United States Patent

[11] **3,607,574**

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[32] Priority **July 11, 1968**
[33] **Japan**
[31] **43-48906**

[54] **AUTOMATIC PACKAGING APPARATUS**
4 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **156/515,** 53/183
[51] **Int. Cl.** **B32b 31/20,** B65b 1/02
[50] **Field of Search** 156/515; 53/179, 183, 373

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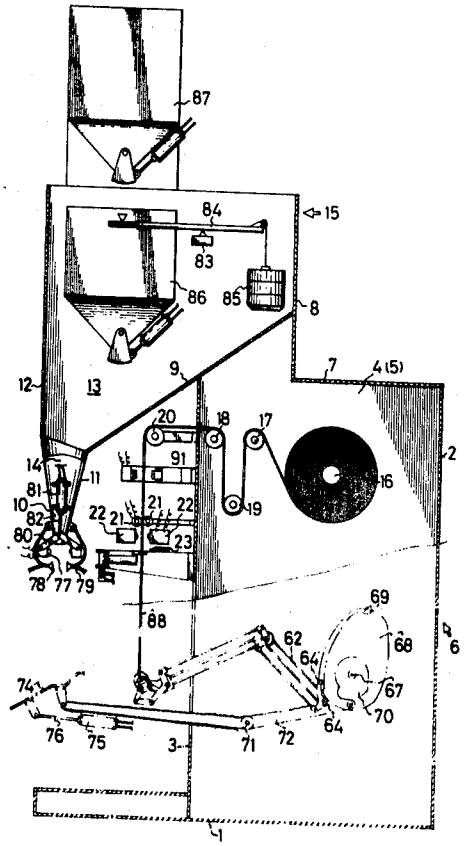
Primary Examiner—Benjamin A. Borchelt
Assistant Examiner—James M. Hanley
Attorney—Browdy and Neimark

ABSTRACT: A packaging machine utilizing a tubular plastic film material whereby the tubular material is formed into a bag and the bag is filled and sealed, all of these operations being performed on the machine. The apparatus includes a parallelogram linkage and gripper jaws for transferring the formed tubing, by its severed end, from the severing position to the material filling position, slackening the lateral margins of the tubing so that vacuum cups can hold them open during filling, and then tightening the margins so that the bag can be filled.



