This invention relates to apparatus for packing articles such as cans and bottles in open ended wrap-around paperboard carriers.

This invention more specifically relates to apparatus for mechanically folding a paperboard blank about a group of articles, and mechanically interlocking overlapping margins of the blank on the bottom of the group of articles, to form a package unit.

This invention is specifically adapted for use with paperboard blanks having interlocking bottom margins of the type disclosed in my copending application S.N. 134,174, filed August 28, 1961, now Patent No. 3,098,583.

In a packaging machine for forming package units by wrapping an open ended paperboard blank about a group of articles, the articles are delivered to the machine in one or more rows by a continuously moving conveyor.

The packaging machine generally comprises three main sections which are identified as:

1. A group forming section in which one or more rows of articles are separated into spaced groups, each comprising two or more articles. Grouping apparatus to perform this function is described in detail in my copending application S.N. 227,505, filed October 1, 1962, now Patent No. 3,194,381.

2. A blanket applying section in which individual wrapper blanks are aligned with, and placed on each group of articles. Blank applying apparatus to perform this function is described in detail in my copending application S.N. 227,246, filed October 1, 1962, now Patent No. 3,162,988.

3. A folding section in which the wrapper blanks are individually folded about each group of articles and mechanically interlocked to form a package unit. Folding apparatus to perform this function is described in detail in this application.

In accordance with my invention, articles such as cans or bottles are delivered to a packaging machine in one or more rows by conventional conveyor means. The conveyor moves the articles onto a stationary rigid plate which extends through the grouping section, the blanket applying section, and partially into the folding section of the machine. The articles are first engaged by the grouping apparatus of the machine which separates the articles into spaced groups comprising a predetermined number of articles arranged in one or two rows. The grouping apparatus propels the articles in spaced groups toward the blanket applying section of the machine. As the groups are disengaged by the grouping apparatus, they are engaged by spaced flight bars extending transversely of the machine. The flight bars are mounted on and driven by a pair of laterally spaced chains which move in a continuous circular path above and below the rigid plate. The flight bars propel the groups of articles through the blanket applying and folding sections of the machine by engaging behind the rearmost articles in each group. As each group of articles passes through the blanket applying section of the machine, a wrapper blank in flat form is aligned with and deposited transversely across the top of the group of articles. The wrapper blank is then folded about the group of articles and mechanically interlocked in the folding section of the machine by apparatus which will be described in detail below.

A preferred embodiment of this invention will now be described in detail with reference to the accompanying drawings in which:

FIGURE 1 is a sectional side view of the folding and locking apparatus of this invention.

FIGURE 2 is a top plan view showing the mechanism for mechanically interlocking the bottom margins of a wrapper blank.

FIGURE 2A is a view similar to FIGURE 2 showing the lock forming mechanism with the upper support plate removed.

FIGURE 3 is a sectional end view of the lock forming mechanism taken along the line 3—3 of FIGURE 1.

FIGURE 4 is a sectional end view of the lock forming mechanism taken along the line 4—4 of FIGURE 1.

FIGURE 5 is a sectional end view of the lock forming mechanism taken along the line 5—5 of FIGURE 1.

FIGURE 6 is a sectional end view of the lock forming mechanism taken along the line 6—6 of FIGURE 1.

FIGURE 7 is a sectional end view of the lock forming mechanism taken along the line 7—7 of FIGURE 1.

FIGURE 8 is a sectional end view of the lock forming mechanism taken along the line 8—8 of FIGURE 1.

FIGURE 9 is a sectional end view of the lock forming mechanism taken along the line 9—9 of FIGURE 1.

FIGURE 10 is a view of the inner interlocking bottom margin of a wrapper blank used with this invention.

FIGURE 11 is a view of the outer interlocking bottom margin of a wrapper blank used with this invention.

FIGURE 12 is a perspective view of a portion of the locking apparatus.

Referring now to FIGURE 1 of the drawings, groups of articles 1 are shown supported on a rigid plate 2. Each group of articles is driven by a flight bar 4 through the blanket applying section generally indicated A, into the folding section. In the blanket applying section A, a flat wrapper blank 3 is placed transversely across the top of each group of articles by the mechanism described in detail in my above mentioned copending application S.N. 227,246.

Flight bars 4 are shown in FIGURE 2 mounted transversely of the machine on a pair of laterally spaced flight chains 5 and 6. The flight bars 4 are arranged and spaced so that there is a flight bar engaged behind the rearmost articles in each group to propel the group through the blanket applying and folding sections of the machine. Flight chain 5 is mounted on a plurality of sprockets including sprockets 7 and 8 as shown in FIGURE 2. Likewise, flight chain 6 is mounted on a plurality of sprockets including sprockets 9 and 10 as shown in FIGURE 2.

