May 12, 1970 F. A. LYON ET AL 3,511,021

VACUUM PACKAGING MEANS

Filed March 28, 1968 8 Sheets-Sheet 1

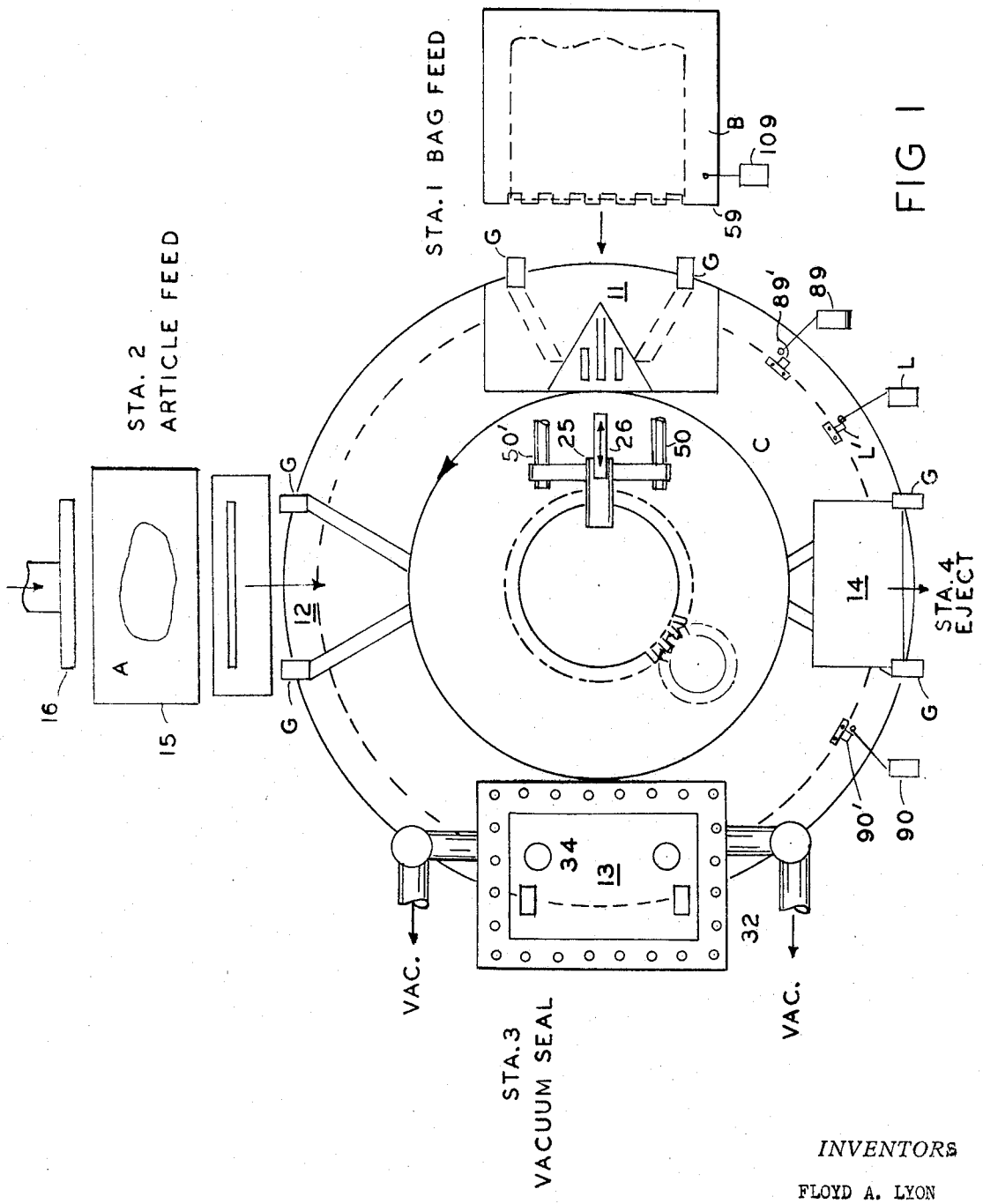

FIG 1

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VACUUM PACKAGING MEANS

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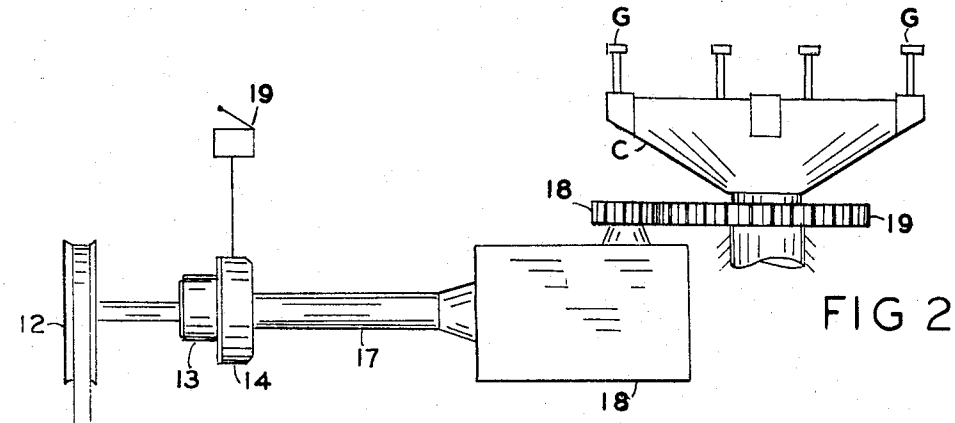

