Sept. 27, 1955 G. M. MAST ET AL 2,718,738

BUNDLE WRAPPING MACHINE

Filed Nov. 30, 1949 5 Sheets-Sheet 1

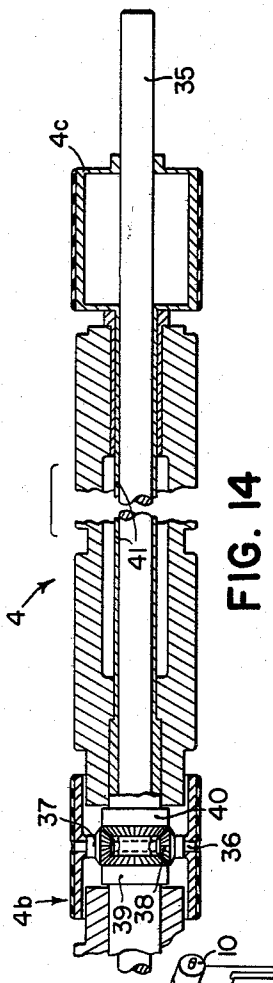


FIG. 14

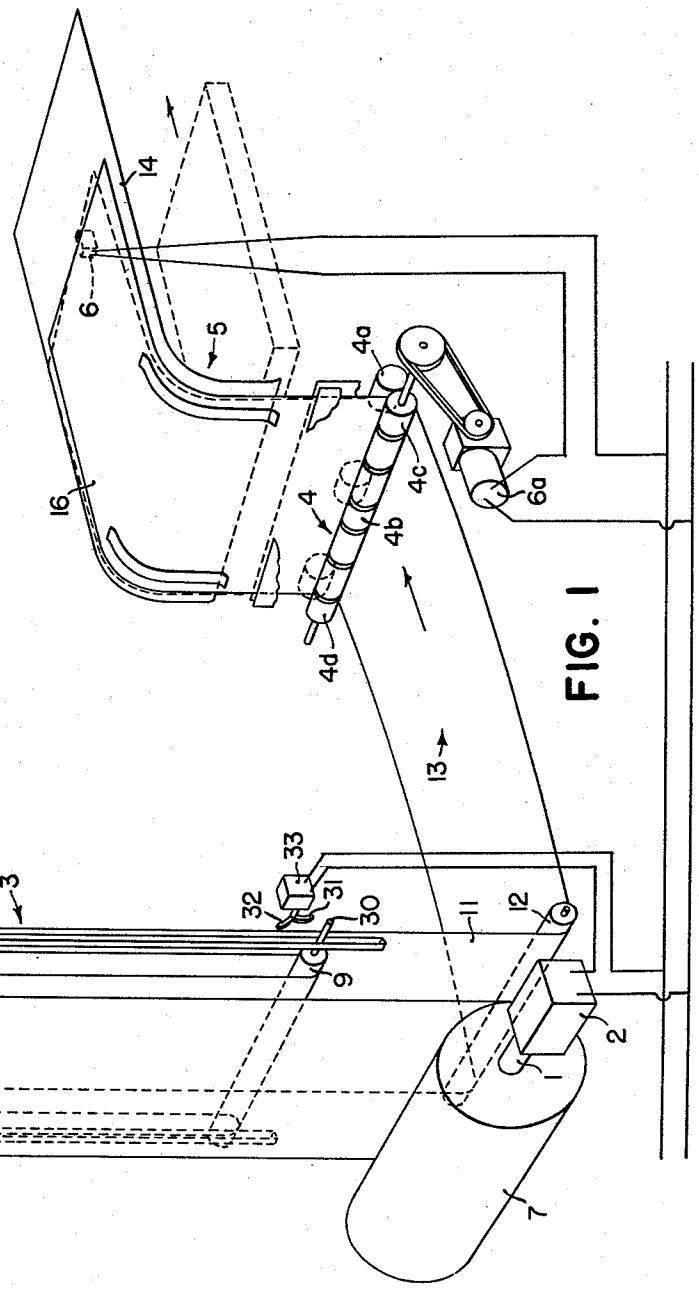


FIG. 1

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BUNDLE WRAPPING MACHINE

Filed Nov. 30, 1949 5 Sheets-Sheet 2

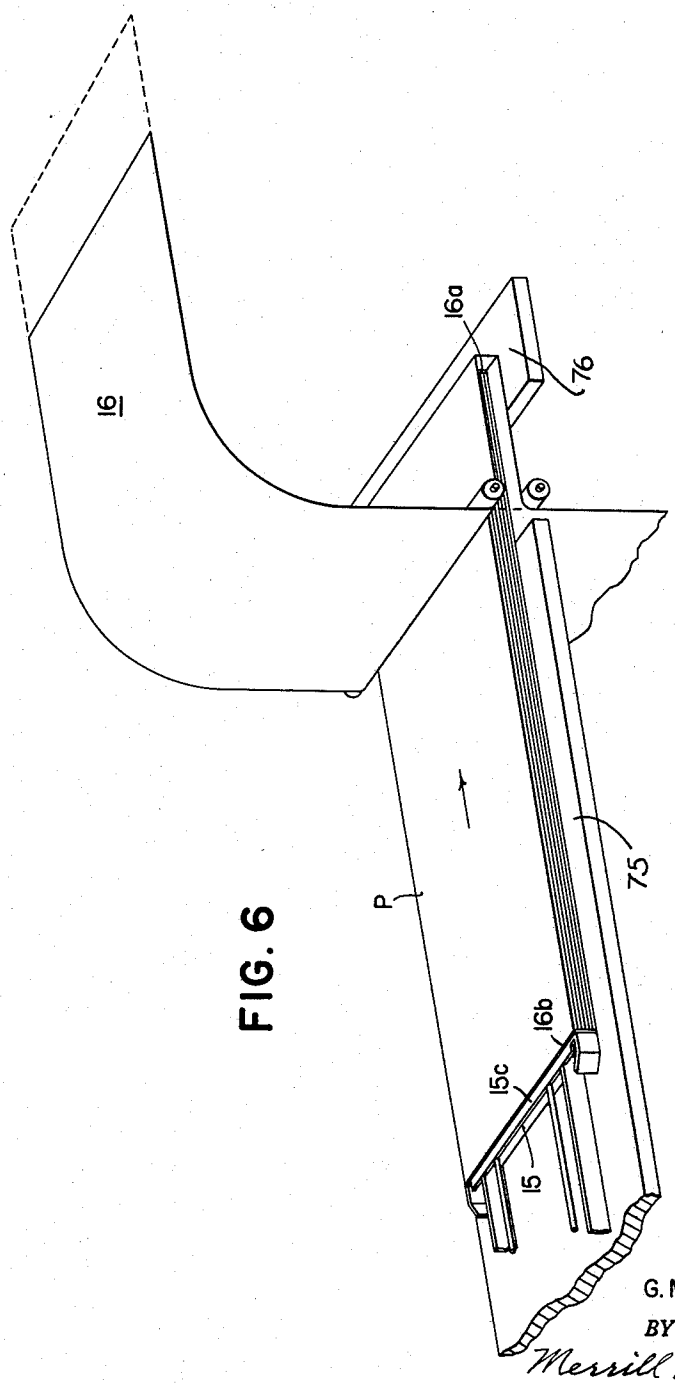


FIG. 6

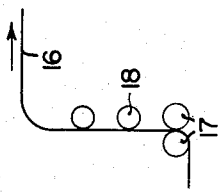


FIG. 5

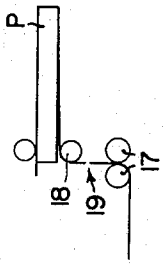


