United States Patent [19]

Zimmerman et al.

[11] **3,908,337**

[45] **Sept. 30, 1975**

[54] **FILM TUCKING APPARATUS**

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[73] Assignee: **Robert Bosch G.m.b.H.,** Stuttgart, Germany

[22] Filed: **May 2, 1974**

[21] Appl. No.: **466,112**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 290,664, Sept. 25, 1972, Pat. No. 3,816,969.

[52] **U.S. Cl.** **53/206;** 53/226

[51] **Int. Cl.²** **B65B 11/48;** B65B 49/08

[58] **Field of Search** 53/206, 210, 226, 229, 53/378

[56] **References Cited**

UNITED STATES PATENTS

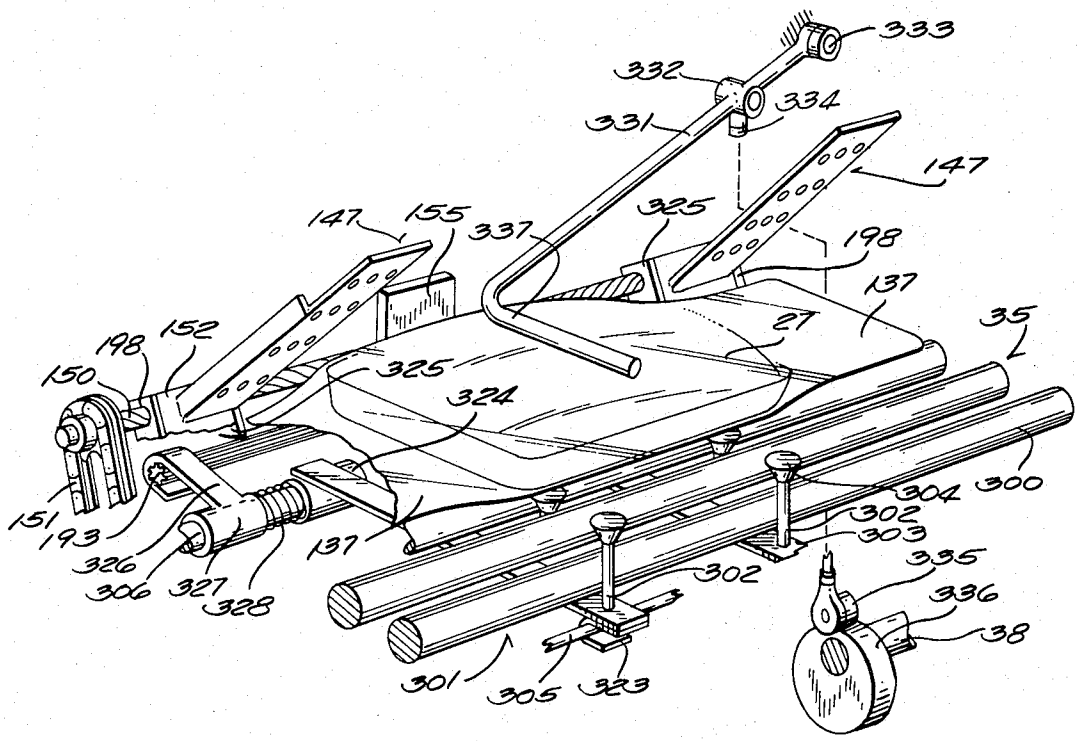
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Assistant Examiner—John Sipos
Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

Film tucking apparatus comprises a conveyor platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform. Pivotally movable with respect to the platform are a pair of tucking arms, one at each side of the article. These arms overlie the film wings and are pivoted to upward position permitting the article to be fed over the platform and to a position between the elevated arms and platform. The arms are lowered into contact with the film wings and the tucking arms are moved toward one another to sweep the film wings beneath the article. An elevator is provided beneath the article to lift it up during closing motion of the tucking arms.