FIG 2

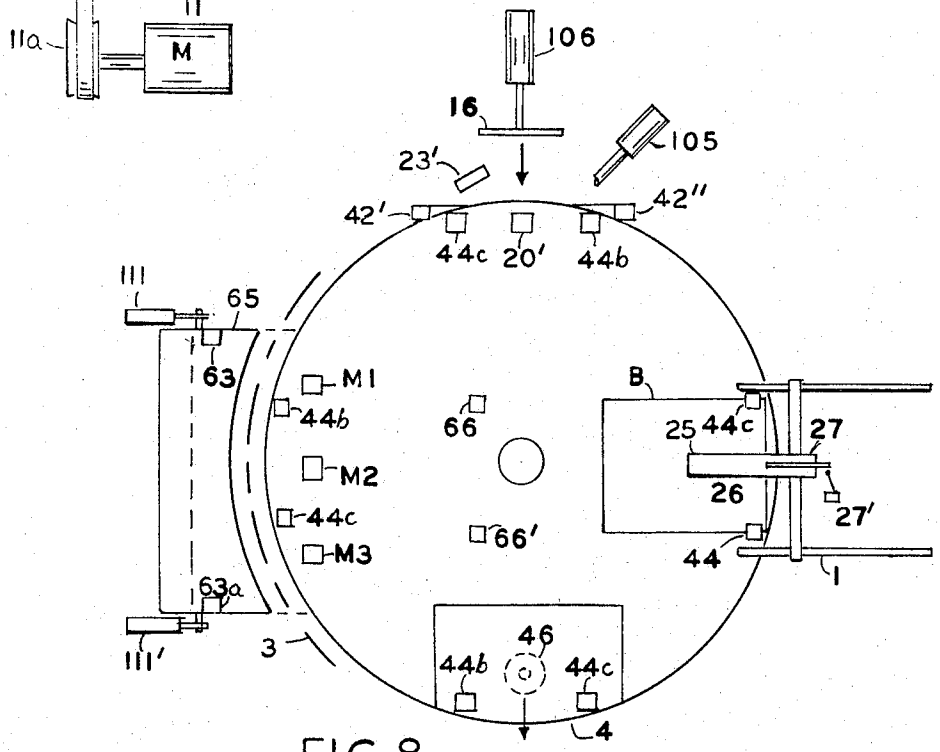

FIG 8

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VACUUM PACKAGING MEANS

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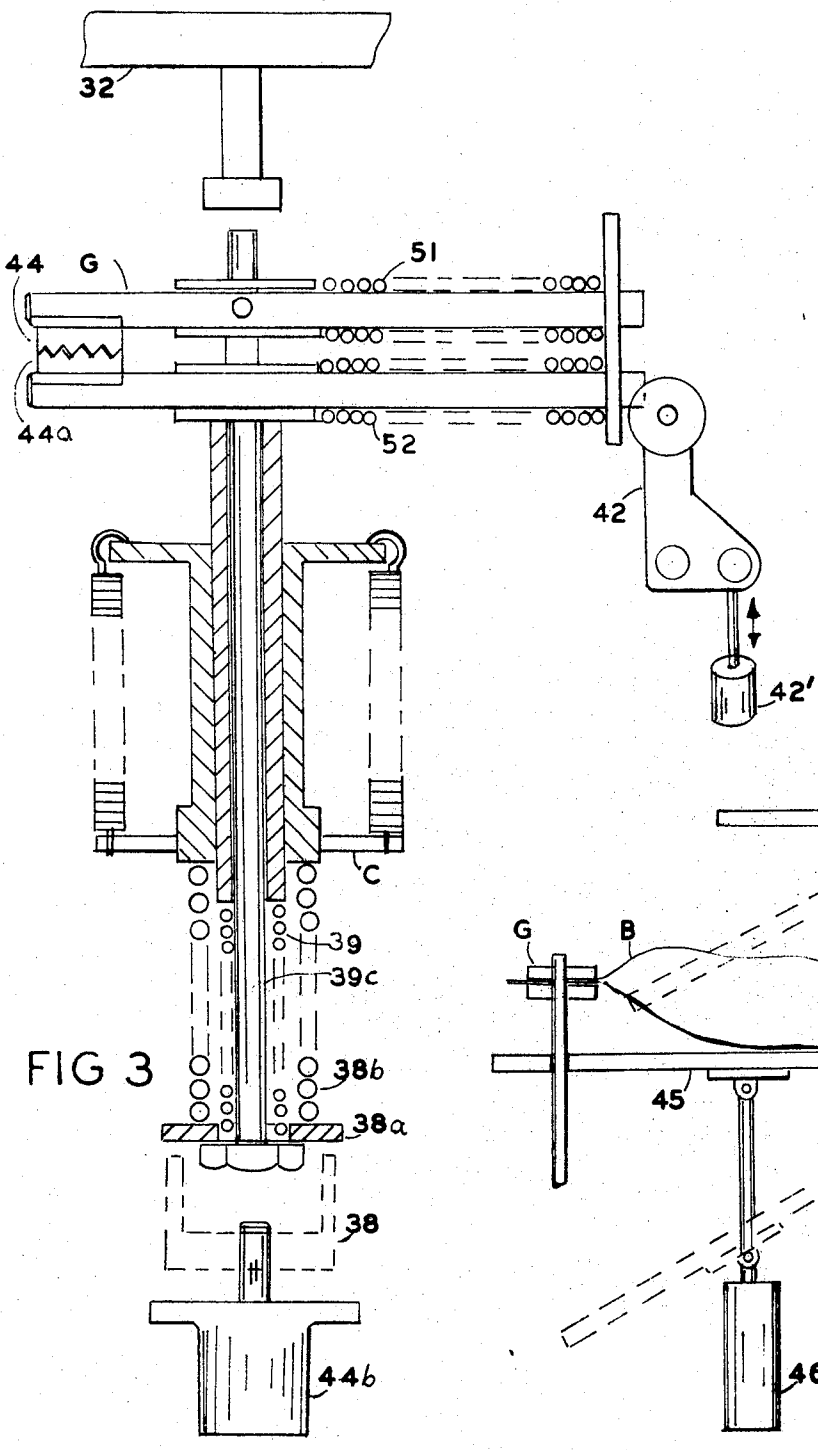

FIG 3

FIG 7

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VACUUM PACKAGING MEANS

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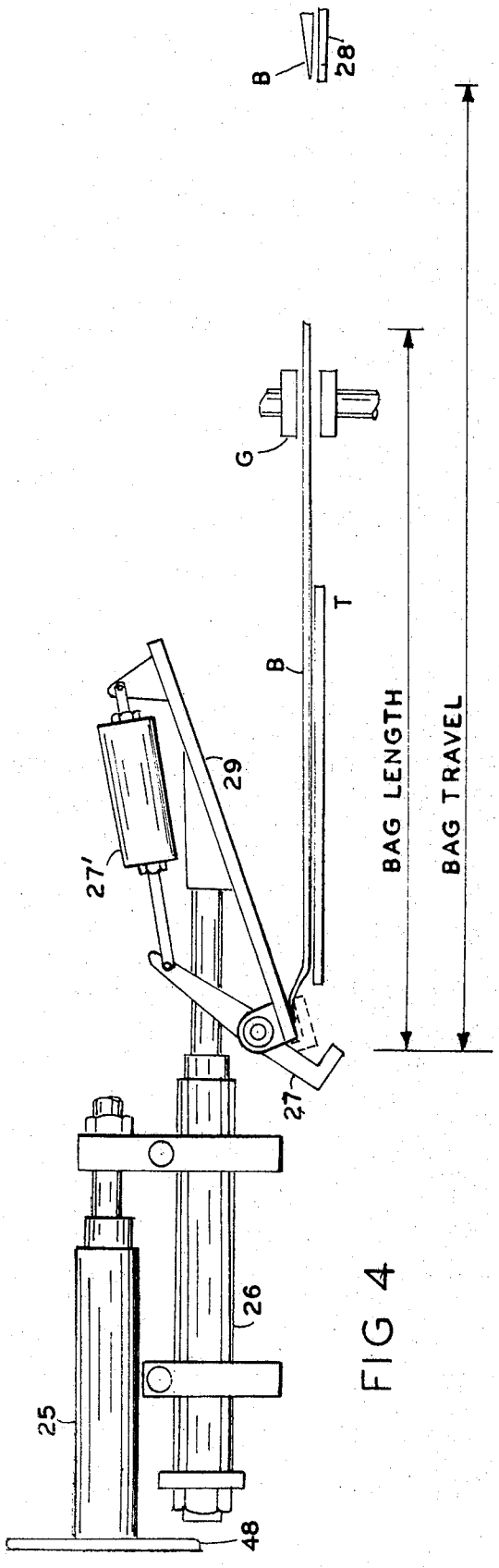