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SHEET 1 OF 4

FIG.1

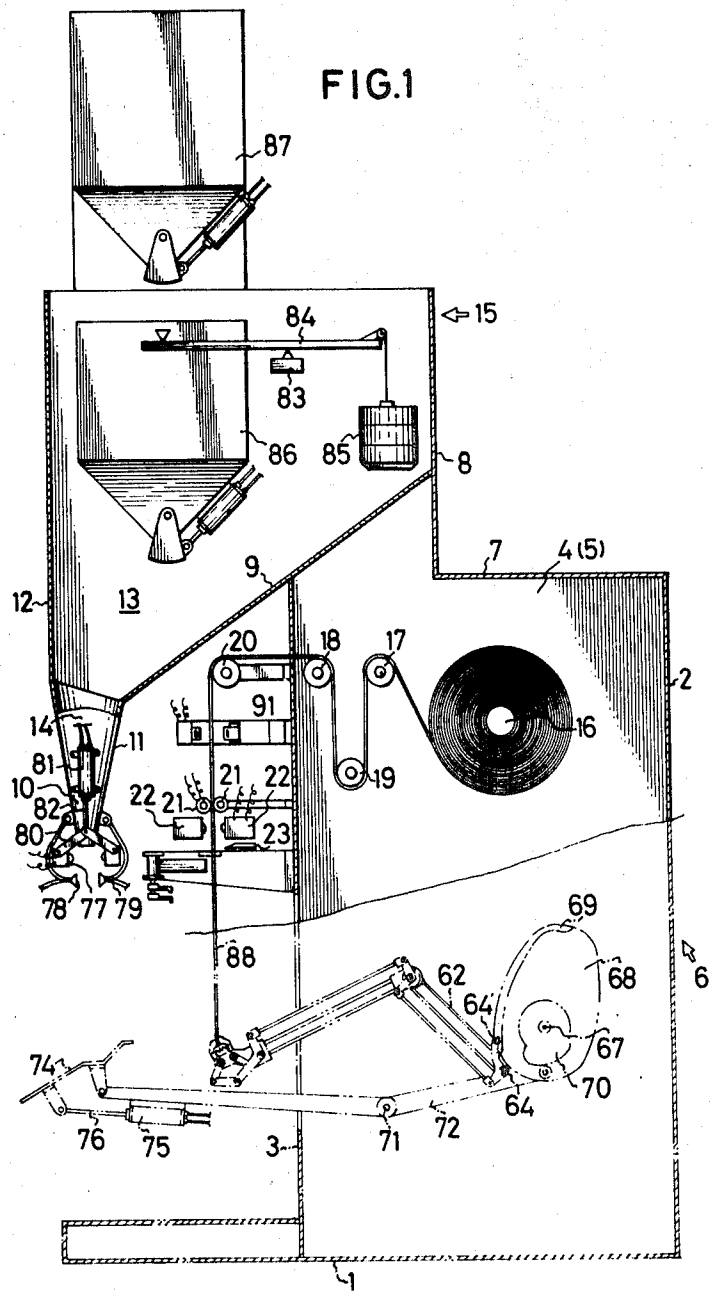

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FIG. 9

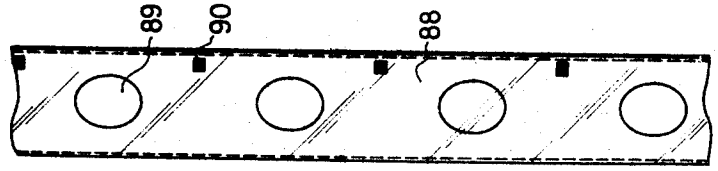

FIG. 2

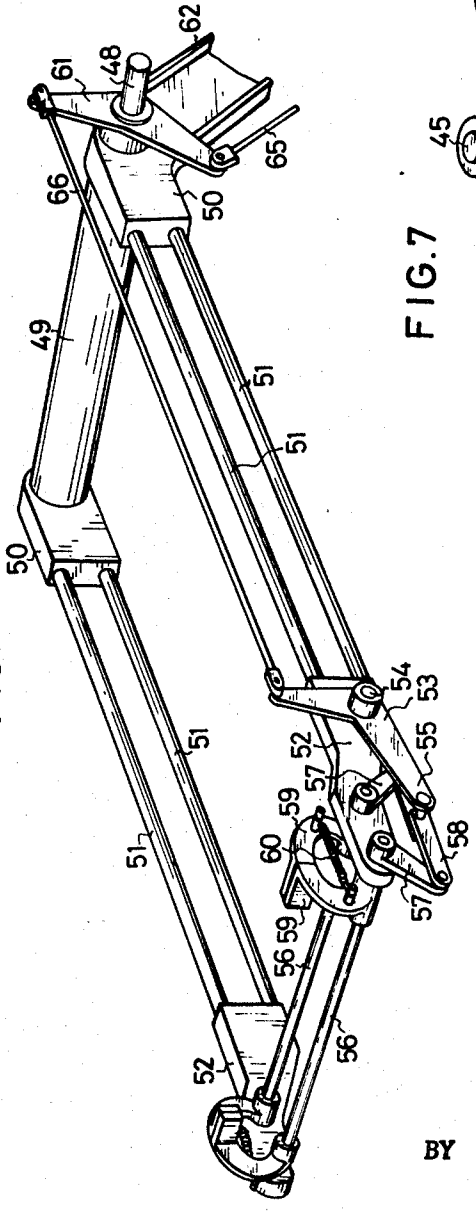

FIG. 7

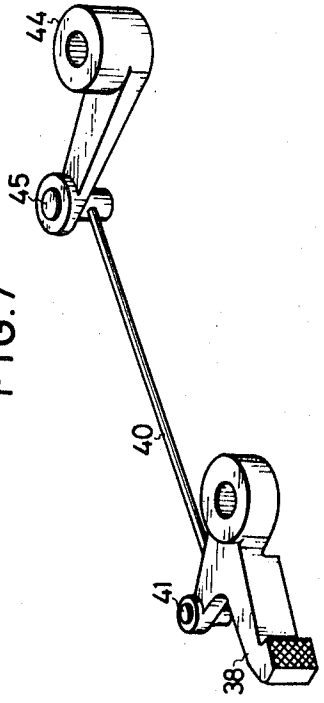

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FIG. 8

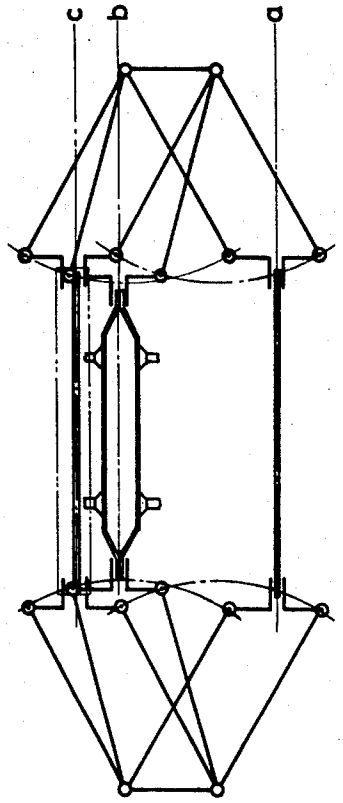

FIG. 3

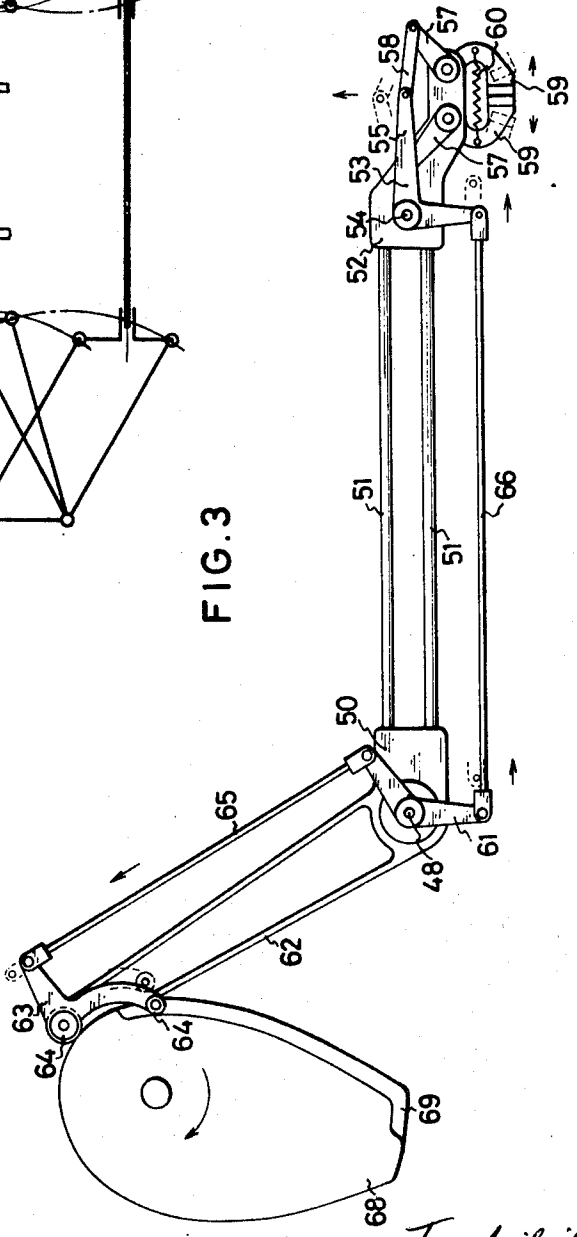

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FIG. 4a

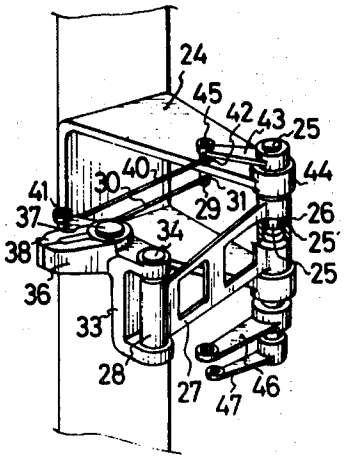


FIG. 4b

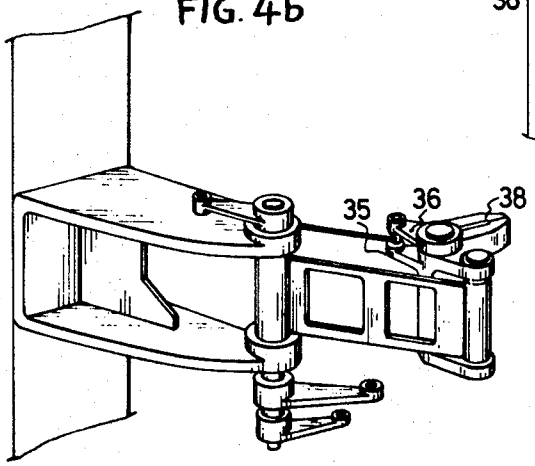


FIG. 6

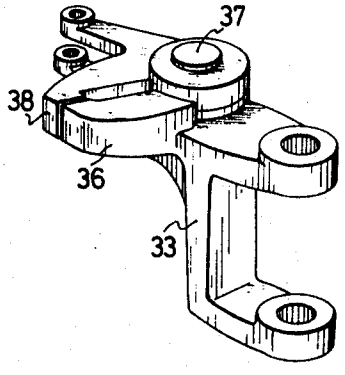
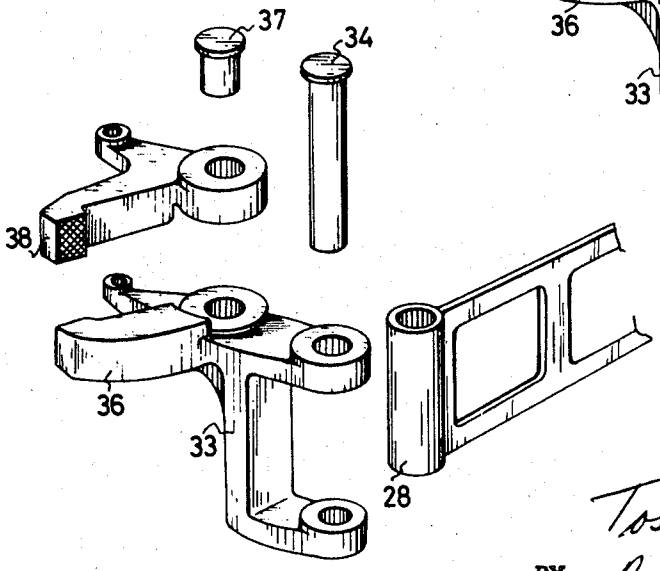


FIG. 5



