Sept. 17, 1957 A. G. RUSSELL ET AL 2,806,632

PACKAGE SEALING MACHINE

Original Filed Nov. 30, 1951 4 Sheets-Sheet 1

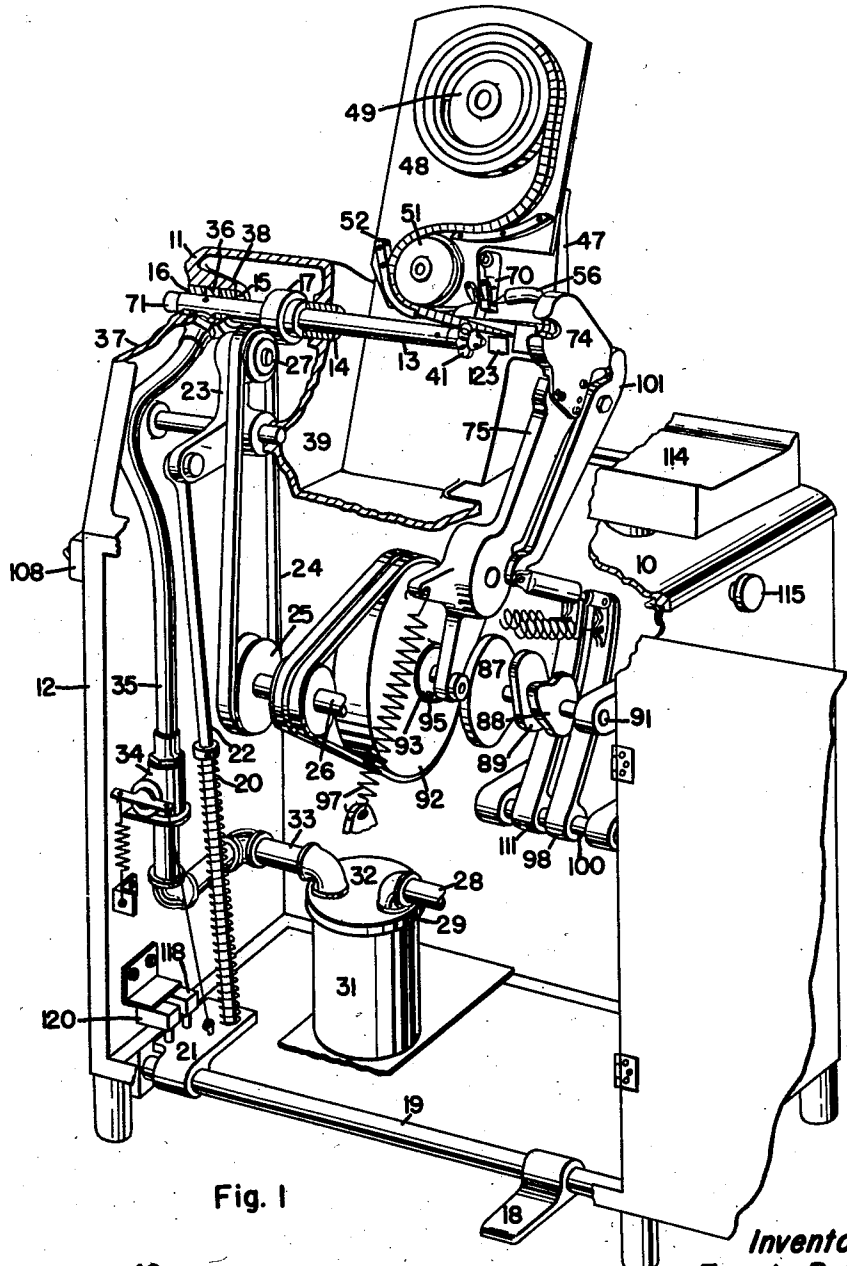


Fig. 1

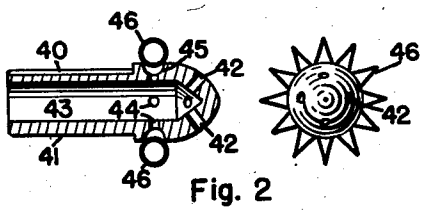


Fig. 2

Inventors
Francis B. Casey
Robert E. Dallon
Arthur G. Russell
Frank A. Clary, Jr.
By Theodore C. Browne
Attorney

