April 21, 1959 C. B. CROSS 2,882,665

UNDERLAP FORMING INSTRUMENTALITIES FOR WRAPPING MACHINES

Filed March 22, 1957 4 Sheets-Sheet 1

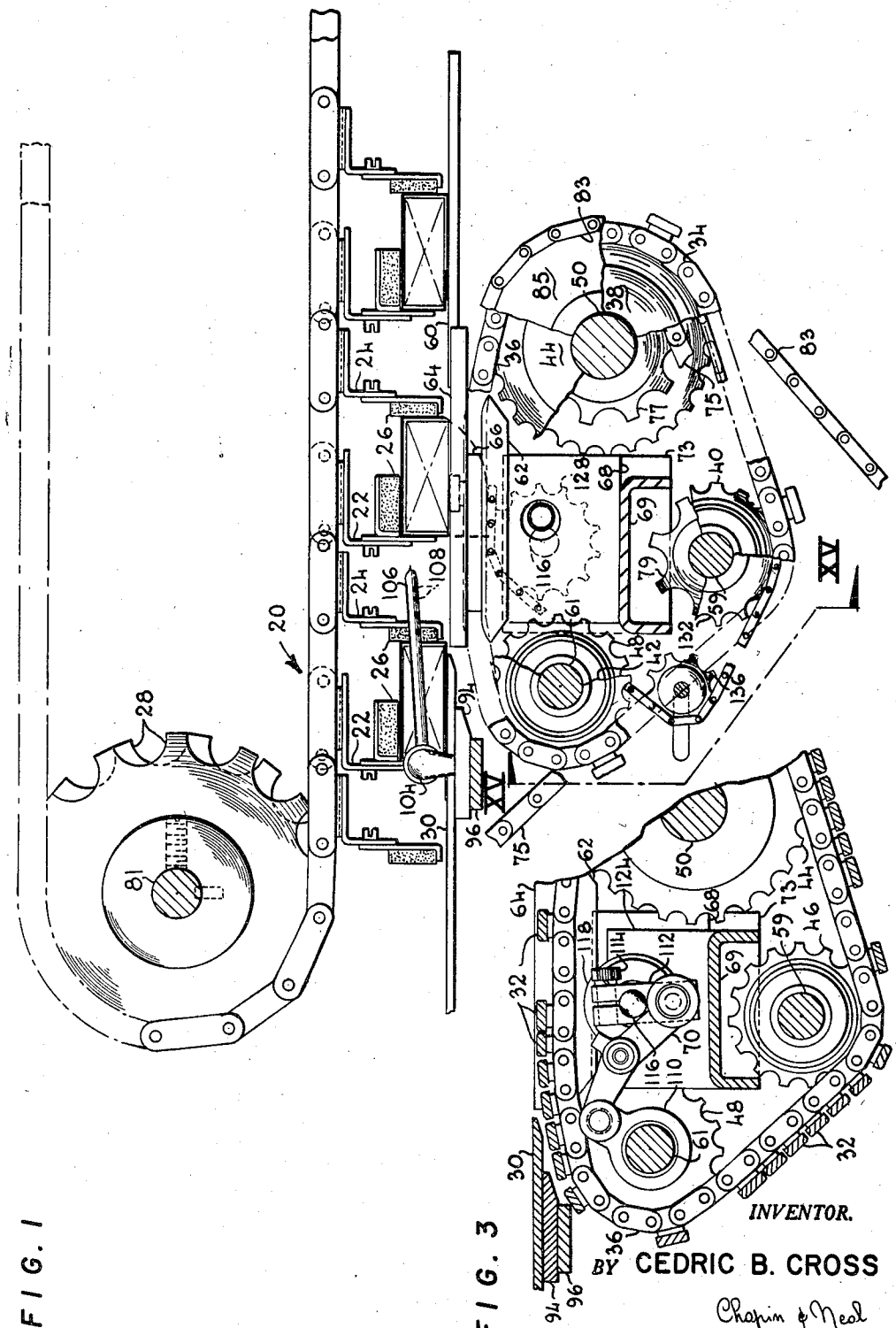


FIG. 1

FIG. 3

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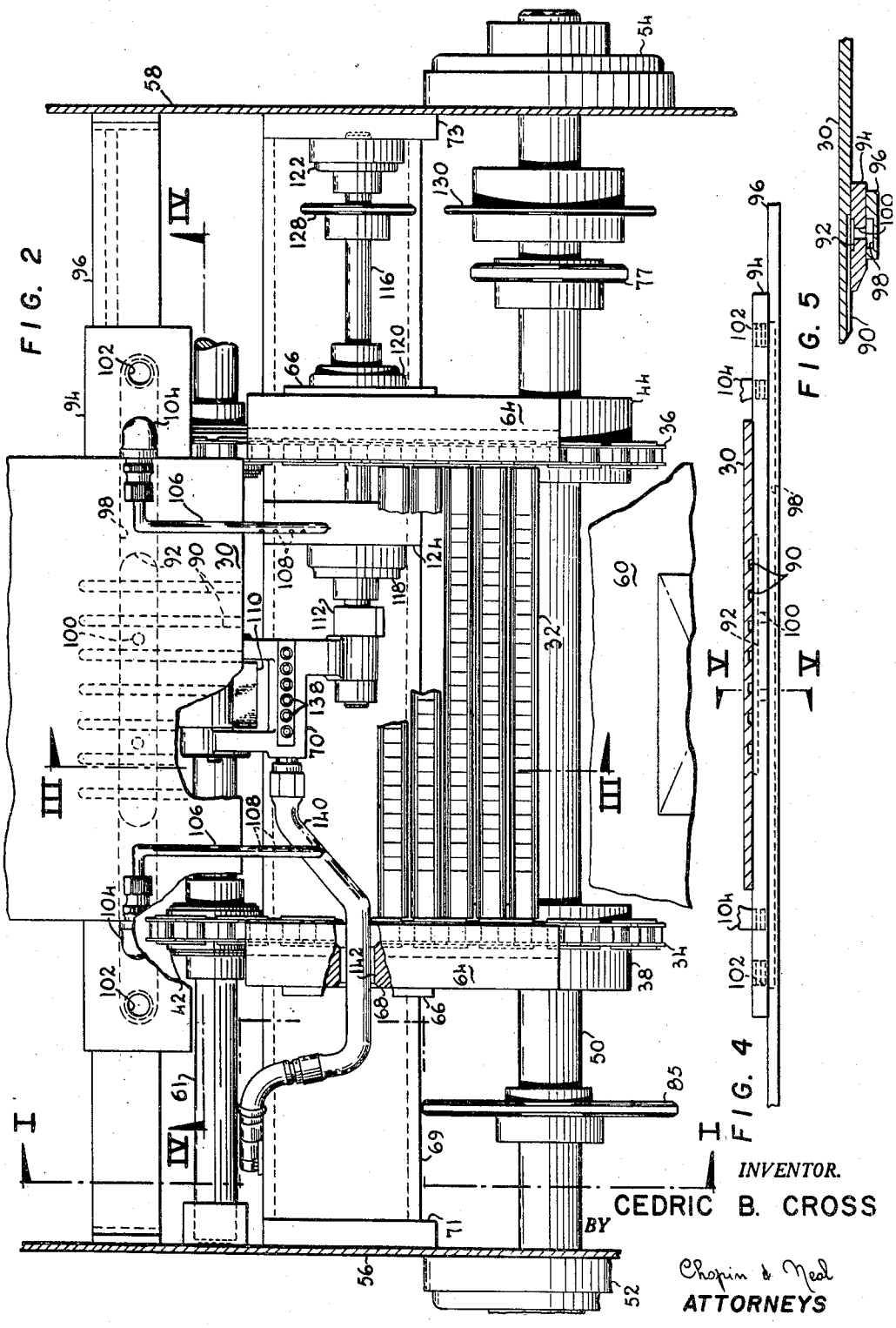