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AUTOMATIC PACKAGING APPARATUS

The present invention is concerned with an apparatus designed for automatic packaging of mainly polished rice grains. The object of the invention is to provide an automatic packaging apparatus which has the shortcomings of conventional packaging apparatus eliminated, effects accurate packaging in bags and yet is cheap in manufacturing cost.

The present invention is also concerned with automatic preparation of bags of soft artificial resin.

DRAWING

The accompanying drawings, FIGS. 1 through 9, illustrate an embodiment of the present invention.

FIG. 1 is a vertically cross-sectional side view representing the whole configuration of apparatus embodying the present invention.

FIG. 2 is an oblique view of critical parts of the apparatus.

FIG. 3 is a side view of the parts shown in FIG. 2.

FIGS. 4 *a* and *b* are respectively oblique views of other critical parts.

FIG. 5 is an oblique view showing parts disassembled of the mechanism shown in FIGS. 4 *a* and *b*.

FIG. 6 is an assembled oblique view of the parts shown in FIG. 5.

FIG. 7 is an oblique view showing in detail the mechanism of FIG. 4.

FIG. 8 is a diagram used for explanation of the operation of the mechanism.

FIG. 9 is a plane view showing the pattern of the hose.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will now be described in detail with reference to an embodiment illustrated in the accompanying drawings.