15 Claims, 33 Drawing Figures



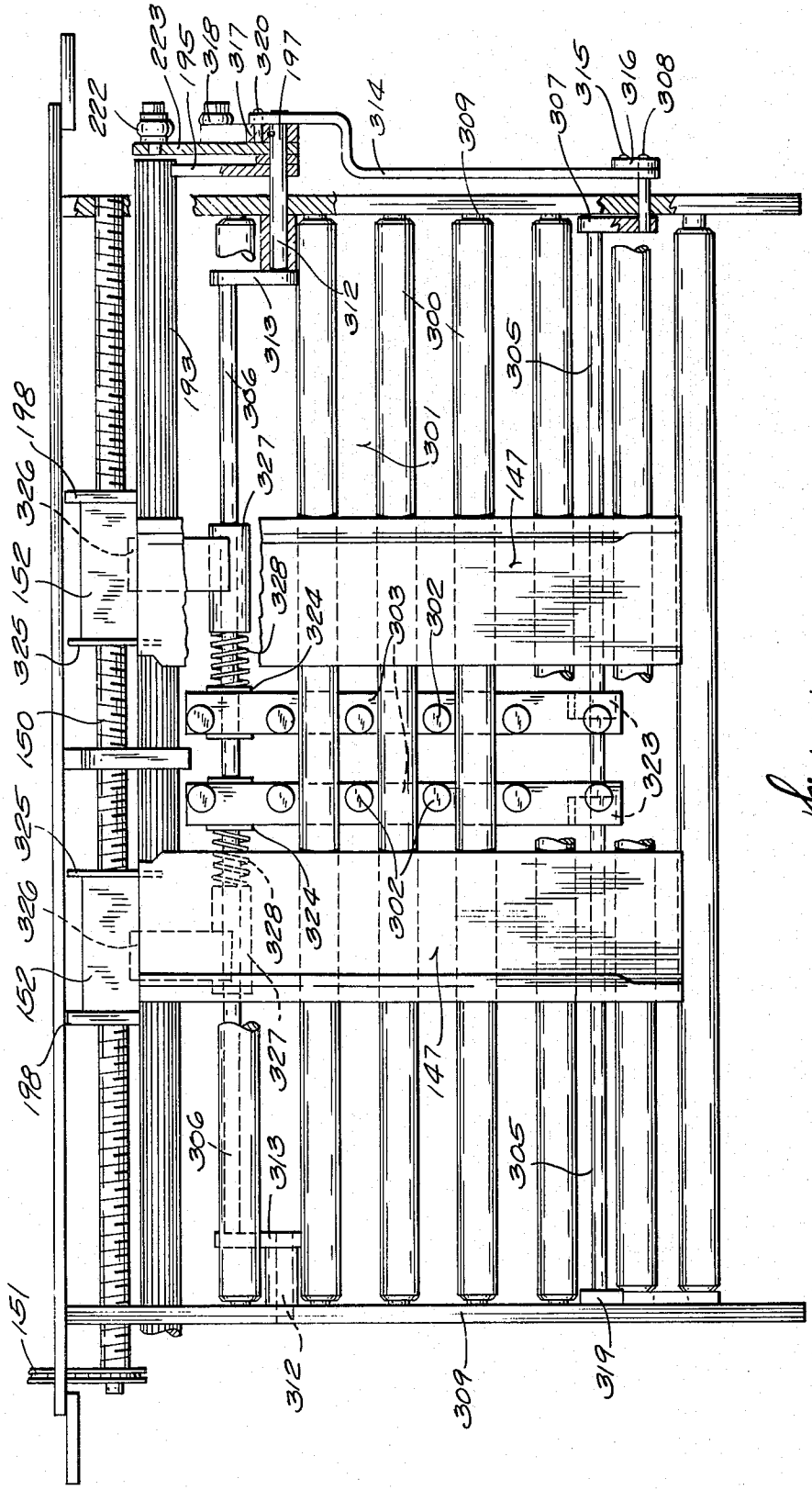


Fig. 2C

FIGS. 1--25, INCLUSIVE, ARE INCORPORATED BY REFERENCE FROM U.S. PATENT 3,816,969, ISSUED JUNE 18, 1974