FIG. 2

FIG. 5

FIG. 4

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FIG. 6

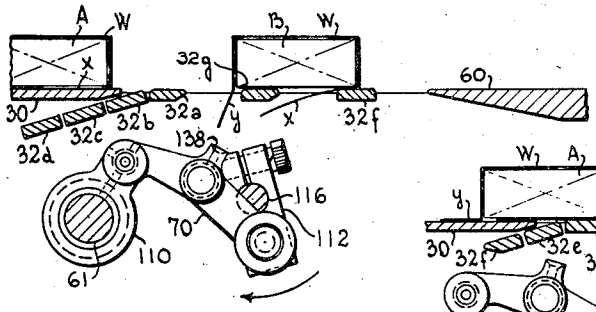


FIG. 7

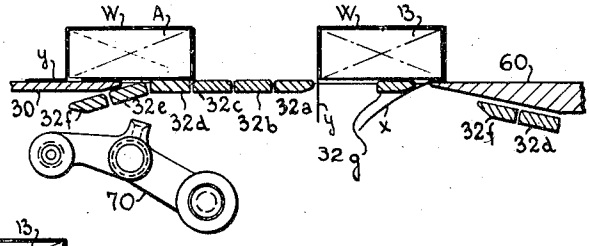


FIG. 8

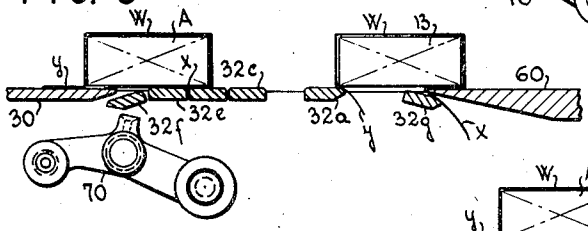


FIG. 9

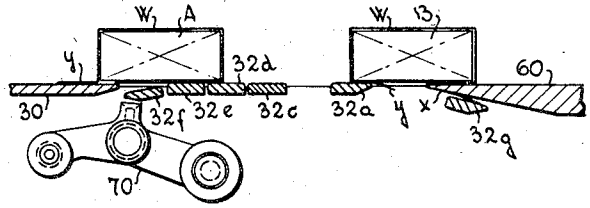


FIG. 10

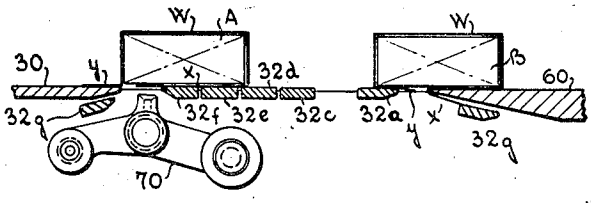


FIG. 11

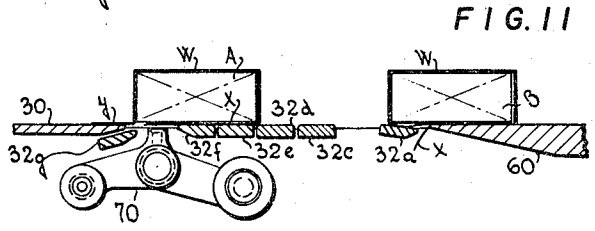
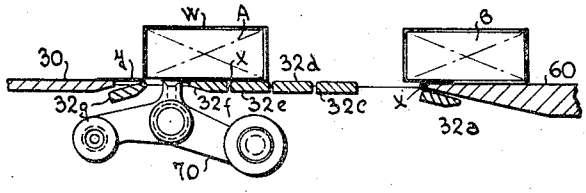


FIG. 12



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FIG. 13

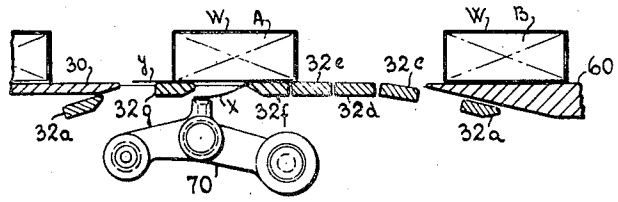


FIG. 14

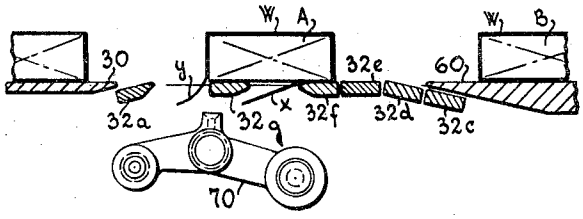
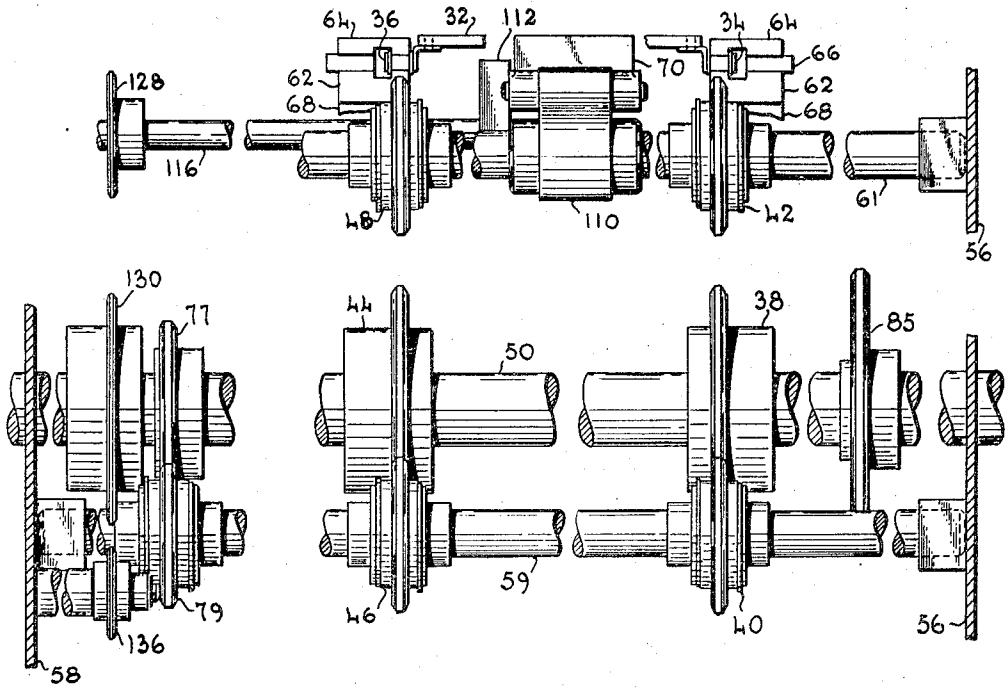