The sprockets 7 and 9 are mounted on shaft 11 which is driven by conventional means not shown. Sprockets 8 and 10 are mounted on a shaft 12 journaled in the side frame of the machine in a conventional manner.

Each wrapper blank 3 as shown in FIGURE 8 includes a top wall 13; side walls 14 and 15; and bottom forming inner and outer margins 16 and 17. Inner margin 16 which is hingedly connected to side wall 14 is illustrated in detail in FIGURE 10. Outer margin 17 which is hingedly connected to side wall 15 is illustrated in detail in FIGURE 11. The function of margins 16 and 17 to form a double carton lock will be described in detail below in connection with the mechanical locking mechanism of the machine.

For the purposes of describing this invention, the articles shown being packaged are a plurality of bottles arranged in two rows and grouped into package units containing six bottles. The bottles move from left to right through the machine as shown in FIGURE 1. It should be understood that this invention is not limited to packaging short neck bottles of the type illustrated, and is equally applicable to packaging cans and long neck bottles as well.

The groups of bottles 1, with a flat blank 3 positioned
transversely across the top thereof, are driven through the folding section of the machine by flight bars 4 in the manner described above. Each group first passes under a pair of laterally spaced half rolls 18 mounted for rotation on a shaft 19 (see FIG. 1). The half rolls break the chimes of the blank around the outside of the bottle caps or high necked bottles, the half rolls would not be necessary. The groups of bottles continue moving past the half rolls and are next engaged by a pair of laterally spaced folding lugs 20. The lugs 20 are mounted on a pair of continuously moving folding chains 21 and 22. The folding chains 21 and 22 are laterally spaced apart approximately the width of the groups of bottles and positioned above the flight chains 5 and 6. A pair of sprockets 23 and 24 mount folding chain 21 for continuous movement in a circular path. Likewise, sprockets 25 and 26 mount folding chain 22 for continuous movement in a circular path. Conventional means (not shown) drives the folding chains through shaft 25A. Pairs of folding lugs 20 are mounted on the chains 21 and 22 in laterally spaced relation and project outwardly of the chains in the manner illustrated in FIGURE 1. Mounted on each lug 20 is a projecting in the lateral opposite direction is a rubber bar 27. Pairs of laterally spaced rubber bars 27 on chains 21, 22 engage opposite sides of a wrapper blank, which has been folded downwardly about the group of bottles by lugs 20, to pull and hold the wrapper blank tightly around the bottles. Positioned between longitudinally spaced folding lugs 20 on each chain 21, 22 is a pusher lug 28. A pair of laterally spaced pusher lugs 28 engage behind each group of articles to assist the flight bars 4 in driving the article through the machine. In summary then, a wrapper blank 3, deposited transversely of a group of bottles 1, is engaged by lugs 20 mounted on chains 21, 22 and positioned on opposite sides of the bottles. The lugs 20 fold the wrapper blank down over the side of the group of articles so that the bottom margins 16 and 17 project below rigid plate 2 as shown in FIGURES 1 and 3. A pair of rubber bars 27 positioned on opposite sides of the blank pull and hold each wrapper blank down tightly around the group of articles. A pair of pusher lugs 28 engage behind the rearmost articles in the group to assist the flight bars in driving the groups of bottles through the locking mechanism of the machine. Each group of articles with a wrapper blank folded down over the sides then passes through the locking mechanism of the machine which will now be described in detail. As each group of bottles 1 moves to the right, as viewed in FIGURE 1; the inner margin 16 of the blank is engaged by guide bar 40. The guide bar 40 engages hinge flap 41 formed integral with margin 16 and swings the flap 41 outwardly relative to the margin 16 as shown in FIGS. 3–6. As flap 41 continues to ride on the upper surface of guide bar 40; inner margin 16 is directed inwardly and upwardly by leg 42 of V-shaped plough 43 toward the position shown in FIGS. 4 and 5. The details of plough 43 are best shown in FIG. 12. Simultaneously, hinge flap 44 integral with outer margin 17 is engaged by folding rails 45 and 46 which bend flap 44 outwardly relative to margin 17 as illustrated in FIGS. 3 and 4. The details of folding rails 45 and 46 are most clearly shown in FIG. 12. The folding rails 45 and 46 direct margin 17 inwardly against the bottom surface of the other leg 47 of V-shaped plough 43 as shown in FIG. 4. The reverse bending of flap 44 causes locking tongues 48 formed integral therewith to be directed toward inner margin 16 as shown in FIG. 4. Inner margin 16 is guided upwardly over V-shaped plough 43 and extends between the top surface of plate 41 and the bottom of support plate 50 as shown in FIG. 4. Support plate 50 as clearly seen in FIG. 2 is an extension of support plate 2, and is provided with a bifurcated end 51. As the margin 16 moves past the bifurcated end 51 of support plate 50, it moves onto the upper surface of support plate 52 which is positioned adjacent to, but longitudinally spaced from support plate 50 (note FIG. 5). Outer margin 17 moves past folding rail 45 and V-shaped plough 43 and onto the upper surface of support plate 53 as shown in FIG. 5. Locking tongues 48 engaged behind locking bar 54 formed integral with outer margin 16 as shown in FIG. 5. Hinge flap 44 with its locking tongues 48 engaged behind locking bar 54 is released by folding rail 46 as shown in FIG. 6 and hangs free. Continued movement of the blank causes hinge flap 41 on inner margin 16 to move out of engagement with guide bar 40 and flap 41 hangs free as seen in FIG. 7. Hinge flap 44 integral with outer margin 17 is simultaneously engaged by guide rail 54 as seen in FIG. 7. Guide rail 54 directs hinge flap 44 upwardly into substantially the plane of the outer margin 17 and thereby completes the first lock of the inner and outer margins. Simultaneously, hinge flap 41 on inner margin 16 moves into engagement with folding block 55 as shown in FIG. 8. Block 55 folds tuck flap 56, formed integral with flap 41, at an angle relative to flap 41 as seen in FIG. 8. The folding block 55 directs the folded tuck flap 56 upwardly projecting in the lateral opposite direction over the outer margin 17. This operation completes the second lock to provide a double lock of the inner and outer margins. The interlocked package unit then continues toward the end of the machine where it is transferred onto conventional conveyors 44 directed upwardly along a vertical plane on the outer margin 17. This invention has been described in detail in accordance with the preferred embodiment illustrated in the drawings; all modifications and variations are contemplated which are within the spirit and scope of the appended claims.