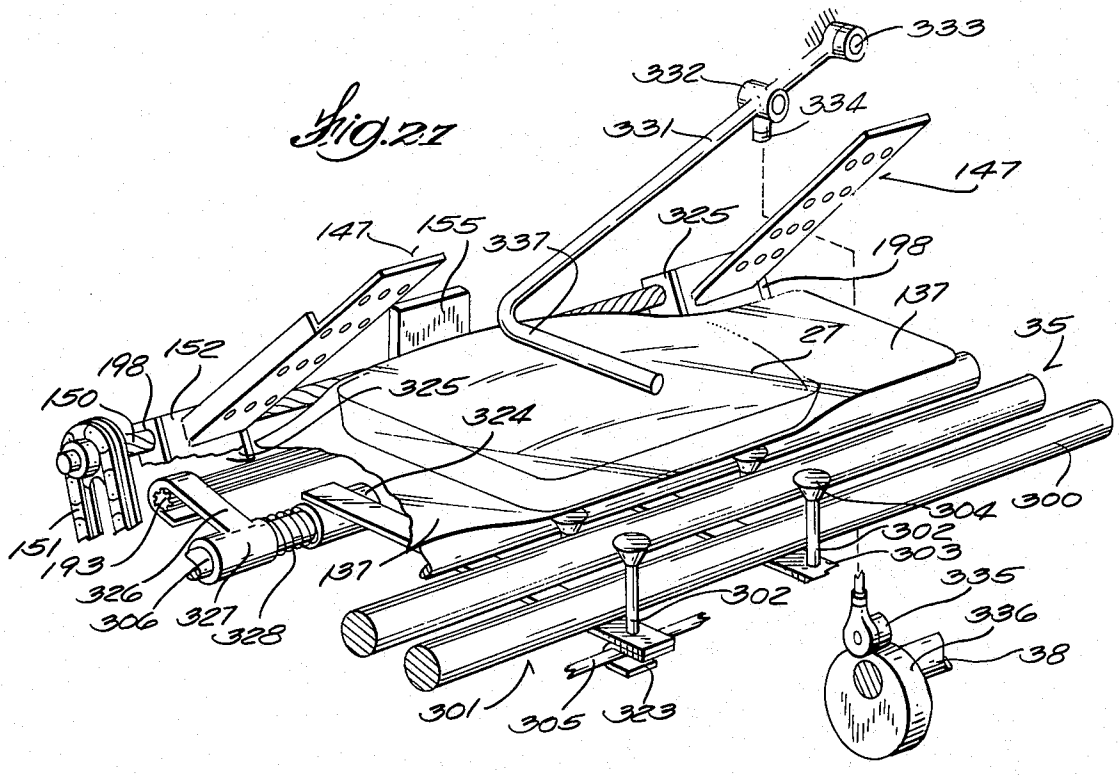


Fig. 27

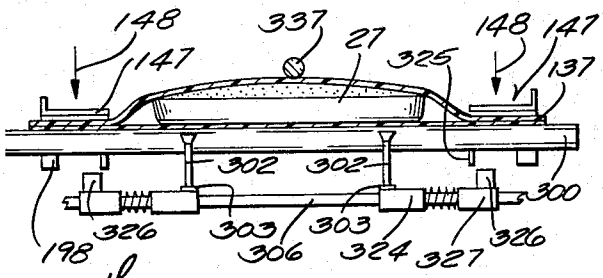


Fig. 28

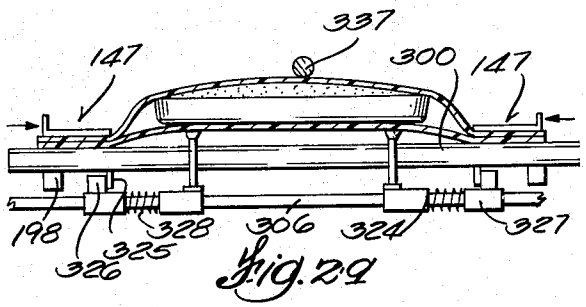


Fig. 29