A base frame 1 has a rear wall 2 erected upward at the rear end and a front wall 3 erected at a position slightly forward from the middle portion thereof and sidewalls 4 and 5 provided between the front and rear walls 2 and 3, said sidewalls 4 and 5 having openings with doors, etc. for closing provided at necessary portions, to form an approximately cubic box 6 with the front wall 3, rear wall 2 and both sidewalls 4 and 5. The box 6 has a top plate 7 extended partially from the rear wall 2 and a wall 8 erected upward at the front edge of the top plate 7 to form the rear wall of an enclosing frame. At an appropriate place of the rear wall 8, a sloping plate 9 is provided with the rear end attached to the rear wall 8, extended forward over the front wall 3 and bent downward at the front to form a rear wall 11 of a feed port 10. Spaced appropriately from the rear wall 11, a front wall 12 of the enclosing frame is erected so that, with sidewalls 13 and 14 provided between the front wall 12 and the rear wall 8, the enclosing frame 15 is formed. The box 6 has a spindle 16 provided therein in a lateral direction at an upper central portion, the spindle 16 being secured to either of the sidewalls 4 and 5 and being adapted to rotate freely or merely fixed as appropriate, a guide pulley 17 pivoted at a position higher than that of the lower opening of the feed port 10 and in parallel to the spindle 16, another guide pulley 18 provided at an appropriate spacing from the guide pulley 17, said guide pulleys 17 and 18 being carried by the sidewalls, and a vertically freely movable hauling pulley 19 provided between and below the guide pulleys 17 and 18. Another guide pulley 20 is provided in a pivoting mechanism in front of the front wall 3 of the box 6 and at the same level with said guide pulleys 17 and 18. Directly below the guide pulley 20 are provided artificial resin material feed control rolls 21 and 21 in a close position with each other. Below the feed control rolls 21 and 21, seal devices 22 and 22 are provided, and under the seal devices 22 and 22, a cutter 23 which is freely movable back and forth and left and right is provided. In the front wall 3 of the box 6, bearings 24 and 24 are secured at a substantial spacing seen from the front and positions directly below the cutter 23, with the extreme ends of the

bearings 24 and 24 extended about midway between the feed port 10 and the cutter 23. At the end portion of each bearing, a spindle hole is provided to accommodate a spindle 25 which has a length enough to project out of the spindle hole and has another spindle 25' fitted thereover into a dual spindle. The spindle 25' has mounted thereover a rotary boss 26 to which one end of an arm 27 is secured. The other end of the arm 27 is secured to another another boss 28. The bearing has also a spindle 29 provided therein separately at a predetermined spacing from the spindle 25. The spindle 29 has a boss 31 mounted thereover for an arm 30 of the same length with said arm 27 and having a boss 32 formed at the other end to carry with the boss 28 at the end of said arm 27 a holder-carrying member 33 through spindles 34 and 35. Thus, the arms 27 and 30 and the carrying member 33 form a parallelogram, while the holder-carrying member 33 has a configuration in the form of a horizontal Y with one holding member 36 projected forward at the midway and a spindle 37 provided at the base. An arm 39 having the other holding member 38 is mounted over the spindle 37 at that portion which projects upward. The arm 39 has a spindle hole provided at the base part to incorporate one end of an arm 40 of the same length with the arm 30 and having a boss 42 provided at the other end. At the upwardly extruding portion of the spindle 25, a boss 44 at the base of an arm 43 is journaled. With a spring 42 provided between the arm 43 and the bearing 24 and a spindle hole provided at the extreme end, the arm 43 is journaled together with the boss 42 at the end of said arm 40 by means of a spindle 45. The spindle 25' is projected below the bearing 24, and the inside spindle 25 is projected downward further. The spindle 25' has an arm 46 secured thereto, and the spindle 25 has an arm 47 secured thereto. By rotating the arm 46, the whole of the holding member unit makes a rotary movement, and by rotating the arm 47, the holding members function to hold or separate. Inside said box 6, a spindle 48 is provided axially under the spindle 16 and guide pulleys 17 and 18 and in parallel to their axial direction. A cylinder 49 is fitted over the spindle 48. At the ends of the cylinder 49, carriers 50 and 50 are attached firmly. The carriers 50 and 50 have respectively the base parts of arms 51 of equal length secured, and the arms 51 have holding member carriers 52 and 52 secured firmly at the ends. At the base part of one of the holding member carriers 52, an obtuse angle rotating member 53 is journaled through a spindle 54, the portion 55 extended forwardly of the obtuse angle rotating member 53 being of such a length that its extreme end is located about midway of two spindle holes provided at about extreme ends of said holding member carriers 52 and 52. In said two spindle holes, rotary spindles 56 and 56 are set for free rotation respectively and extended slightly outward at that side of the holding member carrier 52 which has the obtuse angle rotary member 53 attached thereto, with arms 57 and 58 attached firmly in the form of diverging arms as seen from the side to that portions of the rotary spindles 56 and 56 which are extended beyond the carrier 52. Said rotary spindles 56 and 56 have four holding member 59—mounted thereon firmly, the opposing, member 59 and 59 being so mounted that they are pulled each other by means of a spring 60. On the other hand, said spindle 48 has another obtuse angle rotary member 61 mounted rotatably at the projected portion, and one of said carriers 50 is bent downward at an angle to project an arm 62 at the end of which an obtuse angle rotary member 63 is mounted across a roller 64. Said obtuse angle rotary member 63 has a roller 64' mounted at the end of one extended portion thereof, while the other extended portion of the obtuse angle rotary member 63 is connected through a connecting rod 65 to one end of the obtuse angle rotary member 61 mounted on said spindle 48, and the other end of the obtuse angle rotary member 61 is connected through a connecting rod 66 to one end of the obtuse angle rotary member 53 mounted on said holding member carrier 52. In the box 6, there is also a spindle 67 provided at a position slightly toward the rear wall 2 from said roller 64'. The spindle 67 has two cams 68 and 69 mounted thereon, the cam 68 hav-