FIG. 4

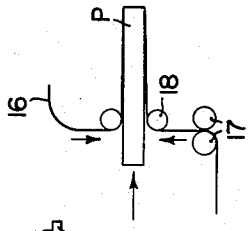


FIG. 3

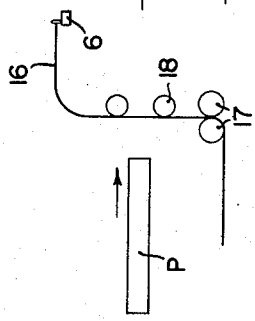


FIG. 2

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BUNDLE WRAPPING MACHINE

Filed Nov. 30, 1949 5 Sheets-Sheet 3

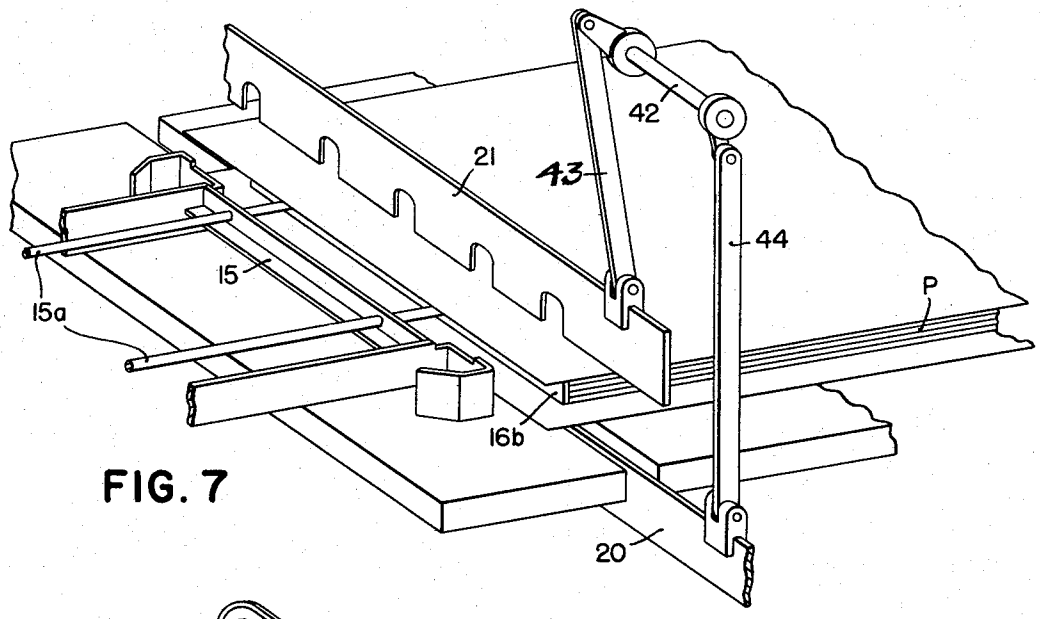


FIG. 7

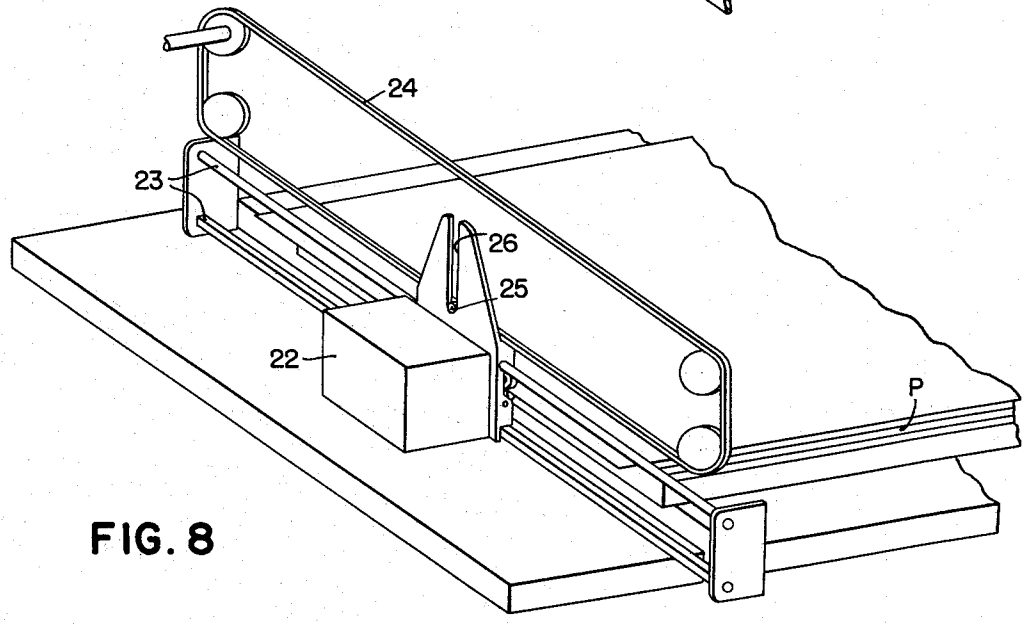


FIG. 8

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BUNDLE WRAPPING MACHINE

Filed Nov. 30, 1949 5 Sheets-Sheet 4