FIG 4

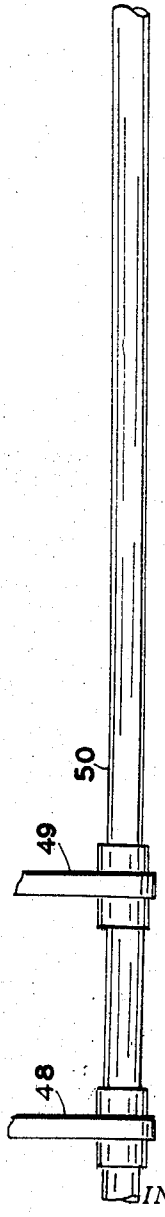

FIG 4A

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VACUUM PACKAGING MEANS

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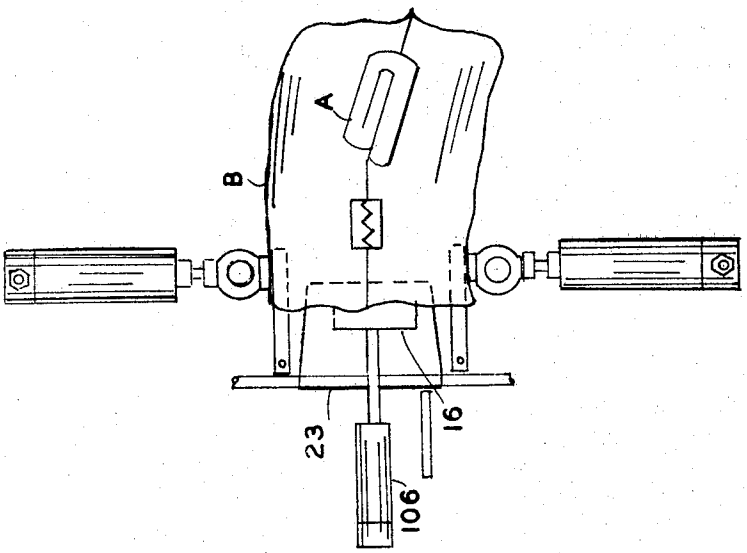

FIG 5B

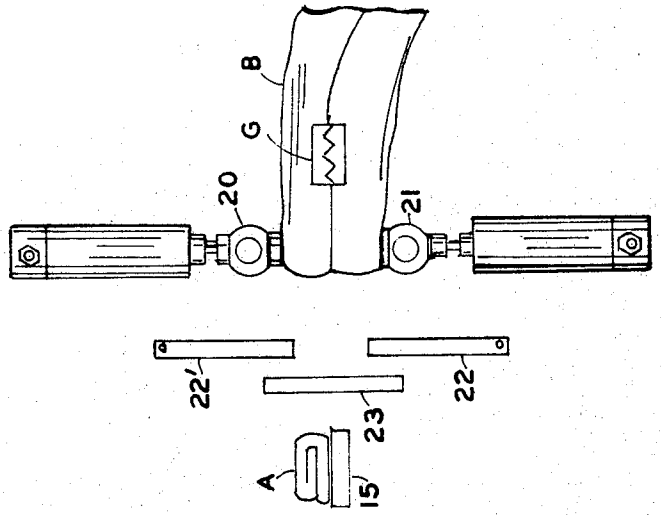

FIG 5A

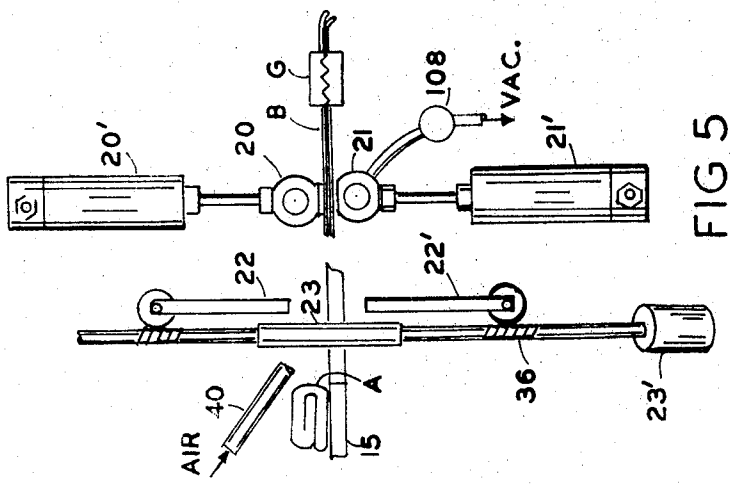

FIG 5

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VACUUM PACKAGING MEANS

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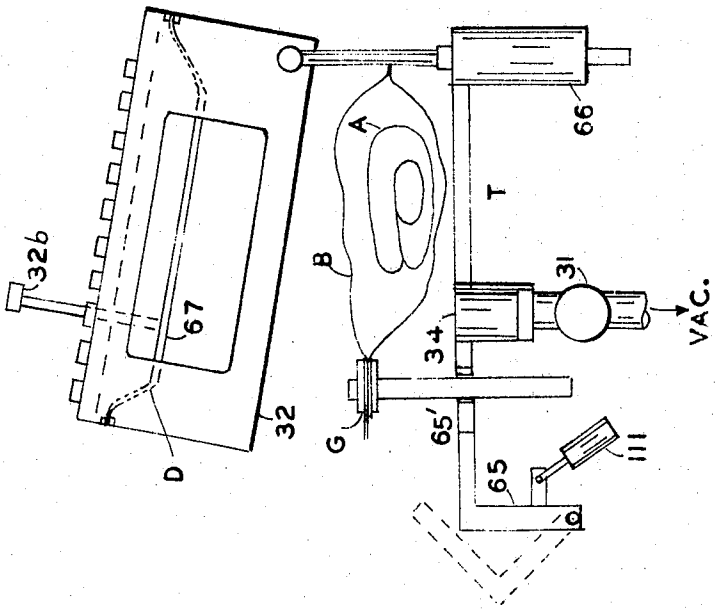