ing said roller 64' in contact and the cam 69 having the roller 64 at the end of arm 62 in contact. With rotation of the cams 68 and 69, the holding members 59 are adapted to move up and down and also open or close. The spindle 67 has another cam 70 mounted thereon. Under the mechanism for supporting rotating movement of said holding members 59, a separate spindle 71 is provided. On the spindle 71, a long rotatable frame 72 is mounted at midway thereof. This rotatable frame 72 has a roller 73 mounted at the end on the side toward the rear wall 2, said roller 73 coming into engagement with the cam 70, while the other end of rotatable frame 72 is extended to beneath the feed port 10 and has a cradle 74 mounted through spindles. A solenoid 75 is mounted on the lower side of said end of rotatable frame 72 the movable lever 76 of the solenoid 75 being connected through a spindle to the reverse side of the cradle 74. Directly under the feed port 10, a welding member 77 for seal of the upper side of a bag is provided for free movement back and forth. Further, arms 79 and 79 are provided across the feed port 10, these arms being adapted to rotate suction valves 78 and 78 and being mounted through spindles. These arms 79 and 79 have respectively arms 80 and 80 pivoted at midways, the latter arms 80 being adapted to open or close the arms 79 and being coupled to a movable member 82 of a solenoid 81 mounted on either of the left and right walls 14 of the feed port 10. Thus, with operation of the solenoid 81, the suction valves are adapted to come into contact. In the enclosing frame 15, a fulcrum 83 is provided at an appropriate position. The fulcrum 83 has mounted thereon an arm 84 which is adapted to rotate about the fulcrum 83. The arm 84 has a weight 85 suspended therefrom on the side toward the rear wall 8 and a hopper scale 86 mounted on the side toward the front wall 12. Over the hopper scale 86, another hopper 87 is provided. Said spindle 16 has a roll of hose made of an artificial resin inserted thereon laterally. The front end of the hose 88 is trained over the guide pulleys 17, 18, 19 and 20 and is held between the feed control rolls 21 and 21. The hose has a desired indication 89 printed successively and a mark 90 printed at a predetermined interval. Slightly above the feed control rolls 21 and 21, a sensing device *a*1, such as a phototransducer, for example is provided for detecting the marks 90. The sensing device 91 is connected by any suitable means with the feed control rolls 21 and 21.