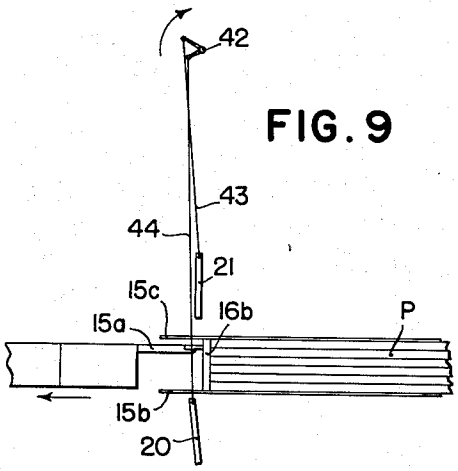


FIG. 9

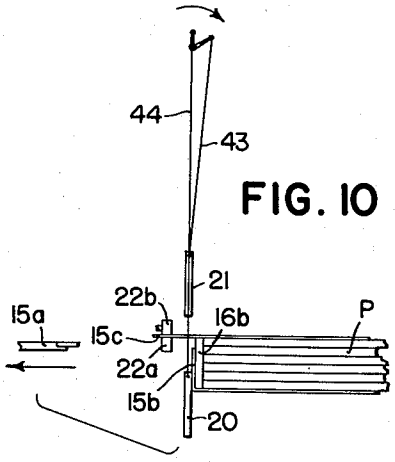


FIG. 10

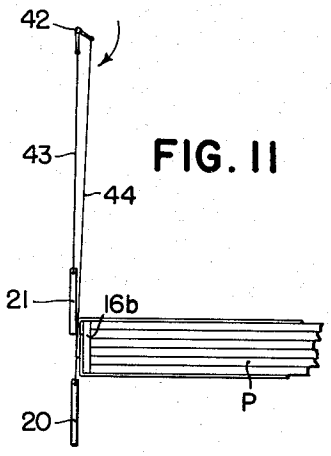


FIG. 11

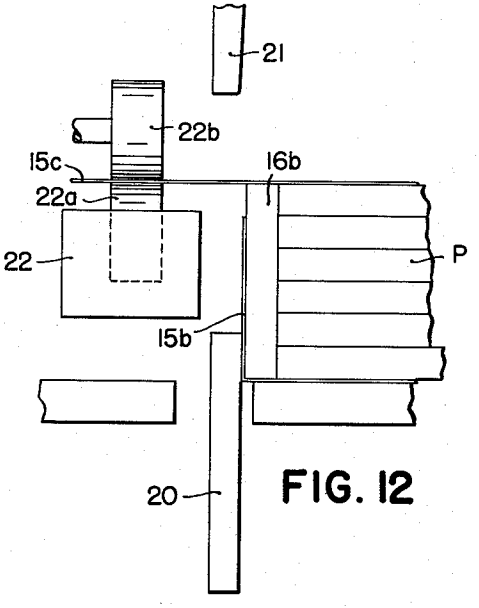


FIG. 12

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BUNDLE WRAPPING MACHINE

Filed Nov. 30, 1949 5 Sheets-Sheet 5

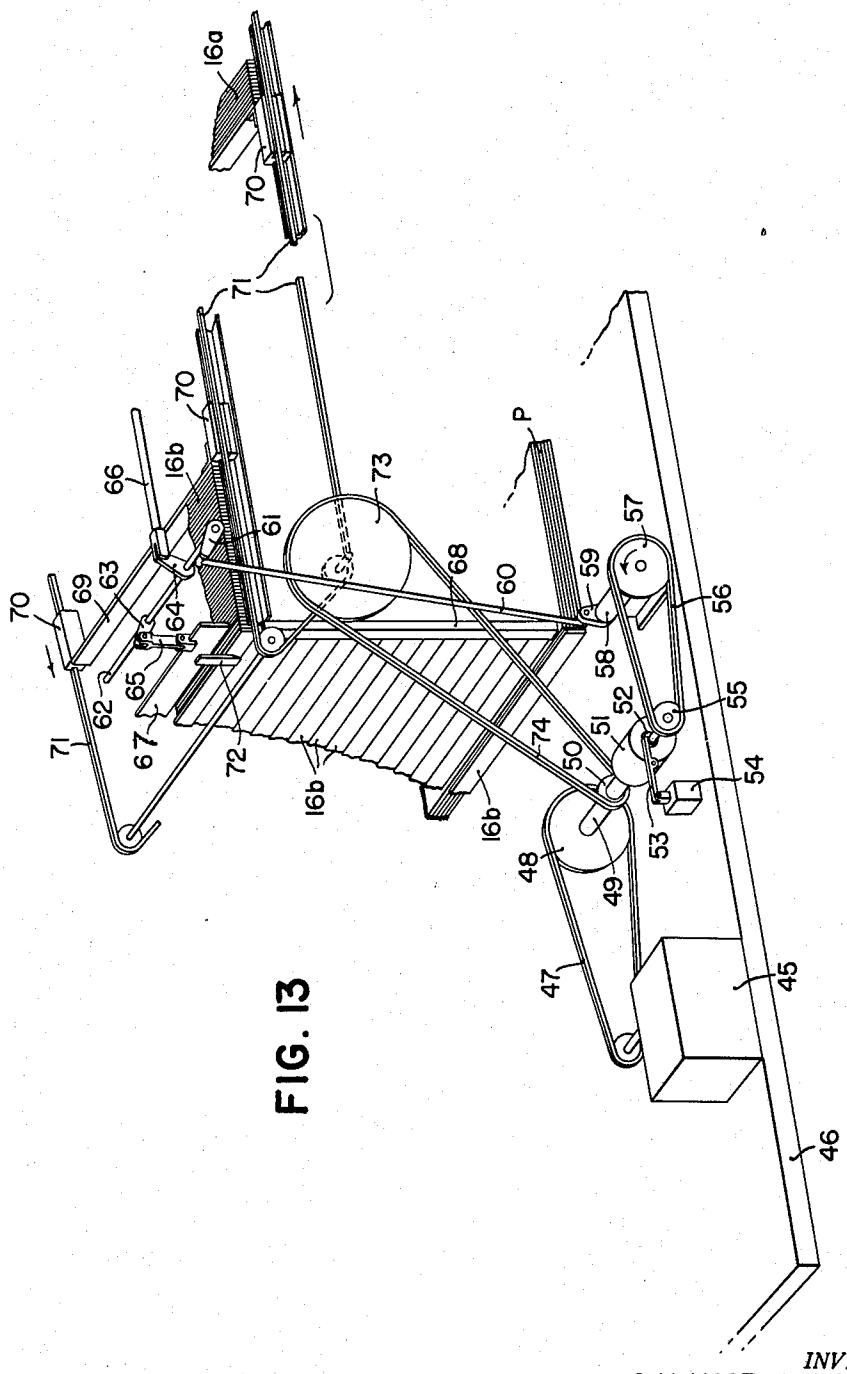


FIG. 13

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2,718,738

Patented Sept. 27, 1955

2,718,738

BUNDLE WRAPPING MACHINE

Gifford M. Mast, Davenport, Wright K. Gannett, near Davenport, and Lloyd E. Moeller, Davenport, Iowa, assignors to Mast Development Company, Inc., Davenport, Iowa, a corporation of Iowa

Application November 30, 1949, Serial No. 130,298

5 Claims. (Cl. 53—38)

Our present invention relates to machines for wrapping bundles, and is designed particularly for the wrapping of bundles of insulating wall boards, although, obviously, not limited to this use, as minor details of construction may be changed to adapt the machine for other uses. These boards vary in size but, in this country, they are commonly four feet (4′) wide by six feet (6′) to twelve feet (12′) in length, and three-eighths inch (⅜″) to one-half inch (½″) in thickness. The mechanism of the present invention is used to wrap up these sheets in bundles from two inches (2″) to four inches (4″) in thickness, which are commonly called for in the trade.