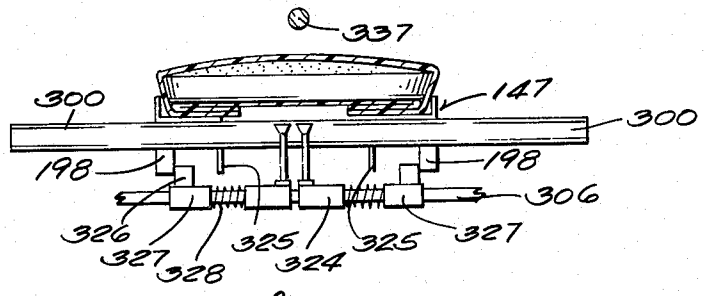


Fig. 30

Fig. 3.1

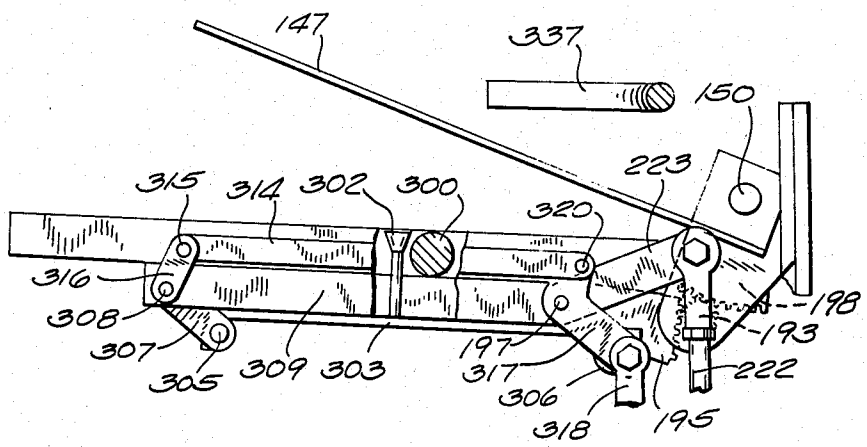


Fig. 3.2

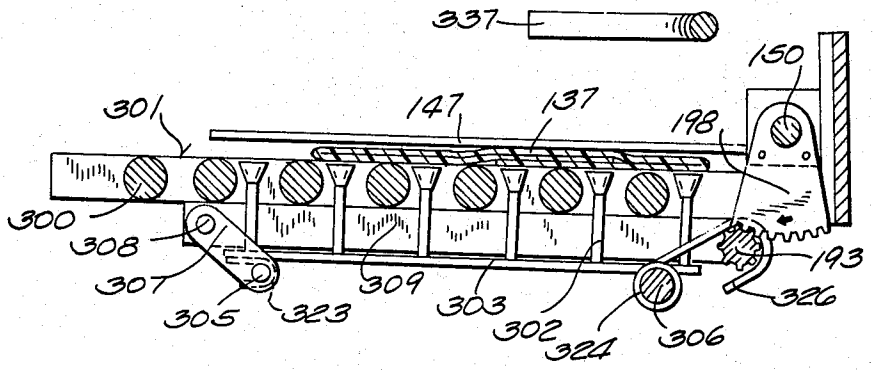
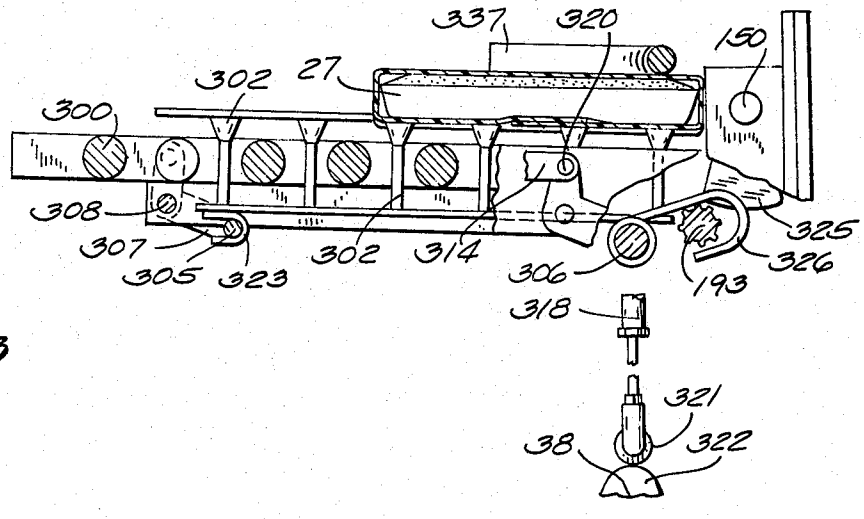