With the foregoing configuration of the apparatus according to the present invention, when the camshaft is driven by any suitable power to rotate the cam 63, the roller 64 in engagement with the cam 63 makes the obtuse angle rotary member 60 to move up and down. Now looking at the movement of the roller 64 provided at the end of the obtuse angle rotary member 60, the roller 64 makes the arm 62 to rotate about the spindle 48. As the result, the integrally constructed arm 51 moves up and down so that the holding members 59 at the end of the arm 51 are raised above the cutter 23. During the process of elevation to such position, the roller 64' pivoted at one end of the obtuse angle rotary member 63 which is pivoted to the end of the arm 62 is in contact with the cam 68 which has a peripheral form adapted to rotate the obtuse angle rotary member 63 in a counterclockwise direction with elevation of the holding member 59. Thus, the holding members 59 are caused to open through the connecting rods 65 and 66 against the force of the spring 60. When the holding members 59 descend, the roller 64' at the end of the obtuse angle rotary member 63, which is provided at the end of the arm 62, is released from the cam 68 into a free state so that the holding members 59 are caused to close by the force of the spring 60. Thus, the holding members 59 repeat the movement of rising to hold he lower end of the hose for the predetermined length and again rising to hold the hose 88 and descending to pull down for the predetermined length. When the holding members 59 rise to hold the lower end of the hose 88 then descend to the position shown in full line in FIG. 3, the holding members 36 and 38 provided beneath the cutter 23 and adapted to move back and forth rotate about the spindles 25 and 25' to hold the hose 88.

Now referring to FIGS. 4 and 8, the spindle 25' rotates for a predetermined angle as the arm 46 is driven to rotate by a cam provided at an appropriate position. Then the holding members 36 and 38 move from the position *a* to the position *c* in FIG. 8. Further, with rotation of the arm 47 mounted on the spindle 25 for a predetermined range by an appropriate cam, the arm 43 at the upper projected portion of the spindle 25 also rotates so that the holding members 36 and 38 have the one member 38 caused to open or close across the arm 40. At the same time, the hose pulled down and cut by the cutter 23 is caused to advance to the position under the feed port 10. More specifically, the holding members 36 and 38 holding the pulled-down hose 88 proceed in a plane arc movement, and this arc movement is one of the significant points of the present invention. Even if the hose cut in the form of a bag 88' is transfered beneath the feed port 10 by the rotary movement of the holding members 36 and 38, the mouth of the bag 88' is not opened unless there is a means to open it. In order to open the mouth of the bag 88', each of the pairs of opposing holding members 36 and 38 must have its position pulled somewhat inside more than that shown in FIG. 8 at *a* so that the top of the bag is slackened, Thus, the position *b* at which the material is packed is so provided that the holding members are pulled inside, with the center (pivot point) between *a* and *b* deviated toward *b*. Accordingly, the mouth of the bag 88' is given a slack at point *b*. In such a state, the solenoid 81 operates to have the suction valves 78 and 78 draw and open the mouth of the bag 88' from sides to allow filling of a previously weighed material. When the filling is almost completed, the holding members proceed from the position *b* to the position *c*. With this movement of the holding members, they extend sideways to close the mouth of the bag and keep the bag in a state adapted to seal the mouth which is then sealed completely by means of the welding member 77.

While such a process is repeated, deviation of the pattern on the surface of a bag may occur depending on the condition of bag preparation. In the present invention, the hose 88 have marks 90 printed thereon at a constant interval. Until such a mark 90 is detected by the sensing device 91, the feed control rolls 21 and 21 continue to operate. Thus, adjustment of the pattern is achieved easily.

The automatic packaging apparatus of the present invention has many features which are not seen in the conventional devices.