Among the objects of this invention are to provide a machine for wrapping the extremely large bundles of the type indicated without injuring the rather fragile material; to provide a machine for wrapping the material with reinforcement strips inside the wrapping; and such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the structure disclosed herein. Our invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings and, while we have shown therein what is now regarded as the preferred embodiment of this invention, we desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents, in perspective, diagrammatically, the paper-feed mechanism of this machine;

Figs. 2, 3, 4, and 5 represent, diagrammatically, the steps in the feeding of the paper through this machine;

Fig. 6 represents, on a larger scale, the feeding of the bundles, about to be wrapped;

Fig. 7 represents the bundling operation just prior to the infolding of the paper at the rear of the bundle;

Fig. 8 represents, in perspective, the mechanism for the gluing of the rear edge of the bottom face of the upper flap of the paper, just prior to the infolding thereof in the packaging operation;

Figs. 9, 10, 11, and 12 represent, diagrammatically, the operation of sealing the rear end of the bundle;

Fig. 13 represents, diagrammatically, the mechanism for and the operation of feeding down behind the sheets to be bundled the edge-reinforcement strip at the rear edge of a group of sheets and a part of the mechanism for feeding in reinforcement strips at the forward ends of the sheets; and

Fig. 14 represents a longitudinal section of a differential paper-drive roller.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this mechanism. Broadly, this machine comprises a paper roll support **1**, a paper roll drive motor **2**, a wrapping paper accumulator **3**, a differential paper feed roll **4** for properly centering the web of paper for the wrapping operation and feeding the paper web, a paper guide **5**, and an adjustable paper stop mechanism **6**. In Fig. 13 there

is shown a part of the mechanism for feeding in, at the forward and rear edges of the bundles, reinforcing strips for protecting the edges of the bundles. This mechanism is located in the space above the paper web in the middle of Fig. 1, so that, as the product being bundled is fed forwardly, it will pass just below the paper guide **5**.

The roll of paper **7** is supported on the paper support **1** which is rotated slowly by the motor **2**, and the web of paper is fed upwardly and over the roll **8**, from which it feeds downwardly around the roll **9**, and then upwardly again around the roll **10**, from which it goes downwardly, as indicated at **11**, and around the roller **12**. From here it travels horizontally, as indicated at **13**, to the roller **4**, and from this upwardly through the guides **5**, being forced upwardly by the rollers **4** and **4***a*. Passing the guides **5**, the paper is fed out on the top of the traveling webs which form a part of the table **14**.

The switch **6** of the paper-feed stop may be placed above or below the paper web but it is preferably placed below and has a wire extending up into the path of the paper where it is engaged by the edge of the paper as it travels forwardly. This results in the stopping of the feeding of the paper, as a circuit leads to the motor **6***a* from the switch **6** of the paper-feed stop, opened by the pressure of the paper. This switch **6** of the paper-feed stop and the motor **6***a*, together with associated wiring, are represented in Figs. 1 and 2. After the paper has been fed to position, as shown in Fig. 1, with the edge of the paper against the switch **6** of the paper-feed stop, edge-reinforcement strips **16***a* and **16***b* are inserted, at the ends of the bundle, so that they will be bound into the bundle, between the paper and the product P being bundled.

The next step is the bundling which comprises, among other things, pushing the product forwardly by means of the infeed pusher **15** of Fig. 6 and over the table **75**. As the bundle is pushed forwardly through the opening **5***a*, the strip **16** of paper is pulled backwardly by the infeed of the product, as illustrated by Figs. 2 to 4. The paper then extends under the bundle, across the front end and over the top, as shown in Fig. 4, with an edge reinforcement strip **16***a* between the paper and the forward edge of the bundle. The material P is fed forwardly from the table **75** to the table **76**.

As the paper is being brought around three sides of the bundle, as indicated in the next preceding paragraph, a pair of shoes, located along the sides of the bundle, engage the forward corners thereof and tuck in those corners, as the bundle advances. Then one edge of each of the side flaps at each side of the bundle is glued and turned in to stick it to the first of these flaps to close the sides of the bundle by another pair of shoes. This infolding of these side flaps is done progressively, starting at the forward corners and, after the side edges have been folded in and glued in place and the paper for bundling the product has been cut from the paper supply, the back fold is completed, as shown in Fig. 11. Then the rear corners are tucked in. The rear reinforcement strip **16***b* is held in place as the bundle is advanced by the infeed pusher **15** and, when the pusher **15** is withdrawn, it is held in place by the rods **15***a*.