FIG 6A

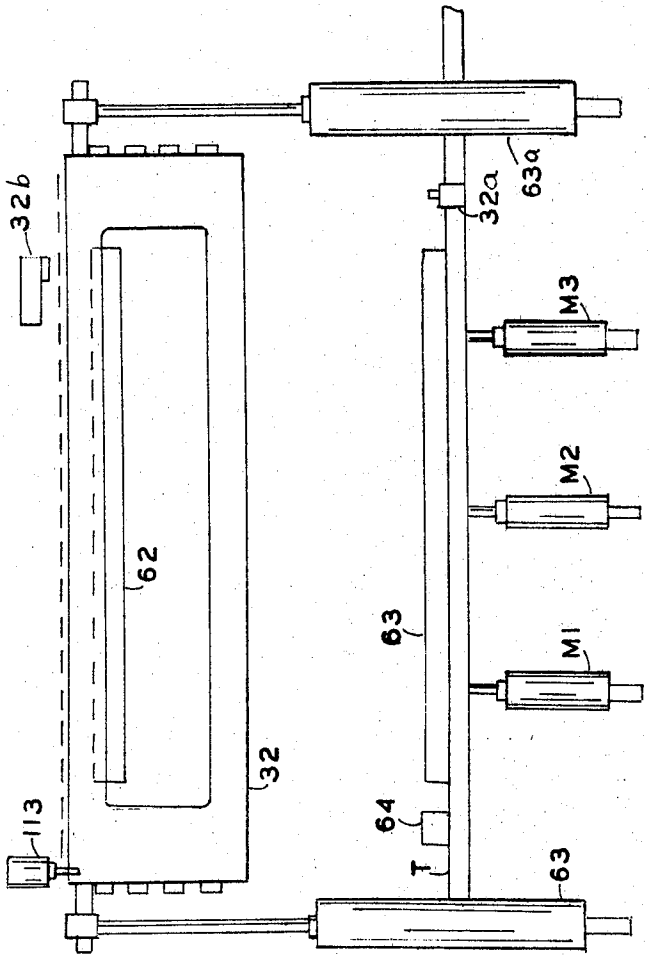

FIG 6

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VACUUM PACKAGING MEANS

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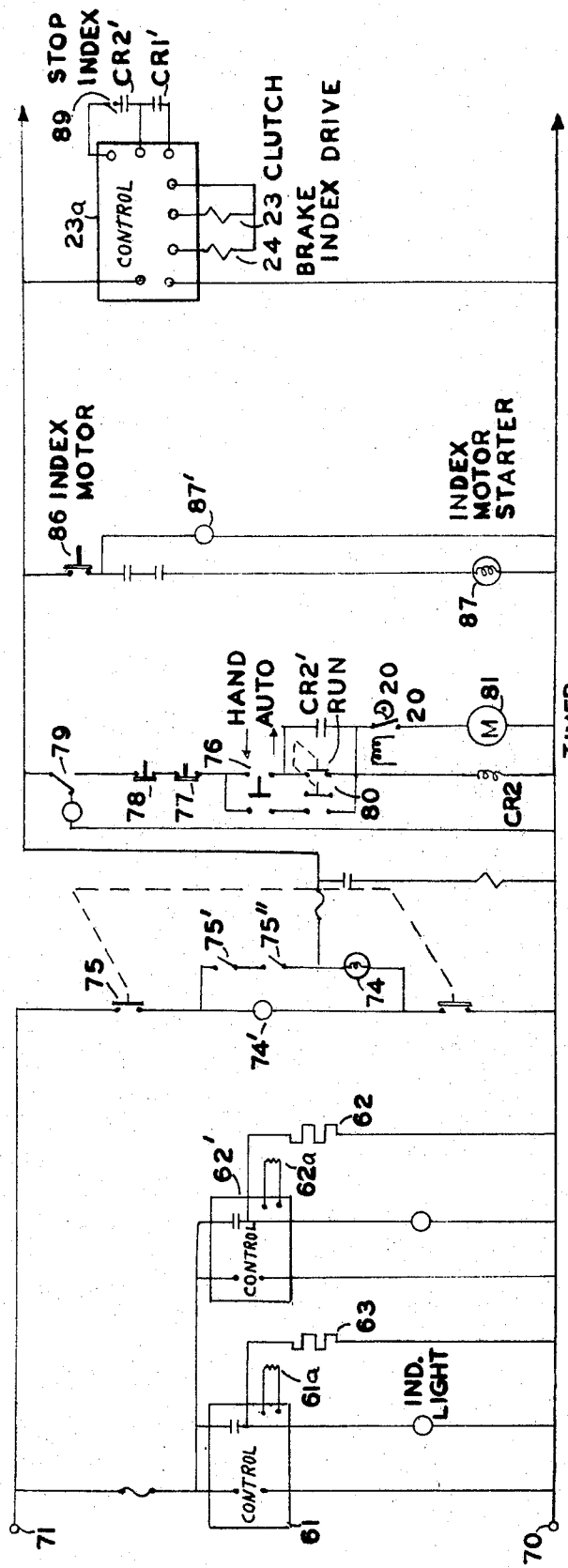

FIG 9

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VACUUM PACKAGING MEANS

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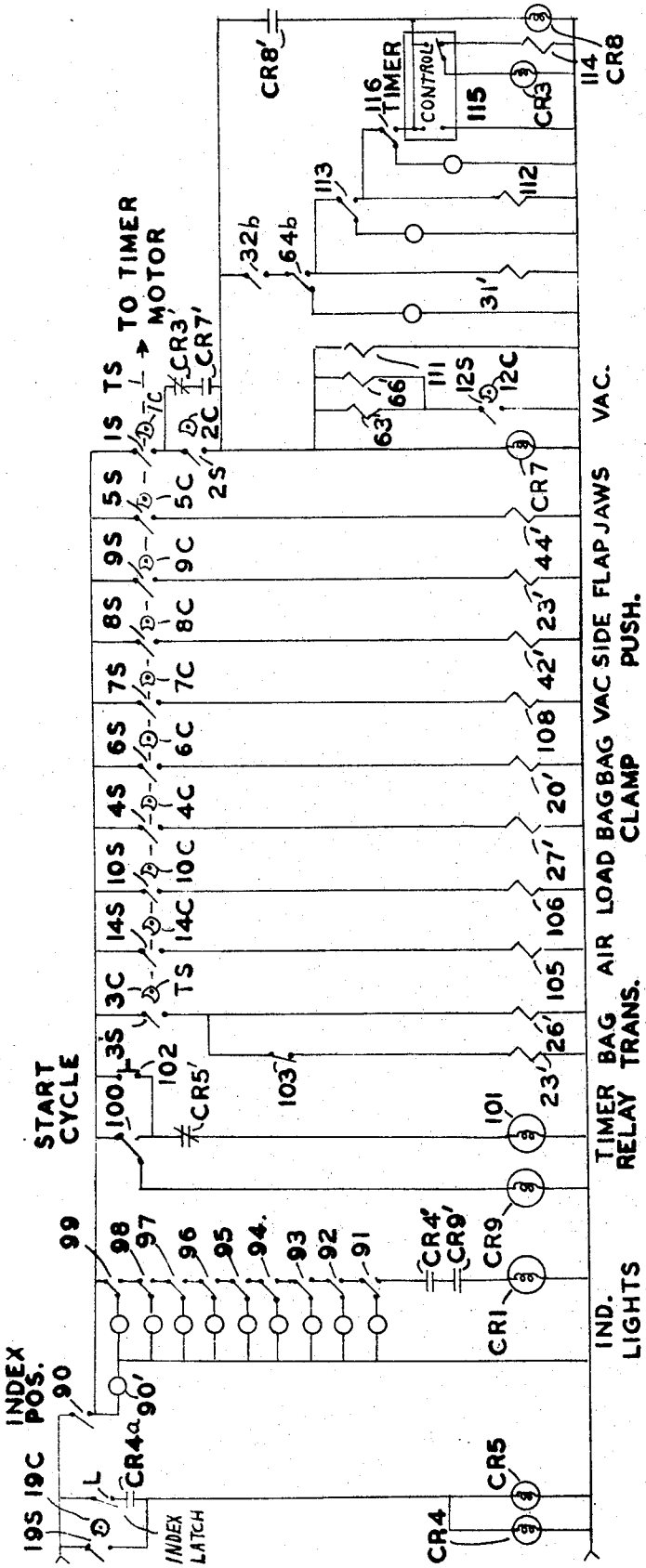

FIG 9A

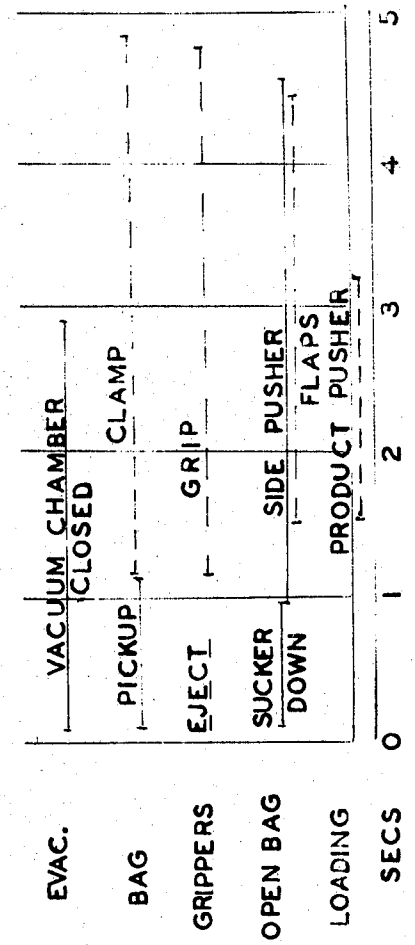

FIG 10

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United States Patent Office 3,511,021
Patented May 12, 1970

3,511,021

VACUUM PACKAGING MEANS

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Filed Mar. 28, 1968, Ser. No. 716,927
Int. Cl. B65b 31/02
U.S. Cl. 53—112 8 Claims

ABSTRACT OF THE DISCLOSURE

A vacuum packaging means for soft articles such as textiles. An indexing table having a plurality of bag holding positions, each with gripping jaws. Bags are fed to the table at a first work location. At a second work location the bags are opened and an article inserted. At a third work location, the bag is compressed, evacuated and sealed. At a fourth work location, the sealed, filled bag is ejected.

