July 31, 1962 J. G. McKAY 3,047,123

CARTON ROTATING AND CONVEYING APPARATUS

Filed Feb. 29, 1960 4 Sheets-Sheet 1

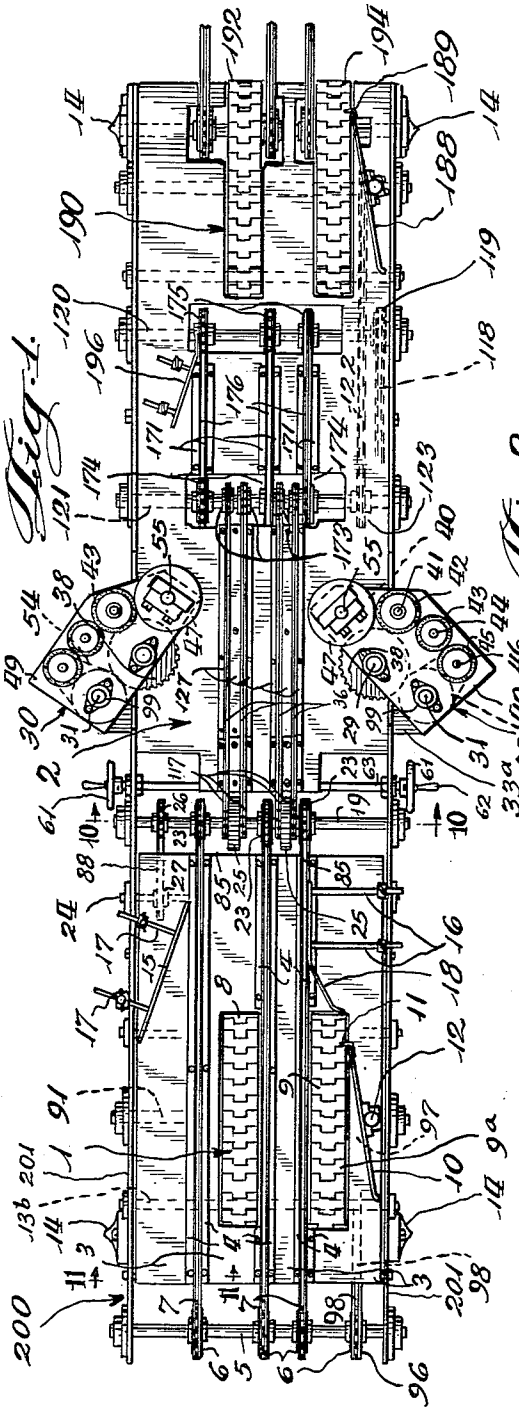


Fig. 1.

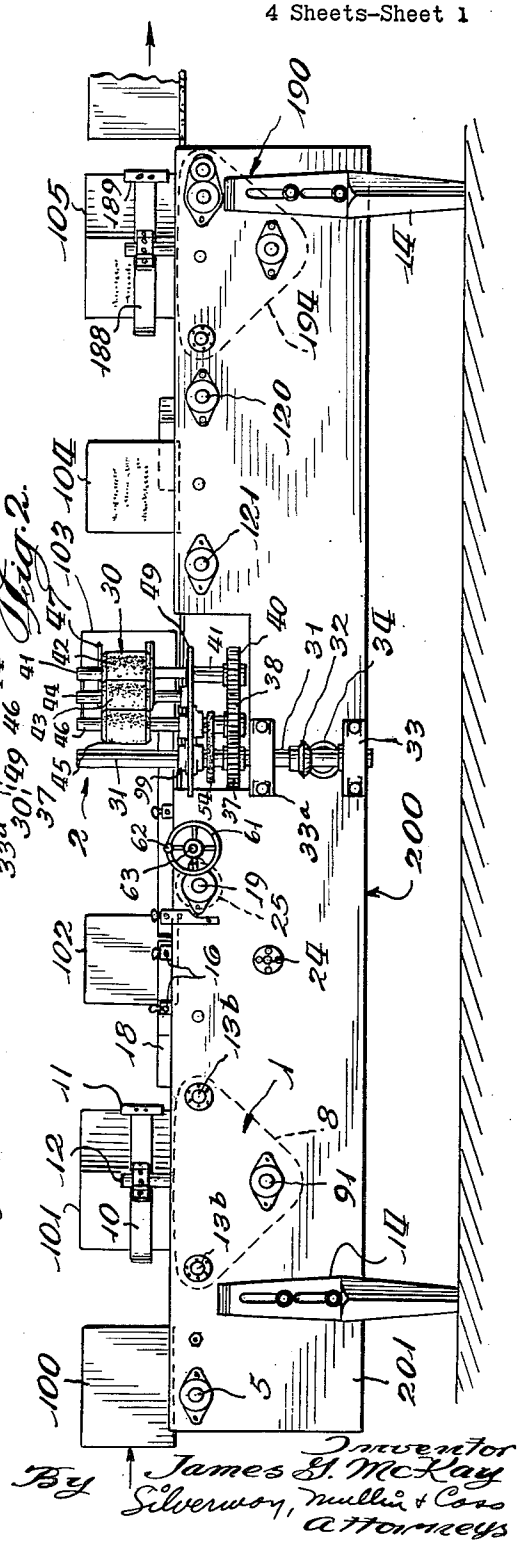


Fig. 2.

Inventor
James G. McKay
By Silverman, Mullin & Cass
Attorneys

July 31, 1962 J. G. McKAY 3,047,123

CARTON ROTATING AND CONVEYING APPARATUS

Filed Feb. 29, 1960 4 Sheets-Sheet 2

Fig. 6.

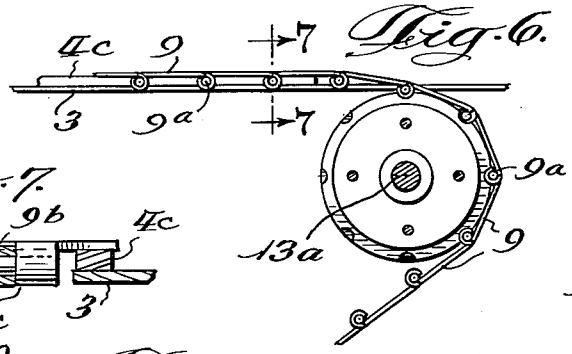


Fig. 7a.