When the rear edge of the bundle reaches the position shown in Fig. 4, between the rolls **17** and **18**, it stops while a cutter travels across the machine below the roll **18** and cuts off the paper, as indicated at **19**. The bundle is then advanced to the position shown in Fig. 9. Then the lower rear folder **20**, located as shown in Fig. 9, rises, spaced somewhat from the rear edge reinforcement strip **16***b*, and moves forwardly to fold the bottom flap in against the edge of the bundle, as shown in Fig. 10. After the flap **15***b* is folded upward by the lower rear folder **20**, the holding bar **15***a* is withdrawn, since

it is no longer needed to hold the rear reinforcement strip **16***b* in place.

Next a glue pot **22** travels across the machine on a pair of rods **23**, actuated by an endless chain **24** looped across the machine and carrying a pin **25** which engages in a slot **26** in an extension of the glue pot, as shown in Fig. 8. This glue pot, of conventional construction, has applying means, preferably in the form of a roller, which dips into the glue in the pot, as shown in Fig. 12, over which roller passes the upper flap of the paper which is pressed down on the roller **22***a* by a roller **22***b*. The result of this is that a thin layer of glue is applied to the inner face of the upper flap. Now, the upper folder blade **21** moves downwardly to fold the upper flap in, as shown in Fig. 11, and the two flaps are secured together when the upper rear flap **15***c* comes against the outside of the lower flap.

When the roll **4** feeds the paper up until it reaches the stop **6**, it is not feeding as rapidly as the motor **2** feeds the paper to the accumulator **3**, with the result that the roll **9** lowers to near the bottom of the accumulator, and the paper accumulates sufficiently to wrap a bundle. When the shaft **30**, going down past the switch **33**, strikes the arm **31** of the switch, it opens the switch and its connection to the motor **2**, so that the feeding of the paper is stopped. Then, when the product being bundled begins to pull out the paper web, the shaft **30** strikes the upper arm **32** of the switch **33**, and the motor **2** is started.

When the backfold is completed, as shown in Fig. 11, a flight of conventional construction and carried by sprocket driven chains carries the bundle forward.

The roll **4** has three rubber-faced sections **4***b*, **4***c*, and **4***d* which cooperate with the rolls **4***a* in feeding the paper up into the guides **5**. These three sections **4***b*, **4***c*, and **4***d* are the same size, are slightly larger than the other intermediate sections, and travel at the same rate as the paper web. Sections **4***c* and **4***d* are connected through a differential gear system **36**, **37**, **38**, and **39** so that, if either **4***c* or **4***d* travels faster than **4***b*, then the other one must travel slower. The shaft **35** is non-rotatable and slightly bowed, with the result that there is a very slight angle between the axes of **4***c* and **4***d*. Hence, there is a tendency to stretch the paper web laterally, with the result that the paper is kept taut and, through differential action of sections **4***c* and **4***d*, is centered laterally on the feed roll.

Reference will now be made more particularly to Fig. 13, showing the mechanism for feeding the edge reinforcement strips into position. A motor **45**, carried by a table **46**, is connected by a belt **47** to a belt pulley **48**, or this may be a sprocket connected by a sprocket chain **47** to the motor **45**. On the shaft **49**, carrying the belt pulley **48**, is a sprocket **50** and a clutch **51**, carrying a single dog **52** which is engaged by a stop **53**. This stop is actuated by the solenoid **54**, releasing the clutch **51** for a single rotation. As a result, the sprocket **55**, through chain **56**, drives the sprocket **57** one-half revolution. This sprocket is connected through the shaft **58** to the eccentric **59**, from which a link **60** leads to a crank arm **61** mounted on a shaft **62**. Crank arms **63** and **64** connect this shaft to links **65** and **66**, to which are connected the ram **67**, forcing the reinforcement strips **16***a* and **16***b* down through grooved guide channels **68**, from which the lowest strips **16***a* and **16***b* are released when they reach the bottom ends of the guides **68**. The ram **67** at the forward end is not shown in the drawing.