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PACKAGE SEALING MACHINE

Original Filed Nov. 30, 1951 4 Sheets-Sheet 2

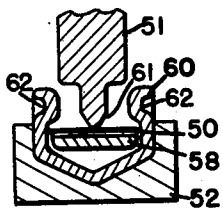


Fig. 6

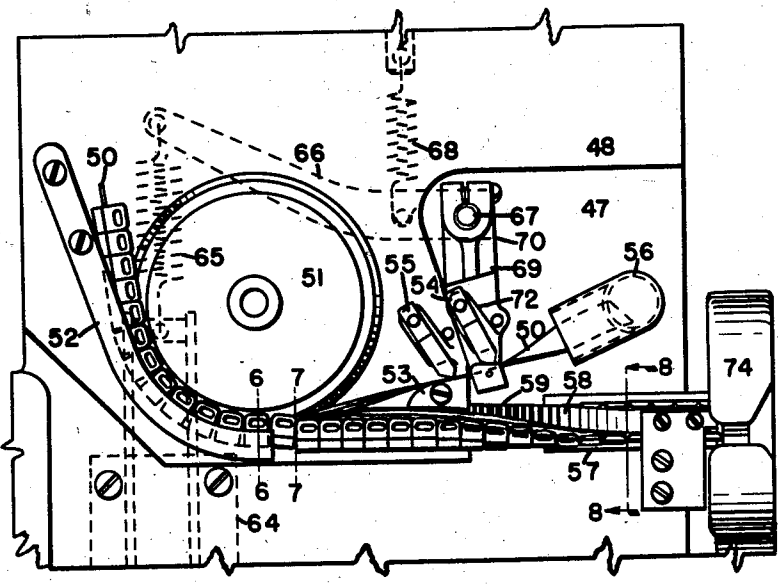


Fig. 3

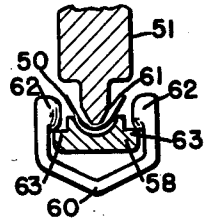


Fig. 7

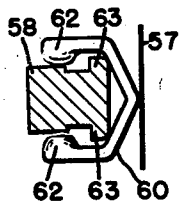


Fig. 8

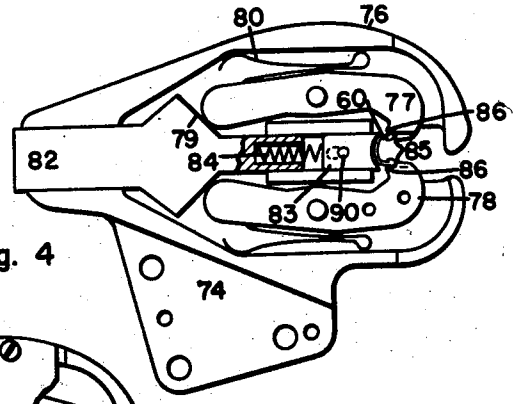


Fig. 4

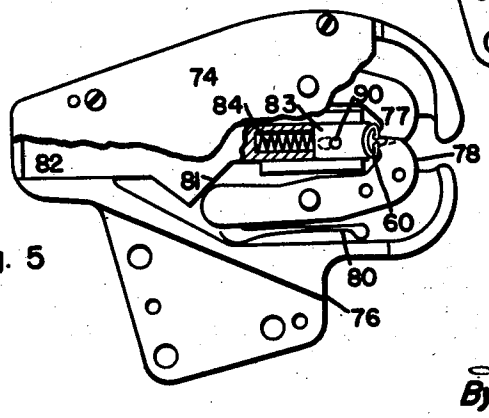


Fig. 5

Inventors
Francis B. Casey
Robert E. Dallon
Arthur G. Russell
Frank A. Clary, Jr.