Fig. 3.3



FILM TUCKING APPARATUS

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of our copending U.S. Pat. application Ser. No. **290,664** filed Sept. **25, 1972,** now U.S. Pat. **3,816,969** granted June **18, 1974,** the entire disclosure of which is incorporated herein by reference.

SUMMARY OF THE INVENTION

This invention relates to the tucking apparatus by which laterally extending film wings are tucked beneath an article which is supported on a conveyor platform. Several embodiments of the invention are disclosed. In all embodiments the platform is provided with an elevator which lifts the article slightly as tucking arms sweep the laterally extending film wings beneath the article in the course of wrapping it. In some embodiments the conveyor platform consists of interrupted roller conveyor sections having a central gap or well in which an elevator paddle is disposed. In other embodiments, the conveyor rollers are continuous and the elevator comprises lift pins which project upwardly between the spaces between adjacent rollers. Mechanism actuated in timed relation to the operation of the wrapping machine sequentially actuates the tucking arms, elevator and a pushoff plate to process the articles through the tucking apparatus.

DESCRIPTION OF THE DRAWINGS

FIGS. **1–25** are illustrated and described in said copending U.S. Pat. **3,816,969.**

FIG. **26** is a plan view of another embodiment of film tucking apparatus incorporating the invention.

FIG. **27** is a fragmentary perspective view of the embodiment shown in FIG. **26.**

FIG. **28** is a fragmentary front elevation of the embodiment of FIGS. **26** and **27,** after the tucking arms have been lowered into engagement with the laterally projecting film wings.

FIG. **29** is a fragmentary front view similar to FIG. **28** and showing a later step in which the elevator lift pins have lifted the package and the tucking arms are beginning to sweep the film wings beneath the package.

FIG. **30** is a fragmentary front view similar to FIGS. **28** and **29** and in which the tucking arms have completed their sweeping motion.

FIG. **31** is a fragmentary side view, partly in cross section, showing parts of the apparatus shown in FIG. **26** with the parts in substantially the same position shown in FIG. **27.**

FIG. **32** is a fragmentary side view similar to FIG. **31** but in which the parts are shown in their positions illustrated in FIG. **28.**

FIG. **33** is a fragmentary side view similar to FIGS. **31** and **32** but in which the parts are shown in their positions illustrated in FIG. **29.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

The entire disclosure of said copending U.S. Pat. No. **3,816,969** is incorporated herein by reference. With respect to some of the claimed subject matter hereof, attention is invited particularly to FIGS. **14, 15, 16, 17** and **22** of the said copending patent and to the description relating thereto.

Newly disclosed subject matter of this application appears in FIGS. **26–33,** inclusive.

Parts in FIGS. **26–33** which correspond to like parts in FIGS. **1–25** are given the same reference characters.

In the embodiment of the tucking apparatus shown in FIGS. **14–17,** inclusive, the conveyor rollers **144** of platform **35** are interrupted axially to provide a gap **145** which functions as a well for the elevator lift blade or paddle **146.** In the embodiment shown in FIGS. **26–33,** the conveyor rollers **300** of platform **35** are similar to rollers **144** of the embodiment of FIGS. **14–17,** except that rollers **300** are axially continuous. These rollers are, however, spaced laterally one from the other with spaces **301** therebetween. As in the previously described embodiment, the rollers **300** are undriven and constitute a platform **35** upon which the partially wrapped package **27** with its laterally projecting film wings **137** is fed during operation of the wrapping machine. A pair of tucking arms **147** are mounted along the rear edge of the conveyor platform **35.** The arms **147** have hubs **152** threaded to receive the lead screw **150** powered by the chain **151,** as in the previously described embodiment.