This invention relates to vacuum packaging means for soft articles such as shirts and other articles of clothing.

In packaging soft articles such as shirts, it is desired that the article be compressed and the package be contoured to the shape of the article to save shipping and storage space. It has been found that soft textile articles can be placed in a bag and compressed to a firm bundle a fraction of the original size. The bag is evacuated by a vacuum pump and the bag sealed. When the package is opened, there are no wrinkles or damage and the article expands to normal size. These articles are not breakable, so there is no need for protection. Boxes are objectionable since they are bulky, heavy and wasteful of shipping and storage space. The present vacuum sealed bag package is moisture-proof, lightweight and compact and can be easily stored in a minimum space.

Accordingly, a principal object of the invention is to provide new and improved packaging means for soft articles such as shirts, and other articles of clothing.

Another object of the invention is to provide new and improved means for packaging soft articles to provide moisture-proof, lightweight and compact packages.

Another object of the invention is to provide a new and improved packaging machine for inserting and vacuum sealing soft articles, comprising:

Indexing table means having a plurality of positions,

Means at a first work station to supply bags of heat sealable material, each of said positions having bag holding means, and article being adapted to index to successive work positions,

Means at a second work station to hold open said bag and insert an article in said bag,

Means at a third work station to evacuate and seal said bag tightly around said article.

GENERAL OPERATION

FIG. 1 is a plan view of an embodiment of the invention.

FIG. 2 is a schematic diagram illustrating the carrier drive.

FIG. 3 is a detail view of the gripper assembly.

FIGS. 4 and 4A are detail views of the bag feeding apparatus, Station 1.

FIGS. 5, 5A and 5B are detail views of Station 2, illustrating the article inserting means.

FIGS. 6 and 6A are front and side views of the vacuum chamber, Station 3.

FIG. 7 is a detail view illustrating the ejecting means, Station 4.

FIG. 8 is a diagram illustrating the locations of the air cylinders.

FIGS. 9 and 9A are schematic electrical diagrams.

FIG. 10 is a chart of the timing sequence.

Referring to FIG. 1, the packaging machine comprises an indexing carrier C. The carrier has four bag holding positions, 11, 12, 13 and 14, and the carrier is adapted to index to four work locations. Each holding position on the table has a pair of grippers G which grip the sides of the bag to hold it in position.

The four work locations are as follows:

Station 1 is the bag pickup. Means are provided to receive a bag B from automatic feeding apparatus or by manual feeding. The automatic feeding apparatus may be a bag making machine of the type commercially available.

Station 2.—Article loading: Articles A such as garments are placed on a feeding platform 15, either manually or with a conveyor. When the articles are pushed into the bag on the carrier by means of the pusher 16, means are provided to hold the bag open for this purpose, as will be described.

Station 3.—Evacuation and sealing: The loaded bag package is transferred by the carrier to the evacuation Station 3. A vacuum chamber 32 is automatically lowered over the package and the air evacuated. Thereafter, heat sealing jaws are actuated to seal the bag. The vacuum chamber is then lifted and the carrier indexed to work Station 4.

Station 4 is the ejection station. Means are provided to release the grippers and remove the package from the carrier. The empty position of the carrier then indexes to Station 1 where it will receive another bag.

The contour packaging machine is adapted to receive, for instance, a fixed 20½" width pouch with variable depth (from 17½" maximum down to 13½" minimum). The bag feeder drops the completed pouch onto drop-off place at its exit end and the pouch transfer transfers the pouch into the indexing grippers. The bag should extend out approximately 1 inch in front of the grippers. This extension of pouch is required to allow proper opening of pouch in Station 2.

The pouch is held by grippers G in the side sealed seam area of the pouch, allowing for the maximum pouch opening. The pouch is held by these grippers throughout the machine cycle and is released at the eject station.

As the pouch appears in the pouch opening Station 2, the two (2) vacuum opening suckers (upper and lower) close and open. This opens the mouth of the bag to receive the garment and just prior to the garment being pushed into the pouch, the entrance flappers open (opening the bag on four (4) sides). An air blast jet is preferably provided for additional assistance in opening the pouch.

The heat seal bars incorporated within the evacuation chamber are preferably mounted in such a manner as to be self-aligning.

Upon reaching proper vacuum, the sealer bars in the evacuation chamber are actuated. The upper sealer bar is fixed to the inside of the evacuation chamber. The lower sealer bar is raised into position by means of three (3) air cylinders. Alignment of bars is important to provide proper sealing. In order to maintain a fully closed and sealed chamber, the rubber discs located on the gripper shaft must come in contact with the bed of the machine to seal off the opening required for the gripper arm shafts.

A diaphragm D located on the top of the chamber provides self-contouring feature around the package for ideal evacuation conditions.

MAIN INDEXING DRIVE

FIG. 2.—The motor drive system of the Packaging Machine is used to rotate the main carrier and grippers from station to station. This unit is actuated by a series of timing switches and stopped by control switches on the machine frame.

OPERATION

The main motor **11** is a 2 H.P. 1800 r.p.m. motor which runs continuously during operation. Motor pulley **11***a* is connected to driven pulley **12**, which is directly coupled to magnetic clutche **13**, brake **14**, shaft **17**, and speed reducer **18**, which turns driving pinion gear **18**, which drives gear **19** of main carrier C and grippers G from station to station. When main carrier C rotates on station, a signal is received from switch **19** located on main frame at delivery station and magnetic brake **14** is energized stopping main carrier C and grippers in register at each station.

POUCH GRIPPER ASSEMBLY—FIG. 3

The pouch or bag gripper assembly (two per station) on carrier C, transfers the pouch or bag from station to station. Once the pouch is picked up at the pouch pickup station and placed into the grippers, it is never let go until the completed evacuated package reaches the eject station. One gripper holds each side of the bag.

The pouch gripper assembly has three basic motions:

(A) The jaws of the gripper opening and closing.

(B) Inward motion towards each other to allow the pouch to be opened at Station **2**.

(C) A vertical motion to level the pouch in the evacuation chamber.

There motions are controlled by:

(A) Gripper opening air actuator **44***b*.

(B) Inward motion bell crank **42**.

(C) Vertical motion—vacuum chamber **32**.

In the pouch pickup station (FIG. 1) the pouch grippers are in open position, actuated up vertically by means of an air cylinder **44***b* which forces inside shaft **39***c* up opening gripper jaws **44**, **44***a*. The jaws **44***a* open sufficiently to receive the bag B as picked up by pouch pickup. As soon as pouch pickup returns, placing the edge of the pouch into the gripper, air actuator **44***b* drops releasing entire shaft assembly, causing the pouch to be gripped by rubber grippers G. The entire gripper assembly is spring loaded so as to be moved vertically by vacuum chamber **32**.

