

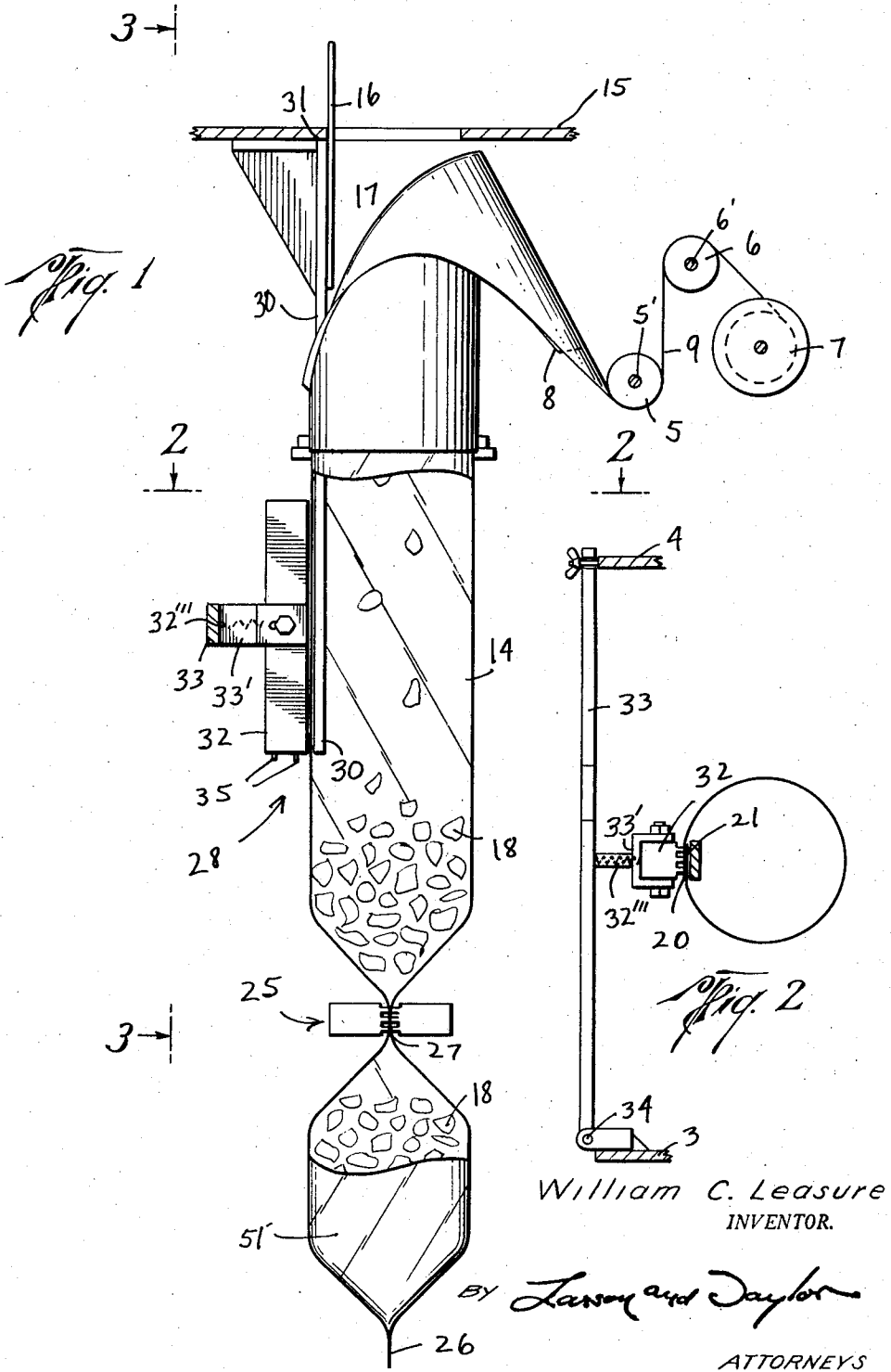
Aug. 18, 1959

W. C. LEASURE
APPARATUS FOR PACKAGING

2,899,875

Filed Dec. 28, 1956

4 Sheets-Sheet 1



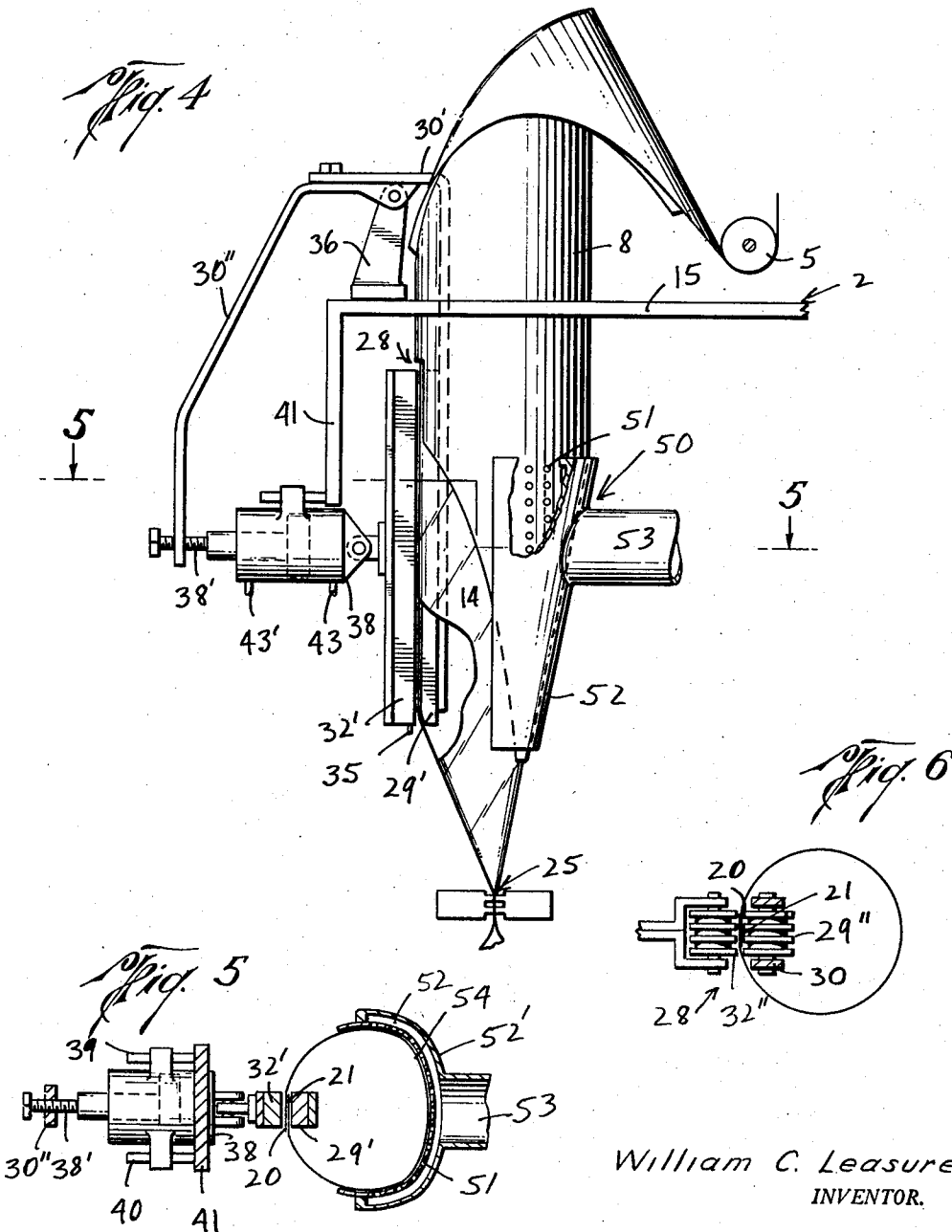
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W. C. LEASURE
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4 Sheets-Sheet 3



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Aug. 18, 1959

W. C. LEASURE

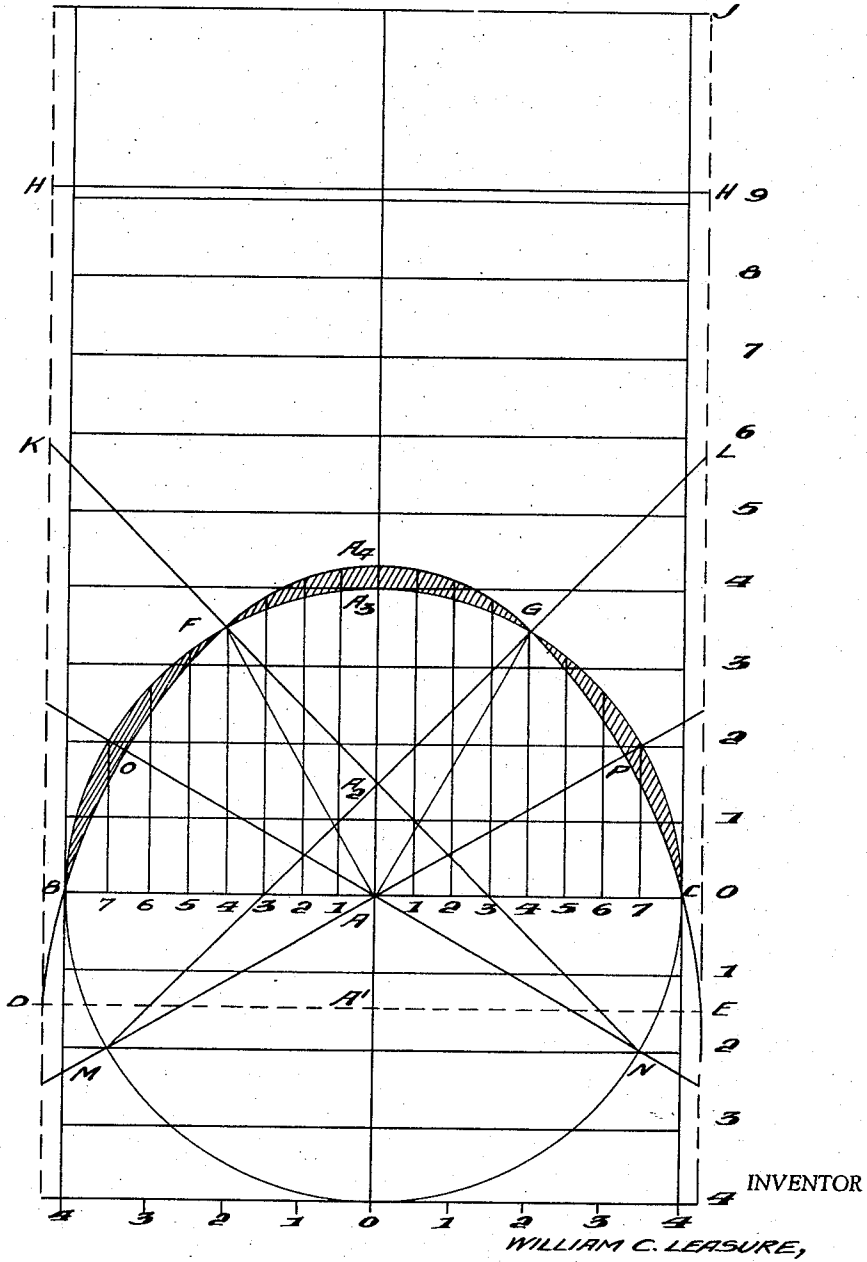
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4 Sheets-Sheet 4

Fig. 7.



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2,899,875

APPARATUS FOR PACKAGING

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7 Claims. (Cl. 93—82)

The present invention relates to a method and apparatus of packaging and more particularly to a method and apparatus of forming packages or containers from strip packaging film by passing the film over a specially constructed former.

Various devices are in use at the present time for forming containers from strip packaging film and charging or filling such containers with product. Such devices include a paper former which is adapted to receive the strip packaging film and position it for passing it between a vertically arranged inner former tube and outer former tube so as to form the strip packaging film into tubular or tube-like containers or packages. Suitable means are provided for pulling the strip package film longitudinally of the vertically arranged inner and outer former tubes and for sealing the longitudinal edge portions of the strip packaging film. As the strip packaging material is pulled longitudinally between the inner and outer former tubes, products are discharged through the inner former tube and into the tube-like container and the containers are thereafter sealed at both ends so as to enclose the product therein. Such packaging machines are, for example, disclosed in the patent to Zwoyer, 1,986,422, issued January 1, 1935.

The operation of forming the container, sealing it longitudinally, charging it with product, and sealing the tube-like container laterally at spaced portions so as to form a closed container is carried out step-wise and automatically by the above devices. There are, however, certain objections to the above method and apparatus.

Since the packages or containers are filled by passing the product or merchandise through the inner former tube, the sizes and quantity of the product or merchandise that may be placed in a given container or package as it is being formed in presently known apparatus is limited by the cross-sectional area of the opening of the inner former tube and the speed at which the product is being fed into the container, as well as the speed at which the containers are being closed off. The opening size of the inner former tube also limits the size of the product or merchandise that may be fed into a package or container, and since only a certain volume of product or merchandise may be discharged through a tube opening of a given size in each filling cycle, it seems obvious that under some circumstances the speed of operation of the automatic machine of present day constructions must be adjusted accordingly, to a speed to accommodate those situations where the filling of the bag as it is being formed required additional time.

Furthermore, with devices presently in use the sealing of the strip packaging material along its longitudinal edge portions as it passes between the inner and outer forming tubes in some instances misaligns the inner former tube relative to the outer former tube particularly where excessive pressure is required and thus the clearance is affected which in turn may cause binding of the strip packaging film as it passes between the inner and outer

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former tubes to such an extent as to interfere with the automatic operation of forming, filling and sealing.

Additional interruption of the automatic sequence of present day packaging apparatus is caused where the material or product being fed through the inner forming tube bridges the opening so as to stop it up either completely or to such an extent as to interfere with the proper feeding or discharge of the product or merchandise from the inner former tube and into the tube-like container being formed.

The present invention is directed to a method and apparatus of packaging which overcomes all of the above and other objections encountered with present day automatic packaging methods and apparatus.

The present invention is designed to overcome the above disadvantages of prior art packaging machines by providing a specially constructed former which shapes the strip material in the container form without the necessity for inner formers. This is accomplished by designing the former in such a way that it maintains the material taut and supports the material throughout the forming operation. The specific former disclosed herein which is for use in forming tubular containers has a tubular end portion with overlapping edges, an intermediate curved portion forming wings on the tubular portion to shape the strip material in tubular form and a curved end portion to receive the strip material. The shaping of the former is mathematically calculated so that a former for any type or size of container may be readily designed. By eliminating the inner former of prior art packaging machines all of the disadvantages inherent in such structures are overcome and certain advantages are achieved which were not possible heretofore.

By eliminating the inner former the full volume of the container may be utilized for filling with product. Furthermore, the strip material may constitute a conveyor to convey the product into the package. As brought out hereinbefore, the product frequently became jammed within the inner former of prior art packaging machines and the obviation of this difficulty constitutes a major advance in the art.

An object of the present invention is to provide a method and apparatus of continuously forming containers or packages of strip packaging film, charging the containers with product, and sealing the container to form a closed bag wherein the inner former tube heretofore used is eliminated whereby the product or merchandise may be discharged directly into the container or package as it is being formed.

Yet a further object of the present invention is to provide a method and apparatus of automatic packaging wherein the strip packaging film which forms the container or package is utilized as a conveyor to convey merchandise or product into the container as it is formed whereby any product or merchandise may be automatically packaged without damage or injury thereto.

Yet a further object of the invention is to provide a method of automatic packaging wherein the product or merchandise being packaged may be conveyed into the package as it is formed without damage or injury to the merchandise or product.

Yet a further object of the invention is to provide a packaging method and apparatus wherein a more efficient filling of a package may be obtained per unit volume of container, and in an amount of time less than heretofore possible with prior art devices.

Still another object of the present invention is to provide an apparatus for forming packages or containers of strip packaging film wherein a better longitudinal edge seal may be obtained on the tube-like structure than heretofore possible with prior art devices.

Even a further object of the present invention is to pro-

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vide an automatic packaging method and apparatus for forming packages or containers of a continuous strip of packaging film wherein the package and the filling thereof may be accomplished in any desired plane to suit the type of merchandise without causing damage thereto.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following description and drawings wherein:

Fig. 1 is a side elevation, partly in section, illustrating a form of the present invention;

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1 showing the arrangement of the edge portion sealing means;

Fig. 3 is a view on the line 3—3 of Fig. 1 and is a front elevational view of the form of the invention of Fig. 1 and illustrating schematically a form of automatic weighing and dumping means for the merchandise or product that is placed in the package;

Fig. 4 is a side elevation illustrating an alternate modification of the sealing means for sealing the edge portions of the strip packaging film material;

Fig. 5 is a sectional view along the line 5—5 of Fig. 4;

Fig. 6 is a view showing still another modification of the sealing means for sealing the longitudinal edge portions of the strip packaging film material; and

Fig. 7 is a view showing the method of designing a former.

Attention is directed to Fig. 3 of the drawings wherein the present invention is illustrated as being supported by suitable framework so as to position the various components in proper relationship to accomplish the desired aims and objects of the invention. As illustrated, the framework may consist of side members 3 and 4 which are suitably spaced so as to receive the rollers 5 and 6, and the drum or roll 7 of strip packaging film material.

As more clearly illustrated in Fig. 1 of the drawings, the strip packaging film is rolled off drum 7 and is guided over the roller 6 and under the roller 5 to be received on the forming shoe 8. If desired, the spindle 5' and 6' of the rollers 5 and 6 respectively, may be received in any suitable means such as longitudinally extending slots or the like (not shown) in the side members 3 and 4 whereby the rollers 5 and 6 may be adjusted vertically relative to each other to obtain the proper tension in the strip packaging film 9 as it moves thereover. The forming shoe 8 may be positioned in the frame 2 by any suitable means such as the brackets 11 and 12 respectively, which brackets are secured to the side members 3 and 4 so as to position the forming shoe 8 at a desired elevation within the framework 2 to receive the strip packaging film 9 from the roller or drum 5.

It will be noted that the forming shoe 8 serves to form the strip packaging film material into a tubular or tube-like form as illustrated at 14 whereby a container is provided for receiving merchandise or product represented at 18 therein.

The design of this forming shoe so that it forms the strip film into a container shape without an inner mandrel is a critical feature of this invention and will be described in greater detail hereinafter.

A baffle plate 16 may be provided on the top 15 of the frame 2 for aiding in discharge of merchandise or product from the automatic weighing and dumping mechanism illustrated schematically in Fig. 3 and generally designated by the numeral 16'. Particular attention is directed to the fact that the product or merchandise 18 is discharged directly into the open top 17 of the tube-like container 14 as it is being formed by the shoe 8.

In automatic packaging apparatus presently in use, the strip packaging film is passed over a paper former and guided vertically between an inner former tube and an outer former tube whereby a tubular or tube-like container or package is formed. Die means are provided for abutting the longitudinal edge portions of the strip packaging film on the outside and against the inner form-

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ing tube on the inside of the longitudinal edge portions so as to seal such longitudinal edge portions of the film 9. It can be appreciated that if excessive pressure is applied by the sealing die against the inner forming tube of the prior art devices, there is a possibility of misaligning the inner forming tube relative to the outer forming tube to the extent of binding the strip packaging film as it moves therebetween.

This may interfere with or even interrupt the automatic sequence of forming, filling and sealing the containers. The present invention overcomes this problem by completely eliminating the inner former mandrel of the prior art constructions. As illustrated in the drawings, for example in Fig. 3, it will be noted that the edges 20 and 21 of the strip packaging film 9 overlap each other as the film is discharged from the forming shoe 8. It is generally customary to provide the edge portions 20 and 21 of the strip packaging film with a heat sealing compound so that such longitudinal edge portions may be sealed in order to form a tubular member or package 14.

Sealing means indicated generally by the numeral 28 are provided in the present invention for sealing along the longitudinal edge portions 20 and 21 of the strip package film 9. The means 28 includes an arm 30 which is secured at its upper end 31 to the top 15 of the frame 2, such arm extending downwardly into the forming shoe 8 as illustrated in Figs. 1 and 3 of the drawings. An arm 33 is pivotally secured at 34 to the side of the frame 2 and includes the U-shaped bracket 33' which slidably supports the shoe 32. Spring means 32'' may be mounted in any suitable manner to yieldingly urge the shoe 32 against the edge portions 20 and 21 and is shown as being mounted in the bracket 33' so as to abut the rear of shoe 32 and yieldingly urge it toward the arm 30 so as to seal the edge portions 20 and 21 as they move longitudinally between the shoe 32 and the arm 30. Suitable electrical leads as illustrated at 35 are provided for heating the shoe 32, the longitudinal edge portions 20 and 21 and adjacent portion of arm 30 to aid in forming a proper seal between the longitudinal edge portions 20 and 21.

Fig. 4 illustrates an alternate arrangement of the sealing means 28 wherein a bracket 36 is shown as being mounted on the top 15 of the frame 2. Such bracket pivotally supports the arm 30' on which is mounted the shoe 29' at the lower end thereof and inside of the tubular package or container 14. The arm 30' is bent downwardly as illustrated at 30'' and is secured at its lower end to the piston rod 38' in cylinder housing 38. The cylinder housing 38 is slidably mounted on the pins 39 and 40 which pins project from the depending frame portion 41.

A shoe 32' is secured to the inner end of the cylinder housing so that when fluid is supplied through the port 43 of the housing 38 relative longitudinal movement between the piston rod 38' and the housing 38 is effected, thereby moving the shoes 29' and 32' towards each other to effect sealing of the edge portions of the strip packaging material therebetween. A power lead 35 is shown whereby the sealing shoes are heated to aid in sealing the edge portions 20 and 21.

The dies 29' and 32' may be moved away from each other by discharge fluid through opening or port 43' so the reverse relative movement between the piston rod 38' and housing 38 may occur, thereby separating dies 29' and 32'.

To aid in pulling the strip packaging material over and longitudinally of the forming shoe 8 and to seal end portions 26 and 27 of the tubular container 14 so as to form closed packages as illustrated at 51', suitable die means as illustrated at 25 are provided for engaging the formed tubular container 14 as shown in Figs. 1, 3 and 4 of the drawings so as to pull the packaging film 9 over the shoe 8 to form it into the tubular member 14. The dies 25 seal off the lower end of the tubular container or package 14 so that thereafter suitable means

may cut the lower end of the tubular member 14 after it has been sealed.

The die 25 then reciprocates or moves upwardly and again grasps the tubular member 14 to pull it longitudinally of shoe 8 and seal it so that it can thereafter be cut.

The construction, arrangement and operation of the shoe means illustrated generally by the number 25, as well as the cutting means is well known in the art and is illustrated by any one of several patents, such as that illustrated by the patent to Zwoyer, No. 1,986,422, issued January 1, 1935. It is, therefore, believed unnecessary to give a detailed description of the dies 25 as they form no part of the present invention.

Also, it should be understood that the step-wise operation of the various components of the invention is synchronized so that the sealing of the lower end of the formed tubular portion 14, the filling thereof with merchandise or product, as well as the longitudinal edge sealing and the cutting of the package into bags of suitable length is carried out in a desired manner. The means for synchronizing these functions are well known in the art and it is, therefore, believed unnecessary to give a detailed description thereof in the present application.

Referring now to Fig. 7 the manner in which a former is designed will be described. Assuming a bag with a width of 4" is desired, draw a circle with A as its center with radius of 4". Draw radial lines on both sides of a vertical radius 30° to each side. As pointed out hereinbefore, any relative line within the shaded areas could be used but normally the particular pattern line ECPGA⁴FOBD is desirable for most films, preventing paper fracture and wrinkling. Obviously, as soon as the packaging film from the roll comes into contact with the former, the shaping process is begun. However, the line ECPGA⁴FOBD may be considered a final line of transformation between the wing portion of the former and the tubular portion. This line has a length substantially equal to pi times the radius AC. This is true due to the fact that the additional length of GA⁴F over GA³F to provide crown is substantially the same as the amount of reduced length in the arcs CPG and BOF over the other arcs between C and G and B and F. Since the radius AC is equal to the width of the bag or half the circumference, it follows that the length of the line of transformation is substantially equal to pi times one-half the circumference of the tubular portion. Let the radii intersect at points F and G. Draw radial lines below the horizontal diameter of the circle at an angle again of 30°, calling the intersection of the radii M and N. Draw MG and NF, calling their intersection on the vertical axis A². A²A³ is the diameter of completed tube portion of the former. Strike a circular arc FG with its center A², letting this arc intersect the vertical radius at A⁴. Draw arcs CG and BF with centers at M and N which flow smoothly into arc FA⁴G, continue from B and C to edges of film width which completes in this example a ½" back seal.

The area within ECPGA⁴FOBD represents the pattern for the tubular portion of the former.

The area outlined by ECPGA⁴FOBD and extending to an arbitrary length for construction needs in this example to H, becomes the pattern for the wings of the former.

The pattern line could follow any relative line within the shaded area but it is found that pattern line ECPGA⁴FOBD is desirable to prevent paper fracture and wrinkling.

With these patterns, the templates for the tube and wings are made allowing for mean diameter and other factors, determined by metal thickness to be used, which are well known in the pattern makers art, allowing the finished former pitch line represented in this example as

line ECPGA⁴FOBD to be precisely the original design and length.

Using the templates prepare pieces of metal of the proper thickness for the tube and wing sections. Roll the tube section to proper diameter and secure. Match the wings to the tube at 30° at proper point near A⁴. The wings then become a natural development, matching at all points along line ECPGA⁴FOBD, welded or soldered to secure.

It is now readily seen that the primary consideration in designing this former is to insure that the packaging film when under tension and developing into a tube-like structure is bearing on all parts of the former exactly as if it were still in the flat. It has been found that a former of this design supports the packaging film completely with pressure on the film equalized over the entire wing area, with friction effective over the entire wing area, from the first contact point until the film is completely enveloped into a tube-like structure, holding the packaging film firmly in tube-like form, thus removing the necessity for an inner mandrel such as used in prior art.

While this explanation covers that for designing a former for a 4" bag, it is obvious that similar procedures will be followed for other sizes.

As previously mentioned, in prior art devices an inner forming or former tube is provided which extends downwardly into the tubular package or container 14 as it is being formed. Product or merchandise to be discharged into the tubular container or package is passed through the inner forming mandrel and into the tubular container or package 14. Such construction and arrangement has many disadvantages. For example, it is not unusual for material as it passes through the inner former mandrel of the prior art devices to stop up the opening in the inner former tube or to interfere with the passage of product therethrough to such an extent as to improperly fill the tubular container 14, thereby necessitating interruption of the automatic packaging apparatus to clear out the opening in the inner former mandrel.

Additionally, the inner former mandrel of prior art constructions greatly restricts or interferes with passage of merchandise or product into the tubular container. Generally, the inner former mandrel is one-quarter of an inch thick and, for example, when producing a four inch wide bag, the cross-sectional area of the passage opening in the inner former tube is 3.29 inches, whereas the cross-sectional area of the opening into the tubular container 14 without the inner former mandrel is 5.11 inches, which means that the removal of the mandrel increases the cross-sectional area of the opening into a container 14 of a four inch bag in excess of fifty percent. It can be appreciated that since the present invention eliminates the inner former mandrel of the prior art constructions, the material or merchandise may be fed into the container 14 more rapidly so that a more efficient filling of the container 14 can be accomplished per unit volume of container, and in a minimum amount of time.

Additionally, all automatic packaging machinery of prior art constructions is constructed and arranged so that the merchandise or product is discharged by gravity downwardly and into the tubular package or container 14 as it is being formed. The gravity feed of the product or merchandise is disadvantageous because certain products such as tomatoes or other fruit or other merchandise may be damaged by the gravity feeding method, and also where the product is light, such as in the case of potato chips, the filling of the tubular container 14 is relatively slow. The present invention overcomes this objection in that it provides an arrangement whereby the charging or filling of the tubular container 14 may be conducted horizontally, or at any suitable angle between horizontally and vertically. Additionally, as the film 9 passes over the shoe 8, it acts as a conveyor for

engaging the merchandise or product to be discharged into the tubular package 14 so as to convey it into the package. This permits the present invention to be arranged horizontally or at any desired angle between vertically and horizontally so that merchandise which might otherwise be damaged by gravity feeding or mechanical feeding, such as used in present constructions may be fed into packages formed by the present method and apparatus without being harmed.

It should be additionally noted that since the inner former mandrel of prior art constructions is eliminated it is possible to fill a container with larger products, since heretofore the size product in the container has been restricted or limited to the diameter of the opening in the inner forming mandrel, whereas, in the present invention the size of the product of merchandise may be substantially the same size as the bag being formed because the product is discharged directly into the bag. I have previously pointed out by way of example that on a four inch size bag the present invention enables merchandise of at least fifty percent greater size to be discharged into the bag and also a fifty percent increase in volume of product is permitted thereby greatly speeding up the whole operation while attaining a more efficient relationship of the product to the bag size being formed.

It can be readily appreciated, from the foregoing, that under some circumstances it may be desirable to position the present invention at some angle between the horizontal and vertical and to adjust the rate of movement of the strip packaging film 9 in relation to the angle of feed to convey the product 18 into the tubular package or container 14 at a predetermined or desired rate. In some situations, it may be desirable to arrange the present invention so that the containers 14 are formed in a horizontal plane, thereby permitting substances which might be damaged or injured by feeding mechanisms of the prior devices to be discharged into tubular containers 14 as they are being formed without damage thereto.

In some situations, it may be desirable to aid in maintaining the tubular form of the strip packaging material as it is being formed or as the merchandise or product is being discharged thereinto. To accomplish this function, suitable suction means as illustrated at 50 in Fig. 4 may be provided. It will be noted that the shoe 8 is provided with an extension and a plurality of openings 51 in the lower end thereof communicate with the annulus 52 formed between the cover 52' and the extension of shoe 8. A pipe 53 communicates with the annulus 52 which pipe may be engaged with suitable means for creating a suction or vacuum in the pipe 53, which reduced pressure tends to draw air into the openings 51 of the shoe 8. This in turn draws the packaging film 9 adjacent the openings 51 toward the openings as illustrated at 54 so as to hold the strip packaging film against the rear portion of the shoe 8 away from the sealing shoe 29'. This construction may be provided in certain situations so as to help in holding the bag opening open as it is being filled with product or merchandise.

It seems readily obvious that the suction means of Fig. 4 may be easily applied to the form of the invention illustrated in Fig. 1 by elongating the rear portion of the shoe 8 to provide a means for receiving the suction mechanism as indicated generally by the numeral 50.

In other situations it may be desirable that the shoes take the form of rollers 29' and 32', respectively, as illustrated in Fig. 6 of the drawings. Here again, suitable electrical means may be provided as illustrated at 35 for heating the rollers to seal the edge portions 20 and 21 of the strip packaging film 9.

The rollers may be mounted in fixed relationship as described with regard to shoes 29 and 32 in Fig. 1 and Fig. 3. modification, or they may be mounted for move-

ment relative to each other as shown in Figs. 4 and 5.

It should be readily obvious that any suitable frame for supporting the various components of the present invention may be utilized and that described herein is for the purposes of illustration only. Also, any suitable automatic weighing and dumping mechanism which is well known in the art may be utilized in cooperation with the present invention.

As previously described, the power supply and means for automatically and step-wise synchronizing the various steps of the present invention is well known in the prior art and attention is directed to the patent to W. R. Zwoyer, previously referred to herein, which illustrates one form of suitable synchronizing means which may be practiced with the present invention.

From the foregoing description it can be seen that the present invention relates to a packaging method and apparatus wherein the inner forming mandrel of prior art devices is eliminated. This enables the merchandise or product to be charged directly into the package as it is formed, thereby eliminating the problems of prior art automatic packaging apparatus where the inner forming tube is utilized. The present invention also provides a sealing arrangement for the longitudinal edge portion of strip packaging material as it is being formed into tubular packages or containers wherein the sealing shoes are mounted opposite each other, one on the inside of the tubular formed packaging material 14 and the other on the outside so that the desired sealing of the edge portions 20 and 21 may be accomplished without the possibility of interfering or interrupting the sequence of automatic packaging apparatus.

Broadly the present invention relates to a method and apparatus for automatic packaging and particularly to a method and apparatus for forming a continuous strip of packaging film into a container, charging the container with product or merchandise and sealing it to enclose the merchandise or product therein. While the container shape disclosed herein is circular, it is readily apparent that the former may be adapted to any shape of container according to the method herein described.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a packaging machine of the class described, a former for transforming sheet material into tubular form, said former having a back portion, curved wing portions and a tubular portion, said back portion extending at an acute angle with respect to said tubular portion, a line of transformation between said curved wing portions and said tubular portion, the line of transformation having a length substantially equal to one-half the circumference of said tubular portion times pi.

2. In a packaging machine, a sailor collar shaped external former for shaping sheet material into tubular form, said former including a tubular neck and wing portions, the tubular neck of said former having the front portion thereof displaced a substantial distance from the rear portion thereof along the longitudinal axis of the tubular neck, the wing portions of said former extending from said front portion to said rear portion, the wing portions being integral with a back portion, the back portion extending at an acute angle with respect to said tubular neck.

3. In a packaging machine, a former for transforming sheet material into tubular form, said former comprising a back portion, curved wing portions and a tubular portion, the wing portion being integral with the back portion, the back portion extending at an acute angle with respect to said tubular portion, said former developable from an integral flat sheet of material, the area of said integral flat sheet of material being equal to the area of said back, wing and tubular portions.

4. A former according to claim 3 wherein a line of transformation extends between the tubular portion and the wing and back portions, said line having a length

equal to one-half the circumference of the tubular portion times pi.

5 5. In a packaging machine in which sheet material is transformed into a tubular shape by passing over a former, the former having a tubular section, wing sections and a back section, a line of transformation extending between the wing sections and the tubular section, said line having a length equal to one-half the circumference of the tubular portion times pi, and means for sealing the longitudinal edges of the material together when in tubular form, said means including an element extending into the tubular section of said former. 10

15 6. In a packaging machine, a former for transforming sheet material into tubular form by passing over a former, said former comprising a back portion, curved wing portions and a tubular portion, the wing portions being integral with the back portion, the back portion extending at an acute angle with respect to said tubular portion, said former developable from an integral flat sheet of material, the area of said integral flat sheet of material being equal to the area of said back, wing and tubular portions, a line of transformation between the wing and tubular portions, said line of transformation having a length equal to one-half the circumference of said tubular portion times pi, said former supporting the sheet material equally in every area increment on the

wing and back portions throughout the transformation of the material from sheet to tubular form.

7. In a packaging machine, a former for transforming sheet material into tubular form, said former comprising integral wing and back portions, a line of transformation forming the forward edge of said wing and back portions, said line of transformation having a length substantially equal to one-half the circumference of the tubular formed sheet material times pi, the back portion extending at an acute angle with respect to the tubular formed sheet material.

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