In lieu of the elevator paddle **146** of FIGS. **14–17,** the tucking apparatus embodiment of the invention shown in FIGS. **26–33** is provided with elevator means comprising lift pins **302.** The pins **302** are arranged in two rows or series, each mounted on its own bar **303** beneath the conveyor platform rollers **300.**

Pins **302** are provided with heads **304** which are small enough to pass through the spaces **301** between adjacent rollers **300.** The heads **304** engage the underside of the partially wrapped article **27** to lift the article above the level of the tucking arms **147** as shown, for example, in FIG. **33.**

Each bar **303** is mounted for axial movement along the rollers **300** on guide rods **305, 306.** The respective guide rods **305, 306** are located beneath the rollers **300** and are mounted for arcuate swinging movement on paired swing links **307, 313.** Swing links **307** for rod **305** are pivoted to frame **309** on pintles **308** (FIGS. **26** and **32**). Swing links **313** for rod **306** are pivoted to frame **309** on pintles **312** (FIG. **26**). Swing arms **307,** 313 are interconnected for parallelogram swinging action of the guide rods **305, 306** by cross link **314.** As best shown in FIGS. **26** and **31,** cross link **314** is pivotally connected by pin **315** to crank arm **316** which is fast to one pintle **308** which in turn is fast to its swing link **307.** The corresponding swing link **319** (FIG. **26**) at the other end of slide rod **305** is pivotally connected to frame **309.**

The other end of cross link **314** is pivotally connected to a bell crank **317** which is fast to the end **197** of pintle **312** which carries the rear cross guide rod **306** on swing link **313.** An actuating link **318** is also pinned to bell crank **317.** As shown in FIG. **33,** actuating link **318** has a cam follower roller **321** which follows a cam **322** on line shaft **38.** Accordingly, the lift pins **302** are raised and lowered simultaneously in time with operations of the machine in accordance with the rotation of line shaft **38** and the various cams attached thereto.

Pin bars **303** are slidably guided along the front guide rod **305** by hooks **323** which function as slide bearings on which the front ends of pin bars **303** can move axially along the conveyor rollers **300**. The hooks **323** constrain the bars **303** to rise and fall in accordance with the movement of the link **318** acting on bell crank **317**. The rear ends of the pin bars **303** are fastened as by welding to sleeves **324** through which extends the rear guide rod **306**. Sleeves **324** are slidable axially along the rod **306**.

Sleeves **324** are coupled by motion transmitting connections to the tucking arms **147** so that motion of the arms **147** axially along the rollers **303** will be transmitted to the bars **303** and hence to the lift pins **302**. As in the previously described embodiment, the tucking arms **147** are provided with sector plates **198** which extend from their hubs **152**. The sector plates **198** have teeth which mesh with the teeth **192** on splined shaft **193**. Accordingly, rotation of the splined shaft **193** will raise and lower the tucking arms **147** as described in connection with FIG. **22**. Splined shaft **193** is also engaged by the teeth on sector crank arm **195** (FIGS. **22**, 26 and **31**) which is free to rotate on end **197** of pintle **312** and which is fast to crank arm **223** which is pivotally connected to the actuating link **222**. Accordingly, up and down motion of link **222**, as shown in FIG. **22** and in FIG. **31**, will be effective to raise and lower the arms **147** through the geared interaction of toothed sector plates **195** and **198** with splined shaft **193**.

As in the previously described embodiment, the tucking arms **147** are moved axially along the conveyor rollers **300** by means of the lead screw **150** which engages the threaded hubs **152** of the arms **147**. The threads over one-half the length of screw **150** are pitched oppositely to the threads along the other one-half the length of screw **150**.

In the present embodiment, each hub **152** is additionally provided with a carrier arm **325** which is spaced axially with respect to the sector crank arm **198**. Each corresponding pair of axially spaced sector crank arms **198** and carrier arm **325** loosely embraces a carrier follower which comprises a hook **326** which is loosely looped around the splined shaft **193** and is fastened to a sleeve **327** slidable on the rods **306**. Sleeves **327** and **324** are axially spaced on the rods **306** and are connected by the coil springs **328**.