The cup **38** is only used at Station No. **2**. The cup **38** pushes washer **38***a*, compressing spring **38***b* to permit side movement of the grippers.

BAG TRANSFER STATION—FIG. 4

This station is designed to pick up a bag or pouch from the pouch delivery plate **59** and place it in such a position into the contour packaging machine that it can readily be transferred from station to station. The transfer station comprises two air cylinders **25**, **26**, a gib system **50**, and a gripper finger system **27**. When the index carrier C comes to rest, and a pouch is in position, the pouch transfer arm **27** comes forward to the pouch drop-off plate **28**. As the arm reaches the drop-off plate, the grippers **27** close on the lead edge of the bag and the arm returns to its rest position. The pouch automatically is placed between the grippers G of the index unit and the grippers close.

Upon placement of the pouch into the grippers, the unit indexes the pouch to the pouch opening and garment insertion station. The following sequence occurs.

POUCH OPENING AND GARMENT INSERTION STATION—FIGS. 5, 5A AND 5B

The garments are manually placed by the operator onto the platform **15**. At the proper time of the cycle, the pusher **16** is actuated manually or automatically to propel the garment forward into the open mouth of the pouch.

POUCH OPENING DEVICE—FIG. 5

The pouch opening device comprises the following items:

(A) Upper and lower vacuum bars **20**, **21**.

(B) Upper and lower entrance flaps **22**, **22'**.

(C) Side entrance flaps **23**, **23'**.

OPERATING SEQUENCE

(1) Index gripper stop in front of garment insertion station FIG. 5.

(2) Vacuum bars **20**, **21** close, vacuum is turned on and bars open. As bars open, FIG. 5A, grippers G move inward toward each other to relax bag.

(3) Upper and lower flaps **22**, **22'** open, gripping the bag to the vacuum bars.

(4) The side flaps **23** open, FIG. 5B, squaring off the mouth of the bag.

(5) The air blast **40** is turned on, straightening out the bag.

(6) The pusher comes forward pushing the garment into the open mouth of the bag, FIG. 5B.

(7) The flaps are removed.

(8) The vacuum on bars **20**, **21** is released and the grippers are pulled back, making the mouth of the bag taut.

The filled pouch is indexed to the evacuation station and the following sequence occurs.

EVACUATION STATION—FIGS. 6, 6A

In this station, the package is evacuated and sealed. The chamber **32** drops and the package is evacuated. As soon as the vacuum within the chamber reaches 20+ inches, the heat seal bars **62**, **63** are brought together sealing the mouth of the package. Thereafter, the heat seal bars open and the chamber **32** opens. The completed package is transferred to the eject station.

EJECT STATION—FIG. 7

When the package reaches the eject station:

(1) The lower portion **45** of the table is dropped by eject cylinder **46**.

(2) Simultaneously, the grippers open and the pouch knock down arms **47** pull the pouch out of the grippers.

The empty set of index grippers move into the pouch pick-up station and the cycle starts again.

More specifically, referring to FIG. 4, when the pouch is delivered to the register board **28**, a signal is given for pouch pickup. During the forward travel of the pickup gripper assembly the gripper fingers **27** on the pickup unit are open and the pouch grippers G on the main carrier are open. In order to bring the pickup arm system close enough to the register board **24**, a system of double air cylinders are used. When the signal is given, shaft of air cylinder **25** of the pouch pickup system travels forward to the full length of its stroke. During its stroke, air cylinder **26** is actuated and the pickup fingers **27** travel forward to pick up pouch B, which is on the register board **28**. The cylinder shaft stroke of cylinder **25** is set to travel forward sufficiently that grippers **21** enter clearance notches of register board, grippers **27** are closed by motor **27'**, clamping pouch between grippers **27** and top hold-down plate **29**. A signal is given and cylinder **25** is exhausted, and during its return, stroke air cylinder **26** exhausts, returning the entire assembly to its rear position The bag is held in the grippers **27** until the signal is given to the main carrier grippers G to close. At this point, grippers **27** open and main carrier C rotates to next station carrying pouch B clamped in the jaws of gripper G. All of the air motors are hydraulic cylinders operated by conventional solenoid valves. The sequence is electrically controlled, as discussed in connection with the circuit of FIGS. 9 and 9A.

FIG. 4A is a partial side view of FIG. 4, illustrating the gib mounting of the bag transfer means. The bag pickup assembly is mounted on brackets **48**, **49** which ride on gib or slide bar **50**, there being one slide bar on the other side.

In FIG. 4, the bag B is shown after having been delivered into operative position and gripped by the grippers

G. The amount of travel of the bag transfer is indicated by the dimension line.

In operation, the air motors **25** and **26** extend the pick-up clamp to the bag feeding plate **28**, which is only partially shown. The plate **28** is notched, as illustrated in FIG. 1, so that the finger clamps can extend into the notches and grip the closed ends of the bag. The bags may be feed onto the plate **28** manually or they may be fed by some automatic machine, and provision is made in the electric control for energizing the apparatus by means of an automatic bag feeding device if desired.

GARMENT INFEED STATION—FIGS. 5, 5A, 5B

Once the pouch B is placed in the grippers G and they close, electric clutch **13** (FIG. 2) is energized and main carrier C is driven by gears **18, 19** to rotate the gripper arms G to the next station (garment infeed Station **2**).

The gripper system G places the open mouth of the pouch, which extends about 1" from gripper, between suckers **20** and **21**, (FIG. 5). Upon receipt of a signal from the control timer, air cylinders **20'** and **21'** are actuated, lowering vacuum tube **20** and raising vacuum tube **21** towards the pouch. Simultaneously, grippers G are moved in together towards the center of the bag by bell cranks **42** before vacuum tubes **20, 21** completely close. Vacuum is turned on as soon as the tubes start their movement towards the pouch. The vacuum tubes **20, 21** remain in their closed position momentarily in order that they have sufficient time to grab on to pouch B. On the next signal, air is exhausted from air cylinders **20', 21'** and vacuum tubes **20** and **21** move apart again, which opens the pouch. Simultaneously, top flipper **22'** and bottom flipper **22** and side flippers **23** are operated through drive and gear system **36**. The bottom flipper **22** provides a shelf whereby the garment can be readily slid into the pouch B without disturbing the pouch, which is being held by suckers **20, 21**. The top flipper **22'** and side flippers **23** act as a funnel, again allowing the garment to pass through the opening without disturbing the open mouth of the pouch. As the flippers open, air blast tube **40** blows air into the pouch B providing a completely "open" pouch for the garment to be inserted. Garment pusher P is actuated pushing the garment off the platform **4** through the opening and into the pouch.

As soon as the garment pusher B starts its return and clears the opening, the side flippers **23**, top flipper **22'** and bottom flipper **22** start to close, vacuum is removed from suckers **20, 21** and the grippers G return to their original position, making the mouth of the pouch taut and flat, preparatory for the evacuation and sealing station. The main carrier C is rotated to bring the filled pouch to the evacuation station.

EVACUATION STATION—FIGS. 6 AND 6A

The evacuation station serves two purposes; one it exhausts the air from the package by means of vacuum, and two, it seals the open side of the pouch.

