a hydrostatic cooker 22 (FIG. 1) which is adapted to process ferromagnetic containers C such as cans. Although containers will be referred to hereinafter as the articles being handled, it will be understood that other ferromagnetic articles may be handled with the turning mechanism of the present invention.

As diagrammatically illustrated in FIG. 1, the hydrostatic cooker 22 includes a continuously driven conveyor 24 which has a plurality of elongated carriers 26 each adapted to support a row or stick of containers C that is about 7 feet long. The rows of containers are deflected off an inlet conveyor 28 into the carriers 26 at a feed station FS when the carriers are moving around a small diameter curved portion 30 of the processing conveyor 24. The conveyor 24 carries the rows of containers in the direction indicated by the arrows in FIG. 1 through a water-filled inlet or preheating chamber 32, through a sterilizing chamber 34 having steam therein at superatmospheric pressure, and through a water filled discharge or cooling chamber 36 having cold water circulating therethrough. The rows of processed containers are then returned to the small diameter curved portion 30 and are gravitationally discharged at a discharge station DS onto an inclined conveyor 40 which forms part of the article-turning mechanism 20 of the present invention.

In general, the turning mechanism 20 comprises the inclined conveyor 40 which advances the containers while supported on the cylindrical surfaces of their chimes 41 onto a deadplate 42 and between an outer turning drum 44 and an inner turning drum 46. After turning the containers as indicated in FIGS. 2 and 6, the containers C gravitate against a cable transport conveyor 48 and a short magnetic stabilizing conveyor 50 which magnetically grips one end of each container thereby stabilizing the containers. The cable transport conveyor 48 then strips the containers from the stabilizing conveyor 50 and moves them past a twister 52 and guide rails 54 which cooperate to shift the containers C from an inclined position to an upright position.

More specifically, the inclined conveyor 40 includes an endless belt which is trained around a pair of rollers 56 (only one roller being shown) and has its upper run 58 supported by a guide plate 60 (FIGS. 3 and 5) that is connected to the frame 62 of the machine by brackets 64 (FIG. 5). The roller 56 (FIG. 4) is keyed to a shaft 66 journaled in the frame 62 and is driven by a right-angle gearbox 68 connected to a motor 70 (FIGS. 2 and 5) by a chain drive 72. The upper run of the conveyor 40 is driven in the direction of arrows A (FIG. 2) at the rate of between about 200 to 350 feet per minute, preferably about 205 feet per minute, thereby handling about 500 to 1,000 cans per minute when the cans are 4 inches long.

The cable conveyor 48 is trained around several large diameter rollers 74 (FIG. 2), and at least one small idler 76 and has its upper run driven at about 290 feet per minute and in the same direction as the upper run of the conveyor 40 by drive means (not shown).

The magnetic stabilizing conveyor 50 comprises an endless belt 80 which is trained around a pair of pulleys 82 journaled in the frame 62 so that the container contacting run 84 of the conveyor 50 is perpendicular to the upper run of the inclined conveyor 40 and is in alignment with the upper run of the cable conveyor 48. A plurality of permanent magnets 86 are connected to magnetic strips 88 and 90 (FIG. 5) which are in turn connected to the frame 62 and are disposed immediately adjacent the run 84 of the conveyor 50. The run 84 of the con-

veyor 50 is driven at about 230 feet per minute and in the same direction as the upper run of the conveyor 40 by a belt drive 92 (FIG. 2) connected to the shaft 94 of the inner turning drum 46.

As best shown in FIGS. 2 and 3, the shaft 96 of the outer turning drum 44 and the shaft 94 of the inner turning drum 46 are journaled in an inclined plate 98 of the frame 62. The drums 44 and 46 are driven in opposite directions as indicated by the arrows B on FIG. 2 by a chain drive 100. The chain drive 100 includes a chain 102 trained around a drive sprocket 104 keyed to the shaft 106 of the motor 70. The chain 102 is also trained around idler sprockets 106 and 108 and around driven sprockets 110 and 112 that are keyed to the shafts 94 and 96 respectively. When the linear speeds of the container contacting runs of the conveyors 40, 48 and 50 are driven at the rate of about 205, 290, and 230 feet per minute, respectively, and when the diameter of the turning drums 44 and 46 are both 15½ inches, a peripheral speed of 205 feet per minute for the inner drum 46 and a peripheral speed of 345 feet per minute for the outer drum was found to be satisfactory when handling cans discharged from the carriers 26 (FIG. 1) at the average rate of about 500 containers per minute.

As mentioned previously, in order to consistently turn each container uniformly, it was determined that all containers while turning should be supported on a surface having a low coefficient of friction, and that the drums 44 and 46 should grip all containers with substantially the same gripping force during turning.