By Theodore C. Browne

Attorney

Sept. 17, 1957 A. G. RUSSELL ET AL 2,806,632

PACKAGE SEALING MACHINE

Original Filed Nov. 30, 1951 4 Sheets-Sheet 3

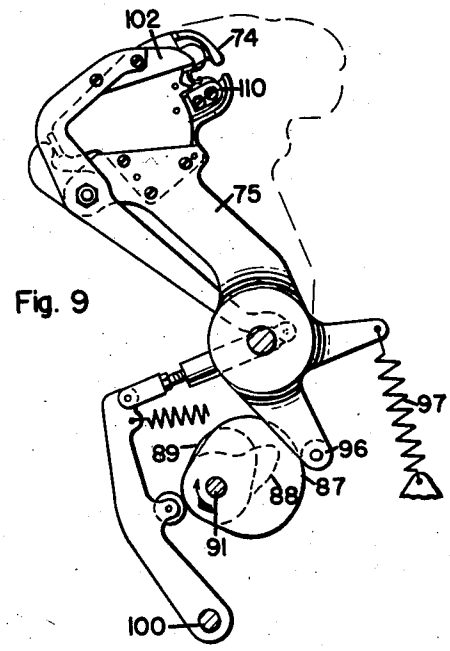


Fig. 9

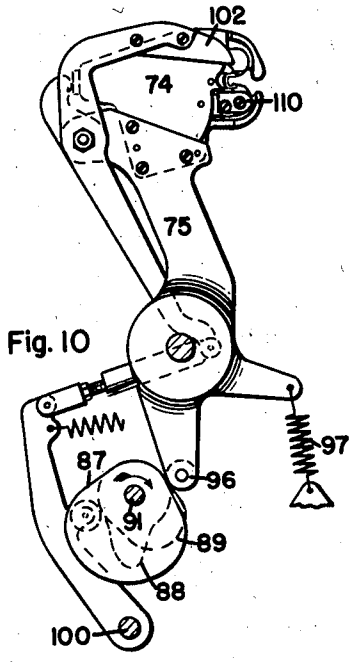


Fig. 10

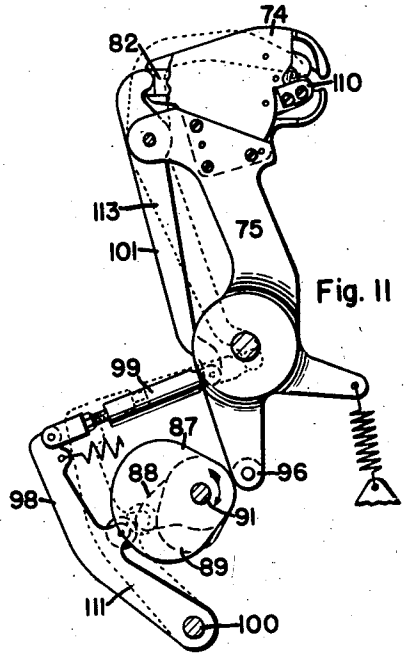


Fig. 11

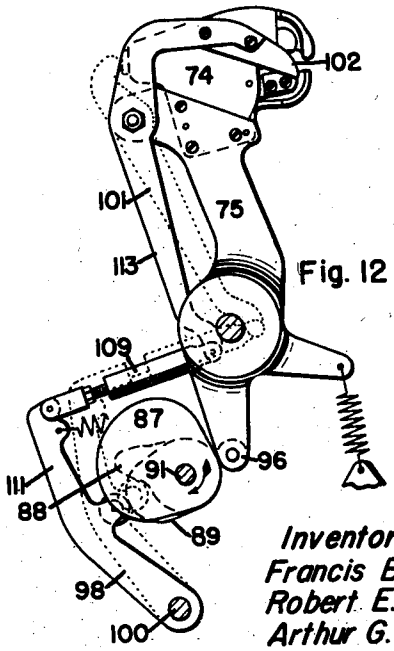


Fig. 12

Inventors
Francis B. Casey
Robert E. Dallon
Arthur G. Russell
Frank A. Clary, Jr.