FIG. 15



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United States Patent Office 2,882,665 Patented Apr. 21, 1959

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UNDERLAP FORMING INSTRUMENTALITIES FOR WRAPPING MACHINES

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Application March 22, 1957, Serial No. 647,769

8 Claims. (Cl. 53—233)

The present invention relates to wrapping machines and more particularly to improved means for completing the encirclement of an article in a wrapper.

Wrapping machines of the type disclosed in U.S. Patent No. 2,810,246, October 22, 1957, have proven to be very effective in increasing the rate at which articles can be wrapped. This in part is due to the novel manner in which the articles are encircled by a wrapper. One form of the encircling means described therein, which has found particular commercial acceptance, contemplates that partially-encircled articles be gripped at their sides by conveyor means with their bottom portions unsupported and free for rotating underlap forming instrumentalities to complete the encircling operation. While these means are highly effective in wrapping a great variety of articles there are certain types of articles which are difficult to firmly grip on their side edges so that the degree of reliability of the wrapping operation is somewhat reduced. Also, such rotating underlap forming instrumentalities are inherently capable of high rates of operation, possibly higher than any other device for such purposes, it is at times necessary to reduce their speed under certain wrapping conditions, as where relatively wide articles are being wrapped in order to obtain a satisfactory degree of reliability.

Accordingly it is the object of this invention to improve underlap forming instrumentalities of this general type to provide support for the surface on which the underlap is to be formed as well as to improve the reliability of operation of such instrumentalities regardless of the size of the articles, all without reducing the rate at which the underlap forming operation may be carried out.

The above and other related objects of the invention as well as its various novel features will be readily apparent from a reading of the following description of the disclosure found in the drawings and the particular novelty thereof pointed out in the appended claims.

In the drawings:

Fig. 1 is a view showing particularly the improved underlap instrumentalities as incorporated in the wrapping machine disclosed in the above-mentioned patent, certain portions being broken away and taken generally on line I—I in Fig. 2;

Fig. 2 is a plan view of the underlap instrumentalities seen in Fig. 1;

Fig. 3 is a section taken generally on the line III—III in Fig. 2;

Fig. 4 is a section taken on the line IV—IV in Fig. 2;

Fig. 5 is a section taken on the line V—V in Fig. 4;

Figs. 6 through 14 are detailed views of the underlap forming instrumentalities seen in Figs. 1 and 2 sequentially showing their manner of operation; and

Fig. 15 is a section taken generally along the line XV—XV in Fig. 1, showing certain drive elements and with one shaft displaced vertically so as to clarify the lateral positions of such elements.

While the underlap forming instrumentalities of this invention have a wide range of utility in packaging machinery a better understanding is obtained by the present disclosure of the manner in which they can be incorporated in a wrapping machine of the type disclosed in the above-mentioned patent. The conveyor means **20** found in Fig. 1 corresponds to the same conveyor means as are pictured in Fig. 21 of said patent. These conveyor means comprise arms **22**, **24** which have resilient pads **26** for gripping articles as they are continuously advanced through the wrapping machine. The conveyor means **20** are driven by sprockets **28** at a fixed rate and in predetermined timed relation to the various instrumentalities of the wrapping machine. Each article is partly encircled in a wrapper and gripped by the arms **22**, **24** all in a manner fully shown in the above designated patent.