Accordingly, the deadplate 42 is provided with a "Teflon" (polytetrafluoroethylene) upper surface. Since the peripheral speed of the inner drum and the speed of the inclined conveyor 40 is the same, it has been found that the containers are uniformly turned if they are in abutting contact as illustrated or if they are presented to the drum 44 and 46 singly. The containers are guided onto the deadplate 42 by guide rails 116 and by a V-shaped inlet edge 118. The trailing edge 120 (FIG. 2) of the deadplate 42 is angled so that both ends of the containers C will roll off the deadplate 42 at the same time, i.e., if the containers are cans both chimes 41 will partially slide and partially roll off the deadplate 42 at the same time as indicated in FIG. 2.

An important feature of the invention is that the periphery of both drums 44 and 46 are concave and are provided with resilient container engaging fingers 123. The outer drum 44 is curved so as to conform to the curvature of the containers C and is positioned so as to grip the containers equally above and below the center line of the containers. The periphery of the inner drum 46 is likewise curved but is curved so as to engage only the upper portion of the containers thus firmly holding the containers against the deadplate 42.

Another important feature of the invention is that the axis of the shafts 94 and 96 lie in a plane P (FIG. 6) which is angled forwardly by the amount indicated by angle S, preferably about 2°, from a plane P' that includes the axis of the shaft 94 and is perpendicular to the path of movement of the containers C entering the deadplate 42. Thus, by virtue of the angle S, a gap G is formed in the outer portion of the foremost container C-1 thereby causing this portion of the container to become spaced from the next following container C-2. The formation of the gap G permits some of the resilient fingers 123 of the outer drum 44 to enter the gap G and accordingly these fingers will more firmly grip and propel the container C-1 as it is being turned. In this way each and every container C is more uniformly gripped, and because of such uniform gripping plus the low coefficient of friction of the deadplate 42, there is less chance of any of the containers being turned less than or in excess of the desired 90°.

It will also be noted that by angling the axis of the outer drum 44 forwardly of the inner drum 46 all relative to the direction of movement of the containers C as above described, the containers are bodily turned or "aimed" in the direction of turn prior to being released by both drums 44 and 46 thereby providing a propelling force, in addition to the force due to the

higher speed of the drum 44, in the direction in which the containers are turned. Thus, this "aiming" of the containers aids the high speed outer drum 44 in reliably gripping as well as propelling the containers toward the magnetic stabilizing conveyor 50.

In operation, rows of sticks of processed containers C are discharged from the hydrostatic cooker 22 (FIG. 1) and are advanced by the conveyor 40 (FIGS. 2 and 6) between the guide rails 116 and onto the deadplate 42. The containers may either be in end-to-end contact or be advanced one at a time into engagement with the turning drums 44 and 46. Since the axis of rotation of the outer high speed turning drum 44 is angled forwardly of the axis of rotation of the inner drum 46, the foremost container C-1 is angled in the direction of turn causing a gap G to occur between the adjacent end faces of the containers outwardly of the turn. This gap G permits some of the resilient fingers 123 of the outer drum 44 to project between the containers C-1 and C-2 thus firmly gripping the container C-1 being turned. The concave curvature of the outer drum 44 also assures a firm turning grip on the container C-1 while the downwardly directed concave surface of the inner drum 46 assures that the containers will be firmly pushed into contact with the deadplate 42 which assures that the containers will not chatter. The containers C are thus reliably turned so that both ends of each container will roll off the angled discharge edge 120 of the deadplate 42 at the same time. The containers C then complete their turns and are magnetically gripped against the stabilizing conveyor 50 prior to being shifted to an upright position by the twister 52.

From the foregoing description it is apparent that the high speed article turning mechanism of the present invention maintains turning control over the containers by receiving containers either singly or in end-to-end contact on a deadplate having a low coefficient of friction, and by aiming the containers to be turned in the direction of turn prior to release from the turning drums so that resilient fingers on the concave peripheral surface of the outer high speed drum can move into the gap between the containers. Turning control is also aided by the concave periphery of the inner turning drum which peripheral surface engages only the upper portion of the containers being turned thereby urging the containers downwardly against the deadplate. After the containers have been released from the turning drums, inertia continues to turn the containers so that the ends of each container roll off the angled discharge edge of the deadplate at the same time. The containers then complete their 90° turns and are engaged and stabilized by the magnetic stabilizing conveyor.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

What I claim is:

1. A high speed article turning mechanism of the type comprising a continuously driven inclined conveyor for moving a row of cylindrical articles at high speed along a linear path, an outer turning drum mounted for rotation about a first axis and having a resilient peripheral surface for engaging the articles, an inner turning drum mounted for rotation about a second axis and having a resilient peripheral surface for engaging another portion of each article, said drums being over said inclined conveyor, means for driving said outer and inner turning drums with the outer drum being driven at a faster peripheral speed than said inclined conveyor and said inner drum, and a driven discharge conveying means for receiving one end of each article after the article has been turned through an angle of about 90° and for removing the articles from the turning mechanism; the improvement comprising a dead plate over said inclined conveyor and under said drums, said deadplate receiving articles from said inclined conveyor and forming a turning station for the articles, said deadplate delivering the turned articles to said inclined conveyor, said deadplate having a lower coefficient of friction than said inclined conveyor.