By Theodore C. Browne
Attorney

Sept. 17, 1957 A. G. RUSSELL ET AL 2,806,632

PACKAGE SEALING MACHINE

Original Filed Nov. 30, 1951 4 Sheets-Sheet 4

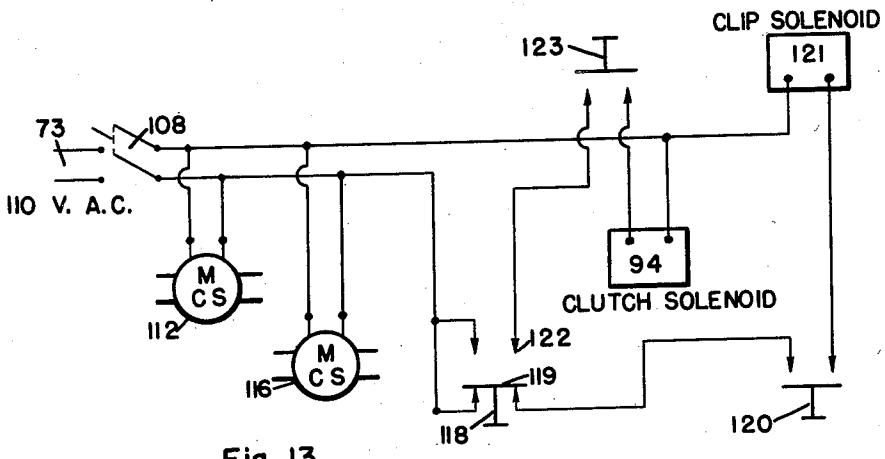


Fig. 13

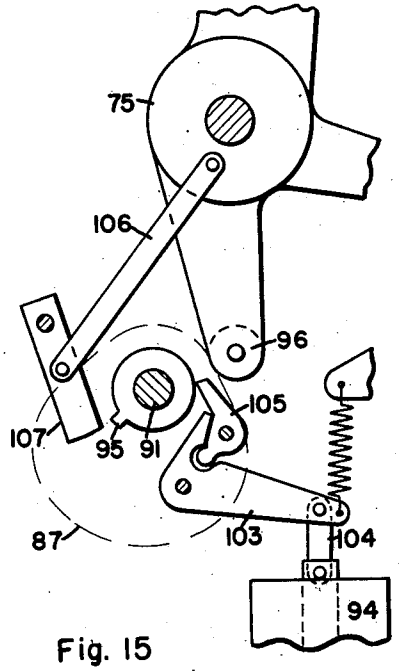


Fig. 15

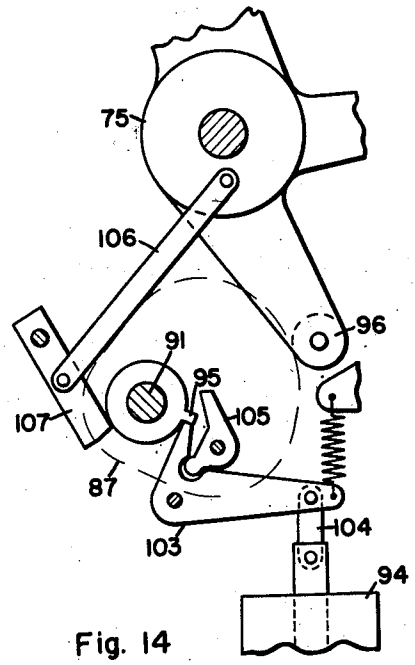


Fig. 14

Inventors
Francis B. Casey
Robert E. Dallon
Arthur G. Russell
Frank A. Clary, Jr.

By Theodore C. Browne
Attorney

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2,806,632

PACKAGE SEALING MACHINE

Arthur Gilbert Russell and Frank Alfred Clary, Jr., Bristol, Conn., and Francis Bernard Casey, Concord, and Robert Eldon Dallon, Lawrence, Mass., assignors to W. R. Grace & Co., Norwalk, Conn., a corporation of Connecticut

Original application November 30, 1951, Serial No. 259,084, now Patent No. 2,733,564, dated February 7, 1956. Divided and this application February 19, 1954, Serial No. 412,923

3 Claims. (Cl. 221—71)

For some time it has been recognized that sealing food, particularly meat, in impermeable, flexible and preferably transparent containers from which the air has been exhausted, and then either freezing or refrigerating the package produces a much superior product. At the same time, it practically eliminates dehydration losses. One particularly successful process is described in U. S. Patent No. 2,376,583 to De Poix and uses bags made from a material which shrinks when exposed to an elevated temperature. Shrinking pulls the bag into intimate contact with the food if the package has been properly vacuumized, and since the bag is thin and transparent, the actual condition of the food may be determined by merely looking at the package. This fact has made the process highly successful in self-service retail meat markets, for the housewife may pick up the package from the open, refrigerated cabinet and examine the meat, yet the meat itself is protected from contamination and handling. As a result, many self-service markets package retail cuts of meat, chickens, poultry, shoulders, butts, smoked meat and many miscellaneous foodstuffs in such bags.

The machine which is the subject of this invention was designed to form such a retail package quickly, cheaply and easily. It will operate equally well on materials which shrink and on non-shrinking transparent wrappings which have been formed into bags. After the food has been placed in the package, it withdraws the air from the package, twists the neck of the package to form an hermetic seal (for one of the interesting characteristics of these transparent, impermeable films is that when they are tightly twisted upon themselves the seal which is formed by the twist is impermeable to air and moisture vapor), then applies and crimps a sealing band on the twist seal to maintain the sealed condition of the bag, and finally trims off the excess neck of the bag beyond the seal.

Although the various portions of the machine cooperate to produce the sealed and trimmed package of the type which has been described, the machine can best be understood by reference to the drawings and by considering its various functions separately.

Description of figures

Figure 1 is a front elevation of the machine.

Figure 2 is a section and end view of the nozzle.

Figure 3 is a front elevation of the clip feed mechanism.

Figure 4 is a side view of the head in its open position.

Figure 5 is a side view of the head in its closed or crimping position.

Figure 6 is a transverse cross section of a portion of the clip wheel and the track on the line 6—6 of Figure 3.

Figure 7 is a transverse cross section of a portion of the clip wheel and the track on the line 7—7 of Figure 3.

Figure 8 is a transverse cross section of the track and clip spring on the line 8—8 of Figure 3.

Figure 9 is a side elevation of the head and arm in its retracted position.

Figure 10 is a side elevation of the head and arm in its forward position.

Figure 11 is a side elevation of the head and arm in clip-crimping position.

Figure 12 is a side elevation of the head and arm in the cut-off position.

Figure 13 is the wiring diagram.

Figure 14 is a diagrammatic representation of the clutch throw-out mechanism when the clutch is disengaged.

Figure 15 is a diagrammatic representation of the clutch throw-out mechanism showing its position when the clutch is engaged.

Vacuum spindle

The machine comprises a work table 10 provided with an integral head-stock portion 11, and supporting frame 12 for the work table. The hollow spindle 13, a tube which is open at both ends, rotates in the head-stock bearings 14, 15, 16. It is driven by the friction-faced pulley 17 which is fixed to the spindle 13 and may be engaged and disengaged with the power means (not shown) by the movement of the pedal 18 which by turning the work shaft 19 and moving the arm 21 together with the push-rod 22 and crank arm 23 moves the face of the V-belt 24 into or out of contact with the face of pulley 17. Pedal 18 is raised by the push spring 20. V-belt 24 runs between pulley 25, fixed to the drive shaft 26 and pulley 27 which is journaled on the crank arm 23.