Constant pressure tending to force the strips **16***a* to the right and **16***b* to the left, as shown in Fig. 13, is furnished by crossbars **69** connected to blocks **70** carried and actuated by chains **71** which slide through the friction blocks **70**. Whenever a ram **67** forces a strip **16***a* or **16***b* downwardly and then withdraws, a group of strips on the table on which they are resting is fed along by the crossbars **69** and blocks **70**, the lead strip stopping against the stop **72**. During this stop period, the chains **71** continue to slide through the blocks **70**, driven by the sprocket **73** and chain **74**.

It is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention or the scope of the appended claims.

Having now described our invention, we claim:

1. In a bundle-wrapping machine, the combination of a paper drive, a table to receive paper from the paper drive, said table being located above said paper drive, paper guide means leading the paper upwardly from said drive and onto said table, a paper-actuated switch means on said table and connected to said paper drive for starting and stopping the drive, a second paper drive, a second table below said first table, above said first paper drive, and located between said first and second paper drives, paper guide means carrying paper from said second paper drive under said second table to said first paper drive, a wrapping table at the same level as said second table and underneath said first table, and a pusher for feeding articles to be wrapped from the second table against said paper as it extends from said first paper drive to said first table and onto said wrapping table.

2. A bundle-wrapping machine as defined by claim 1, further characterized by strip-inserting mechanism above said wrapping table and below said paper-receiving table for feeding reinforcing strips during the wrapping operation.

3. A bundle-wrapping machine as defined by claim 1, further characterized by a paper accumulator having a vertically movable roller for delivering paper to said first paper drive, and means controlled by said vertically movable roller for controlling said second paper drive.

4. In a bundle wrapping machine, a table for supporting temporarily one end of a length of wrapping material to be wrapped around a bundle, a second table for receiving the bundle material to be wrapped, a third table to receive the bundle material to be wrapped thereon, said second table and said third table being positioned in substantially the same horizontal plane and located so that the first mentioned table is above the third table, the second and third tables having an opening therebetween, means for feeding lengths of said wrapping material below the second table, through said opening, and up to the first table where it is temporarily held, means for feeding the bundle material from the second table across said opening and to the third table, feeding of the bundle material to the third table across said opening causing withdrawal of the wrapping material from the first table and wrapping it around the bundle material, and means beyond the opening between the second and third tables for sealing said wrapping material around said bundle.

5. A bundle wrapping machine as defined by claim 4, further characterized by an accumulating means, located at the rearward end of said second table, means for supporting the wrapping material underneath said second table, and means including a driven roller at the other end of said second table and substantially underneath said opening for feeding the wrapping material through said opening and up to said first table.

References Cited in the file of this patent

UNITED STATES PATENTS

691,930	Bracy	Jan. 28, 1902
1,085,260	Holden et al.	Jan. 27, 1914
1,175,361	Kempf et al.	Mar. 14, 1916
1,458,977	Escobales	June 19, 1923
1,499,505	Conley et al.	July 1, 1924
1,499,537	Kurkowski	July 1, 1924
1,583,339	Conley et al.	May 4, 1926
1,586,719	Swab	June 1, 1926
1,626,409	Gwinn	Apr. 26, 1927

(Other references on following page)

5

UNITED STATES PATENTS

1,805,197	Wood	May 12, 1931
1,945,086	Schmitt	Jan. 30, 1934
1,955,713	Tomlin	Feb. 15, 1934
2,082,945	Ferenci	June 8, 1937
2,132,546	Smith	Oct. 11, 1938
2,288,350	Gollwitzer	June 30, 1942
2,304,395	Bodolay	Dec. 8, 1942

6

2,304,971	Tuttle et al.	Dec. 15, 1942
2,336,795	Malhiot	Dec. 14, 1943
2,485,865	Costello	Oct. 25, 1949
2,486,892	Sumida	Nov. 1, 1949
2,502,374	Gilowitz	Mar. 28, 1950
2,609,646	Total	Sept. 9, 1952

FOREIGN PATENTS

590,305	Germany	Jan. 6, 1934