2. A high speed article turning mechanism according to claim 1 wherein the peripheral surfaces of the outer and inner turning drums are concave.

3. A high speed article turning mechanism according to claim 1 wherein the deadplate includes a discharge edge which is angled in a direction parallel to the axis of each article as each article moves off said deadplate onto said inclined conveyor.

4. An article turning mechanism according to claim 1 wherein said resilient peripheral surface of said inner drum is concave and is positioned to push the articles downwardly against said deadplate.

5. An article turning mechanism according to claim 4 wherein said deadplate has a low coefficient of friction.

6. A high speed article-turning mechanism of the type comprising a continuously driven inclined conveyor for moving a row of cylindrical articles at high speed along a linear path, an outer turning drum mounted for rotation about a first axis and having a resilient peripheral surface for engaging the articles at a turning station, an inner turning drum mounted for rotation about a second axis and having a resilient peripheral surface for engaging another portion of each article at the turning station, means for driving said outer and inner turning drums with the outer drum being driven at a faster peripheral speed than said conveyor and said inner drum, and driven discharge conveying means for receiving one end of each article after the article has been turned through an angle about 90° and for removing the article from the turning mechanism; the improvement wherein said first and second drum axes lie in a common plane which is angled such that said first axis is disposed forwardly of a second plane that is perpendicular to said linear path and contains said second axis causing a gap to occur between the article being turned and the next following article into which some of the resilient material on the outer drum projects.

7. A high speed article-turning mechanism according to claim 6 wherein the resilient peripheral surface of said outer drum is concave.

8. A high speed article-turning mechanism according to claim 7 wherein said peripheral surface includes resilient fingers, and wherein some of said resilient fingers project into said gap to firmly engage and propel the article during the turning operation.

9. A high speed article-turning mechanism according to claim 8 wherein the peripheral surface of both the outer and inner drums include resilient fingers.

10. A high speed article-turning mechanism according to claim 7 wherein the article contacting resilient peripheral surface of said inner drum is concave.

11. A high speed article-turning mechanism of the type comprising a continuously driven inclined conveyor for mov-

ing a row of ferromagnetic cylindrical articles at high speed along a linear path, an outer turning drum mounted for rotation about a first axis and having a concave resilient peripheral surface for engaging the articles, an inner turning drum mounted for rotation about a second axis and having a resilient peripheral surface for engaging another portion of the articles, and means for driving said outer and inner turning drums with the outer drum being driven at a faster peripheral speed than said conveyor and said inner drum; the improvement comprising a deadplate disposed over said inclined conveyor at a turning station for receiving articles therefrom, and a magnetic stabilizing conveyor positioned to receive one end of each article after the article has been turned through an angle of about 90°, said stabilizing conveyor having a container contacting run disposed adjacent the lower edge of said inclined conveyor and being driven in the same direction and at substantially the same speed as said inclined conveyor.

12. An article turning mechanism according to claim 11 wherein said first and said second axis lie in a common plane, which plane is angled so that said first axis is disposed forwardly of a second plane that is perpendicular to said linear path and contains said second axis.

13. An article-turning mechanism according to claim 12 wherein the articles are containers and wherein the forward position of said first axis relative to said second axis causes a gap to open between those portions of the container being turned and the next following container which contact said concave peripheral resilient surface of said outer turning drum.

14. An article turning mechanism according to claim 13 wherein the resilient surface of said outer turning drum includes resilient fingers, and wherein some of said resilient fingers project into said gap to firmly engage and propel the container during the turning operation.

15. An article-turning mechanism according to claim 14 wherein said deadplate includes a discharge edge which is angled in a direction parallel to the axis of the containers as the containers move off said deadplate onto said inclined conveyor.

16. An article turning mechanism according to claim 14 wherein said resilient peripheral surface of said inner drum is concave and includes radially extending resilient fingers which grip the containers.

17. An article-turning mechanism according to claim 11 wherein said deadplate includes a discharge edge which is angled in a direction parallel to the axis of each article as each article moves off said deadplate onto said inclined conveyor.

18. An article turning mechanism according to claim 11 which reliably operates at a speed of between about 500 to 1,000 containers per minute.

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