A direct driven vacuum pump is usually built into the base of the machine, but the machine may also be connected to a permanently installed vacuum line. In order to illustrate clearly the operative parts of this machine, the vacuum pump and the drive motor have not been shown since their position obscures the operative parts. Vacuum conduit 28 is connected to vacuum tank 29. The function of the vacuum tank is not only to minimize fluctuations in the vacuum, but to trap any small particles of food which may be drawn into the nozzle. The tank cylinder 31 is held on the tank head 32 by toggle fasteners (not shown) so that the cylinder may be easily removed and scalded at the end of the package run. The tank is connected by conduit 33 to the vacuum valve 34, and this in turn is connected through conduit 35 to vacuum bearing 36. The side plate 37 of the head stock 11 carries an inwardly facing boss 38 in which the two bearings 15 and 16 are fitted respectively near the face and the base. The spindle is further supported by an outboard bearing 14 set into the right-hand wall 39 of the head stock. When the machine is in use, the left hand end of the spindle 13 is closed with a rubber stopper 71 seated in the spindle bore. Within the boss 38 and between the bearings 15 and 16 there is an annular space. Since the conduit 35 leading from the vacuum valve is connected into this space and the wall of the spindle is drilled at this point with a number of holes, air may be drawn from the nozzle through the holes into the reduced pressure area of the space between the bearings and down through the vacuum conduit while the spindle is rotating.

The actual nozzle 41 (shown in detail in Figure 2) is about the size of and is shaped very much like a 37 mm. projectile. The cylindrical portion is machined for a sliding fit in the bore of the vacuum spindle 13. In the area which an artilleryman would call the bourrelet, a semi-circular channel 45 is cut which receives and holds a toroidal coil spring 46. Holes 42—42 leading into the bore 43 are drilled in the ogive portion. Additionally, holes 44—44 are drilled through the floor of channel 45 into the bore 43. The nozzle may be slid toward the crimping head or away from it, as may be necessary to adapt the operation of the machine for various weights and sizes of packages, and then is locked

in position by a locking screw which fits a longitudinal groove 40 cut in the nozzle. The screw, together with the slot, prevents the nozzle from being set so far to the right that it will interfere with the motion of the crimping head. The vacuum valve 34 is adjused so that in the off position a small amount of air is always drawn through the nozzle. When a bag is placed over the nozzle and lightly held against the spindle, this small flow of air removes sufficient air from the neck of the bag so that the bag is drawn down between the indvidual turns of spring 46 and is uniformly gathered about the spindle. Air exhausted through holes 44—44 helps in pulling the bag material into the turns in the spring. This action insures that the amount of material which is drawn into each flute which the spring forms in the neck of the bag is relatively uniform and a twisted, ropelike, uniform seal is produced when the nozzle is later rotated. A cylindrical member with radial slots would be equally effective in forming the flutes in the neck, but the spring is preferable because it is easy to clean and sterilize.

The vacuum valve 34 is operated by a cable attached to arm 21. It is adjusted so that it is just cracked open when the foot pedal 18 is fully raised.

Relatively uniform flutes and twist of the neck can be secured without the flute-forming spring or a preliminary withdrawal of air from the neck, but the operator must start the nozzle rotating slowly and grip and release the neck about the nozzle alternately to prevent bunching. This would require more attention and coordination than should be required from a machine operator.

Clip feed

An upward extension 47 of the work table 10 forms an inclined back plate which supports the clip feeding assembly, generally indicated at 48. The clips 60 used in this machine may be generally described as U-shaped, but instead of a continuous curve appearing at the base of the U, the base is formed with two angularly disposed portions giving the configuration of a building with a hip-roof to the open clip. The arms of the clip may be parallel or may be slightly inclined toward each other. Each arm is provided with an inwardly embossed portion near its end which is intended to engage the trackway of this machine. The clips are strung on a carrier tape which is preferably formed of relatively stiff, resilient paper and is wider than the greatest distance between the arms of the clip. The tape is assembled into the aperture of the clip so that its edges are in frictional engagement with the inner surfaces of the arms; and since the tape is wider than the distance between the arms, it is maintained transversely bowed between the arms. The assembled clips are preferably formed into a roll with the arms directed outwardly radially. This position prevents the clips from binding while in the roll or when being unrolled. Both the clip and the assembly of clips on the carrier tape were developed independently especially for use in this machine. Neither in itself forms part of the present application.

A roll of clips is placed on the hub 49 much as a reel of motion picture film is placed on a projector spindle. A leader, merely an extension of the paper strip 50 on which the clips are strung, is threaded beneath the clip wheel 51, over the clip retainer 52, over the separator block 53, and beneath the clip feed pawls 54 and 55. The paper strip is led into the elbow 56 which conducts the strip to the rear of the machine.

As the clips pass beneath the wheel 51, they engage the feed track 58. The cross section of the track changes progressively from practically a flat strip at the line 6—6 to the section shown at 8—8 (see Figures 6, 7 and 8). Beyond the line 7—7, the track 58 is twisted one-quarter revolution ,shown at 59, so that the clips, which initially face upwardly, slide off feed track 58 with their open ends facing the operator.

The periphery of the clip wheel 51 is shown in cross section in Figures 6 and 7. The wheel is machined to form a peripheral tongue 61. The clips 60 shown in the figures carry indented bosses 62—62 adjacent their open ends. The paper strip 50 just fits between the two upstanding walls of the clip and is wider than the distance between the inner face of the bosses. As the contour of the track changes, as shown in the cross section figures, tongue 61 cups the paper strip by pushing it into the upper, concave surface of the track. The arched paper strip, now narrower than the space between the bosses, is pulled free of the clip, but by this time the clips engage the outer margins 63—63 of the track and cannot fall off.

Leaf spring 57, shown in section in Figure 8 and which lies just behind the track, forces the clip against track 58 and into the proper position to be received by the crimping head 74.

The clip advance mechanism, generally indicated at 70, comprises a pull-down solenoid 64, pull spring 65, rocker arm 66 journaled to the back plate 47 at 67, pull-up spring 68, and pawl arm 69. Arm 69 is rigidly fixed to arm 66 so that when the solenoid 64 is energized, pawl 54 is pushed toward the right dragging with it the paper tape. When the switch 120 is released, pull-up spring 68 raises the arm together with the solenoid armature and swings the pawl arm 69 back to the left. On the return stroke, the pawl 54 lifts slightly against the resistance of the pawl spring 72. Pawl 55 is a duplicate of the pawl 54, but is journaled to the back plate 47. It prevents the paper from being pushed backwards on the return stroke of pawl 54. At each pull of the solenoid 64 one clip is pushed off the track and into the crimping head 74 which is in position to receive the clip.

The clip advance mechanism can be operated mechanically, i. e., by a pedal or pull lever, but electrical operation is preferred; it is more compact and requires no separate act of the operator to control the movement of the clips.

Clip crimper

The crimping head, generally indicated at 74, is supported on arm 75 in such a manner that it may be swung transversely of the table 10. The head comprises the casing 76 (Figures 4 and 5) in which crimping jaws 77 and 78 are journaled. The forward or crimping end of the jaws approach each other when the head is in its advanced position and when the cam faces 79 and 81 of the plunger 82 engage the rear end of the jaws.

When the head is in its rear position, the jaws 77 and 78 are separated and are nearly horizontal. The floating punch 83 of the plunger 82 is then pushed forward by the spring 84 so that a nest is formed from these three parts which is adapted to receive a clip 60. The movement of punch 83 is limited by pin 90 which slides in short slots cut in the casing and the cover plate. After the head has moved into its forward position, the jaws 77 and 78 begin to close, but although the jaws move toward the axis of the head, they also swing towards its rear, thus forcing the clip backwards against the punch 83 which, in turn, compresses spring 84. The effect of this rearward movement is to form the base portion of the clip into a horseshoe which loosely surrounds the twisted neck of the package. The continuing movement of the jaws 77 and 78 bends the arms of the clip still further, but then the plunger 82 has already bottomed on the punch 83. The combined movement of the punch and the jaws bends the arms until they butt against each other and lie transversely to the axis of the plunger. Also, the base of the clip is deformed into a flattened, continuous curve.

It appears necessary in closing a twisted, ropelike but elastic neck to surround a substantial part of the neck with the closing band before much pressure is applied; otherwise the material will squirm out of the band when subjected to pressure and as a clip closes it can cut the neck. The sequence of operations just described prevents cutting because, as the arms are bent inwardly, the base

is arched to receive the full twisted neck. Then the arms are bent more closely together enclosing the neck within the clip, and finally the clip ends are butted end to end as the arched base is flattened by the punch.

Jaws **77** and **78** are chamfered at **85—85** so that, when the jaws are horizontal, the small recesses form the forward wall of the clip receiving nest. The side wall of the chamfer forms one wall of a projection **86** which, as the jaws close, rolls into the hollow of the upset boss **62** of the clip. Positively interfitting the clip and the jaws in this manner before pressure is applied by the punch **83** holds the clip in position and prevents the clip from being twisted in closing. This, otherwise, could occur, since the neck of the package is not only tightly twisted, but is quite elastic and squirms when compressed. When the pressure applied to plunger **82** is relaxed, leaf springs **80** force plunger **82** backwards and open jaws **77—78**.

Drive

The head is driven by an array of cams **87**, **88** and **89** on the counter shaft **91** which receives its power through belts running over a pulley on the main shaft **26** and over a flywheel pulley **92** attached to the cam shaft **91**. The flywheel is engaged and disengaged on the cam shaft through a single revolution clutch **93** which is tripped by the pull of solenoid **94**. This clutch controls all motions of the head. Its stop pin **95** is set to disengage the clutch when the head is in its retracted position.