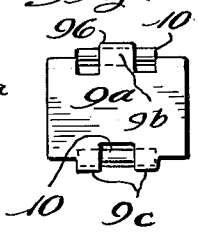


Fig. 7.

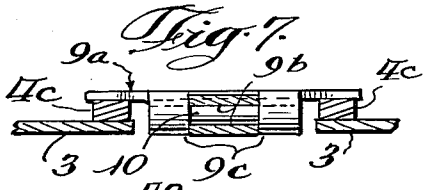
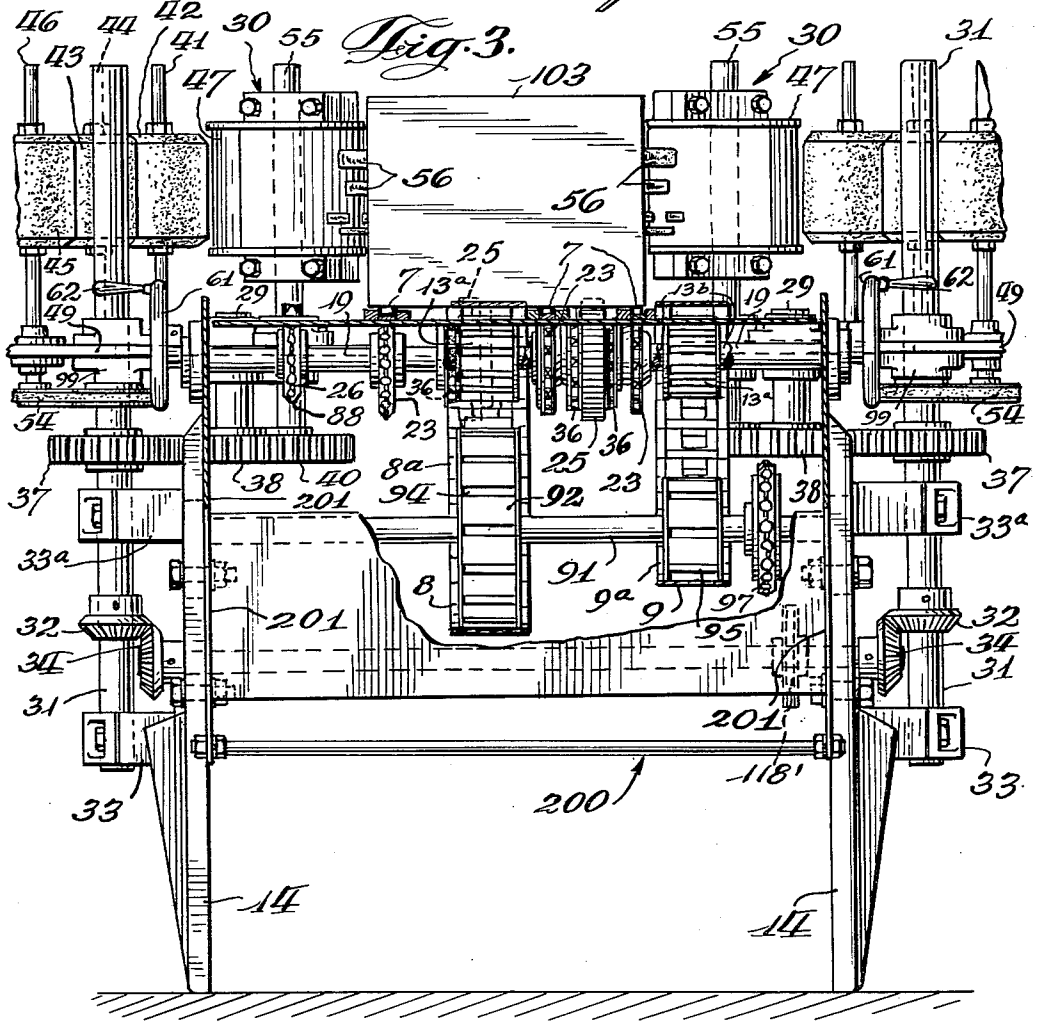


Fig. 3.



Inventors
James G. McKay
By Silverman, Mullin & Cox
Attorneys

July 31, 1962 J. G. McKAY 3,047,123

CARTON ROTATING AND CONVEYING APPARATUS

Filed Feb. 29, 1960 4 Sheets-Sheet 3

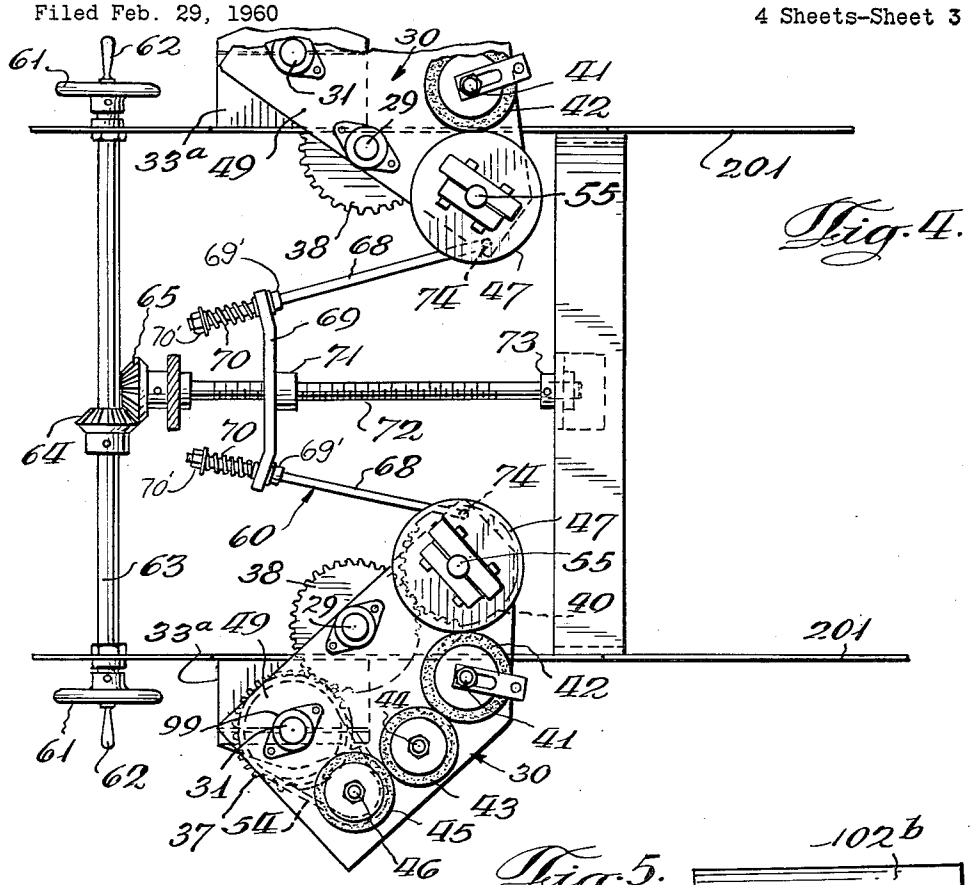


Fig. 4.