OPERATION, VACUUM STATION

When grippers G which carry the filled pouch B from the garment infeed station reach the evacuation station, a signal is given by a switch **55**. Upon receiving an actuation signal, the movable table section **65** is moved inward by cylinders **111** (FIG. 9A) to seal the gap required for the grippers G to rotate. The front lift cylinders **63, 63*a*** and rear chamber lift cylinders **66** are exhausted and the chamber **32** drops to the table T surface. When the chamber hits chamber down switch **32*a***, vacuum solenoid valves **31** are actuated and vacuum drawn from the chamber through vacuum orifices **34** located in the bed of the table. When maximum vacuum is reached (20" mercury), vacuum switch **64*b*** actuates heater lift cylinder **M1, M2, M3**, sealing open mouth of pouch. The package detector plate and compressor **67** senses whether or not a filled pouch is in the chamber. If there is no filled package in the chamber switch, vacuum safety switch **32*b*** is not depressed and a vacuum is not drawn in the chamber. The dwell time for the sealing cycle is controlled through timer **64** which is actuated by vacuum switch **32*a***.

In the vacuum chamber **32** is mounted a flexible diaphragm which is sealed to the upper portion of the vacuum chamber so that when the air is sucked out of the vacuum chamber from the bottom, then the diaphragm D is forced down by air pressure which enters through apertures in the top of the chamber so as to compress the article to a fraction of its normal size. At the same time, the bag is evacuated and then sealed so that the package is a vacuum-sealed compressed package. It has been found that with articles like sweaters and other soft bulky, light weight articles, that the volume can be reduced to about 25% of the normal volume so that a great saving in shipping and storage space can be achieved.

Referring to FIG. 7, the eject platform **45** is rotatably mounted and operated by motor **46**. As the platform **45** moves down, its extension arm **47** strips the bag out of the open gripper jaws G and permits the filled bag to slide out.

Referring to FIG. 8, there is shown a diagram illustrating the location of all of the air cylinder motors and solenoid valves.

At the bag loading Station 1, cylinders **25** and **26** operate the bag clamp **27** and the clamp itself is operated by a motor **27'**. Cylinders **44*b*, 44*c*** operate the grippers.

Station **2** (see also FIG. 5).—In addition to the gripper motors, there are motors **42', 42"** for pushing the grippers sideways by means of bell cranks **42** (see FIG. 3). Also, there is an air blast from valve **105** to assist in opening the bag, and there are upper and lower vacuum sucker valves **20'** and **21'**. Also, there is a motor **23'** for operating the upper, lower and side flaps (see FIG. 5) which operate to rotate into the open mouth of the bag so that the article may be inserted, which is done by means of the pusher motor **106**.

In the vacuum station **3** (see also FIG. 6), there are front chamber lift motors **63, 63*a***. There are also rear chamber lift motors **66, 66'**.

Motors **M1, M2** and **M3** raise the lower heating bar **61**. The motors **111, 111'** move the table portion **65**. This is necessary to allow space for the grippers to rotate through the vacuum station. After the grippers are indexed in the vacuum station, the table portion **65** is rotated down to horizontal position by the motors **111, 111'**. The table portion **65** has notches **65'** to accommodate the gripper shafts. The edges of the movable portion and the corresponding contacting edges of the table have rubber lips or seals, so that a vacuum seal may be obtained when the chamber **32** is lowered.

Station **4** has gripper opener motors **44*b*** and **44*c*** and an ejector motor **46** (see FIG. 7). All above motors are solenoid valved air cylinders connected to a source of compressed air.

FIGS. 9 and 9A are an electrical schematic diagram. Power is applied on terminals **70** and **71**. The two sealing bars located in the vacuum chamber are individually controlled in temperature by the heating controls **61'** and **62'** which are conventional. The main power relay coil **74** is energized by main power button **75** through conventional door interlocks **75', 75"**. Main power indicator light **74'** lights when the main power relay **74** is energized. The Hand-Auto switch **76** is connected to select manual or automatic operation. Switch **76** is energized through emergency stop switches **77, 78**, which are preferably connected in series with one or more safety switches **79**, controlled by air pressure. The other side of the Hand-Auto switch **76** is connected through the Run switch **80** which is adapted to energize relay coil **CR2**. The lower contact of switch **76** is also connected through the contacts **CR2'** of **CR2** to the timer motor **81**.

Relay coils CR4 and CR5 are connected in series with switch 19S which is operated by cam 19C. Switch 19S is bypassed by latch switch L in series with holding contacts CR4'. Relay coil CR1 is connected in series with contacts CR9' and CR4' and preferably through a plurality of micro-control switches 91–99 and index position switch 90. The sensing switches 91 and 99 are optional and may be placed to sense position of any movable part of the machine so that all movable parts will be in the proper position for energizing CR1.

Relay coil CR9 is connected in series with bag sensing switch 100. Timer relay coil 101 is connected in series with switch 100 and contacts CR5' which are normally closed, as indicated by the slant line. Start cycle switch 102 is connected parallel with switch 100. Bag transfer solenoid 25' is connected in series with bag feed safety switch 103 and switch 3S, which is operated by cam 3C on the timing shaft TS, which is driven by timer motor 81. Bag transfer solenoid 26' is connected in series with switch 3S.

Air blast solenoid 105 is connected in series with switch 14S which is operated by cam 14C.

Loader air solenoid 106 is connected in series with switch 10S, which is operated by cam 10C. Bag clamping finger solenoid 27' is connected in series with switch 4S, which is operated by cam 4C. The air solenoid 20' for the bag opening vacuum suckers is connected in series with switch 6S which is operated by cam 6C.

Vacuum air solenoid 108 is connected in series with switch 7S, which is operated by cam 7C. Solenoid 42', which operates the side pushing bell crank 42 for the grippers, is connected in series with switch 8S, which is operated by cam 8C.

Solenoid 23*a* which operates the side flaps is connected in series with switch 9S, which is operated by cam 9C. Solenoid 44' which operates the gripper jaws is connected in series with switch 5S which is operated by timer cam 5C.

Relay coil CR7 is connected in series with switches 1S and 2S, which are operated by timer cams 1C and 2C. The contacts CR3' and CR7' are connected in series and both of them are connected in parallel with switch 2S.

Vacuum chamber front solenoid 63' is connected in series with switch 12S, which is operated by timer cam 12C. The rear chamber solenoid 66' is connected in parallel with solenoid 63'. The squeezer air solenoid 111 is connected in parallel with solenoid 66' when switch 12S is closed.

The vacuum air solenoid 31' which supplies vacuum to the chamber 32 is connected in series with the vacuum chamber position sensing switches 64B and 32B in FIG. 6. The vacuum solenoid 112 is connected in series with vacuum sensing switch 113, which controls the vacuum pressure in the chamber. The vacuum chamber heater bar cylinders M1, M2 and M3 (FIG. 6), are controlled by solenoid 114, which is operated through the timer control unit 115, which in turn is actuated by the vacuum sensing switch 116, so that after the proper vacuum is obtained, the heat sealing bars 61, 62 (FIG. 6) will operate. After the timer 115 reaches its pre-set time, it deactivates the heater solenoid 114 and energizes relay CR3 which opens CR3', removes all power from this portion of the circuit and releases front and rear air solenoids 63', 66' and squeezer air solenoid.

ELECTRICAL OPERATION

When power is applied, the sealing bars 61, 62 in the vacuum chamber will heat up. The two sealing bars 61, 62 in the vacuum chamber 32 are individually controlled by the two temperature controllers 61', 62', in response to sensors 61*a*, 62*a*.

Pushing the "Main Power" control button 75 will operate the main control relay 74 and supply power to all other controls.