One of the main features is the use of a long hose 88 of artificial resin material rolled in a flat form which has its extreme end sealed in the form of a flat hose and is then drawn out and cut at an upper part to provide the mouth of a bag. So far as the applicant knows from investigation, such is a quite novel idea and presents many advantages. Where an material is to be filled from the upper side, an artificial resin material or other material in the form of not a hose but a sheet is usually used. In order to form the mouth of a bag, it is pulled down, and while it is being pulled down, its sides are sealed together vertically into a bag. Even if a hose is used, it is cut partially before it is pulled out. This involves a fatal shortcoming for packing a large amount of material. For example, in transforming a sheet into a bag, the vertically sealed portion has two layers of bag material. When the top or bottom is sealed, sealing of three or four layers is encountered partially. To seal them together is almost impossible. Thus, such a device is not usable practically. The thought to pull down a flat hose and cut the hose at an upper part to form the mouth of a bag has never occurred so that a sheet of artificial resin has been in use conventionally. Even if a sheet is not used but a roll of flat hose is used, it is unexceptionally pulled up to seal the lower part and fill a material. As the result, material grains flowing out of the bag drop on the hose which is cut to form a bag, thus hindering operations.

The present process of pulling down the hose is quite advantageous and presents remarkable effects. In the conventional methods in which the hose is pulled up, the hose has its mouth opened while it is being pulled up. For the purpose, a

roller is put in the hose, and as the roller moves, the hose is opened. Consequently, the time allowable for sealing the bottom after the hose has been pulled up is very short, often causing incomplete welding. According to the present invention, however, the sealed hose is pulled down so that the welder can be pressed against the hose for a sufficient time during the operation of packing and the succeeding process of pulling down continuously. Thus, the method of the invention is entirely free of incomplete sealing. Should the bag be damaged due to incomplete sealing, the rice grains dissipate and are no longer more valuable as a commodity.

Another feature of the invention is that the hose having the upper part cut is moved forward, while the holding members are moved in a plane arc. This has been described in detail in the foregoing and it will not be necessary to discuss this again.

It will be readily understood from the foregoing that the apparatus of the present invention is of refined configuration with no mechanically defective parts which tend to cause a failure and is a remarkably simple mechanism, permitting use of a roll of hose and allowing ready adjustment of the pattern. In short, it has no shortcomings. These advantages are obtained by the process of pulling down the hose and cutting it at the upper part.

What is claimed is:

1. An apparatus for packaging materials comprising means for dispensing heat-sealable thermoplastic tubing;

means for dispensing flowable material to be packed;

means for heat sealing said tubing;

means for severing said tubing;

means for drawing the tubing from the dispensing means downwardly relative to said heat-sealing means and severing means;

means for transferring the end of a severed length of tubing from adjacent the severing means to said material-dispensing means;

gripping means for holding two opposite lateral margins of said tubing prior to severing and while it is in flat form; said gripping means being so mounted for movement in a generally horizontal direction that the severed tubing can be moved from a position adjacent the severing means to a position below the material-dispensing means; and

means to cause the two margins of the tubing to approach one another to slacken the wall of the tubing and enable opening of the mouth of the bag, whereby the gripping means operates in timed relation so that said tubing is initially heat sealed, a length of said tubing is then drawn downwardly and is severed to form a bag open at its upper end, and the bag is then filled with material from its upper end.

2. The apparatus of claim 1 further including pneumatic suction means adjacent the material-dispensing means for engagement with the opposite external surfaces of the tubing in order to hold open the mouth of the bag during filling thereof.

3. The apparatus of claim 1 wherein the transferring means comprises two spaced cooperating pairs of gripper jaws for engaging the margins of the tubing, each pair of jaws being mounted at the extremity of a pivoted arm, the said arms being so arranged for simultaneous swinging movement between their pivots that at the respective ends of a range of pivoting movement of the arms the pairs of jaws occupy positions adjacent said severing means and said heat-sealing means, and are spaced apart by a distance such that the tubing is held in a taut condition, while at a position intermediate said range of pivoting movement the jaws are located adjacent the material-dispensing means and are spaced more closely together to slacken the tubing.

4. The apparatus of claim 3 wherein said pivoted arms comprise parallelogram linkages so that the gripping faces of said jaws remain oriented in the plane of the tubing throughout the range of pivoting movement of said arms.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,607,574 Dated September 21, 1971

Inventor(s) Toshihiko SATAKE

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

Column 3, line 40, "a 1" should be --91--

Column 3, line 68, after "hold" "he" should read --the--; and after "hose" insert the following --rolled on the spindle 16 then descending to pull down the hose--

Signed and sealed this 11th day of April 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

ORM PO-1050 (10-69)

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