Each article is therefore advanced toward the improved underlap forming instrumentalities of this invention along a plate or platform **30** with a wrapper partially encircled thereabout. It will be noted (Fig. 1) that one end of the wrapper lies against the bottom face of the article as it is advanced along the plate **30** while the other end of the wrapper trails behind.

Said underlap forming instrumentalities comprise transverse bars **32** which are connected at each end to spaced roller chains **34** and **36**. These roller chains are respectively trained over sprockets **38**, **40**, **42** and sprockets **44**, **46**, and **48** (Figs. 1, 2 and 15). The sprockets **38** and **44** are secured to a shaft **50** which is journaled in bearings **52**, **54** carried on the machine side walls **56**, **58**. The sprockets **40**, **46** rotate about antifriction bearings on a fixed transverse shaft **59** while sprockets **42**, **48** are carried in a similar manner on a fixed transverse shaft **61**. The bars **32** are guided for movement in a path parallel to and contiguous with the path of movement of the bottom faces of the articles. Such contiguous movement is maintained substantially throughout the length of an opening between the plate **30** and a second spaced plate or platform **60** by chain guides **62** and **64** (Figs. 1, 2 and 15) which control the upper runs of chains **34**, **36**. The guides **62**, **64** are set apart by spacers **66** and mounted on uprights **68** extending from a transversely disposed channel member **69** secured at its respective ends to the side frames **56**, **58** by way of pads **71**, **73**.

The movement of the conveyor **20** (Fig. 1) and the movement of the traveling bars **32** are tied together by a chain **75** passing around sprockets **77**, **79** on shafts **50**, **59** and a sprocket (not shown) secured to shaft **81** to which the conveyor sprockets **28** are also secured. All chains and sprockets are then driven by a chain **83** extending from a power source, not shown, and passing around a sprocket **85** secured to shaft **50**. This predetermined timed relation is established with the bars **32** traveling in the same direction as, but at a faster rate, than the articles.

The transverse bars **32** may be spaced along the chains **34**, **36** in the manner seen in Figs. 3, 6 and 7 wherein articulated groups are spaced apart and separated by single bars. In Figs. 6 and 7 the bars of the articulated groups are identified **32***a*, **32***b*, **32***c*, **32***d*, **32***e* and **32***f*, while the "single" bar is denoted as **32***g*. As will be apparent from the following description of the operation the "single" bars **32***g* and the leading bars **32***a* of each group are the main bars for manipulating the wrapper ends as an underlap is formed, while the remaining bars in each group provide varying degrees of support for the article. In fact certain size articles are adequately supported by less than the full group of bars. Thus bar **32***b* may be omitted as seen in Figs. 8–14.

With this arrangement as an article A (Fig. 6) is carried towards the end of plate **30** it will be seen that

one end *x* of the wrapper W is between the plate **30** and the bottom face of the article A. The other end *y* of the wrapper W is trailing behind the article as is better seen in Fig. 7. When the article A is carried beyond the end of plate **30** it will be supported by the bar **32***d* (Fig. 7). As the article A continues to advance (Figs. 8, 9 and 10) it is progressively supported by the bars **32***e* and **32***f*. After the trailing edge of the article A passes beyond the end of plate **30** wrapper end *y* will be supported by the bar **32***g* which trails and is spaced from the bar **32***f*. This leaves the wrapper end *x* free to extend into the opening provided by the spaced plates **30** and **60** either under the influence of gravity or with the assistance of some external force. In the drawing a suction unit **70**, later described, may provide such external force, however, for the present purposes it may be assumed that the wrapper end *x* falls freely by gravity to the position shown in Fig. 14 as the article A continues to advance progressively from the position seen in Fig. 12 to that seen in Fig. 14. The bars **32***g* and **32***f* support the article (Fig. 13) and then freely permit both wrapper ends to extend (Fig. 14) into the opening between the spaced plates **30** and **60** with the bar **32***g* interposed between the wrapper ends.