1. Apparatus for folding and locking a wrapper blank having inner and outer interlocking margins formed integral with blank sidewalks about a group of articles including, means for advancing a group of articles along supporting surfaces, folding means engaging the blank and for folding the sidewalks of said blank margins around the sides of said group of articles so that said inner and outer margins on the blank project below a first support plate, guide bar means mounted in the path of said inner margin adapted to direct and hold a first hinge flap outwardly relative to said inner margin, plurality of means engaged with said inner margin adapted to fold said inner margin inwardly below said group of articles, first folding means adapted to fold said outer margin inwardly toward said inner margin while folding said second hinge flap on said outer margin to bring a locking tongue integral with said second hinge flap into interlocking engagement with a locking bar on said inner margin, guide means for folding said second hinge flap into the general plane of said outer margin, and second folding means engaging said first hinge flap to fold and guide a tuck flap into interlocking engagement with a second, to complete the interlocking of said margins.

2. The device of claim 1 in which said folding means includes a pair of lug members mounted in diametrically opposed relation on a pair of chains, said lug members of each pair being spaced apart approximately the width of said group of articles, and sprocket means mounting said chains so that each pair of said chains is adapted to pull and hold said blank down against horizontal plane on opposite sides of said group so that a pair of lug members engages, folds and travels with each group until the blank is securely locked.

3. The device of claim 2 in which friction means is mounted on said chains adjacent each of said lugs, said friction means being adapted to pull and hold said blank down tightly about said group of articles.

4. In a machine for forming a flat wrapper blank having side walls and inner and outer margins formed integral with said side walls about a group of articles, drive means for advancing said group of articles along a sup-
porting surface, folding means adapted to fold said blank down over the sides of said group of articles, said folding means including a pair of lug members mounted on endless chain means and spaced apart approximately the width of said group, sprocket means mounting said chain means for movement in a continuous path adjacent said group of articles, said lug mean operative to engage the wrapper blank and to fold the sides of said blank down over the sides of said group of articles while advancing along with the group of articles as said group is moved forward by said drive means.

5. The device of claim 4 in which friction means is mounted on said chain means adjacent said lug means to pull and hold said blank down tightly about said group of articles as the group is advanced.

6. The device of claim 5 in which pusher means is further provided on said chain means to engage behind said group of articles to assist said drive means in advancing said group through the machine.

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