The hook **326** does not fill the space between the carrier arms **198, 325**. Accordingly, the aforedescribed arrangement provides for lost motion connection between the tucking arms **147** and the straps **303**. The springs **328** provide a yieldable connection between the hooks **326** and the straps **303**. Moreover, as is clear from FIG. **33**, the hook **326** can back away from the splined shaft **193** when the pins are lifted, without losing engagement therewith.

The operation of the embodiment of FIGS. **26–33** is similar to the operation of the embodiment of FIGS. **14–17**, except that the elevator pins **302** and tucking arms **147** are independently actuated, although in timed sequence. In this embodiment link arm **222** raises and lowers tucking arms **147** and link arm **318** raises and lowers the pins **302**. The actuating sequence is timed by reason of the actuation of all of the parts through the line shafts **38, 47**.

Moreover, in the embodiment of FIGS. **26–33**, the lift pins **302** can be widely spaced for wide packages and narrowly spaced for narrow packages by reason of the slide couplings of the pin bars **303** with the guide rods **305, 306** and the lost motion couplings between the pin bars **303** and the tucking arms **147**.

The embodiment of FIGS. **26–33** also includes a package hold-down arm **331** which is pivotally mounted on a stationary pin **333** and has a lifting portion **332** pivotally connected by link **334** to a cam follower **335** actuated by cam **336** on line shaft **38**. Arm **331** has a Teflon coated finger portion **337** which engages the top of the article **27** to hold the package against dislocation during the sweeping motion of the sweep arms **147**. Cam **336** is timed to lower the hold-down finger onto the article **27** before the tucking arms **147** sweep thereunder and to lift the finger before the pushoff arm **155** is actuated.

In operation, package **27** with extending film wings **137** is advanced to the illustrated position in FIG. **27** at which point of time the arms **147** are elevated and the elevator fingers **302** are retracted downwardly. Cam operated link actuator **222** then turns splined shaft **193** to lower arms **147** in the direction of arrows **148**, as in FIG. **28**, toward the position of the parts shown in FIGS. **28** and **32** in which the tucking arms **147** engage the film wings **137**. The next step is for the cam **322**, as shown in FIG. **33**, to lift the pins **302** to their position raising the package **27** as shown in FIGS. **33** and **29**. Chain **151** will now be actuated to turn the lead screw **150** and cause the arms **147** to move toward each other and start to sweep the film wings underneath the package **27**.

As the tucking arms **147** sweep beneath the package **27**, meanwhile having picked up the follower hooks **326**, to also move the straps **303** for the pins **302** toward one another, the cam **322** will have rotated to a point beyond that shown in FIG. **33** and the pins **302** will drop to their position shown in FIG. **30**, thus to be clear of the package. When the film wings **137** are fully tucked beneath the article **27**, cam **336** on shaft **38** (FIG. **2**) will lift the hold-down finger **337** to a position clear of the package **27** as shown in FIG. **30**, whereupon the pushoff plate **155** may now push the article **27** from conveyor platform **35** onto conveyor platform **37**, as shown in FIG. **12**.

We claim:

1. Film tucking apparatus comprising a platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform, paired tucking arms, one at each side of the article and overlying said film wings, said film wings being thus disposed between said arms and said platform, article elevator means, means for raising the elevator means with respect to the platform to lift the article above the platform and open a narrow space between the platform and article into which the film wings may be swept and means for advancing said tucking arms toward each other into said space to wipe the film wings along the platform and the article and sweep the film wings beneath the article.

2. The apparatus of claim **1** in which the platform comprises interrupted conveyor rollers having a gap, said elevator means comprising a lift arm disposed in said gap.

3. The apparatus of claim **1** in which the platform comprises laterally spaced conveyor rollers, said elevator means comprising lift pins disposed in the spaces between rollers.