Referring back to Fig. 6 article B having a similar wrapper W with ends *x* and *y* shows the next position which article A would assume. Article B is similarly supported by bars **32***g* and **32***f* as the wrapper ends *x* and *y* extend further into the opening between the plates **30** and **60**. As article B approaches plate **60** (Fig. 7) bar **32***a* is approaching the wrapper end *y* as spaced bar **32***g* is in a position preparatory to folding the wrapper end *x* against the edge of plate **60** to hold said end away from the bottom face of article B. When the bars **32***a* and **32***g* reach the position illustrated in Fig. 8 wrapper end *x* is folded over against the edge of plate **60**, and wrapper end *y* is being wiped against the bottom of package B. Wiping of wrapper end *y* against the bottom face of article B is substantially completed in Figs. 9 and 10, continued movement of article B and bar **32***g* releases wrapper end *x* as the article is advanced along plate **60** with end *x* overlying end *y*. The underlap-forming operation is substantially completed in this manner as seen from Figs. 11 and 12. It should be noted that throughout the underlap-forming operation the article (A or B) has been supported by one or another of the bars **32**.

As mentioned above it may be found desirable to provide some external force to facilitate or assure the extension of one or both of the wrapper ends *x* and *y* into the opening between the spaced plates **30** and **60**. For such purpose fluid pressure means either as a suction unit or pressure jets have been found preferable.

Thus the undersurface of plate **30** (Figs. 2, 4 and 5) is provided with longitudinally extending passageways **90** which open on a plenum **92** formed in transverse plate **94**. The plate **94** is carried by a transverse supporting bar **96** having a plenum **98** which is connected to the plenum **92** by holes **100** in the plate **94**. Openings **102** in the plate **94** are provided to receive connections from a suitable source of pressurized air and pressurize the plenums **98** and **92**. Thus jets of air are directed from the passageways or ports **90** into the opening between the plates **30** and **60** to assist the extension of the wrapper ends *x* and *y* into that opening.

Also communicating with the plenum **98** are elbow fittings **104** threaded into the plate **94**. Attached to the other ends of the elbows **104** are longitudinally extending pipes **106** spaced outside the path of article travel. Ports **108** (Figs. 1 and 2) direct jets of air inwardly and downwardly against the upper surfaces of the wrapper ends to further assure their extension into the opening between the plates **30** and **60** so that they may be manipulated by the bars **32** to form an underlay as previously described.

While the air pressure means above described have their particular uses, it has been found that the suction unit **70** has particular utility in assuring the extension of the leading wrapper end *x* into the opening between the plates **30** and **60** especially where wide (in a transverse sense) articles are being wrapped. The suction unit **70** (Figs. 2 and 3) is pivotally connected at one end to a member **110** which is free to oscillate on the shaft **61**. The other end of the unit **70** is pivotally connected to a crank arm **112** which is secured by clamp screw **114** to a shaft **116**. The shaft **116** is journaled in bearings **118**, **120** and **122** secured respectively to an upright **124**, the upright **68** and the pad **73** (Fig. 2). The crankshaft **116** is rotated in timed relation to the movement of the bars **32** by a chain **126** which passes around a sprocket **128** secured to said shaft. The chain **126** is driven (Figs. 1, 2 and 15) by a sprocket **130** secured to the shaft **59** and passes around idler sprockets **132**, **134** on the shafts **59**, **61** respectively and an adjustable take-up sprocket **136**. The suction unit **70** is provided with upwardly directed suction ports **138** (Fig. 2) which are interiorly connected with a flexible tube **140**. The tube **140** extends through an opening **142** in the near upright **168** and then to a suction pump or other suitable vacuum source.

The described mounting of the suction unit **70** results in its being disposed beneath the upper bars **32** through a greater portion of their cycle of operation (Figs. 6–9). Then when the bars **32***f* and **32***g* are spaced apart above the unit **70** it is raised (by rotation of the crank arm **112**) into such spacing (Figs. 10 and 11). It will be noted that the bars **32***f*, **32***g* are beveled to facilitate this movement. In Fig. 12 it will be seen that the suction ports have engaged the wrapper end *x* and then in Fig. 13 the positive action of the suction unit in bringing the end *x* into the opening between the plates **30** and **60** in advance of the bar **32***g* will be observed. Engagement of the unit **70** with the wrapper end *x* is prolonged and thus made more effective by the mounting means employed. In this regard it should be noted that the unit **70** has a component of movement in the same direction as that of the articles, thus giving more positive assurance that end *x* will be in advance of bar **32***g* before it is released as seen in Fig. 14.

The above described underlap-forming instrumentalities moving in the same direction as the articles at all times provide support for said articles and in addition to the high degree of reliability which they provide, with or without fluid pressure assistance, they are capable of extremely fast rates of operation.

Having thus described my invention what I claim as novel and desire to secure by Letters Patent of the United States is:

1. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against the bottom face of the article and the other end trailing therebehind, a first platform for supporting the bottom face of such a partially encircled article as it is advanced, a second platform spaced from said first platform in the direction of article travel to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, said first platform having fluid pressure ports directed toward said opening immediately below and in the direction of article travel for facilitating the extension of said wrapper ends into said opening, longitudinally extending fluid pressure pipes adjacent and above said opening and outside the path of article movement, said pipes having ports angled inwardly and downwardly to direct fluid pressure against said wrapper ends to further facilitate the extension of said ends into said opening, a first shaft beneath said first platform, a second shaft beneath said second platform, a pair of transversely spaced sprockets on each of said shafts, a pair of chains carried by said sprockets, tranverse bars attached to and extending to and extending between said chains, said bars

being arranged in spaced relation along said chains, said arrangement comprising groups of articulated bars each group being spaced from and separated by a single bar, guide rails for the upper runs of said chains, said guide rails being arranged to guide the chains so that the transverse bars will move through a path contiguous with the path of the bottom face of the article as it is being advanced substantially throughout the length of the opening between said platforms, a suction unit having upwardly facing suction ports and pivotally connected at one end to an oscillating member on said first shaft, a crank arm connected to the other end of said suction unit, means for rotating one pair of sprockets in a direction to cause the transverse members carried by the upper chain runs to move in the same direction as the article and at a faster rate and in such predetermined relation thereto that the trailing portion of a group of articulated bars first supports the article as it is first advanced over said opening, means for rotating said crank arm in such predetermined relation to the movement of said bars that the ports of the suction unit engage the said one wrapper end to draw it into said opening between said trailing portion and the following trailing single bar, the timed relation of the bar movement to the article advance being such that upon further movement said following single bar holds said one wrapper end against said second platform as the leading portion of the following trailing group of articulated bars engages the other wrapper end and lays it against the bottom face of the article.

2. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against the bottom face of the article and the other end trailing therebehind, a first platform for supporting the bottom face of such a partially encircled article as it is advanced, a second platform spaced from said first platform in the direction of article travel to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, a first shaft beneath said first platform, a second shaft beneath said second platform, a pair of transversely spaced sprockets on each of said shafts, a pair of transversely spaced chains carried by said sprockets, transverse bars attached to and extending between said chains, said bars being arranged in spaced relation along said chains, said arrangement comprising groups of articulated bars spaced from and separated by a single bar, guide rails for the upper runs of said chains, said guide rails being arranged to guide the chains so that the transverse bars will move through a path contiguous with the path of the bottom face of the article as it is being advanced substantially through the length of the opening between said platforms, a suction unit having upwardly facing suction ports and pivotally connected at one end to an oscillating member on said first shaft, a crank arm connected to the other end of said suction unit, means for rotating one pair of sprockets in a direction to cause the transverse members carried by the upper chain runs to move in the same direction as the article and at a faster rate and in such predetermined relation that the trailing portion of a group of articulatd bars first supports the article as it is first advanced over said opening, means for rotating said crank arm in such predetermined relation to the movement of said bars that the ports of the suction unit engage the said one wrapper end to draw it into said opening between said trailing portion and the following trailing single bar, the timed relation of the bar movement to the article advance being such that upon further movement said following single bar holds said one wrapper end against said second platform as the leading portion of a trailing group of articulated bars engages the other wrapper end and lays it against the bottom face of the article.

3. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against the bottom face of the article and the other end trailing therebehind, a first platform for supporting the bottom face of such a partially encircled article as it is advanced, a second platform spaced from said first platform in the direction of article travel to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, a first shaft and a second shaft, a pair of transversely spaced sprockets on each of said shafts, a pair of transversely spaced chains carried by said sprockets, transverse bars attached to and extending between said chains, said bars being arranged in spaced relation along said chains, means for guiding the upper runs of the chains so that the transverse bars will move through a path contiguous with the path of the bottom face of the article as it is being advanced substantially throughout the length of the opening between said platforms, a suction unit having upwardly facing suction ports, means for rotating said sprockets in a direction to cause the transverse members carried by the upper chain runs to move in the same direction as the article and at a faster rate and in such predetermined relation that the trailing portion of a group of articulated bars first supports the article as it is first advanced over said opening, means for moving said suction unit into and out of the path of movement of the transverse bars on the upper chain runs in such predetermined relation to the movement of said bars that the ports of the suction unit engage the said one wrapper end to draw it into said opening between said trailing portion and the following trailing single bar, the timed relation of the bar movement to the article advance being such that upon further movement the single bar holds said one wrapper end against said second platform as the leading portion of a trailing group of articulated bars engages the other wrapper end and lays it against the bottom face of the article.

4. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against the bottom face of the article and the other end trailing therebehind, a first platform supporting the bottom face of such a partially encircled article as it is advanced, a second platform spaced from said first platform in the direction of article travel to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, spaced transverse members movable through a path intersecting the path of movement of the wrapper ends extending into said opening, the path of movement of said members being contiguous with the path of movement of the article bottom and means for so moving said members in the same direction as and at a faster rate than the article and in such predetermined timed relation to the movement of the article that one member supports the article as it is first advanced over said opening, a second following spaced member next supports the article and then holds said one wrapper end away from the article bottom and a third following spaced member next supports the article and lays said other wrapper end against the bottom face of the article, continuous advancement of the article bringing said bottom face over said second platform with said one wrapper end overlying said other wrapper end, the article supporting relationships of the spaced members overlapping so that the article is at all times supported as it is advanced over said opening.

5. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against one face of the article and the other end trailing therebehind, a first plate having a surface along which said one face of such a partially encircled article is advanced, a second plate spaced from said first plate in the direction of article movement to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, a plurality of transverse members

spaced apart in the direction of article movement and movable through a closed path a portion of which intersects the path of movement of the wrapper ends extending into said opening, means for so moving said members, suction means disposed beneath the path of article advance over said opening and movable in predetermined timed relation to the movement of said movable members to extend therebetween and into engagement with said one wrapper end to pull said wrapper end into said opening, the means for moving said spaced members being adapted to move said members through said intersecting portion in the same direction as and at a faster rate than the article and in such predetermined timed relation to the movement of the article that one of said members holds said one wrapper end clear of said one article face as a following member lays said other wrapper end against said one article face, continued advancement of the article bringing said one face along said second plate with said one wrapper end overlying said other wrapper end.

6. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against one face of the article and the other end trailing therebehind, a first plate having a surface along which said one face of such a partially encircled article is advanced, a second plate spaced from said first plate in the direction of article movement to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, fluid pressure means for facilitating the extension of both of said wrapper ends into said opening, a plurality of transverse members spaced apart in the direction of article advance and movable through a closed path a portion of which intersects the path of movement of the wrapper ends extending into said opening, the intersecting portion of the path of movement of said members being contiguous with the path of movement of said one article face, and means for so moving said members through said intersecting portion in the same direction as and at a faster rate than the article and in such predetermined timed relation to the movement of the article that one of said members holds said one wrapper end clear of said one article face as a following member lays said other wrapper end against said one article face, continued advancement of the article bringing said one face along said second plate with said one wrapper end overlying said other wrapper end.

7. In a wrapping machine, means for continuously rectilinearly advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against the bottom of the article and the other end trailing therebehind, a first plate along the upper surface of which the article bottom is advanced, a second plate spaced apart from said first plate in the direction of article movement to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, the upper surface of said second plate lying in the same plane as the upper surface of said first plate, a plurality of transverse members spaced apart in the direction of article advance and movable through a closed path a portion of which intersects the path of movement of the wrapper ends extending into said opening, the intersecting portion of the path of movement of said members being contiguous with the path of movement of the article bottom, and means for so moving said members through said intersecting portion in the same direction as and at a faster rate than the article and in such predetermined timed relation to the movement of the article that one of said members holds said one wrapper end clear of said article bottom as a following member lays said other wrapper end against said one article face, continued movement of the article bringing said bottom over said second plate with said one wrapper end overlying said other wrapper end.

8. In a wrapping machine, means for continuously advancing articles which are each partially encircled in a wrapper with one end of the wrapper laying against one face of the article and the other end trailing therebehind, a first plate having a surface along which said one face of such a partially encircled article is advanced, a second plate spaced from said first plate in the direction of article advance to provide an opening into which the wrapper ends extend as the article is progressively advanced by said advancing means, a plurality of transverse members spaced apart in the direction of article advance and movable through a closed path a portion of which intersects the path of movement of the wrapper ends extending into said opening, the path of movement of said members through said intersecting portion being contiguous with the path of movement of said one article face substantially throughout the length of said opening, and means for so moving said members through said intersecting portion in the same direction as and at a faster rate than the article and in such predetermined timed relation to the movement of the article that one of said members holds said one wrapper end clear of said one article face as a following member lays said other wrapper end against said one article face, continued movement of the article bringing said one face along said second plate with said one wrapper end overlying said other wrapper end.

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