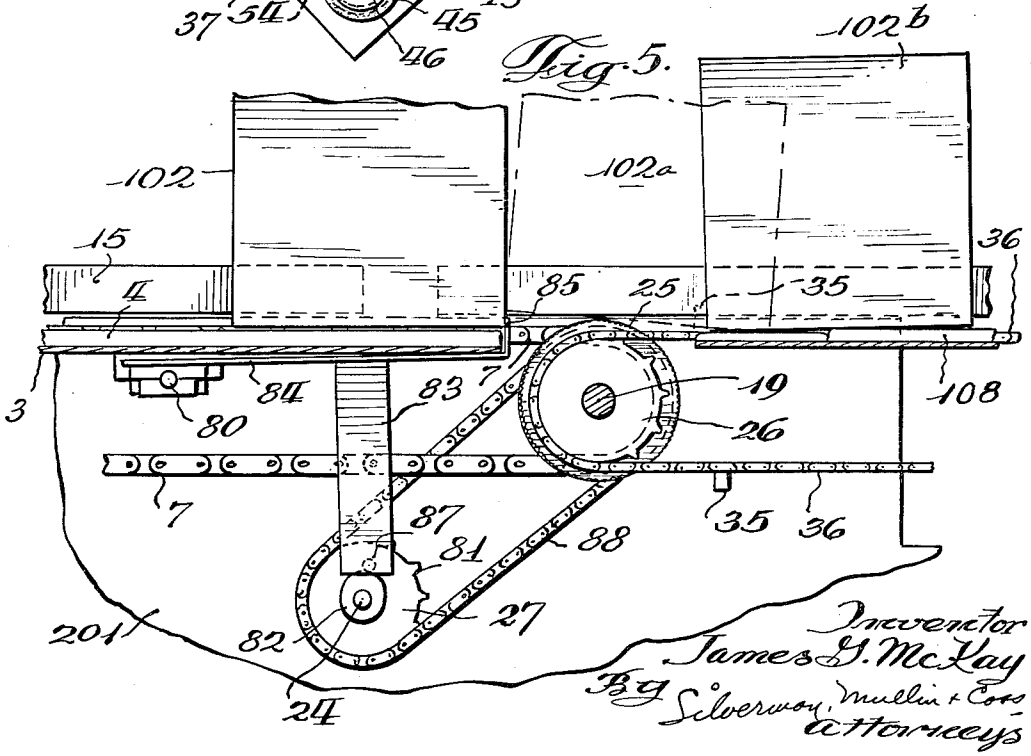


Fig. 5.

Inventor
James G. McKay
By Silverman, Mullin & Cass
attorneys

July 31, 1962 J. G. McKAY 3,047,123

CARTON ROTATING AND CONVEYING APPARATUS

Filed Feb. 29, 1960 4 Sheets-Sheet 4

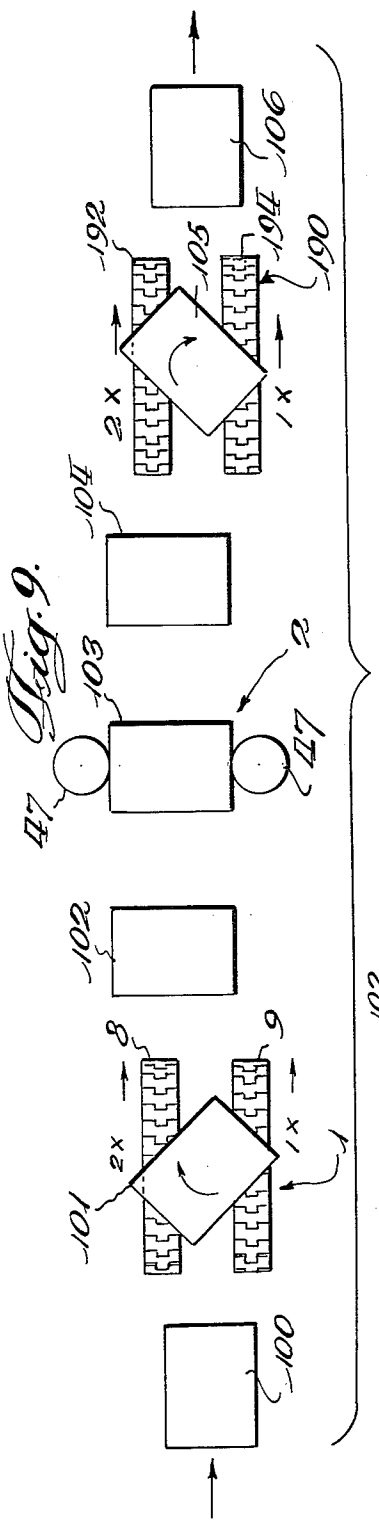


Fig. 9.

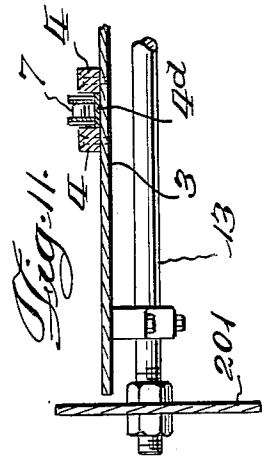


Fig. 11.

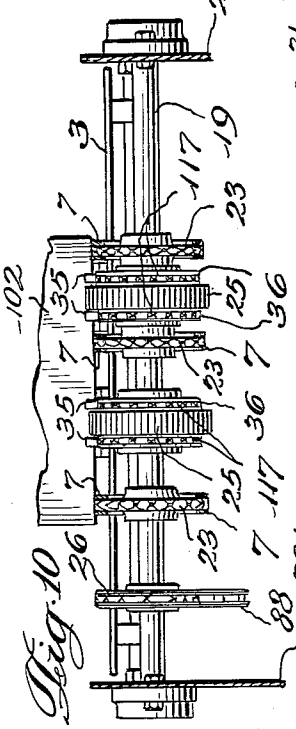


Fig. 10

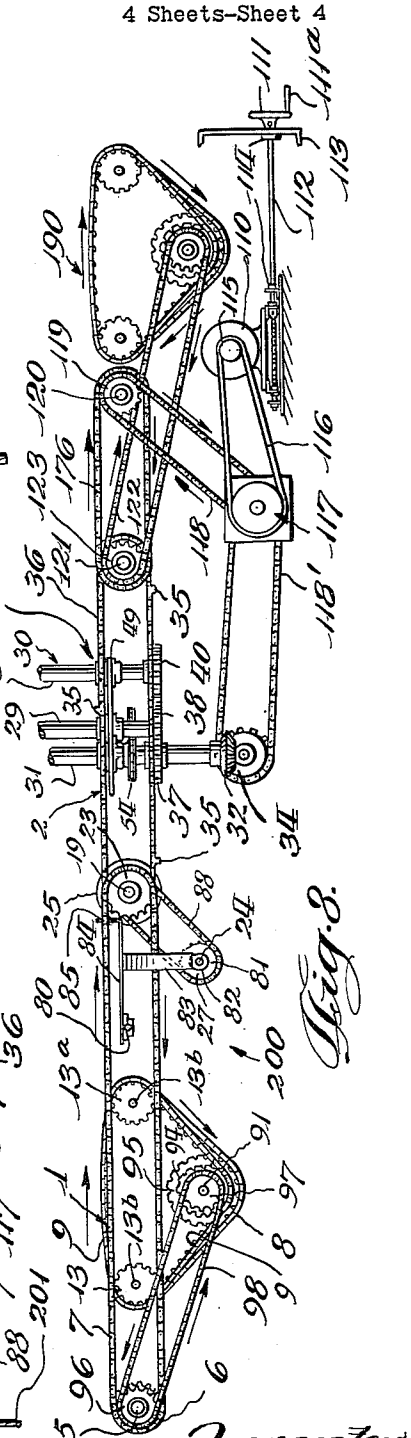


Fig. 8.

Inventor
James G. McKay
By Silverman, Mullin & Cass
Attorneys

United States Patent Office

3,047,123

Patented July 31, 1962

3,047,123

CARTON ROTATING AND CONVEYING APPARATUS

James G. McKay, 5138 N. Mobile Ave., Chicago, Ill.

Filed Feb. 29, 1960, Ser. No. 11,693
8 Claims. (Cl. 198—33)

This invention relates in general to a carton or box rotating and conveying system and more particularly relates to a differential drive box rotator and to an aligning arrangement for use in an automatic conveying system.

Recent developments in automatic packaging equipment require that cartons or boxes be packed, sealed and imprinted reliably at high speed and that the equipment for performing these functions be adapted for a variable size box, container or package. The containers are provided with flaps extending longitudinally along the top and parallel to the direction of travel to permit easy sealing under control of apparatus placed along the sides of the system, but then each carton or box must be rotated or turned to permit printing on one or both sides perpendicular to the long axis of the flaps. Approaches to the problem of turning the box to permit easy printing vary from manual to automatic, although the most usual is to provide an automatically operated turntable in the conveying line or system for rotating the boxes.

The use of turntables, however, limits the speed and versatility of the system as the containers or boxes are often of considerable weight and a sufficient time interval must be allowed between containers to permit the turntable to receive the box and rotate or turn it. In addition, considerable complicated mechanism and apparatus must be provided to properly shift the boxes to and off the turntable and coordinate its movement with the rest of the system or line.

In the present invention these problems are eliminated by the simple expedient of providing a pair of chains moving parallel with the conveyor route, but at different speeds to provide a net speed of movement of one chain relative the other for conveying a box along its normal route with one side moving faster than the other so that the box is turned without interruption of its progress. With this arrangement boxes weighing up to sixty pounds each have been readily rotated at the rate of sixty per minute.

In addition, the apparatus of the present invention provides considerable flexibility in the size of container which may be turned while being conveyed. Thus, normally a pair of differential rotating chains are dimensioned to be fifty percent longer than the longest box to be turned with one chain moving at twice the speed of the other, but by the provision of a simple adjustable projection extending into the path of box travel for engaging one corner of a box greater than that length, the end of the box may be held while the other side is moved by one of the chains. This rotates the box about the engaged corner and thus accomplishes the rotation for boxes of considerably greater than normal length.

For preventing excessive turning such as might occur if an extremely short box were being conveyed and for otherwise guiding the boxes, adjustable brackets are provided adjacent the sides of the conveyor line for guiding the swivelled or turned box as it approaches the end of the turning chain run to prevent it from entering the conveyor route or channel at an angle of other than 90° to its original position.

To solve the problem of securing print registration on boxes moving at the high speed accommodated by this system, a simple cam controlled stop is provided for engaging the front of each box after it is rotated. This permits a lug synchronized with the type position thereafter to guide the box from a determined position. In addition, as each box may be immediately followed by another, an arrangement is provided for ensuring that the stop can engage the succeeding box for synchronizing or aligning its position with respect to the print roller.

It is, therefore, an object of the present invention to provide an automatically operated, economical, flexible and simplified container rotator and aligning arrangement in a conveying system.

It is another object of the present invention to provide for the rotation of containers in a conveying system, while carrying the same along the normal direction of travel.

It is another object of this invention to provide for the high speed rotation and automatic conveying of variable size containers, which may carry substantial weight.

It is another object of this invention to provide simple, economical, automatically operated apparatus in a container conveyor system for synchronizing and adjusting the movement of a rotated container with respect to apparatus positioned along the conveying route.

It is still another object of this invention to ensure that an automatically rotated container in a conveying system is positioned to permit printing to be registered thereon in a predetermined location.

It is still another object of this invention to ensure that successive boxes moving at high speed in an automatic conveying system are synchronized and aligned by permitting apparatus to engage the front position of successive boxes for retarding the motion thereof, although in close proximity to the rear portion of a preceding box.

A feature of this invention is the arrangement which conveys each carton along its path of travel, while rotating it.

Another feature of this invention is the provision of a pair of conveying belts, chains or like apparatus which move at different speeds to rotate a box being conveyed thereby.

Another feature of this invention is the provision of simple bracket arrangements for guiding boxes of considerable difference in size during and after rotation of each box to ensure their proper position with respect to the conveying route.

Another feature of this invention is the provision of a simple bracket arrangement for cooperating with the conveying chain to rotate boxes of considerable length.

Another feature of this invention is the provision of a single cam controlled stop arrangement for aligning the position of each box with the position of certain moving apparatus displaced along the conveyor route.

Still another feature of this invention is the provision of a simple arrangement for tipping each box after being disengaged from the stop to permit the stop to engage the front of a succeeding box which may be in close proximity to the preceding box.

With the foregoing objects, features and advantages in view together with others which will appear as the description proceeds, it will be noted that the invention comprises certain novel features of construction, arrangement and structure hereinafter more fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, and that various changes in the form, proportion, size and minor details of the described construction, arrangement and structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of this invention, there is illustrated in the accompanying drawings a preferred embodiment, from an inspection of which, when considered in connection with the following description, this invention, its mode of construction, as-

sembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawings in which the same characters or reference are employed to indicate corresponding or similar parts throughout the several figures of the drawings:

FIGS. 1 and 2 are top and side views respectively of a conveying system incorporating the concepts of the present invention.

FIG. 3 is a fragmentary elevational view taken to show apparatus along several different planes.

FIG. 4 is a fragmentary plan view showing some of the details of the print roll adjustment arrangement.

FIG. 5 is a fragmentary side elevational view of the conveying system showing the details of the stop arrangement whereby the box position is synchronized with the movement of the print roller.

FIGS. 6, 7 and 7*a* are detailed semi-diagrammatic views of respective chain segments.

FIG. 8 is a schematic view of the structure for powering the various apparatus of the conveying system.

FIG. 9 is a diagrammatic side view of the structure for positioning the boxes and illustrating the relationship of various apparatus during the progress of moving a box over the conveying route.

FIG. 10 is a sectional view taken along the line **10**—**10** in FIG. 1 and showing the manner in which a portion of the conveying apparatus is disposed.

FIG. 11 is a fragmentary sectional view taken along the line **11**—**11** in FIG. 1 illustrating one arrangement of the supporting wear and guide plates for the conveying chains.

The invention generally may be described by reference to FIGS. 8 and 9 in conjunction with FIGS. 1 and 2. In FIG. 9 a box or container indicated by the reference character **100** is shown as it is initially received on the conveyor **200**. It is then carried by the conveying chains **7** as may be seen by reference to FIGS. 1 and 8 to the box rotating stage indicated at 1. Rotation of the box at that stage permits the print to be registered on the appropriate side of the box.

Stage 1 comprises the differentially driven belts or chains **8** and **9** seen in FIGS. 1 and 9 which rotate the box indicated by the reference character **101** clockwise as indicated by the arrow, due to the comparatively rapid movement of chain **8** with respect to chain **9**. The chain speed is controlled by the peripheral speed of the individually associated sprockets **94** and **95** respectively, which are, in turn, driven from the shaft **91**. Thus to turn a box that is for example substantially 50% as long as the chains **8** and **9**, chain **8** is driven at twice the speed of chain **9**. The length of the chains and speed of movement are of course dictated by the needs of the system. After the box **101** has been rotated, it is again carried forward by chains **7** and brought to a halt by the stop **85** in the position indicated by box **102**.

As seen in FIG. 1, an adjustable bracket **15** is adjacent the end of chains **8** and **9** provided along one side of the conveyor **200** and is mounted at an angle to the direction of box travel. A somewhat similar bracket **18** is mounted at the other side of the conveyor **200** substantially opposite the bracket **15**. Inasmuch as the portion of the box carried by chain **8** is moving faster than the portion carried by chain **9**, the faster moving portion rotates about the slower to swivel the long axis of the box beyond chain **8**. That side or portion will therefore engage bracket **15** which prevents excessive turning by guiding that side of the box. Similarly, bracket **18** can engage the other side of the box to prevent excessive turning. Both brackets **15** and **18** are positioned to realign the box in a desired position with respect to the sides **201** of the conveyor **200** and are arranged so that as the box is guided inwardly from either bracket, a turn of more than 90° is prevented by their presence.

Adjustable bracket **10** having the projection **11** extending over the chain **9** is provided when boxes of longer than normal dimension are to be handled. Thus such a box would not be fully turned by the time its front end reached the end of chains **8** and **9**. Projection **11** engages the adjacent front corner of the box and holds it until the portion carried by chain **8** is fully rotated at which time the engaged corner is rotated out of engagement with projection **11** and guided by brackets **15** and **18** into the desired position on the conveyor **200**.

The stop **85** is provided for the purpose of terminating movement of the box toward the print rolls **47** until the guides or lugs **35** are properly positioned with respect thereto. The lugs **35** are located in predetermined positions on conveying chains **36** of the second or printing stage **2** with respect to the type face on print rolls **47** and are moved at a corresponding speed to insure that the print is registered in the proper position on each box.

At the appropriate interval the stop **85** is released by cam **82** shown in FIGS. 5 and 8 and the box then given a slight forward and upward projection by a pair of serrated or knurled wheels indicated at **25**. As the box **102**, for example, moves over the wheels, it tips forward to permit stop **85** immediately to engage the next box. A lug **35** on each of the conveying chains **36** engages the rear side of the box **102** and moves it positively forward. The position of the box with respect to the print rolls **47** is synchronized by the engaging lugs **35** to insure that the print is properly registered thereon.

Additional synchronizing means may be provided by inclined plate **108** seen in FIG. 5. As the box indicated by **102***b* may be carried forward by chains **36**, the box is raised above the level of the chains **36** and its movement terminated. Lug **35** then comes along and drives the box forward. Its position is therefore synchronized with the print rolls.

The box, now designated **103** passes between the print rolls **47** on the print assembly generally indicated by the reference character **30**. The print rolls **47** act thereon to register print on either or both sides of the box, and it is thereafter conveyed forward to a position generally indicated by box **104**. It may then either be rotated again for another operation, as shown by boxes **105** and **106**, if necessary to permit easier unloading, or if otherwise desired, simply conveyed to a succeeding destination.

Referring now to FIG. 8 showing a general schematic arrangement of the power transmission system, it will be seen that a motor **110** furnishes power to the entire conveyor system whereby all movements are synchronized. The motor **110** carries an adjustable pulley **115** of any well known type, which may be manually adjusted by turning handle **111***a* and wheel **111** to rotate rod **112**, which is supported by bracket **13** and threaded through nut **114**. Motor **110** is reciprocated thereby to adjust the tension or engagement of belt **116** with respect to pulley **115**. This is provided to vary the speed at which the system operates.

The belt **116** transmits power to a gear reducer arrangement generally indicated at **117**, which in turn drives the chains **118** and **118'**. The chain **118** is driven in the direction indicated by the associated arrow, and other respective chains in the system are likewise driven in the direction indicated by an arrow associated therewith. Chain **118'** is arranged to drive gear **34** in any well-known manner to drive in turn the print rollers **47** through gear **32** and shaft **31** journalled at **33**, as shown in FIG. 1. Alternatively gears **34** and **32** and the print rollers **47** may be driven by chains **118** in a manner that will become apparent.

Chain **118** drives sprocket **119** and its connected shaft **120**. Sprocket **119** and shaft **120** have associated therewith a number of other sprockets **175** for driving respective chains **176** laterally displaced along shaft **120** as may best be seen by reference to FIG. 1. The power transmitted from chain **118** to sprocket **119** and shaft **120** is transmitted by way of chains **176** to respective sprockets

174, which are mounted on shaft 121. Shaft 121 carries a number of other sprockets 119 laterally displaced therealong including the sprocket 123. The power transmitted through shaft 121 to sprocket 123 is in turn transmitted over chain 122, for example, to a second stage box rotator arrangement indicated generally at 190 and operating similarly to the box rotating arrangement indicated at stage 1, which will be discussed in further detail.

Sprockets 119 transmit power by way of respective chains 36 to corresponding sprockets 117, which are mounted on shaft 19. This drives shaft 19 and its attendant apparatus including sprocket 26 and its chain 88, sprockets 23 and conveying chains 7 and the knurled or serrated wheels 25. Chain 88 rotates sprocket 81 mounted on a shaft 24 for controlling the cam 82, its follower rod 83 and the synchronizing stop 85 as may be seen in FIG. 8.

Power transmitted over the chains 7 is transmitted through the medium of respective sprockets 6 through the shaft 5 to chain 98 by way of sprocket 96. Chain 98 transmits this power to sprocket 97 mounted on shaft 91, and shaft 91 in turn transmits this power to the sprockets 94 and 95 and the chains 8 and 9 controlled thereby.

The shaft 91 has mounted thereon a pair of sprockets 94 and 95 of differing diameter whereby their outer peripheries rotate at different speeds. The chains 8 and 9 are caused to rotate by sprockets 95 and 94 respectively, and in turn drive respective sprockets 13 and 13*a*, each having an associated shaft 13*b*. This comprises the box rotating stage 1 and is generally similar to the box rotating arrangement indicated at 190.

Referring now more specifically to FIGS. 1 and 2 it will be seen that the conveyor system comprises, in addition to the power transmission arrangement just described, the support members or side plates 201 extending the longitudinal distance of the conveyor 200 and in which the respective shafts 5, 13*b*, 24, 19, 121 and 120, etc. are suitably supported. The side plates 201 are each supported adjacent both ends by legs such as 14. The particular method of support, however, forms no part of this invention, it being understood that, if desired, the entire assembly may be placed on, for example, casters and its position changed as needed.

Forming the conveyor table and supported between the side plates 201 are a number of horizontal support members 3 forming a table for supporting wear blocks 4*d* and/or guide plates such as 4, 127 and 171 under and adjacent respective edges of chains 7, 36 and 176, for example as seen in FIG. 11. This prevents the chains from sagging under the weight of any box placed thereon. It will be appreciated that the differential or box rotating chains 8 and 9 may likewise be supported by guide plates or wear blocks such as 4*c*, for example shown in FIG. 7, and that they are supported slightly above the level of the other chains. This permits the chains 8 and 9 to disengage a box from chains 7 by lifting the box slightly.

As may be seen in FIGS. 1, 3, 6, 7 and 7*a*, the chains 8 and 9 comprise a number of segments each wider than chains 7 for the purpose of providing a support area commensurate with that supplied by the larger number of conveying chains 7. Generally, by making chain segments such as 9*a* each 3 to 3½ inches wide and 1½ inches long, the needed support area is adequately provided. Chains 8 and 9 are otherwise generally similar in construction and operation to chains 7 and other chains in the system in that each segment may have an extending central ear 9*b*, for example, which fits between a pair of extending ears 9*c* on the next segment and is held engaged therewith by a pin 10', while corresponding sprocket indentations engage each chain segment adjacent the central extending ear to either move or be moved by each chain segment as it engages the sprocket.

A box rotating or twister bracket 10 is adjustably mounted on a pin 12 adjacent to the conveyor chains 8 and 9 and at an angle to the direction in which the box is moving. At its forward end, the plate 10 has a slight projection or flange 11 protruding into the path box of box travel. As previously explained, bracket 10 is used for a run of boxes of longer than normal length which may not be fully turned by chains 8 and 9 in their length. As each box approaches the position of projection 11, the projection momentarily engages the corner thereof. This prevents forward movement of that corner, while the opposite corner being free, is moved forward by chain 8 so that the box pivots around 11 until the engaged corner is disengaged from projection 11 and the box is carried forward and guided by brackets 15 and 18.

Brackets 15 and 18 mounted on each side of the conveying chains 7 serve to guide the boxes into the main conveying path or route and to prevent excessive turning of the boxes. Bracket 15 is adjusted to a desired position with respect to the box path by means of arms 17 and the posts supporting the same, while bracket 18 is similarly adjusted by means of arms 16. As already discussed, if the boxes are shorter than 50% of the length of the differential claims 8 and 9, they have a tendency to be turned more than 90°. Brackets 15 and 18 each prevent this by engaging one of the turned sides and displacing the box toward the normal path due to the angle at which they are set and adjusted.

In addition to the brackets discussed, other brackets not shown are usually disposed along the conveying route for guiding the boxes, and maintaining box alignment or may be used to guide each box in a desired direction.

After being carried past the box rotating stage 1, each box is engaged in succession by a pair of stops 85. As may be seen in FIG. 5, each stop is pivotally supported at pin 80 by means of an arm 84. The arm 84 is controlled by a follower arm 83, which rides cam 82. Cam 82 is mounted on shaft 24, which in turn is powered by sprockets 26 and 27 and the chain 88 as already mentioned. The position of cam 82 and its speed of operation are controlled with respect to lugs 35 on conveying chains 36 to drop the arm 83 in synchronism with a predetermined position of lugs 35 to disengage the stop 85 from box 102, for example, at the proper interval. Box 102 then moves forward under the influence of chains 7 until it engages serrated wheels 25. The disposition of the apparatus along the shaft 19 upon which wheels 25 are mounted is probably best seen in FIGS. 5 and 10. The view in FIG. 5 is taken in the plane of the shaft 91 and also in the plane of shaft 19 to show the lateral relationship of the various components including some of the printing apparatus.

The wheels 25 being of somewhat larger circumference than the associated sprockets and chains raise the box, and as it passes thereover, the front end of the box tips forward to raise the back end, as shown by diagrammatically illustrated box 102*a* in FIG. 5. As the boxes are moving at high speed, this permits the stop 85 to immediately engage the succeeding box without interference. As box 102*a* moves forward under the influence of serrated wheels 25, it is positively engaged by the lugs 35 on chains 36 as shown by box 102*b* so that its position with respect to the printing rolls 47 is synchronized and the box is carried toward the printing assembly 30.

As already mentioned, another type of simple synchronizing means may be used. Thus plate 108 which has an inclined surface may raise box 102*b* above the level of chains 36 as it is carried forward. It will now wait until one of the lugs 35 positively engages its back wall and moves it forward in synchronism with the print rolls.

The printing assembly 30 on each side of the conveyor 200 is driven as may best be seen in FIG. 3 from chain 118' through respective gears 34 and 32, and shafts 31. Each shaft 31 is journalled and supported at 33 and 33*a* on the respective side 201 and in turn rotatable supports a print table 49 at 99. The table 49 carries shafts 46,

44, 41, 29 and 55, which support ink rolls 45, 43 and 42, gear 38 and print roll 47 respectively.

Each print roll 47 is powered from shaft 31 through a suitable gear train comprising gears 37, 38 and 40 on shafts 31, 29 and 55 respectively. Ink retaining and transfer pads and rolls 45, 43 and 42, supply ink to the print roll and are driven from the shaft 31 through the pulley arrangement 54.

Wheels 61 and respective handles 62 at the sides of the conveyor 200 are mounted on shaft 63 to permit adjustment of the print table 49 and print rolls 47 so that proper print registration is secured on each box.

Referring to FIG. 4, it will be seen that the wheels 62 are mounted at the ends of shaft 63 which connects by means of gears 64 and 65 to the threaded shaft 72. Shaft 72 is journalled at 73 in a suitable bracket or cross member, and it is rotated by movement of shaft 63 and wheels 61. Threaded member 71 on shaft 72 then moves either in one direction or the other along shaft 72 depending on the direction of movement of shaft 63. The movement of member 71 is translated through member 69 to either apply or increase the pressure on collars 69' or springs 70 and the nuts 70' which restrain the respective springs 70 upon respective rods 68. Each rod 68 is pinned to or engaged with a respective one of the print roll support tables 49 at 74. Collars 69' or nuts 70' respond to the degree of pressure placed thereon by member 69 and rotate the table 49 accordingly through rods 68. Thus, if member 71 is moved in any direction along shaft 72, it pivots the respective tables 49 in a corresponding direction.

The pivoting of the print table 49 on shaft 31 changes the relative position of the type face on the corresponding print roll 47 with respect to the box side. Therefore, when each print table 49 is rotated, adjustment gear 38 is rotated correspondingly and it transmits its motion through the gear 40 to the associated print roll 47 to rotate that roll to a corresponding position. This ensures that the initial portion of its type face 56 will first engage the box side. Thus, the position of the rolls 47 with respect to the box width is adjusted, while the position in which the print is registered on the box is properly maintained. The springs 70 serve to absorb the shock of contact between the boxes and print rollers.

In practice, a box 100, for example, after having been packed and sealed is automatically carried forward by chains with its longitudinal axis aligned midway between chains 8 and 9. As chains 8 and 9 move in an endless belt around sprockets 6 and 23, they frictionally carry the box forward until it engages the chains 8 and 9. The chains 8 and 9 are wider than the chains 7 to provide suitable support for the box and in addition are further above the table top 3 than chains 7 so that each box is effectively disengaged from chains 7 on being engaged by chains 8 and 9. The chains 8 and 9 are displaced somewhat to one side with respect to the sides 20 of conveyor 200 for the purpose of allowing long boxes to swivel or rotate without excessive displacement beyond the sides of conveyor 201. As pointed out above the box is initially guided with respect to their position.

As the chain 8, for example, rotates at twice the speed of chain 9, it frictionally carries its associated side of the box forward at much faster speed than the other, wherefore the box pivots or rotates a full 90° by the time it is at the end of chains 8 and 9. If needed for such reason as the undue box length, a rotation flange or projection 11 is provided, as before explained, for engaging a corner of the box to hold that corner while the other side is carried forward by chain 8 to initiate and complete the box rotation. It will also be pointed out that the degree of rotation may either be made less than 90° or greater, as is easily apparent by appropriately adopting one of the described components whereby the system is rendered exceedingly flexible.

As the box is brought to the end of chains 8 and 9, it is again carried forward under engagement with chains 7. Brackets 15 and 18 which are especially useful for short boxes are shaped and adjusted as needed to suitably guide the box into symmetrical disposition with respect to the sides 201 of conveyor 200, while as may be easily seen, a box engaging either bracket has one side brought flat against that bracket and is therefore prevented from turning more than 90° at the time it is fully engaged by chains 7 and adjacent the portion of bracket 18 that is parallel to the conveyor route. Additionally bracket 18 serves to displace each box toward the center of the conveyor route so that it is properly disposed with respect to the print rollers 47. Brackets not shown may also be disposed along any of the other chains to ensure that the box alignment is maintained.

The box is carried forward under the influence of chains 7 until it encounters the synchronizing stops 85, which are located between shafts 19 and 24. Now as shaft 19 rotates, it controls the cam 82 as previously explained and that cam permits follower arm 83 to drop so that stop 85 also falls below the bottom of the box. This permits the box to again be carried forwardly by chain 7 in synchronism with the position lugs 35 and the print rolls 47.

The box now is engaged by wheels 25, and given a slight forward and upward tilt and then tips forward as shown for box 102*a* to allow stops 85 to engage the next box which may have been in abutment with box 102*a*.

The box is engaged by lugs 35 as shown for box 102*b* carried by chains 36 either after engagement by wheels 25 or after engagement by plate 108 and positively brought to a position indicated by box 103 in engagement with the type face 56 on print rolls 47. The dropping of the stop 85 and movement of the box is of course timed with the arrival of lugs 35 at a certain position so that the box position in synchronized with the print rolls 47. The velocity or speed of movement is controlled to maintain the synchronized position during the passage of box 103 through stage 2. The box therefore is carried between print rolls 47 which register the print thereon and it is thereafter carried to a position indicated by box 104, whereafter it may again be rotated as by stage 190 or its movement otherwise controlled, as desired.

It will be observed that stage 190 comprises a pair of chains 192 and 194 which are constructed and operated in a manner similar to chains 8 and 9, and that they are displaced toward one side of the center of the conveyor 200 for a purpose already described. Bracket 196 is therefore provided immediately preceding chains 192 and 194 and at the end of chains 176. It is adjusted and positioned by means of arms 198 to displace the box 104 in alignment with chains 192 and 194.

The box 104 approaching the chains 192 and 194 is often arranged with its long axis parallel to the direction of movement of chains 192 and 194. This may result in the box indicated by 105 being rotated insufficiently in the provided chain length. Therefore an adjustable bracket 188 having a projection 189 is positioned adjacent chain 194 to and in turning the box as described for bracket 10, so that the box is fully turned as shown at 106 for further operation.

Thus, having described one embodiment of my invention with respect to a box rotator and printing arrangement for use in a conveyor system, but realizing the application of my invention to other types of articles and in other types of conveying or processing systems, I am appending hereto a series of claims commensurate with the breadth of the invention.

What is claimed is:

1. In a conveying system of the type wherein a plurality of cartons are successively received and moved with one axis parallel to the direction of movement and upon each of which an operation is to be performed succes-

sively at a predetermined position thereon parallel to an axis perpendicular to said one axis, the improvement comprising a pair of belts displaced with respect to the longitudinal axis of said system and arranged to engage respective bottom portions of each carton while moving at different speeds whereby each carton is successively rotated, and means for restraining the extent of said rotation while said carton is so engaged whereby said one axis is placed perpendicular to the direction of said movement and said perpendicular axis is placed parallel to the direction of movement, said means arranged to displace said perpendicular axis substantially in coincidence with said longitudinal axis while each carton is conveyed in said one direction, the length of said carton along said one parallel axis being greater than a predetermined dimension, and means adjacent one belt for restraining a corner of each carton as it approaches the end of said belt whereby the other belt will rotate said carton around said restrained corner to cause release of said restrained corner.

2. In a conveying system of the type wherein a plurality of cartons are successively received and moved at high speed with one axis parallel to the direction of movement and upon which an operation is to be performed at a predetermined position parallel to an axis perpendicular to said one axis, the improvement comprising means for moving respective portions of said carton at different relative speeds whereby said one axis is placed perpendicular to the direction of said movement and said perpendicular axis is placed parallel to the direction of movement, a cam operated single stop for thereafter terminating said movement by engaging the front side of each carton in succession and for disengaging said front side in timed relationship with certain moving apparatus, means for moving each carton after disengagement of said stop therefrom in synchronism with said apparatus whereby said operation is performed at said predetermined position parallel to said perpendicular axis, and means for rotating each carton about a horizontal axis on disengagement from said stop to permit a succeeding carton to be engaged by said stop.

3. In a conveying system of the type wherein a plurality of cartons are successively received and moved at high speed with one axis parallel to the direction of movement and upon which an operation is to be performed along another axis displaced from said one axis, and wherein said cartons may be of different linear dimension along said one axis, the improvement comprising a pair of endless belts of respective predetermined lengths for engaging respective portions of each carton, means for moving each belt at different relative speeds whereby said one axis of each engaged carton is placed at an angle to the direction of said movement and said other axis is placed parallel to the direction of said movement said belts arranged to engage each carton for a predetermined distance, and last means operative while said carton is so engaged for ensuring that the one axis of each carton is placed at said angle despite the linear dimension of the engaged carton along said one axis with respect to said predetermined distance.

4. The arrangement claimed in claim 3 in which one of said belts is moved at twice the velocity of the other for rotating a carton substantially 90° whose one axis is approximately 50% of said predetermined distance.

5. The arrangement claimed in claim 3 in which said last means comprises a pair of brackets disposed at an angle to said direction of and adjacent the end of said predetermined distance to ensure that cartons whose one axis is shorter than a predetermined value are not rotated beyond a predetermined degree on being disengaged from said belts.

6. The arrangement claimed in claim 3 in which said last means comprises a bracket disposed adjacent the end of said predetermined distance for engaging one corner of a carton while moved by said belts to ensure that a carton whose one axis longer than a predetermined value is rotated to a predetermined degree in said distance.

7. In a conveying system of the type wherein a plurality of cartons is received for successive movement of said cartons at high speed along a conveyor route and in which said cartons may be of different lengths and the sides of said cartons perpendicular to the direction of movement are to have printing registered thereon at a predetermined station along the length of said conveyor route, the improvement comprising a pair of differentially driven belts for engaging each carton in succession and for moving each carton along said route while rotating each carton, a single stop normally positioned for engaging each carton after its rotation to terminate its movement and momentary reciprocable for permitting an engaged carton thereafter to be moved, and means for conveying each released carton thereafter along said route while pivoting the released carton about an axis perpendicular to said route to permit said stop to be reciprocated for engaging a carton in substantial abutment with the released carton.

8. In the system claimed in claim 7 in which said pivoting means comprise a rotating wheel whose periphery lies adjacent said stop for engaging each carton immediately after its release, and there is a lug moving at a rate and in a position synchronized with said moving apparatus and arranged to pass around the axis of rotation of said wheel for engaging the back of each carton pivoted by said wheel before the released carton can be carried into engagement with said moving apparatus.

References Cited in the file of this patent

UNITED STATES PATENTS

1,616,101	Ackley	Feb. 1, 1927
2,664,816	Gibson	Jan. 5, 1954
2,776,038	Caldwell	Jan. 1, 1957
2,805,753	Palmer	Sept. 10, 1957
2,911,091	Imse	Nov. 3, 1959