Figures 9, 10, 11 and 12 illustrate the various positions of the head as the cam shaft **91** turns. The dotted outline in Figure 9 shows the relative movement of the head **74**. The solid outline shows the head in its retracted position into which it has been forced by the cam **87** which engages the cam follower **96** on arm **75**. In Figure 10, cam **87** has now turned so that the spring **97** has pulled the head into its forward position. In Figure 11, the crimping jaw cam **88** has forced the plunger arm **98** backwards, and the motion of this arm working through the spring loaded linkage **99** and lever linkage **101** has pushed in the plunger **82** and crimped the clip. Arm **98** and knife arm **111** are journaled on shaft **100**. In Figure 12, the knife cam **89** working on a substantially identical arm **111**, spring loaded linkage **109** and lever linkage **113**, has operated the knife **102** which trims off the excess portion of the bag. The lower blade **110** of the knife is attached to the lower crimping jaw **78**. As the cam shaft **91** turns further, cam **87** forces the head again into its retracted position.

Safety mechanisms are essential and are shown in Figures 14 and 15. First, stop arm **103** is pinned to the armature of the solenoid **94** through the swinging link **104**. It is pulled out of the path of the stop pin **95** on the clutch when the solenoid is energized. At the same time, its motion throws the safety stop **105** into the path of the stop pin so that, if the switch that controls the solenoid is held down longer than necessary, the clutch is nevertheless disengaged at the completion of one revolution. Second, a swinging link **106** is pinned on the arm **75**, as diagrammatically shown in Figures 14 and 15, and its outer end is pinned to a swinging stop block **107**. As the head advances, the point of connection between the arm **75** and the swinging link moves to the left and the full movement is sufficient to move the stop block out of the path of the stop pin on the clutch. However, if the head has not reached its forward position, the stop block remains in the path of the stop pin **95**. Driving means are thus disconnected and neither the crimping nor the cutting operation can take place if anything interferes with the full forward movement of the head. Third, spring loaded linkages **99** and **109** are interposed between the cam follower arms **98** and **111** and the plunger and knife levers **101** and **113**, respectively. If the knife attempts to bite a clip, for example, spring loaded linkage **109** compresses while the cam **89** completes the circle. Spring loaded linkage **99** has, in addition to its safety function, the important duty of adjusting the crimping to bulky or to thin twist seals without attention on the part of the operator. If a bulky twist is put into the clip, the crimping jaws cannot close the whole way; nevertheless, the crimping operation is completed, because the difference in movement is taken up by the die spring **99**. Were the head advanced by the thrust of a cam, its force could crush an operator's hand or destroy a package of food if the package slipped or if the operator were careless. But by pulling the head forward to its clip closing position by the pull of a spring, this spring can be made strong enough to move the arm and keep the cam follower in contact with the cam and yet be weak enough so that an operator would not be seriously injured by the movement of the head.

Wiring

The wiring is simple (see Figure 13). From the mains **73**, power is led through the double pole switch **108** to the drive motor **112** and vacuum pump motor **116**. When the switch is "on," both motors run continuously. A tap carries the current to a single pole double throw normally closed microswitch **118**. The current passes through the normally closed switch leaf **119** and to the normally open single pole microswitch **120**. The other side of the line leads to the clip solenoid **121** and from the solenoid to the switch **120**. The switched point **122** of switch **118** is connected to finger switch **123**, a normally open single pole switch, which is located on the back support panel. The other side of the line is run through the clutch solenoid **94** to the other pole of the finger switch **123**. Both microswitches are actuated by the arm **21**. Microswitch **120** closes first and so feeds a clip into the head; then as the pedal is further depressed switch **118** cuts out clip feed solenoid **121** and switches the circuit through the finger switch **123**. When the finger switch is touched, the head moves forward, but both the pedal and the finger switch must be depressed simultaneously. Otherwise the circuit through the clutch solenoid **94** will not be established and the head remains in its rearward position.

Operation

First, the operator adjusts the height of the product table **114** to make the twist at the axis of the package and bring it in line with the vacuum nozzle. For example, for hams the product table must be adjusted to a lower position than for broiler chickens. Locking screw **115** holds the product table in its adjusted position.

Next, the position of the nozzle is adjusted by sliding the nozzle in or out of the hollow spindle. For example, the nozzle is slid back towards the head stock for hams and brought forward for light broilers. The reason is that a ham bag is heavy and requires a long twist, while a broiler bag is lighter.

Next, the operator takes the food product which has already been placed in the bag, places it on the product table, and then pulls the neck of the bag over the nozzle. The neck of the bag is grasped lightly about the spindle by the operator's left hand. Because of the slight flow of air through the nozzle, the material in the neck of the bag is drawn down between the convolutions of the spring and against the nozzle and spindle. The operator then steps on the pedal lightly. This action closes microswitch **120** controlling the clip feed solenoid, and a clip is forced off the track and into the nest of the head. Further pressure on the pedal opens valve **34** and evacuates the air from the bag. Further slight depression of pedal **18** starts the spindle rotating and winds the fluted neck about itself. The operator then releases pedal **18** slightly to stop the rotation of the spindle. The pedal, however, is far enough depressed so that current is switched by the microswitch **118** from the clip feed circuit to the clutch solenoid circuit, but is interrupted by

the open circuit finger switch **123**. When the operator touches the finger switch with the left hand, still depressing pedal **18** slightly, the clutch is tripped and the head advances, crimping the band about the twisted neck. Then the knife closes and trims off the excess length of the neck.

Cleaning

In the packaging of all food products, particularly meat, fats and small pieces of flesh stick to the machinery. Consequently, at the end of the package run it is necessary to clean and sterilize the machine. To do this, the nozzle **41** is removed from the spindle **13**, the spring **46** is sprung off from the nozzle, and these parts are sterilized by washing or boiling. The rubber stopper **71** is removed from the left-hand end of the spindle and the spindle is cleaned by ramming a soapy swab through the bore. Toggle latches on the vacuum tank **29** are opened and the cylinder **31** with its trapped waste is removed for cleaning and sterilizing. The vacuum conduit and valve may be sterilized by flowing hot water through the system, first closing the bore of the spindle at the left end with a rubber stopper. Or it is practicable to fill a food bag with hot soapy water, first replacing the rubber stopper and the vacuum cylinder, turn on the machine, and suck the cleaning solution from the bag down into the vacuum tank. All surfaces of the machine which come in contact with the food are either enameled iron or stainless steel so that they may be kept clean and sterile.

Experience with the machine has indicated that operators can, after three weeks of experience, reach the production rate of 5 to 7 smoked hams averaging between 12 and 18 lbs. weight per minute; turkeys of 9 lbs. and less, 6 to 8 minutes; roasting chickens, 6 to 8 per minute; and ducklings weighing from 6 to 8 lbs., 5 to 7 per minute.

This application is a divisional application of our copending application, Serial No. 259,084, filed November 30, 1951, now Patent No. 2,733,564.

We claim:

1. In a device wherein generally U-shaped clips having substantially parallel upstanding arms are supplied strung on a stiff resilient carrier tape, wherein the tape is wider than the greatest distance between the arms of said clip, whereby the tape is maintained in a transversely bowed condition with its edges in frictional engagement with the inner surfaces of said arms, means for freeing the clips from said tape and for delivering the freed clips in a spacially oriented condition comprising a clip trackway having a cross-section which varies progressively from that of a free blade adapted to pass between the arms of the clip and between the base of the clip and the tape at one end to an approximation of the cross-section of the clip at the other end, a groove in the back surface of said trackway adjacent the free blade end thereof, a peripherally tongued wheel adjacent said trackway and positioned to cooperate with said groove, said wheel and said groove adapted when the free blade end is inserted between the tape and the base of the clips to cup the tape passing therebetween sufficiently that the width of the cupped tape is less than the minimum distance between the arms of a clip, means associated with said trackway to retain said clips thereon, and means remote from the trackway and the clips to advance the tape and thereby advance the clips.

2. In a device wherein generally U-shaped clips, having substantially parallel upstanding arms and an opposed inwardly embossed portion near the end of each arm, are supplied strung on a stiff, resilient carrier tape wherein the tape is wider than the greatest distance between the arms of said clip whereby the tape is maintained in a transversely bowed condition with its edges in frictional engagement with the inner surfaces of said arms, means for freeing the clips from said tape and for delivering the freed clips in a spacially oriented condition comprising a clip trackway having a cross section which varies progressively from that of a free blade adapted to pass between the arms of the clip and between the base of the clip and the tape at one end to an approximation of the cross section of the clip at the other end, the face portion of said trackway having a width greater than the minimum distance between the embossed portions on the arms of said clips, a groove on the back surface of said trackway adjacent the free blade end thereof, a peripherally tongued wheel adjacent said trackway and positioned to cooperate with said groove, said wheel and said groove adapted when the free blade end is inserted between the tape and the base of the clips to cup the tape passing therebetween sufficiently that the width of the cupped tape is less than the minimum distance between the arms of a clip, and means remote from the trackway and the clips to advance the tape and thereby advance the clips.

3. The device claimed in claim 2 wherein the means to advance the tape comprises a pair of pawls positioned successively on said tape and adapted to permit the movement of the tape in a direction away from said trackway and to prevent movement in the opposite direction, means for maintaining the first of said pawls in a fixed position relative to said trackway, means for moving the second of said pawls from a position adjacent the first of said pawls to a position remote therefrom and means for returning the second of said pawls to the first enumerated position.

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