4. Film tucking apparatus comprising a platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform, paired tucking arms, one at each side of the article and overlying said film wings, article elevator means, means for raising the elevator means to lift the article and means for advancing said tucking arms toward each other and beneath the lifted article to sweep the film wings beneath the article, said platform comprising laterally spaced conveyor rollers, said elevator means comprising lift pins disposed in the spaces between rollers, said elevator means further comprising paired arms below the conveyor rollers and upon which said lift pins are mounted, guide means for the paired arms of the elevator and motion transmitting connection between the tucking arms and the paired arms of the elevator means whereby said paired arms are moved along their guide means as a consequence of motion of the tucking arms.

5. The apparatus of claim 4 in which said motion transmitting connections comprise lost motion connections.

6. Film tucking apparatus comprising a platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform, paired tucking arms, one at each side of the article and overlying said film wings, article elevator means, means for raising the elevator means to lift the article and means for advancing said tucking arms toward each other and beneath the lifted article to sweep the film wings beneath the article, said platform comprising laterally spaced conveyor rollers, said elevator means comprising lift pins disposed in the spaces between rollers, said elevator means further comprising paired arms below the conveyor rollers and upon which said lift pins are mounted, the means for raising said elevator means comprising linkages connected to said paired arms and means for actuating said linkages in timed relation to the means for advancing the tucking arms toward each other.

7. The apparatus of claim 1 in combination with an article hold-down arm and means to actuate said arm in time with said tucking arms.

8. Film tucking apparatus comprising a platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform, paired tucking arms, one at each side of the article and overlying said film wings, article elevator means, means for raising the elevator means to lift the article and means for advancing said tucking arms toward each other and beneath the lifted article to sweep the film wings beneath the article, said tucking arms having threaded hub sockets, the means to advance said arms toward each other comprising a lead screw threaded through said sockets.

9. Film tucking apparatus comprising a platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform, paired tucking arms, one at each side of the article and overlying said film wings, article elevator means, means for raising the elevator means to lift the article and means for advancing said tucking arms toward each other and beneath the lifted article to sweep the film wings beneath the article, said tucking arms having hubs with toothed crank arms extending therefrom, a splined shaft engaged with the teeth of said crank arms and means for rotating said splined shaft to raise and lower the tucking arms with respect to the platform.

10. The apparatus of claim 9 in which said means for raising the elevator means comprises a toothed crank arm engaged with said splined shaft, for concurrent action of the elevator means and tucking arms.

11. The apparatus of claim 9 in which said means for raising the elevator means comprises linkage and means actuating said linkages independently of the splined shaft.

12. Film tucking apparatus comprising a platform for a partially wrapped article having film wings extending beyond both sides of the article and overlying the platform, paired tucking arms, one at each side of the article and overlying said film wings, article elevator means, means for raising the elevator means to lift the article and means for advancing said tucking arms toward each other and beneath the lifted article to sweep the film wings beneath the article, and motion transmitting connections between the elevator means and the tucking arms, whereby motion of the tucking arms toward and away from one another will be transmitted to the elevator means.

13. The apparatus of claim 12 in which said motion transmitting connections comprise lost motion connections.

14. The apparatus of claim 13 in which said lost motion connections comprise spaced carriers on said tucking arms, said elevator means comprising a follower finger disposed between said carriers, whereby to be loosely captivated therebetween.

15. The apparatus of claim 14 in combination with means for raising and lowering said tucking arms and including a splined shaft and a toothed crank arm interconnecting a tucking arm and said splined shaft, said follower comprising a hook at least partly around said splined shaft, one of said carriers comprising one of said toothed crank arms for a tucking arm at one side of the hook and the other said carrier being spaced therefrom axially along said splined shaft and at the other side of the hook.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,908,337

DATED : September 30, 1975

INVENTOR(S) : Thomas C. Zimmerman and Charles E. Michaels

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Title page:

change line [73] to delete "Robert Bosch G.m.b.H, Stuttgart, Germany" and substitute Reliance Electric Company, Cleveland, Ohio

change Attorney, Agent or Firm to delete "Michael J. Striker" and substitute Joseph P. House, Jr.

Signed and Sealed this

ninth Day of *March 1976*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks