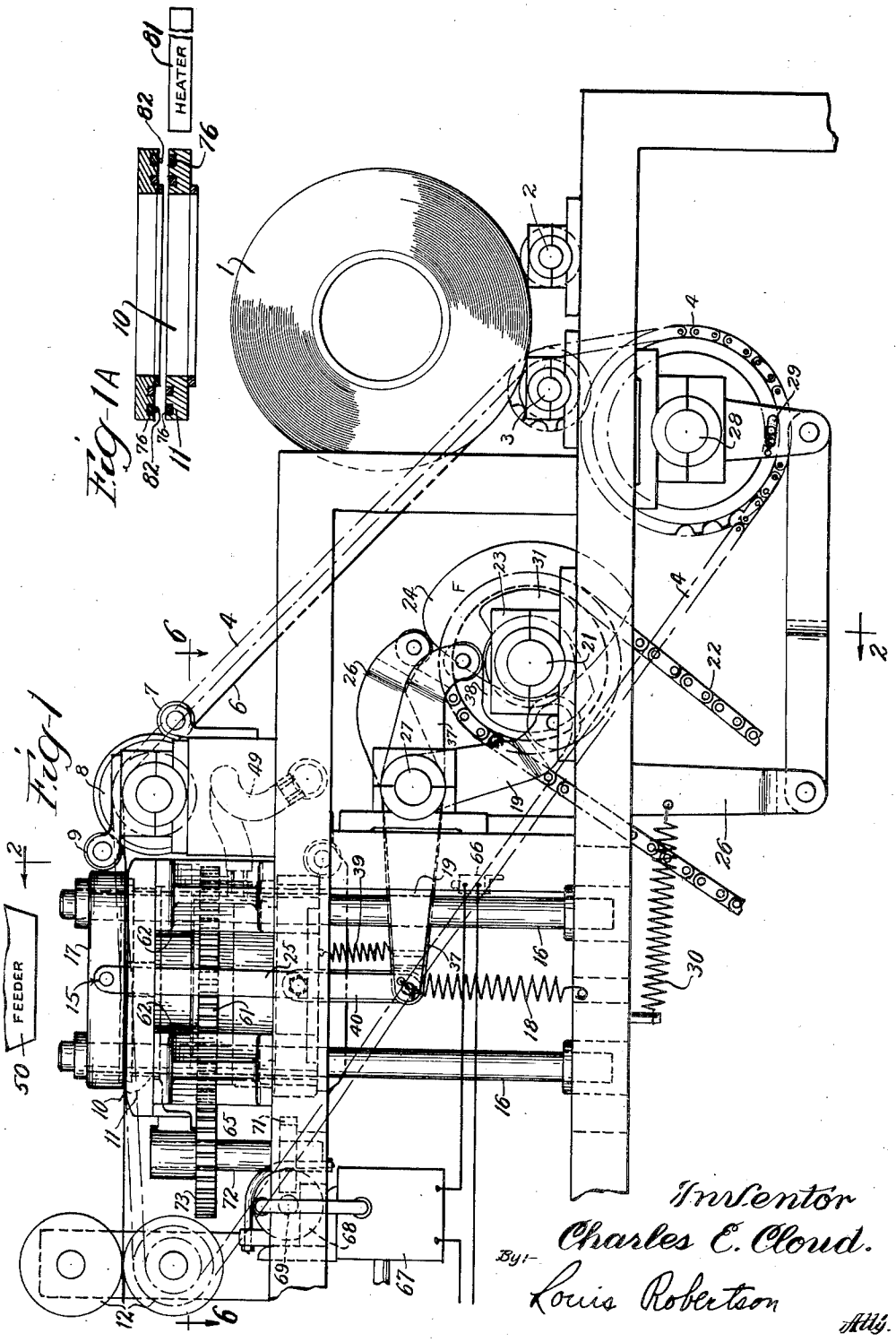
Oct. 28, 1952 C. E. CLOUD 2,615,200

METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

Filed Feb. 9, 1949 16 Sheets-Sheet 1



Oct. 28, 1952 C. E. CLOUD 2,615,200

METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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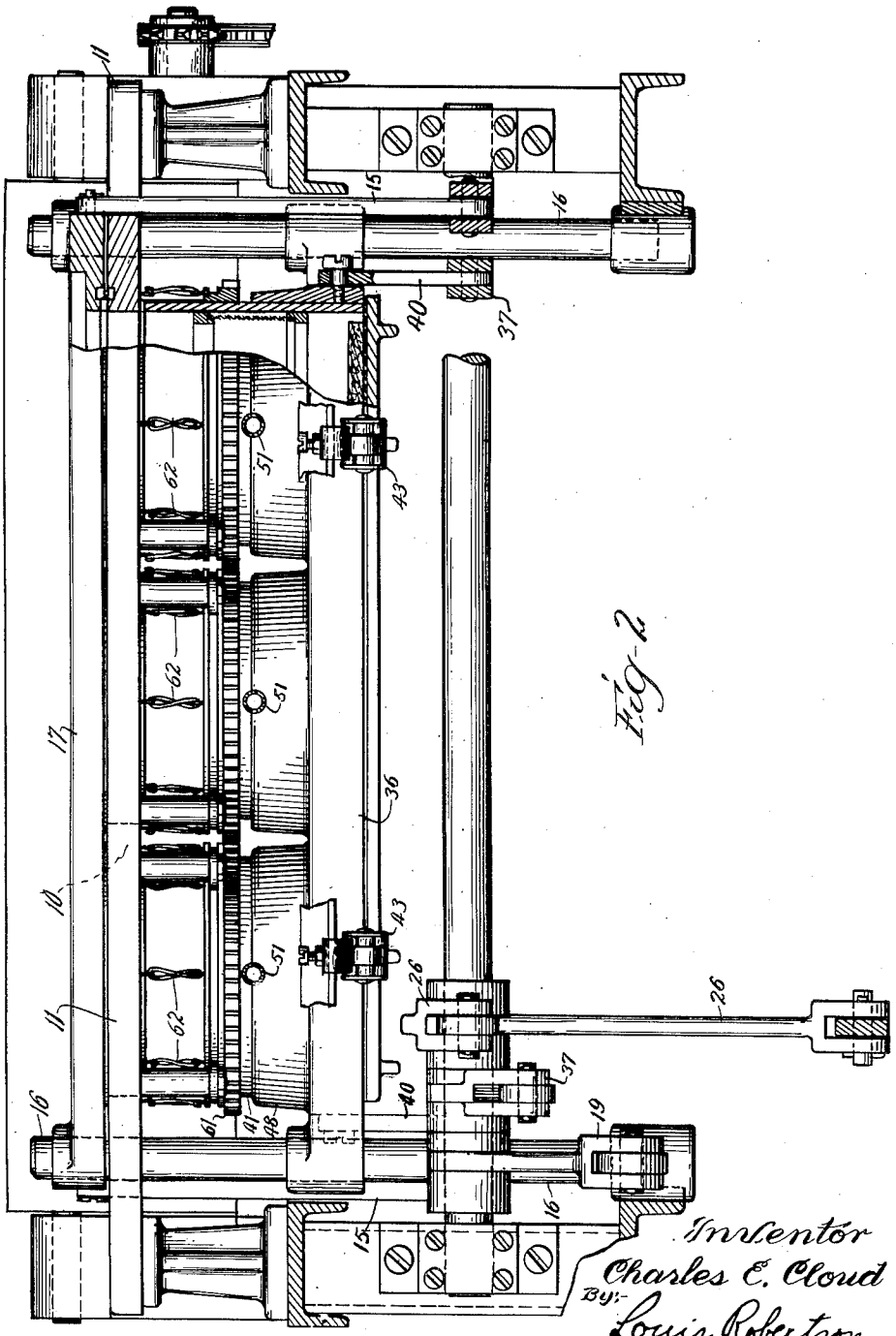


Fig. 2

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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-3

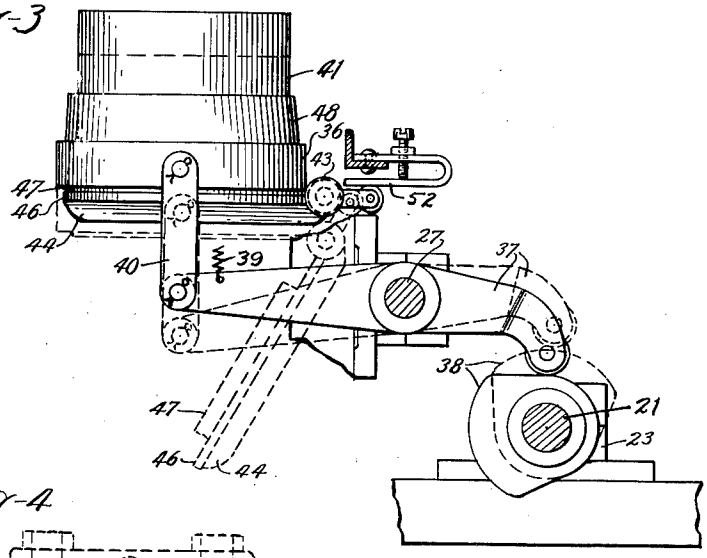


Fig-4

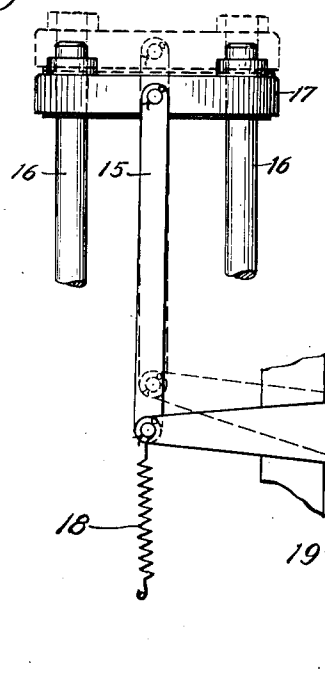
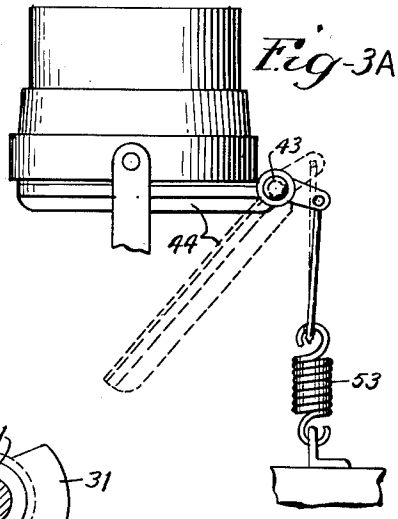


Fig-3A



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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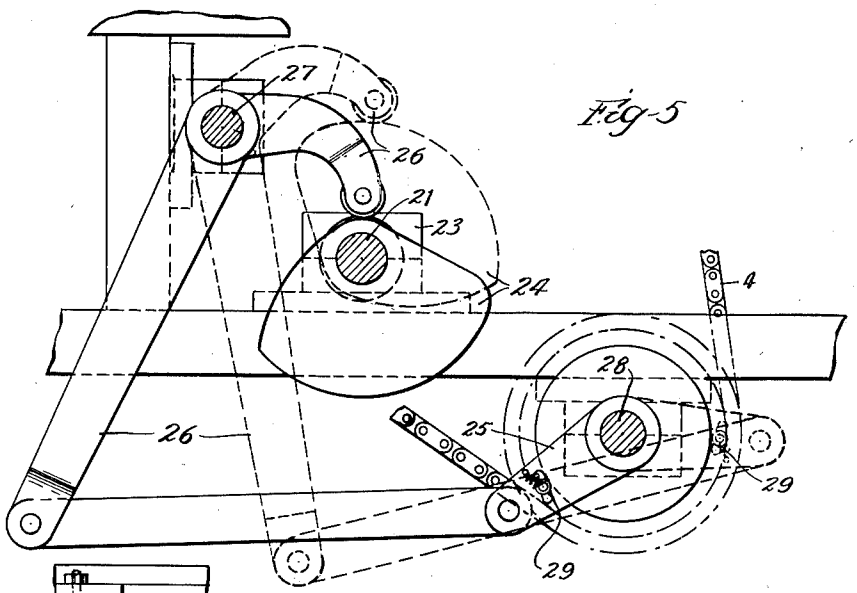


Fig-5

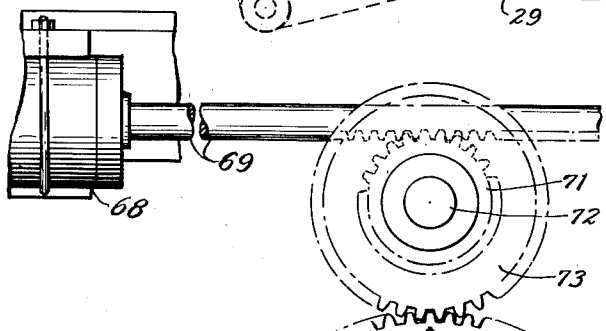
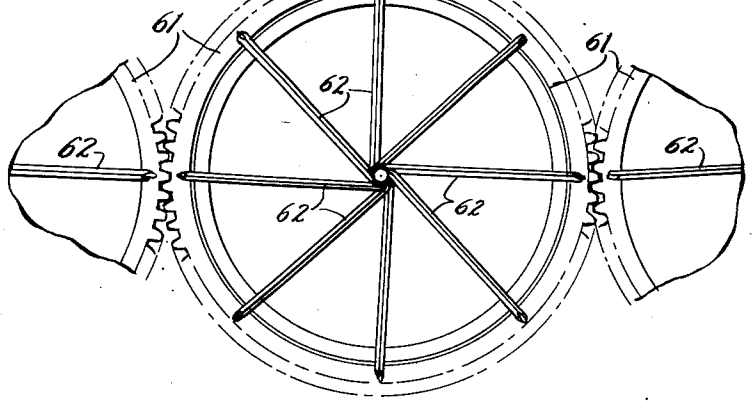


Fig-6



Inventor
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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-7

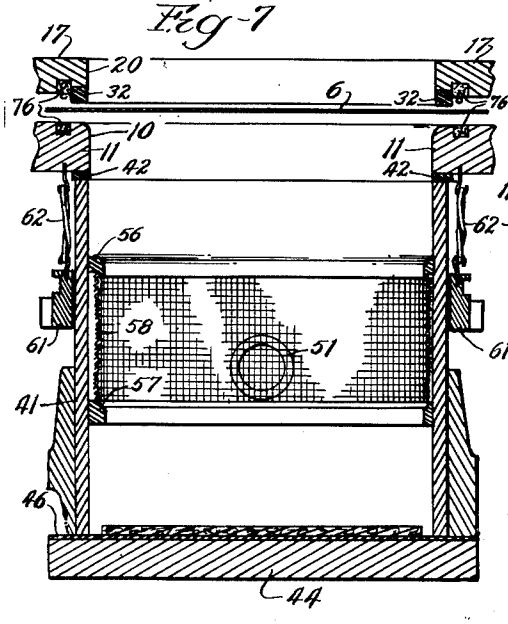


Fig-8

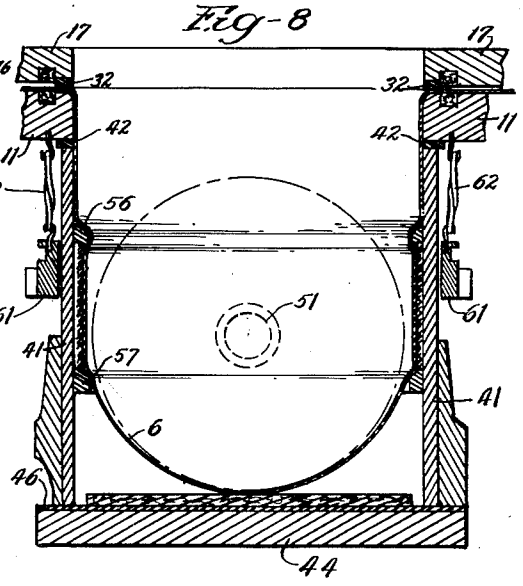


Fig-9

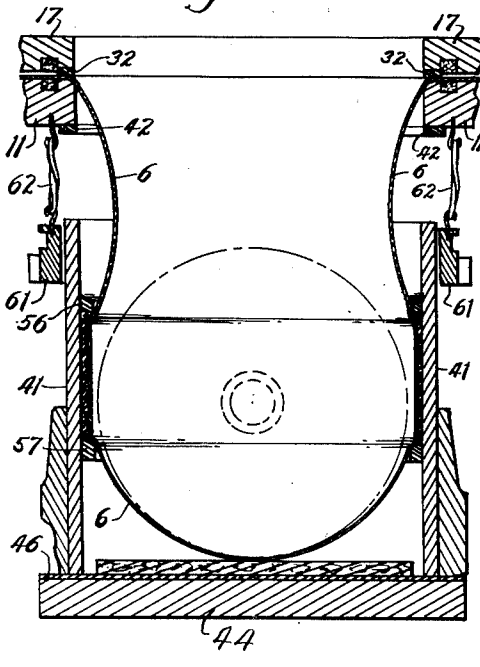
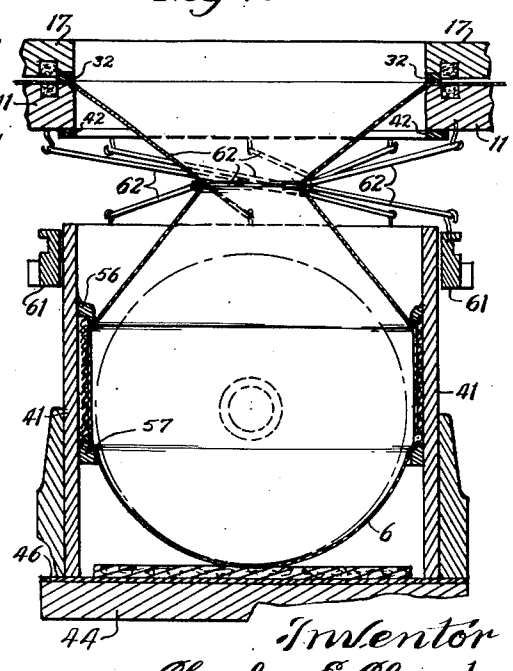


Fig-10



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-11

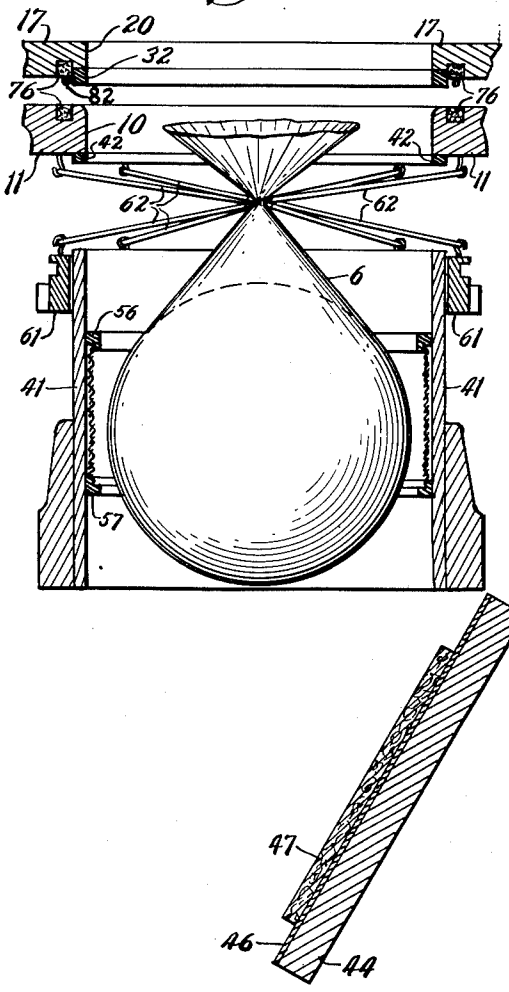


Fig-12

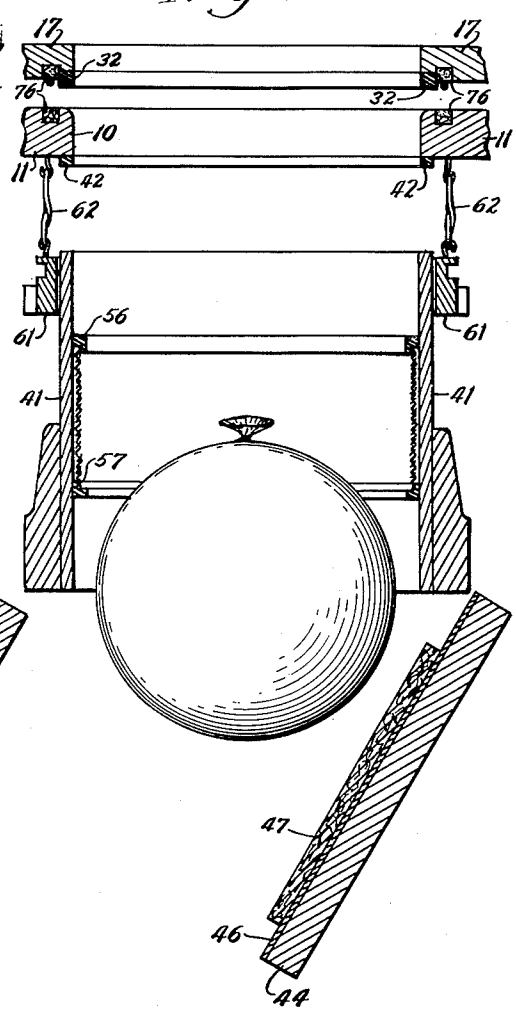
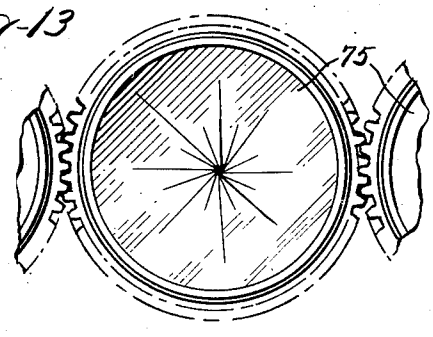


Fig-13



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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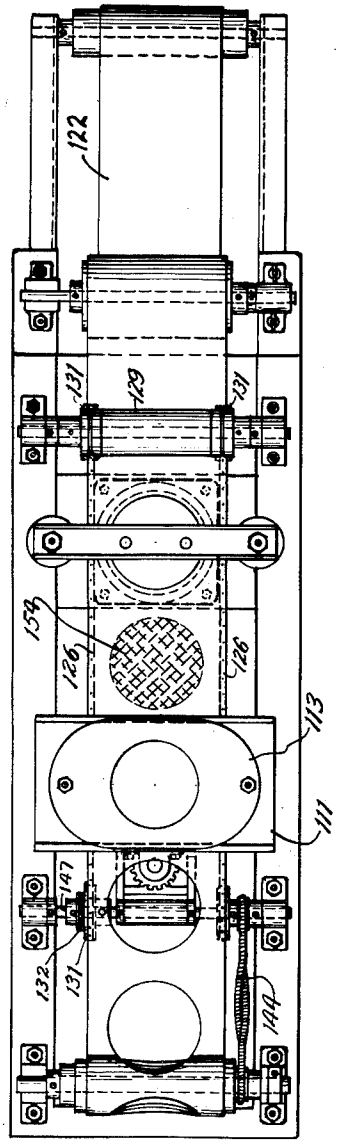


Fig-14

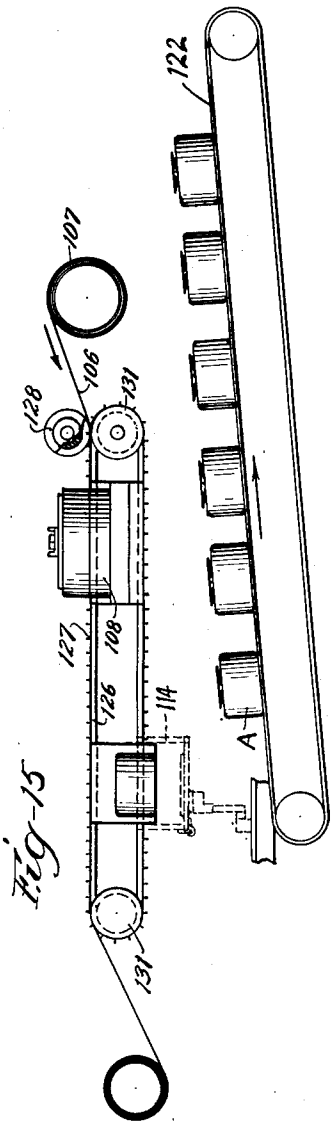


Fig-15

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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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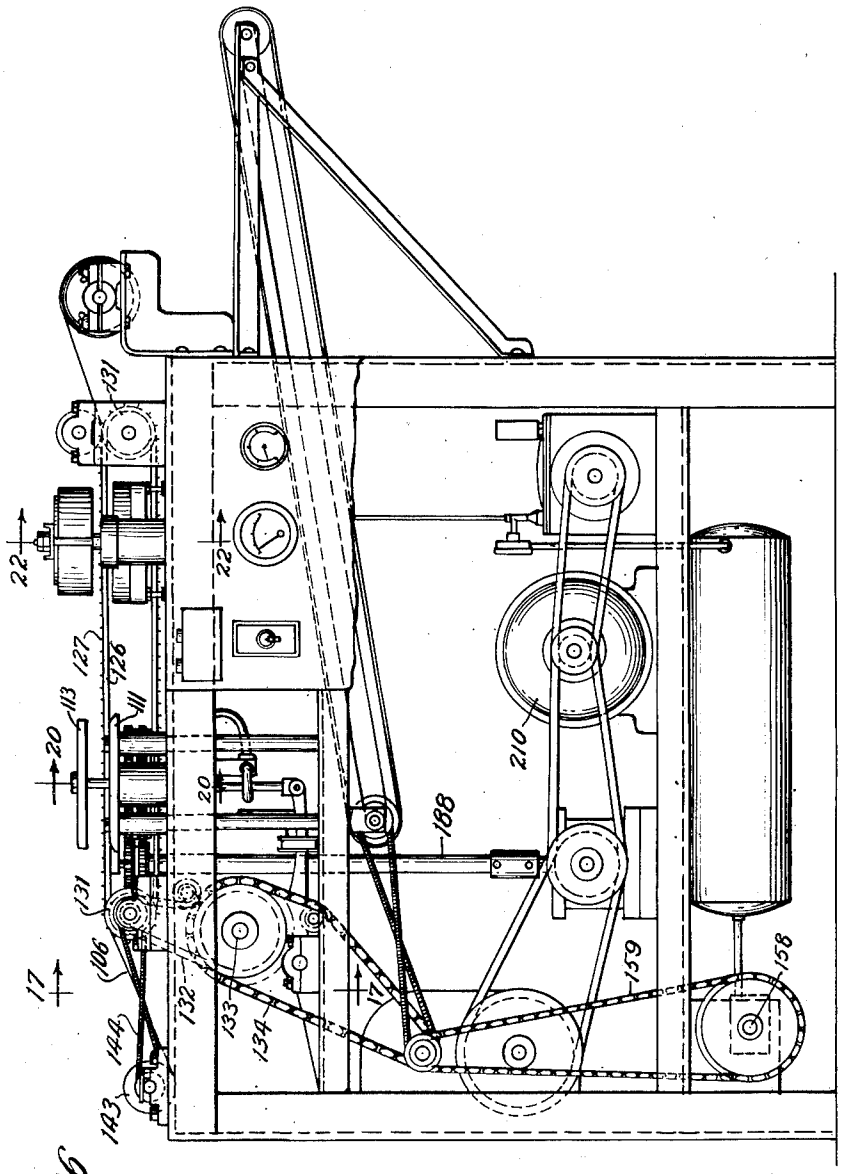


Fig-16

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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-17

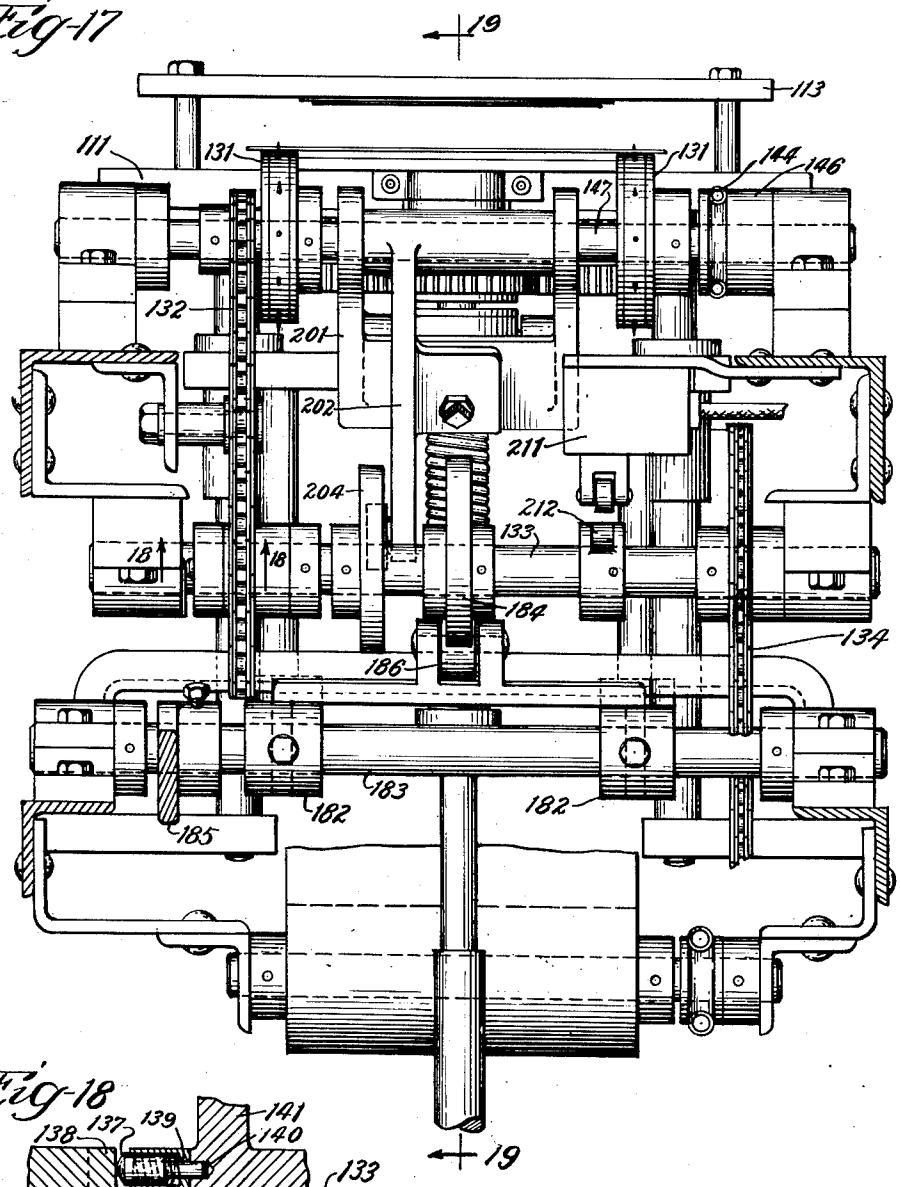
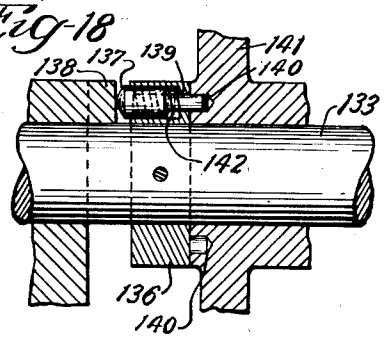


Fig-18



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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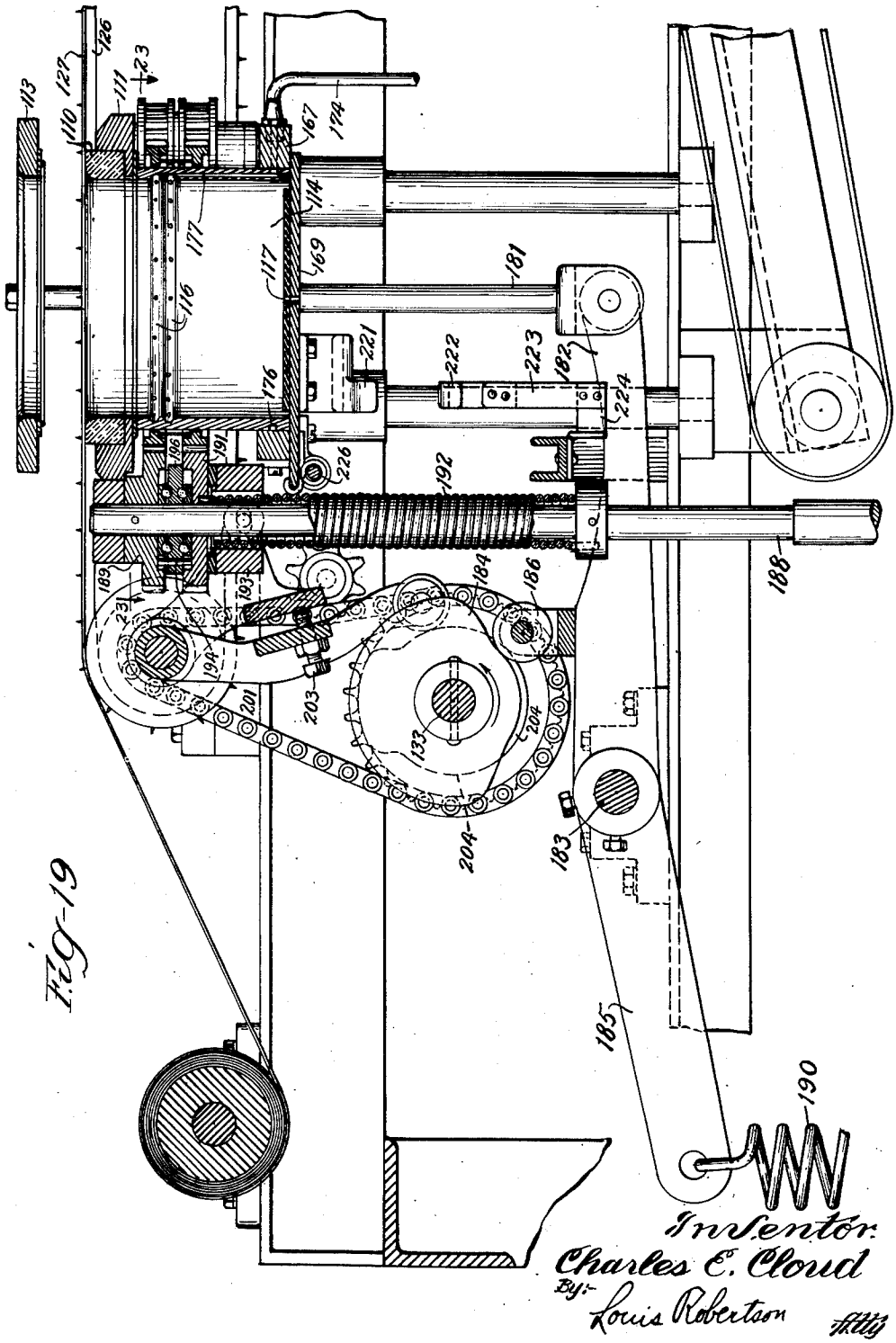


Fig-19

Inventor:
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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-20

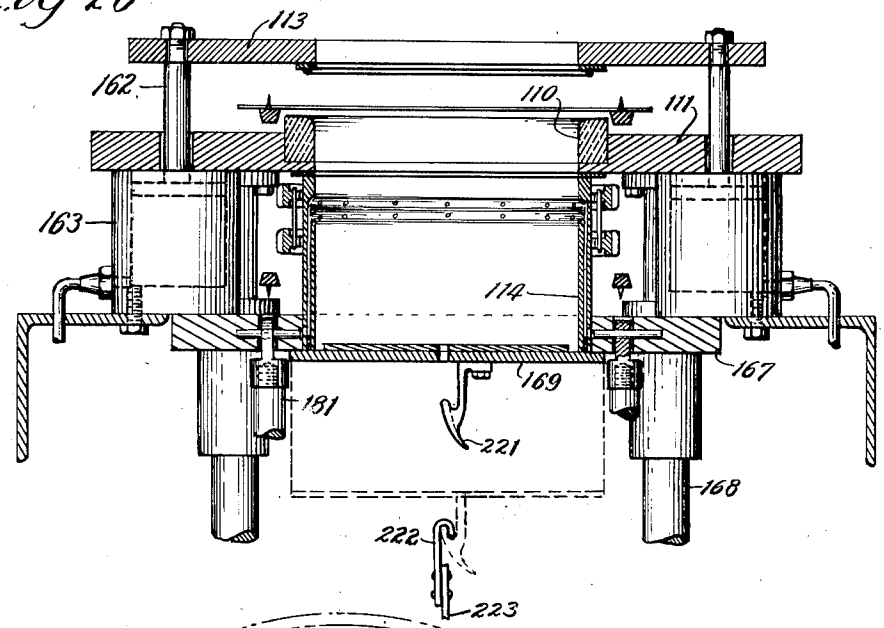
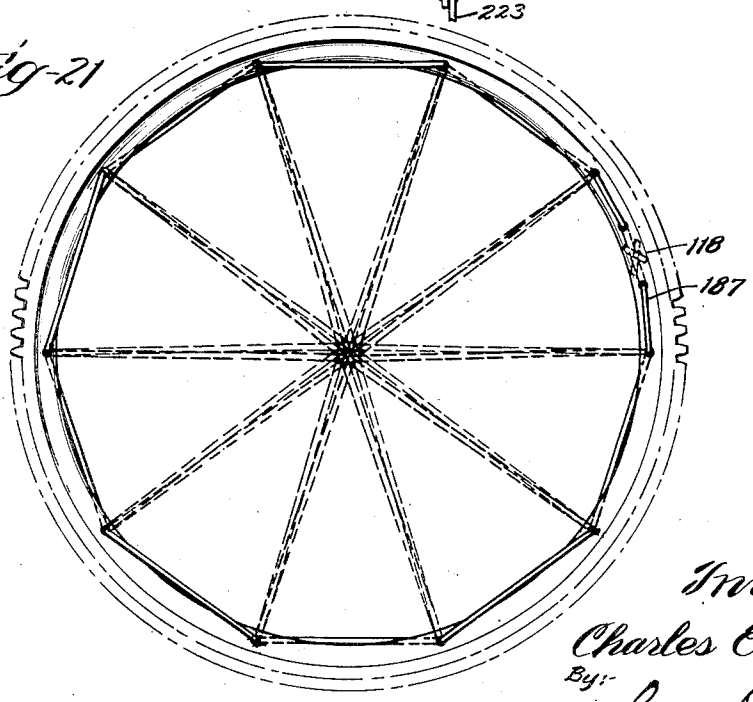


Fig-21



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-22

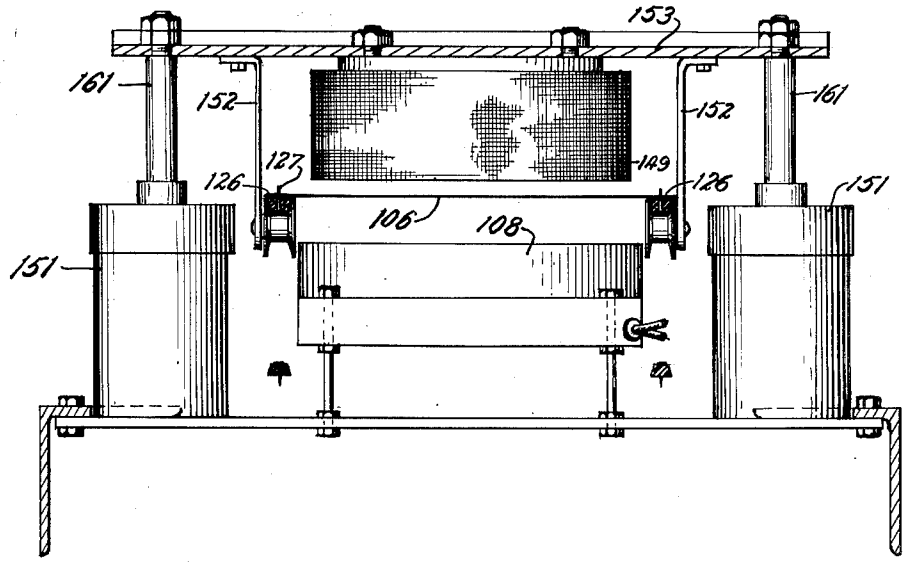
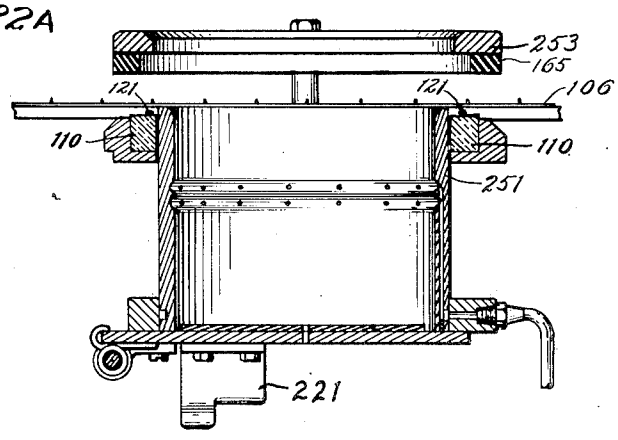


Fig-22A



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Fig-23

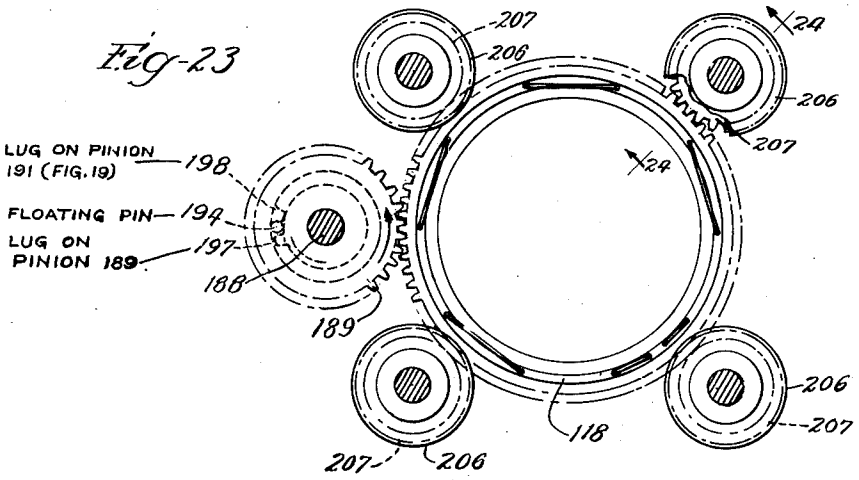


Fig-24

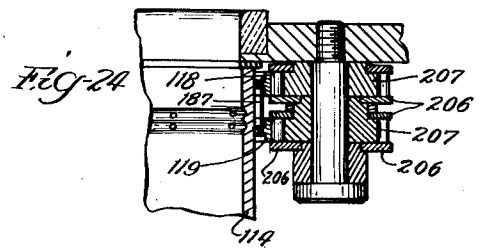
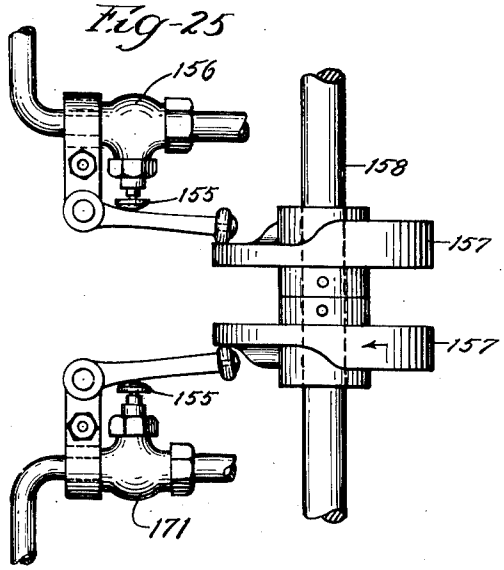


Fig-25



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Fig-26

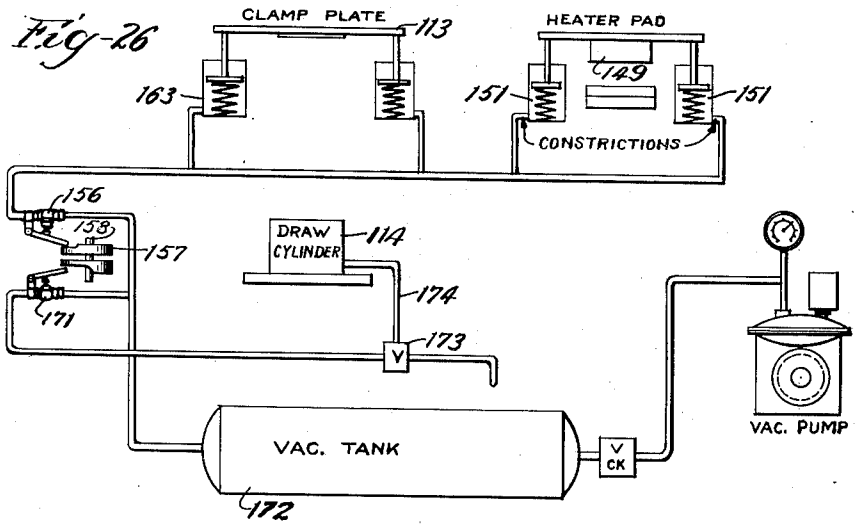


Fig-27

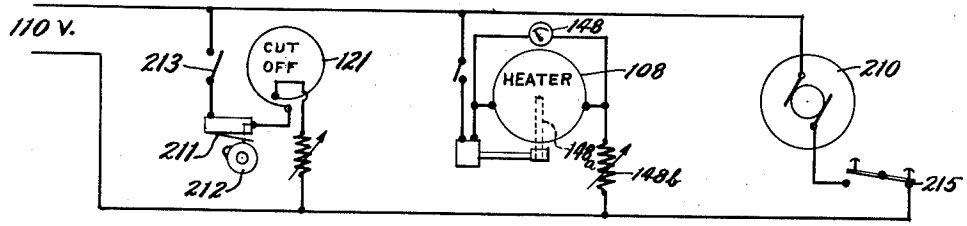
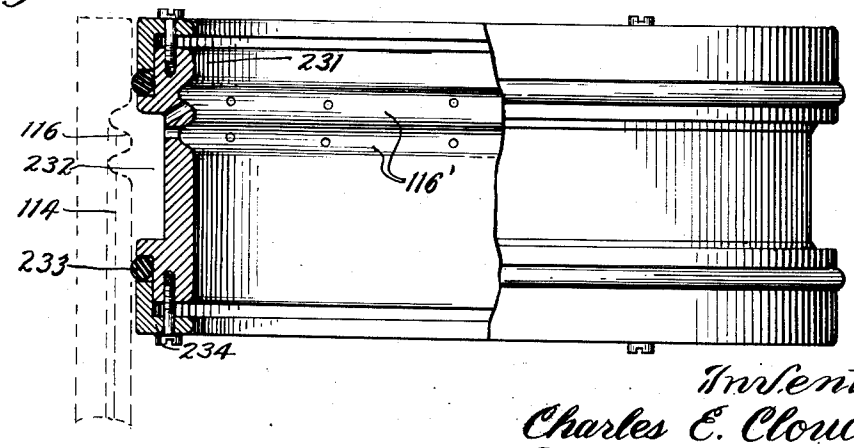


Fig-28



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-29

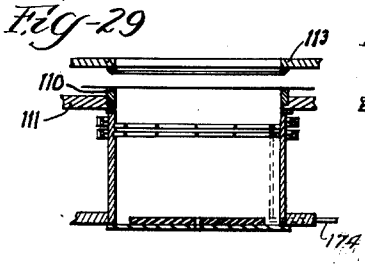


Fig-30

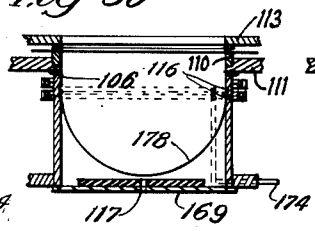


Fig-31

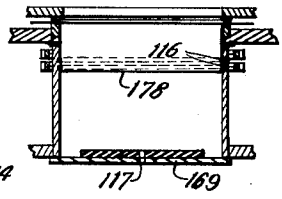


Fig-32

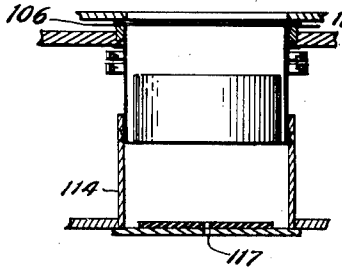


Fig-33

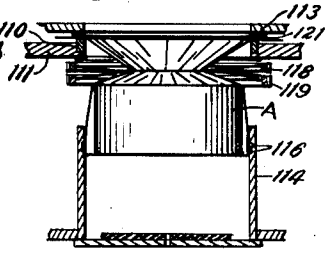


Fig-34

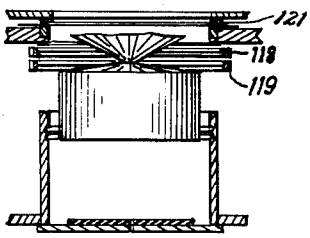


Fig-35

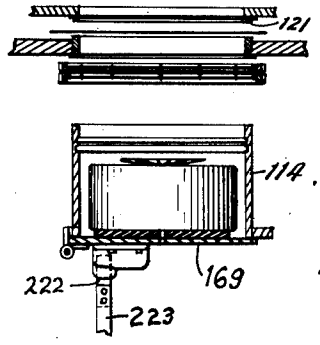
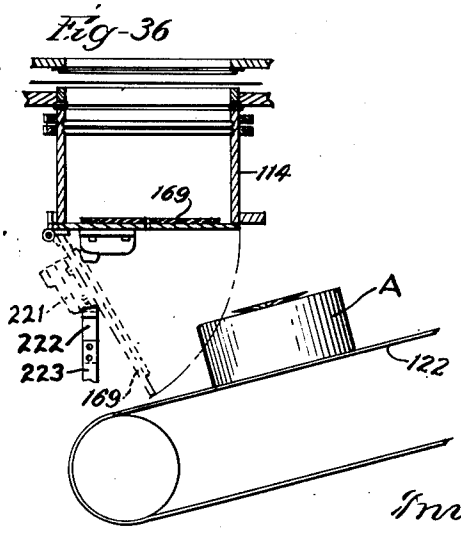


Fig-36



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METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

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Fig-37

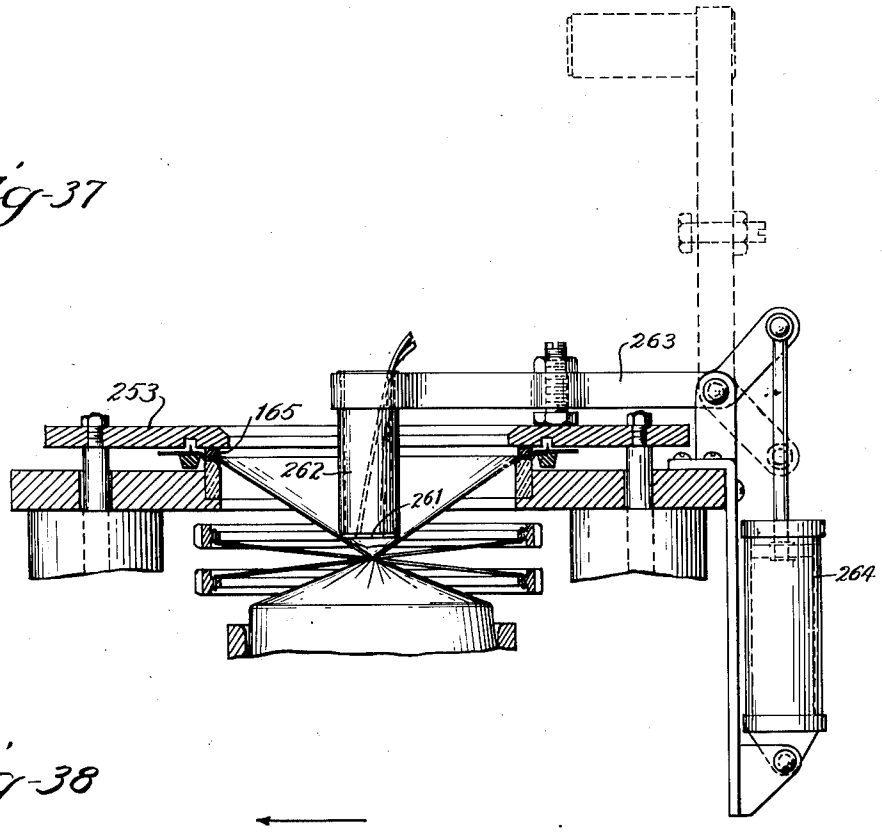
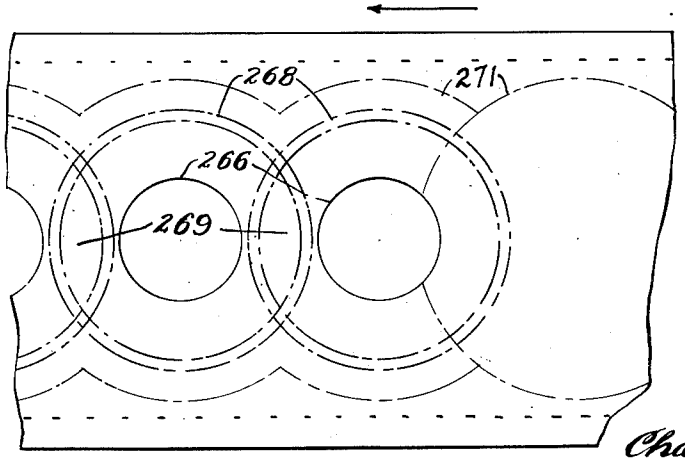


Fig-38



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Atty.

Patented Oct. 28, 1952

2,615,200

UNITED STATES PATENT OFFICE

2,615,200

METHOD AND APPARATUS FOR WRAPPING ARTICLES IN STRETCHABLE SHEET MATERIAL

Charles E. Cloud, Wilmette, Ill., assignor to William S. Cloud, Wilmette, Ill.

Application February 9, 1949, Serial No. 75,322

21 Claims. (Cl. 18—19)

1

This invention relates to methods of wrapping articles in stretchable sheet material and to apparatus for practicing such methods.

In practicing some aspects of my invention, it is necessary that the sheet material used be stretchable, or be capable of being rendered stretchable by the application thereto of heat, chemicals or other softening means. In some practices of my invention, the sheet material is also preferably transparent, moisture-proof, impermeable to air and certain other gases, and heat-sealable; that is, capable of having engaging portions fused together when heated. One such sheet material which has all of these characteristics suitable for practicing my invention, and which is commercially available, is a flexible transparent stabilized rubber hydrochloride film. Such material is well-known in the trade under the name of "Pliofilm," being manufactured by the Goodyear Tire & Rubber Company of Akron, Ohio, under Patent No. 1,989,632. The stabilization seems to be desirable for lasting qualities of the film, rather than being necessary for this invention.

There are numerous, well-recognized advantages in wrapping articles in material which conforms to the exact size and shape of the articles, especially where the material is transparent. Several methods have been devised to do this. One, as described in Patent No. 2,312,049, involves suspending a stretchable sheet in horizontal position over a metal frame, manually forcing the article against the sheet to form a pocket therein containing the article, manually twisting the article and the sheet to close and seal the pocket, and severing the excess portion of the sheet by a knife or other cutting means. A fully automatic apparatus for practicing another method is described in Patent No. 2,403,482.

One of the objects of my invention is to provide methods and means for wrapping articles in material which conforms to the exact size and shape of the articles, but which eliminate the hand operations, reduce cost, increase speed and simplify the apparatus.

Other objects and advantages will appear from the following description and from the drawings.

Two general embodiments of the invention, selected for the purposes of illustration, are shown in the accompanying drawings, in which:

Figure 1 is a fragmentary and simplified side elevation of the machine.

Fig. 1A is a somewhat diagrammatic sectional view of a modification of the invention for spot heating of the film.

2

Fig. 2 is a transverse section approximately on the irregular line 2—2 of Fig. 1, some parts being omitted for clarity.

Fig. 3 is a detail section showing the mechanism for raising and lowering sleeves 41 and associated parts.

Fig. 3A is a detail section showing alternative apparatus for opening and closing bottom plate 44.

Fig. 4 is a detail section showing the mechanism for raising and lowering holding plate 17.

Fig. 5 is a detail section showing the mechanism for driving sprocket chain 4, which feeds the sheet material.

Fig. 6 is a horizontal sectional view looking downwardly and taken approximately on line 6—6 of Fig. 1, showing the mechanism for driving geared rings 61, the parts being moved from the Fig. 1 position.

Figs. 7 to 12 are diagrammatic views illustrating the various changed positions in the operation of wrapping a spherical object.

Fig. 13 is a view showing the upper face of a sleeve type of closing device as a modified form of the invention.

The remaining figures show a preferred modification of the invention as follows:

Fig. 14 is a view of this preferred form of the invention from above.

Fig. 15 is a diagrammatic side representation of the structure of Fig. 14.

Fig. 16 is a side view of the structure shown in Fig. 14, some parts being omitted for clarity.

Fig. 17 is a vertical sectional view taken approximately on the line 17—17 of Fig. 16, the lower part of the apparatus being omitted.

Fig. 18 is a fragmentary detail sectional view taken approximately on the line 18—18 of Fig. 17.

Fig. 19 is a fragmentary longitudinal vertical sectional view taken approximately on the line 19—19 of Fig. 17.

Fig. 20 is a fragmentary transverse vertical sectional view taken approximately on the line 20—20 of Fig. 16.

Fig. 21 is a view looking down the choke rings removed from the machine, the dotted line showing the position of the strands when one ring has been turned with respect to the other to stretch the bands across the space.

Fig. 22 is a fragmentary transverse sectional view taken approximately on the line 22—22 of Fig. 16.

Fig. 22A is a fragmentary vertical sectional view illustrating a modification of the invention

in which the film seals directly against the upper edge of the vacuum sleeve.

Fig. 23 is a horizontal sectional view taken approximately on the line 23—23 of Fig. 19 to show the support of the choke ring.

Fig. 24 is a fragmentary sectional view taken approximately on the line 24—24 of Fig. 23.

Fig. 25 is a fragmentary detail view showing the cam control of the vacuum lines for operating the vertically moving parts of the apparatus.

Fig. 26 is a diagrammatic representation of the vacuum system.

Fig. 27 is a diagrammatic representation of the electrical system.

Fig. 28 is a fragmentary vertical sectional view showing an adapter for reducing the effective size of the main vacuum chamber.

Figs. 29 through 36 are diagrammatic vertical sectional views showing the successive stages of the wrapping of one article.

Fig. 37 is a fragmentary sectional view showing a modified form of the invention cutting the material along a smaller line.

Fig. 38 is a diagrammatic view showing the way in which the structure of Fig. 37 saves material.

Although the law requires a full and exact description of at least one form of the invention, such as that which follows, it is, of course, the purpose of a patent to cover each new inventive concept therein, no matter how it may later be disguised by variations in form or additions of further improvements; and the appended claims are intended to accomplish this purpose by particularly pointing out the parts, improvements or combinations in which the inventive concepts are found.

General operation

In the forms of the invention shown in the drawings, a web or sheet 6 of stretchable material is drawn from a roll 1, to a position over rings or openings 10 in plate 11. There the sheet is firmly clamped or held. The portions of the sheet immediately over the openings are forced down through them to form pockets into which the articles are deposited. The tops of the pockets are closed, and the pocket portions of the sheet containing the wrapped articles are cut out. The balance of the sheet is then advanced and the process repeated.

Sheet feed (Fig. 1)

A roll 1 of sheet material 6 rests on rollers 2 and 3. This arrangement permits greater ease and speed in the changing of rolls than does the usual mounting and is preferred in some respects, although it was not conceived by me. Roller 3 is driven intermittently through a sprocket by sprocket chain 4, in timed relation to the movement of heating drum 8 and wringer rolls 12, the combined movement of which advances sheet material 6. If the sheet material is not stretchable in its natural condition, it is now exposed to chemicals or heat to so render it. Although methods and apparatus for treating sheet material to render it stretchable are old in the art, I have illustrated one method of heating the sheet material, which is appropriate for common "Pliofilm," indicated above as being suitable for practicing my invention. Other methods of heating are illustrated in Figs. 1A, and 14 to 27, and are disclosed in Patents Nos. 2,312,049 and 2,403,482. In the method here illustrated, the sheet 6 passes under guide roller 7, around heating drum 8 and under guide roller 9. Heating drum 8 is preferably driven intermittently by chain 4, and is maintained at the proper temperature by steam or any other convenient means. From the guide roller 9 the sheet is drawn by feed rolls 12 over openings 10 in plate or support 11. The sheet pauses while portions of the sheet are forced through holes 10 to form pockets in which articles are wrapped. After the wrapped articles have been severed from the web, the remainder of the web is drawn on by feed rolls 12, at least one of which is intermittently driven by chain 4. This remainder or scrap may pass from the feed rolls 12 to suitable wind-up means such as revolving core, which may be located outside of the limits of the drawings. The sellers of a particular sheet material will be able to advise the approximate temperature to which it should be heated to be readily stretchable, and the heating should be adjustable so that the exact optimum temperature can be reached by observing the operation. By proper placement of the openings in plate 11, and proper advancing of the sheet material, the remainder (scrap) thereof is preferably reduced to as little as is consistent with proper handling and disposal thereof, which may vary with the sheet material being used.

The apparatus for activating sprocket chain 4 and for the timing thereof is best illustrated in Figs. 1 and 5. Main cam shaft 21 which, directly or indirectly, controls all parts of the machine, is driven constantly by sprocket chain 22, which is connected in the usual manner to a motor (not shown). As shown in Fig. 5, a cam 24 is affixed to shaft 21, which rotates in bearing blocks 23. This cam 24 actuates cam follower or lever 26, pivotally supported by shaft 27. The movement of lever 26, caused by cam 24, controls the movement of link 25, pivoted on shaft 28, and which intermittently drives sprocket chain 4. The intermittent drive is accomplished by means of any suitable overrunning clutch device, typified by roller 29. This mechanism is biased for return movement by tension spring 30, of which one end is attached to the frame and the other to lever 26.

Sheet holding

A fresh portion of sheet 6 having been advanced to a position over rings or openings 10 in plate 11, mechanism becomes effective for firmly clamping or holding this portion over the openings while the portions of the sheet immediately over the openings are forced down through them to form pockets and until after the pockets have been filled, closed and cut off. Methods of holding sheet material, and apparatus for so doing, are old in the art. It can be done by either fluid or mechanical pressure. I have shown one form of apparatus for doing this in the drawings, especially Fig. 4.

Slidably mounted on vertical rods or shafts 16, and held horizontally thereby, is a top or holding plate 17, containing, as best illustrated in Figs. 7 to 12, openings 20 corresponding in size and shape to the openings 10 in plate 11. Plate 17 is biased downwardly by tension springs 18, of which one end is attached to the frame and the other to cam followers or levers 19, which are adapted to regulate the vertical movement of plate 17 by means of links 15. Levers 19 are pivotally mounted on shaft 27 and are uniformly controlled by having one end of each ride on cams 31, carried by shaft 21, which cams are so shaped as to allow or assist tension springs 18

to lower plate 17, when the forward motion of sheet 6 has ceased, to clamp the sheet between plate 17 and plate 11 and hold it while pockets are formed, filled, closed and cut off, at which time they raise plate 17. Although I prefer to have two sets of cams affixed to opposite ends of shaft 21, for purposes of simplification only one set of these cams, and their related levers, are shown on certain of the drawings.

To avoid the possibility of rupturing sheet 6, and to secure a firm grip on the edges of the pockets where the stress on the held portion of the sheet will be greatest, I prefer to attach to the lower edges of the openings 20 in plate 17 rings 32 of sponge rubber or other resilient and non-abrasive material. This is best shown in Figs. 7 to 12. It may also be desirable to round off the upper edges of the openings 10 in plate 11 to prevent rupturing.

Pocket forming

Fresh portions of sheet 6 being held over the openings 10 in plate 11, there becomes effective the mechanism for forcing these portions through the openings to form pockets.

Pockets have heretofore usually been formed by fluid pressure, or by mechanical pressure, the latter in some cases exerted by the articles which are to be enclosed in the pockets. Combinations of these methods have been used. I prefer to make the initial forming of the pockets by fluid pressure and thereafter to further enlarge them by a gripped stretch (moving apart two positively held parts of the pocket). This is preferred for a number of reasons, including the following:

First, the use of any one of the methods alone is inefficient in its use of sheet material. It has long been recognized that a vacuum is progressively more effective toward the center or bottom of a pocket created by it, so that the material from which the pocket is formed becomes progressively thinner toward the center. Thus, the use of vacuum alone inherently prevents the forming of the largest size pocket which could be made from a given area of material, and the walls of the pocket that is formed will be of widely varying thickness and strength. It has also been recognized that, due in part to friction, stretching by a member exerting mechanical pressure against the center stretches mostly the portions away from the center or bottom of a pocket formed by it, so that it has the same inherent limitations although the thinner portions of pockets formed by it are placed differently. Stretching by the weight of an object to be wrapped has the same effect as stretching by mechanical pressure, and should be considered as merely a form thereof. Obviously, as the two forms of stretching produce opposite results, they somewhat offset one another, but the results are believed to vary. Different surfaces used for the mechanical stretching permit varying slippage with different amounts and distribution of stretching. By following the fluid stretch with a gripped stretch as in the present invention such slippage is avoided. The results are more dependable and greater stretching of the neck portion of the pocket seems practical. It is to be understood that apparatus for forming pockets by either fluid pressure or mechanical pressure, either alone or in any combination, could be used with some features of the present invention.

The preferred method of pocket forming, as well as some prior methods, has the advantage of preforming the pockets. One broad field in the packaging art includes the packaging of liquids. Liquids cannot be packaged without difficulties unless either a preformed pocket is available or dams are provided. Similar difficulties are encountered in the packaging of loose material or powder, such as cement, tea or bouillon powder, and in the packaging of gases. All of these types can be readily packaged by the apparatus illustrated and described, with a suitable pocket-filling device.

Slidably mounted on vertical rods or shafts 16, and held horizontally thereby, is horizontal casting or beam 36 (Fig. 2). As best seen in Fig. 3, the vertical movement of beam 36 is governed by cams 38 attached to shaft 21 and which rock cam followers or levers 37, pivotally mounted on shaft 27. The end of levers 37 remote from the cams 38 are attached to beam 36 by links 40. Beam 36 is biased upwardly by tension springs 39 (Fig. 1), of which one end is attached to the frame and the other to levers 37. Cams 38 are so shaped as to allow tension springs 39 to raise beam 36 approximately as the sheet is gripped between plates 11 and 17, the cam lowering beam 36 when the mechanical stretching is to be done. Rigidly attached to beam 36 are tubes or sleeves 41, the inside diameter of which, as best illustrated in Figs. 7–12, corresponds in size and shape to the openings in plates 11 and 17. The tubes 41 may be held by set screws in collars 48 preferably cast as parts of beam 36. Tubes 41 are so positioned that when beam 36 is fully raised a substantially air-tight contact is made between the tops of tubes 41 and the bottom edges of the openings in plate 11. To ensure the tightness of this contact, it may be desirable to cement gaskets 42 to the lower edges of the openings 10 in plate 11. Also attached to beam 36, by hinges 43, is a bottom plate 44 adapted to be swung up to form an air-tight closure at the bottoms of tubes 41. Here again, to ensure the tightness of the contact, it may be desirable to surface plate 44 with a layer of sponge rubber 45 having an impervious upper face. The term "shell" may be used to designate the pocketing unit which is illustrated as embodying mainly the tube 41, this term being especially suitable when it is desired to imply that the bottom is closed during the draw-down of the pocket without specifically mentioning the bottom plate 44. If fragile articles or ones which bruise easily are to be dropped into the pockets, it may be desirable to add a second layer of sponge rubber 47, which may be of such size and shape that it will fit into the bottoms of the tubes. Tubes 41 are connected with a vacuum pump (not shown) by vacuum hose 49 (Fig. 1) through ports 51 (Figs. 2, 7 and 8) which lead through the containers 48 and sleeves 41. The vacuum pump can operate continuously.

As the sheet 6 is being gripped between plates 11 and 17, levers 37, riding on cams 38, allow tension springs 39 to raise sleeves 41 into contact with plate 11. The movement of levers 37 also indirectly operates bottom plate 44 attached by hinge 43 to beam 36. The end of bottom plate 44, extending beyond hinges 43, strikes resilient adjustable stops 52, swinging up bottom plate 44 into contact with the bottoms of tubes 41. To ensure closure at all points, a separate bottom plate may be provided for each sleeve 41, each actuated by a separate stop 52.

An alternate apparatus for operating bottom plate 44 is shown in Fig. 3A. There a tension spring 53 is attached at one end to the frame

and at the other to a rope, the other end of which extends through and is knotted above the end of each bottom plate 44. This will operate in the same manner as will set stops 52. The spring 53 or spring stop 52 ensures a closing pressure on plate 44 in spite of variations in the parts, and adjustments for spring 53 may be provided as shown for stop 52.

At this time the vacuum becomes effective through ports 51 to draw sheet 6 into sleeves 41, as shown by comparing Figs. 7 and 8. On the inside of sleeves 41, as shown in Figs. 7–12, are mounted rings 56 and 57, supporting screens 58. Screens 58 prevent the sheet 6 from being pulled through the rather large ports 51 and thus being ruptured. It will be observed that in each tube 41 the film seals against rings 56 and 57 thus closing off the vacuum chamber formed between screen 58 and tube 41. This shuts off the vacuum from below ring 57 so that expansion of the pocket by vacuum is automatically terminated in about the position seen in Fig. 8. The vacuum stretch having been completed, cams 38 and levers 37 lower sleeves 41. This does not break the vacuum holding the pocket down in sleeves 41 because each pocket is sealed against ring 56 by the vacuum. As shown in Fig. 9, lowering sleeves 41, in which the pockets are held by vacuum, will cause those portions of sheet 6 being held between plate 11 and rings 56 to be further stretched. Rings 56 extend inwardly beyond screens 58, to give a snubbing effect which, assisted by the roughness of the screen, prevents the film from slipping and perhaps breaking the vacuum during the mechanical stretch. As sleeves 41 and beam 36 are lowered, stops 52 cease to hold bottom plates 44 against the bottoms of sleeves 41; but the bottom plate continues to be held up by the vacuum within the sleeves 41.

Pocket filling

The pocket now being fully formed, the articles are deposited therein. As methods of feeding articles into pockets, and apparatus for so doing, are old in the art, it is deemed unnecessary to describe the diagrammatically represented feeder 50, the type of which will vary according to the particular article or type of article to be packaged. The form of the invention shown in the drawings is even adapted to package powders, liquids and gases, if vertically moving, possibly tapered nozzles are used for feeding. When necessary to prevent loss of contents, the necks of the pockets may be constricted in two steps, the first (before filling the pockets) closing the neck about the nozzles, and the second closing the necks completely as the nozzles are withdrawn.

Pocket closing

To close with greater speed and efficiency, and to allow the use of one closing mechanism regardless of the size or type of the contents of the pockets, I prefer to use the pocket closing mechanism shown in Figs. 1, 2, and 7–12. Rotatably mounted around the upper portions of sleeves 41, at the outside thereof, are geared rings 61, the teeth of which mesh so that all such rings may be driven through one of them. At spaced intervals endless bands or strips 62 of rubber or other suitable material are attached between rings 61 and the edges of the openings 10 in plate 11. These strips do not have to be of stretchable material, although that permits some simplification and is preferred. The twisting of rings 61 forces these strips 62 from a separated, substantially vertical position, as shown in Figs. 2, and 7–9, into an intersecting, substantially horizontal position, as shown in Figs. 6, 10 and 11, closing the pockets surprisingly tightly.

The sealing of the pockets may be effected when the pockets are closed, if sealing is desirable. If the sheet material used is the common, non-stretchable "Pliofilm," it must have been previously heated to render it stretchable, and the mere closing of the pockets will seal them, since they will not have been stretched excessively or allowed to stand long enough to lose their tackiness. To heat-seal certain other sheet materials, it may be necessary to use strips 62 of resistance wire or other material which will conduct heat and to heat them by electricity at the moment they effect a closure of the pockets. When using other materials which are not heat-sealable, it may be desirable to hold the closure by glue, cord or tape. Apparatus for this is old in the packaging art.

One apparatus which may be used to twist the rings 61 is best shown in Figs. 1 and 6. Mounted in a position to be tripped by the lowering of lever 37 is switch 66 for valve control unit 67, which admits air to cylinder 68, forcing out rack or geared rod 69, which is meshed with gear 71 mounted on vertical rod or shaft 72, rotatably mounted on the frame, and having mounted thereon gear 73, which is meshed with one of geared rings 61. The air cylinder and controls are preferably of the type, commercially available, which forces rod 69 first out and then in, thus returning strips 62 to their substantially vertical positions, as shown in Fig. 12, so that the apparatus is readied for the next articles. This type of apparatus permits control of the amount of twisting which is done, which may be necessary if, for example, strips 62 are of resistance wire or other relatively non-stretchable material.

For strips 62 can be substituted a tube 75 of rubber or other suitable material, which may be secured to the choke rings 61 by cement, clamping rings, or both. The twisting in such case will cause the tube to form an annular sheet over the pocket, further twisting causing this sheet to constrict the aperture therethrough and eventually close it, as seen in Fig. 13, squeezing anything within the aperture.

It is believed that the strength of the vacuum holding the film against the screen 58 can be so selected that the constrictor will pull the film away from the ring 56 and screen 58 enough to break the vacuum. In any event, the strength of the vacuum should be adjustable. This may be accomplished by providing an adjustable relief valve or by providing adjustable means for determining the speed of the vacuum pump, assuming it is of a type in which the pressure varies with speed.

To safeguard against the possibility that the vacuum may not be dependably broken in this way, it is preferred at present to provide automatic means for breaking the vacuum in timed relation to the remaining apparatus. For example, a valve to the vacuum line could be opened automatically by a cam on shaft 21.

It is to be noted that the closing or constricting apparatus described is admirably adaptable for remote uses such as for holding objects and, in the case of the sleeve form, for use where diaphragm closers are necessary, as in cameras.

Pocket severing

The apparatus for severing the filled, closed pockets from the remainder of the sheet will vary with the sheet material used. For some materials it will be preferable to cut by knives which may be imbedded in plate 17 or plate 11 or in both. I have shown in Figs. 7–12 apparatus for cutting out the pockets by heated wires. Imbedded in opposed portions of plates 17 and 11 surrounding rings 32 are rings 76 of refractory or other heat and electrical insulating material. Attached to either upper or lower rings 76 are wires 82 substantially surrounding the openings 20. The opposite rings 76 may be resilient. These wires 82 may be heated in the usual manner (not shown) to a degree sufficient to sever sheet 6 by connection to a source of current at about the time or after the pockets are sealed, or may be maintained in such a heated condition if the film is held reliably by ring 32. In wrapping articles so large that part of the upper part of the neck of the pocket should be used in the body of the wrap, this can be accomplished by severing and releasing the wrap just before the closing choker strands 62 reach the gripping position at which the wrap could no longer slip through. The pockets having been severed or cut out, when plate 17 is raised the wrapped articles will drop out of sleeves 41. Prior to this time bottom plate 44 will have swung down, opening sleeves 41 when the vacuum holding it is broken by the constricting operation as shown in Fig. 11. If the constricting operation does not reliably break the vacuum, a vacuum relieving valve may be automatically opened at the proper time. If strips 62 are not of elastic material, it may be desirable to so construct the apparatus for practicing my invention that the means provided for holding the ends of these strips will come closer together vertically as they are revolved with respect to each other to close the pocket.

The appearance of the final wrapper can be greatly improved by constructing the heater so that it leaves unheated, or much less heated, the part of the sheet material which forms the upper part of the pocket. This portion then remains unstretched, or nearly unstretched, and retains a relatively glossy appearance. Because of the gathering of the material below it, at the constriction, the glossly portion forms loose pleats so that it is suggestive of a waxy-leafed flower. The selective heating of the sheet material can be accomplished by passing it over heated plates 81 (Fig. 1A) of the correct size and position, so that the part of the film which comes to rest over a plate, and is therefore heated thereby, will next come to rest over the center of one of the openings 10. Best results may be accomplished by releasing the pocket from clamping ring 32 during the constricting operation, so that the glossy material will best be gathered into folds. The constriction should be formed of material which was heated, however, so that the parts thereof will adhere to one another to produce a permanent seal. Any heated and stretched portion between the seal and the unheated portion will contract and draw the unheated portion close to the seal. Even without the differential heating, there is produced a flower more attractive than the twisted pigtail of prior stretch sealing.

An even better flower is obtained by locating the resistance wire 82 for severing the film a substantial distance away from opening 10, as seen in Fig. 1A, and leaving a band of film, of say ½" width, between it and the opening. This band is not stretched and therefore may be left entirely unheated, and retains its full gloss. Of course cushion rings 76 should be provided in alignment with wire 82 whether or not some are also provided closer to opening 10 to be adaptable for either position of wire 82. The heater 81 may then have the same diameter as opening 10 to heat all of the material that forms the pocket, but not that which surrounds it and forms the flower.

Modification—general description

Although the modification shown in the drawings beginning with Fig. 14 differs in many respects from the form of the invention shown in Figs. 1 to 13, it is very similar in the broader aspects. The structure of Figs. 1 to 13 can be modified to any degree in accordance with the other figures, in which a web 106 is drawn from a roll 107 of film, is heated by heater 108 and comes to rest over a ring 110 in or formed by plate 111. Here it is clamped by clamp plate 113 while an article is wrapped with the portion of the film within the ring.

This portion of the film is drawn by vacuum down into tube or sleeve 114 which may also be called the vacuum chamber. The expansion of the pocket thus formed in the film 106 seals the film over gripping grooves 116 (Fig. 30). A small vent 117 preferably lets air bleed into the vacuum chamber 114 so that the bottom 178 of the film draws itself up by its elasticity (Fig. 31). The pocket nevertheless continues to be held by gripping grooves 116 while tube 114 is drawn downwardly to stretch the upper portion of the pocket. The article to be wrapped is then dropped into the pocket (Fig. 32) and the pocket is closed above the article by operation of choke rings 118 and 119 (Figs. 33, 34). The cut-off wire 121 is now heated to sever the wrapper from the web (Fig. 35) and the wrapped article is dropped upon conveyor 122 (Fig. 36) which carries it from the machine.

Film feed

Best results in feeding the web through the machine with a minimum of interruptions has been obtained by use of a pair of spaced belts 126 (Figs. 14–16) having pins 127 upstanding therefrom. As seen in Fig. 22, these pins 127 engage the web 106 along the marginal portions thereof. The web is pushed onto the pins by slotted rollers 128 which may be separated by feed roll 129. The belts 126 are V-belts and extend around pulleys 131. A slight drag is applied to the film roll 107 as by a friction brake on its shaft.

As seen in Figs. 16, 17 and 18 the forward pulleys are driven by a chain 132 which in turn is driven intermittently by shaft 133 driven continuously by chain 134. The manner of obtaining the intermittent drive is indicated in Fig. 18. Collar 136 rotates constantly with shaft 133. Once during each revolution at the time when feeding of the web should begin, head 137 of clutch dog 139 strikes stationary cam 138 which presses the dog 139 to the right so that it enters a recess 140 on the face of the hub of sprocket 141. The clutch dog 139 bears against a shoulder or wall of recess 140 on the sprocket 141 to drive the sprocket 141 as long as the clutch dog 139 is held at its righthand position as shown in Fig. 18. When the web has been driven the proper amount the clutch dog 139 and its head 137 move beyond cam 138 and the clutch is disen-

gaged by spring 142 which urges the clutch dog 139 to the left. At this time another recess 140 will have been moved to the position for receiving dog 139 when it is again pressed in by cam 138.

The scrap film is wound on a roll 143. This roll is driven by a belt 144 preferably in the form of a coil spring which in turn is driven by pulley 146 on shaft 147 by which forward pulleys 131 are driven. The pulley 146 is of a size to wind the scrap film too fast most of the time except that the spring belt 144 slips enough to maintain the desired degree of tension on the web 106.

Heater

The heater 108 may have a generally flat upper surface, preferably having minute waves or irregularities, which is heated by an electrical resistance unit within the heater. As seen in Fig. 27, a thermostat or temperature-responsive device 148*a* is provided within heater 108 to control the temperature of heater 108 to any desired temperature by interrupting the circuit of the resistance unit wires. An adjustable external resistance 148*b* may be provided for adjusting the flow of current so that the thermostat will shut off the flow of current less frequently. A voltmeter 148 is of assistance in this connection.

Between feeding movements of the film the film is pressed against the heater 108 by a cushion 149 (Fig. 22) which may be formed of sponge rubber covered with cloth. The cushion 149 is lowered by vacuum cylinders 151 and raised again, when the vacuum is released, by return springs within said cylinders. As the cushion 149 is raised the belts 126 are also raised by means of belt lifters 152 carried by the cross beam 153 which carries cushion 149. The film 106 has some tendency to stick to the heater 108. The raising of the belts 126 peels it from the heater before the longitudinal movement of the film. This can alternatively be accomplished by proper tensioning and positioning of the belts, in which case the tensioning means may be considered a means for urging upwardly the parts of the belts holding the web at the heater. The illustrated form is preferred because it is more dependable.

The heater 108 is preferably spaced far enough away from the plates 111 and 113 so that the film will come to rest between them, and the heated area 154 will have time to cool below the temperature to which it had to be heated to be readily stretchable. Surprisingly, this results in better characteristics for stretching, resulting either from the cooling, the passage of time, or both.

Vacuum cylinders 151 are controlled by valve 156 which in turn is controlled by cam 157 as seen in Figs. 25 and 26. Cam 157 is driven by shaft 158 which, as seen in Fig. 16, is driven by chain 159 so that the shaft 158 rotates once per each revolution of the shaft 133. With the valve in the position seen in Fig. 25, a vent through the valve stem is opened by valve button 155 (opened by a spring within the stem) to break the vacuum and allow the pistons and their piston rods 161 to rise.

The mounting of cross beam 153 directly on the piston rods 161 of cylinders 151, as seen in Fig. 22, preferably with a loose mounting, has been found to be very much more reliable than any simple construction in which guide rods are used for the cross beam 153. Uniform action of piston rods 161 is ensured by constrictions in the vacuum lines adjacent cylinders 151. Likewise, constrictions are provided in the passages to cylinders 163.

Clamp plate

As seen in Fig. 20, the clamp plate 113 is mounted and actuated in a manner similar to the cross beam 153 just described. Specifically, it is carried directly by piston rods 162 of vacuum cylinders 163. As seen in Fig. 26, the vacuum cylinders 163 are controlled by valve 156 jointly with vacuum cylinders 151. Thus both the clamp plate 113 and the cushion 149 are lowered simultaneously as the web comes to a stop.

A preferred arrangement of cut-off wire 121, annular sealing and gripping cushion 165 is seen in Fig. 22A, other figures being merely diagrammatic as to these details. The sealing wire is preferably carried by the ring 110 of a ceramic or the like.

Vacuum sleeve

A preferred form of vacuum sleeve or tube 114 is shown in Figs. 19 and 20. It is carried by an elevating or sliding beam 167 which slides on guide rod 168. During the initial application of vacuum, the sleeve 114 is in the upper position, either sealed against plate 111 (Fig. 19) or extending therethrough to be sealed directly against film 106 (Fig. 22A). A suitable sealing gasket may be provided in the former case. Also, the bottom door 169 is closed by its spring 226.

As the clamp plate 113 closes down upon the film to clamp it to ring 110, vacuum is admitted by operation of valve 171 (Fig. 26) to connect the vacuum tank 172 to the vacuum cylinder 114. The hand valve 173 shown in Fig. 26 is merely for shutting off this connection when the machine is running without being ready to wrap.

As seen in Fig. 19, vacuum is supplied to sleeve 114 through tube 174 and through a passage in beam 167 to an annular groove 176 in sleeve 114. From groove 176 several vertical passages 177 extend up to and open into gripping grooves 116. The openings are preferably small enough so that no screen is necessary to prevent rupturing the film at the holes.

The vacuum line 174 draws air from the approximately sealed chamber within the sleeve 114, thereby producing a vacuum in that chamber so that the atmospheric pressure above the film presses the film down into the chamber 114, as seen in Fig. 30, until the film seals across the gripping grooves 116. Thereafter air can no longer be drawn from within the chamber 114 to the vacuum line 174. For some purposes, especially when wrapping flat-bottomed articles, it will now be preferred to let the hemispherical bottom portion 178 of film 106 draw back to a flattened position as seen in Fig. 31. When this is desired, care will be taken not to allow the door 169 to seal the bottom portion of the chamber 114 too completely. To this end the tiny vent 117 is preferably provided in the door 169. This vent is too small to destroy the vacuum while the film is being drawn down into the sleeve 114. The vacuum is quickly destroyed, however, in the lower part of the sleeve when the film has shut off the flow of air from this zone by sealing the gripping grooves 116.

The gripping grooves 116, particularly because there are two of them, reliably hold the film during continued formation of the pocket. To complete the pocket, the sleeve 114 is lowered, as indicated in Fig. 32, thereby stretching the upper portion of the pocket.

The sleeve 114 is lowered by sliding the beam

167 (Fig. 20) downwardly by means of rods 181 which are rigidly connected to the beam 167. The rods 181 are drawn down by levers 182 (Fig. 19) pivoted to shaft 183. The levers 182 are pushed down by a cam 184 operating on a cam follower 186 (seen also in Fig. 17). Cam 184 is driven constantly on shaft 133, which is driven constantly as previously described. When permitted by cam 184, the sleeve 114 is raised by a return spring 190 acting on arm 185, fixed on shaft 183.

Choke rings

After the article to be wrapped has been dropped into the pocket as seen in Fig. 32, either by hand or by a feeding mechanism, the choke rings close the upper portion of the pocket above the article, as indicated in Figs. 33 and 34. The choke rings and their operation are seen best in Figs. 19 and 21, and their support is seen best in Figs. 23 and 24. The band 187, which is threaded through and between the choke rings, is preferably rubber covered with a braided tube of nylon. One length is used, threaded across from hole to hole, instead of a plurality of short lengths each from one ring to the other only, so as to obtain the advantage of some stretching between the holes of one ring. This pays out a little extra length from each ring to supplement the portion of the strand between the rings when required.

According to the preferred form of operation indicated in Fig. 19, both rings are normally constantly rotated by a shaft 188, which is constantly driven as indicated in Fig. 16. The choking is accomplished by restraining the lower ring 119 and stopping it while the upper ring 118 continues to rotate.

To this end, ring 118 is driven constantly by pinion 189 keyed to shaft 188. Ring 119 is driven by pinion 191 which may be called a floating pinion in that it is not permanently connected to shaft 188. It is driven by shaft 188 through spring 192, which also presses it upwardly. The spring 192 urges the pinion 191 to a forwardly rotated position in which the rings 118 and 119 are aligned so that the intervening portions of strand 187 extend more or less straight up and down between the rings 118 and 119.

At the proper time for choking, the pinion 191 is stopped by a friction brake 193. The continued rotation of upper ring 118 after lower ring 119 is thus stopped stretches the intervening portions of strand 187 across the opening within the rings as indicated in dotted lines in Fig. 21. Preferably both rings 118 and 119 then rotate in the same relative position with respect to one another to twist the neck of the wrapper. The neck may by then have been severed from the web, but preferably it is kept intact, the lower part of the package having been released instead. The brake 193 will then be released and the spring 192 will drive the pinion 191 faster than the pinion 189 so that the lower ring 119 catches up with the upper ring 118, thereby opening the choking strand 187 to release the package (Fig. 35).

The described action of pinion 191 under influence of the spring 192 and the brake 193 is accomplished with the aid of a floating pin 194 (Figs. 19 and 23). This pin is held by an idler collar 196. Its ends run in concentric grooves in pinions 189 and 191. Each groove extends almost, but not quite, all the way around its pinion. The two ends of the groove in the pinion 189 are sepaarted by a lug 197 (Fig. 23), and the two ends of the groove in pinion 191 are separated by a lug 198. When pinion 191 is free from brake 193, it is driven ahead by spring 192 until lug 198 bears against pin 194 which in turn bears against lug 197. This holds the rings 118 and 119 in the desired normal alignment while they both rotate. When the brake 193 is applied to pinion 191, the pinion 191 stops. Lug 197 carried by pinion 189 continues to rotate and after approximately one revolution it strikes pin 194 and rotates the pin 194 with its collar 196. After approximately another revolution, the pin 194 strikes lug 198 and drives the pinion 191 in spite of the friction applied thereto by brake 193. Thus the amount of relative rotation between rings 118 and 119 is controlled and the two rings rotate together in the relationship which has produced the desired choking. The amount of relative rotation between rings 118 and 119 depends on the relative sizes between these rings and the pinions 189 and 191, approximately one revolution having been found suitable.

Choking brake

The choking brake 193 is carried by a yoke 201, which, as seen best in Fig. 17, is pivotally carried by shaft 147. A lever 202, also pivotally carried by shaft 147, actuates the yoke 201, through an adjustment screw 203, and is in turn actuated by cam 204 on shaft 133. Thus the brake is applied in timed relation to the remainder of the machine with a braking force adjusted by screw 203.

Mounting of rings

The choke rings 118 and 119 are preferably mounted as seen in Figs. 23 and 24. Thus each one is positioned vertically by flanges or washers 206, which are positioned at at least three points around the periphery of the rings. Also, each ring is centered about the axis of tube 114 by at least three positioners such as pinions or rollers 207. Unless the rings 118 and 119 are provided with smooth annular shoulders, in addition to their teeth, the positioners 207 should be pinions meshing with the teeth of the rings. Flanges 206 and pinions 207 located at the four positions shown in Fig. 23 have been found to be adequate. A set of flanges 206 is positioned above ring 119 to resist the upward pull on that ring by the bands 187 when they are stretched. The pinions 207 may of course be provided with a rolling type of bearing if desired.

Cut-off control

The cut-off wire 121 is supplied with current by control switch 211 which in turn is controlled by cam 212 on shaft 133 (Figs. 17 and 27). The relative positions of the cam and switch may be set to time the cut-off quite accurately so as to cut the package from the web just after, or in some instances just before, the rings 118 and 119 have completed the closure of the neck of the package. A manual switch 213 can be opened to prevent heating of the cut-off wire before wrapping begins, or this circuit can be controlled by main switch 215 which controls driving motor 219.

Control of door

The control of the bottom door 169 is best understood from Figs. 19, 20, 35 and 36. The door is provided with a hook blade 221 rigidly mounted on the bottom thereof. A spring latch hook 222 is positioned to engage the hook blade 221, as seen in Fig. 35, when the sleeve 114 is lowered. The latch hook 222 is carried by a

flat spring 223 which permits the latch hook 222 to yield laterally to receive the blade 221. The lower end of the spring 223 may be rigidly secured to a bracket 224 on a fixed part of the framework.

As the sleeve 114 is raised from the position of Fig. 35 to the position of Fig. 36, the latch hook 222 draws the door 169 to the position shown in dotted lines in Fig. 36, letting the packaged article A slide out onto conveyor 122. Before the tube 114 reaches the upper position it will have drawn blade 221 lengthwise out from under latch 222 so that the door 169 will be closed by a spring 226 (Fig. 19) associated with its hinge.

Adapter for smaller articles

When it is desired to package smaller articles than those for which tube 114 is designed, it will sometimes be preferable to use an adapter as seen in Fig. 28. This adapter may comprise a main ring 231 bearing gripper grooves 116' which communicate with vacuum hose 174 either directly or through an annular space 232 and main gripper grooves 116. Thus the suction of these grooves will be applied to the grooves 116'. The main ring 231 may be sealed to the tube 114 in any suitable manner, as by rubber sealing rings 233 spread into firm contact with the walls of tube 114 and ring 231 by clamping rings 234. This seal is not necessary when hose 174 is connected to grooves 116' independently of space 232.

Modified vacuum sleeve

Fig. 22A shows a form of vacuum sleeve and associated structure which has some advantages over the other forms. The vacuum sleeve 251 extends upwardly through the clamp ring 110 and in its upper position is a little higher than the top of this ring. Thus when the clamp plate 113 moves downwardly it presses the film 106 slightly around the upper edge of the sleeve 251, sealing the film directly to the upper edge of the sleeve. Cushion 165 of sponge or foam rubber clamps the film against the ring 110 to hold the film during stretching. Preferably the cushion 165 is positioned slightly outside of the cut-off wire 121 so that the film will be wrapped partially around this cut-off wire, thus ensuring adequate contact therewith. It may be noted that this arrangement of clamping cushion on the outside of the cut-off wire is now preferred for other forms of the invention even though not so illustrated.

Modified cut-off

Fig. 37 shows an attachment which may be added to the machine of any of the other figures or which may be substituted for the cut-off wire therein. In this attachment the cut-off wire 261 is carried by a holder such as a tube 262 of ceramic material which in turn is mounted as on an arm 263 to be oscillated by a hydraulic cylinder 264. As the wrap approaches the figure shown in Fig. 37, the tubes 262 will be swung from the dotted line position to the full line position, at which point the wire 261 will sever the web.

As the web retracts the cut-off circle is indicated at 266. The web now need only be advanced sufficiently to remove this cut-off circle from the gripping ring 165. In other words, after the web has been moved the gripping ring may be again applied along the line 268, thus reusing the material in the zone 269. In other words, this material in the zone 269 forms the connecting portion of two successive wraps, being drawn down into the cup but not used in the wrap itself. The arcs 271 will be heated portions of the web, although the draftsman has not shown them as larger compared to the circles 269 than is in practice the fact. As seen from Fig. 37, the web is not much wider than the diameter of the ring 165, which corresponds to the circle 268. With this arrangement, the feed of the web can be varied so that each advance is shorter than otherwise, about 4/5 of the advance which would otherwise be required having been found suitable, thus effectuating a substantial saving of material.

The machine of this invention, particularly the form shown in the figures beginning with Fig. 14, has been found to be very practical and adaptable. A widely varying assortment of articles has been wrapped on it. Breakage of the stretched wrapping is relatively low in spite of the fact that the film is stretched enough to use relatively small areas of the initial film to wrap articles of substantial size. In other words, this machine is economical in the use of wrapping material. Although the wrapper throughout the finished wrapping may not be of uniform thickness, there being no need for this, the stretching is so distributed throughout the pocket that extremely weak spots are avoided as are thick spots which would represent an objectionable waste of material. The apparatus is suitable for a wide variety of uses, including packaging fills, which cannot stand much pressure during packaging, either because of a fragile nature or because the pressure would extrude the fill. Also the constricting apparatus can be used for constricting a paper wrap or constricting even beyond the field of packaging as in constricting itself to close or partially close an aperture or constricting upon any member needing to be held, or held and approximately centered.

The gripping groove feature could also be used in a wide variety of circumstances, as in holding a pocket stretched down when it had initially been formed by a plunger.

I claim:

1. Apparatus for enclosing a fill within stretchable sheet material including means for forming a pocket in a portion of the sheet and means for closing the neck of said pocket above a fill in the pocket; said closing means including a constrictor consisting of two independent end elements having connecting elements therebetween successively disposed circumferentially around the neck but each extending longitudinally of the neck between the two end elements of the constrictor, driving means for rotating one end element of the constrictor while restraining the other end element of the constrictor to produce a relative rotation between the two end elements until they pass diametrically opposite positions to draw portions of the connective elements of the constrictor toward the axis of the neck to close the neck and squeeze it while closed, said driving means thereafter further rotating the constrictor to twist the neck directly; and said apparatus including means for restraining one end of the neck during said twisting operation.

2. In a machine for enclosing articles in elastic sheet material, pocket forming apparatus including a support containing an opening, means

for holding a portion of said sheet material over said opening, a tube extending generally perpendicular to the plane of said opening, means for closing the bottom of said tube and for moving the top of said tube toward said opening, means for forcing through said opening and into said tube the central part of the portion of sheet material held thereover while a surrounding part is held on said support, means for holding the said portion in said tube, and means for moving said tube away from the edges of said opening to stretch further the intervening part of the sheet material.

3. In an apparatus for enclosing articles in stretchable sheet material, the combination of means for forming a pocket in a portion of said sheet to receive an article to be enclosed, and means for closing said pockets; said closing means including a constrictor consisting of two independent end elements having connecting elements therebetween circumferentially surrounding the neck of the pocket above the article and means for rotating one end element of said constrictor with respect to the other to draw portions of the connective elements of said constrictor approximately into contact with one another and the neck of said pocket.

4. The method of enclosing articles in stretchable sheet material comprising forming a pocket in a portion of said sheet, depositing in said pocket the article to be enclosed, holding a constrictor consisting of two independent end elements having connecting elements therebetween so that the connective elements thereof are around the neck of said pocket without constricting it, and rotating at least one end element of said constrictor with respect to the other to force portions of said connective elements into an intersecting position substantially at the axis of the neck.

5. Apparatus for forming a pocket in a stretchable sheet material including a support having an opening therein, means for securing sheet material across the opening, a shell extending away from the sheet beyond the opening, means for causing fluid pressure to press the sheet through the opening and into secured engagement with the shell, and means to move the shell away from the support to further stretch the portion of the material between the zone of said engagement and the support.

6. Apparatus for forming a pocket in a stretchable sheet material including a support having an opening therein, means for securing sheet material across the opening, a tube extending away from the sheet beyond the opening, means for causing fluid pressure to press the sheet through the opening and into secured engagement with the tube, and means to move the tube away from the support to further stretch the portion of the material between the zone of said engagement and the support, said tube including an annular shoulder with a face facing generally away from the opening and along the face of which the sheet material is forced by fluid pressure to help hold the material to the tube during subsequent stretching.

7. Apparatus for forming a pocket in a stretchable sheet material including a support having an opening therein, means for securing sheet material across the opening, a tube extending away from the sheet beyond the opening and having a screen extending away from the opening, means for causing fluid pressure to press the sheet through the opening and into frictional engagement with the screen, and means to move the tube away from the support to further stretch the portion of the material between the zone of said frictional engagement and the support.

8. Apparatus for forming a pocket in a stretchable sheet material including a support having an opening therein, means for securing sheet material across the opening, a tube extending away from the sheet beyond the opening, means for causing fluid pressure to press the sheet through the opening and into secured engagement with the tube, and means to move the tube away from the support to further stretch the portion of the material between the zone of said engagement and the support, said tube including an annular zone having portions projecting inwardly and around which portions the material is pressed by the fluid pressure to aid in holding the material during the further stretching.

9. Means for wrapping articles including a support having an opening therethrough, clamp means for securing a sheet of stretchable material across the opening, a tube extending away from the sheet movable axially of the opening, means for effectuating a seal between the sheet and the tube, means for closing and sealing the other end of the tube, means for applying vacuum to the tube to draw the sheet material down into the tube, means for moving the tube axially away from the opening, said tube being so constructed that under influence of the vacuum it holds the material so as to stretch the material further between the zone of holding and the opening, and means for constricting a portion of the material thus further stretched to close the material about an article.

10. Apparatus for enclosing articles in sheet material rendered elastic by heat including means for selectively heating a predetermined area of a sheet of said material, means for forming a pocket in the heated portion comprising a support containing an opening, means for forcing the sheet material through the opening to form a pocket for receiving an article, means for gathering the material of the pocket between the opening and the article and means positioned to be effective outside of said heated area for severing from the sheet the heated material together with some adjoining material beyond the heated material from the article and which is substantially unheated and unstretched which, as a result of said gathering, is drawn into the form of a flower.

11. The method of forming a wrapper about an article and a flower thereon which comprises heating a portion of a sheet of material of a nature to be rendered relatively stretchable by heat, stretching said portion to form a pocket, gathering the neck of said pocket and severing from the sheet said pocket with the gathered neck together with adjoining portions of the material beyond the heated material from the article and which are substantially unheated and unstretched and which as a result of said gathering form a flower.

12. Apparatus for forming a pocket in stretchable sheet material including a tube open at its receiving end and having a plurality of annular shoulders on its inside wall spaced from the open end and having faces facing generally away therefrom, means for securing sheet material in a position over said end and sealed with respect to the tube, means for withdrawing air

from said tube below said shoulders to produce a partial vacuum therein and draw the sheet material into the tube and around the shoulders, and means to move the tube downwardly away from the sheet-securing means to stretch further the portions of the material between the securing means and the shoulders.

13. Apparatus for forming a pocket in stretchable sheet material including a downwardly extending tube open at its upper end and having an annular vacuum groove spaced from both ends and means for closing the portion of the tube therebelow, means for securing sheet material in a position over the open end of the tube in sealed relationship with the tube, means for applying vacuum to the annular groove to draw the sheet down into the tube and into sealing engagement with the groove, bleeding means for relieving the vacuum below the groove, after the groove has been sealed, to release the bottom portion of the sheet material so that it may draw itself up to provide a flatter bottom for the pocket therein.

14. Packaging apparatus including a tube having open upper and lower ends, a pivoted closure for the bottom end biased toward the closed position, means for securing sheet material over the upper end in sealed relation with respect to the tube, means for causing fluid pressure to press the sheet into the tube to form a pocket and into secured relationship with the tube, means for moving the tube downwardly away from the securing means thereabove while the sheet material is secured within the tube to stretch the portion of the sheet material between the securing means outside of the tube and the portion of the sheet material in secured engagement within the tube, means for closing the stretched portion of the sheet material above a fill therein and severing it from the sheet, and latch means engageable with the bottom closure upon downward movement of the tube to open the bottom closure upon upward movement of the tube for releasing the wrapped article therefrom.

15. Apparatus for heating and feeding thermoplastic sheet material, including a plate, means for heating the plate, means for feeding the sheet material across the plate including edge-securing means along each edge of the material, a pressure member above the sheet material and above the plate, means for moving the pressure member toward the plate to press the sheet material against the plate, and means effective upon return movement of the pressure member to urge the edge-engaging means away from the plate to remove the sheet material from the plate independently of feeding movement of the sheet material.

16. Packaging apparatus including a pocketing ring, means for feeding stretchable film across the ring by movements less than the diameter of the ring, means for stretching the film through the ring between movements to form a pocket and constricting the sides of the pocket to close the lower portion thereof, and cut-off means movable through the ring to cut off said package along a line of smaller diameter than the length of said movements.

17. The method of enclosing fills in stretchable sheet material including the steps of stretching the material to form a pocket while the material surrounding the pocket is held, depositing a fill in the pocket, pressing inwardly on the neck of the pocket at various points around the neck spaced between the fill and the held material surrounding the pocket to constrict the neck and close it while the lower portion of the pocket, at least during the initial constriction, is held stationary.

18. The method of enclosing fills in stretchable sheet material including the steps of stretching the material to form a pocket while the material surrounding the pocket is held, depositing a fill in the pocket, pressing inwardly on the neck of the pocket at various points around the neck spaced between the fill and the held material surrounding the pocket to constrict the neck independently of relative rotation of the pocket about the axis of the neck, and to close the neck.

19. Apparatus for enclosing fills in stretchable sheet material, including means for holding the sheet, means for stretching a pocket into the sheet while it is held and for holding the lower portion of the pocket, and constricting means for closing the neck forming the upper portion of the pocket including means for engaging the neck at a plurality of points around the neck and pressing inwardly on the neck independently of rotation of the pocket about the axis of the neck, and continuing the inward pressing until each point approximately reaches the axis.

20. The method of packaging in film which includes clamping a web of elastic film, stretching a pocket in the film, closing the pocket about a fill therein, severing the closed pocket from the web, allowing the web to constrict whereby the hole cut in the removal of the pocket is enlarged, advancing the web to remove the enlarged hole from the working zone, clamping a zone of the web which extends close to the enlarged hole, again stretching a pocket into the web, this time stretching again a portion of the web which was stretched in forming the previous pocket, closing the pocket about a fill, and severing the the closed pocket from the web, leaving as part of the web the twice-stretched portion thereof.

21. The method of enclosing fills in stretchable sheet material including the steps of stretching the material to form a pocket while the material surrounding the pocket is held, holding the material in the pocket by suction to hold the pocket stretched, depositing a fill in the pocket, pressing inwardly on the upper portion of the pocket at various points around the pocket spaced between the fill and the held material surrounding the pocket to constrict the upper portion and close it while the lower portion of the pocket, at least during the initial constriction, is held as stated, without gripping the fill.

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