Push "Index Motor" button 86 to start index motor 87, which will be indicated by the pilot light 87'.

Place "Hand-Off-Automatic" switch 76 in automatic position.

Push "Run" button 80 which will energize coil CR2 and its holding contacts CR2'. Machine is now ready to run. Pushing either of the "Emergency Stop" switches 77, 78, which are located convenient to the operator, or turning the "Hand-Off-Auto" switch 76 to "Off" will release CR2.

Timer motor 81 is started by momentary start switch 100 or 102 and timer relay 101. Solenoid 101' closes switch 20S in series with timer motor 81. Switch 20S is held closed by cam 20C. Switch 100 then returns to energize CR9 and CR1 indexing circuit.

Contacts CR2' and switch 20S, operated by timer cam 20C, energize the timer motor 81, which controls the operation of the Packaging Machine by a series of cams operating the air cylinders. If the Packaging Machine is out of position or indicates a fault, it will not cycle. At the end of the cycle, switch 20S opens and stops timer motor 81.

INDEX CONTROL

In "auto" position of switch 80 when CR9', CR4' (FIG. 9A) contacts and all safety switches 91–99 are closed, CR1 will be energized. The contacts CR1' will close and start the clutch 23 circuit of the index motor. As the table swings around, it will hit a "stop" switch 89, which will start the brake 24 circuit and release the clutch 23.

Indexing is started by switch 19S, assuming all other control circuits are in "go" condition, and the motor will index the grippers to Station No. 2 where it is stopped by switch 89, which is operated by a cam 89*a*, which cam is adjustably connected to the rotating gripper arms. There are other cams 89*b*, 89*c*, 89*d*, which stop the indexing motor at the other three work locations.

The switch 89 is connected to operate the brake control 23*a* so as to disconnect clutch 23 and apply the brake 24. The index position switch 90 and the index latch switch L are also operated by cams 90' and L' which are adjustably mounted on the moving gripper assembly as illustrated in FIG. 1, on different levels to avoid interference.

INDEX SAFETY INDICATIONS AND CONTROL

When the table is in the proper position of the packaging machine to cycle, it is indicated by the light 90'. While the table is indexing or the table has stopped off its "spot"position, this light will go off.

There are preferably nine movable part position sensing switches 91–99 and corresponding indicators. These are optional and may be by-passed. If any of these are open, the Packaging Machine will not index until the fault is corrected.

CYCLE START

When the machine is in Run position, if the bags are fed automatically, a bag delivery bar or sensor pushes the Sensing Start switch 100. This energizes the timer relay 101, which lets the Packaging Machine cycle. Manual switch 102 may also be used.

If the previous cycle has not indexed for any reason, the CR5 relay would be energized and contact CR5' opened and the Start switch would not be able to energize the timer relay.

AIR CYLINDER CONTROL

Most air cylinders are controlled by the timer cams on timer shaft TS. If power is removed, they all return to an open position. The bag transfer (FIG. 4) has upper and lower cylinders 25, 26 and corresponding solenoids 25', 26'. Timer switch 3S energizes the air solenoids and both cylinders move forward. Solenoid 27' actuates bag clamp 27.

VACUUM CHAMBER CONTROL

The start signal for the vacuum chamber is received from cam **2C** and switch **2S** of the timer. This energizes **CR7** and contacts **CR7''** and also energizes the front chamber **63'**, rear chamber **66'** and squeezer **111** air solenoids to close the chamber **32**. When the chamber bottoms, it closes a switch **64***b* which energizes both vacuum air solenoids **31'**.

When the pre-set vacuum pressure is reached, the vacuum sensing switch **113** closes and starts the industrial timer **115** and energizes the vacuum control air solenoid. When the industrial timer has completed its cycle, it energizes **CR3** which releases **CR7** and all air solenoids. The chamber opens and waits for its next start signal. If proper vacuum is not obtained, the industrial timer **115** does not operate.

LOADING STATION CONTROL

When the bag arrives on the loading station, switch **6S**, operated by the time cam **6C**, operates solenoid **20'**, which actuates the bag opening vacuum suckers, while switch **7S** operates the solenoid **108** to apply vacuum. After the bag is open, switch **8S** actuates the solenoid **42'** which in turn actuates the bell crank **42** to move the grippers sideways. It will be appreciated that there is a bell crank and corresponding solenoid for each gripper—two for each station and 8 in all, as discussed in connection with FIG. 8. The function of the side pushing of the grippers is to relax the bag so it can be opened. The grippers normally hold the sides of the bag taut due to the spring loading of the jaws by the springs **51**, **52**, etc. (FIG. 3).

The side and bottom flaps of FIG. 5 are then energized by air cylinder motor **23'**, which is actuated by switch **9S**, which is, in turn, operated by cam **9C**.

The gripper jaws are actuated by the air cylinder motor **44'** (see FIG. 3), operated by switch **9S**.

The timer motor operates until the end of the cycle when it is stopped by switch **20S**, operated by cam **20C**.

Just prior to the end of the timer motor cycle, the switch **19S** closes, which closes the circuit **CR4** and **CR5**. The contact **CR4'** closes the circuit to **CR1** and contact **CR1''** starts the index clutch. As the table indexes, it opens index latch switch which releases **CR4** and **CR5**. The clutch stays energized until the index stop switch **89** is hit and the brake is applied ot the index motor and is then ready for the next cycle.

FIG. 10 is a diagram of the time sequence of operations, illustrating a 3 second cycle. It will be appreciated that there are four bags on the apparatus at one time and operations at each station go forward simultaneously.

Line **1** illustrates the period of the cycle when the vacuum chamber is closed.

Line **2** illustrates the bag feed at Station **1**.

Line **3** illustrates the gripper clamping period.

Line **4** illustrates the operation at the bag loading station and illustrates the opening of the bag with the upper and lower vacuum suckers, the side pushers for the grippers, the operation of the flaps.

Line **5** illustrates the time of pushing the article into a bag while the flaps are open.

Many modifications may be made by those who desire to practice the invention without departing from the scope thereof which is defined by the following claims.

What is claimed is:

1. A packaging machine for inserting and vacuum sealing soft articles comprising:

indexing carrier means having a plurality of positions, said carrier means having bag holding means at each of said positions,

said carrier means being adapted to index to successive work stations,

means at a first work station to supply bags of heat sealable material,

means at a second work station to hold open said bag and insert an article in said bag,

means at a third work station to evacuate and seal said bag tightly around said article.

2. Apparatus as in claim **1** having means at a fourth work station to eject said sealed package from said table.

3. Apparatus as in claim **1** wherein said bag holding means comprise a pair of grippers adapted to grip the sides of a bag, said grippers being adapted to hold said bag taut for heat sealing, and means to move said grippers together to relax said bag to insert an article therein.

4. Apparatus as in claim **2** having means to periodically index said carrier and synchronize the work means at said work stations.

5. Apparatus as in claim **1** wherein said means at said first work station comprises bag pickup fingers, and motor means connected to said fingers to deliver a bag to said bag holding means.

6. Apparatus as in claim **1** wherein said means at said second work station comprises means to hold said bag open and, a hydraulic piston to push an article into said bag.

7. Apparatus as in claim **1** wherein said means at said third work station comprises a vacuum chamber adapted to enclose said filled bag and heat sealing means adapted to seal said bag.

8. Apparatus as in claim **2** wherein said carrier is a rotary carrier, having grippers and said bag slides on a stationary table.

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U.S. Cl. X.R.

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