

Feb. 7, 1956

A. G. RUSSELL ET AL
PACKAGE SEALING MACHINE

2,733,442

Original Filed Nov. 30, 1951

4 Sheets-Sheet 1

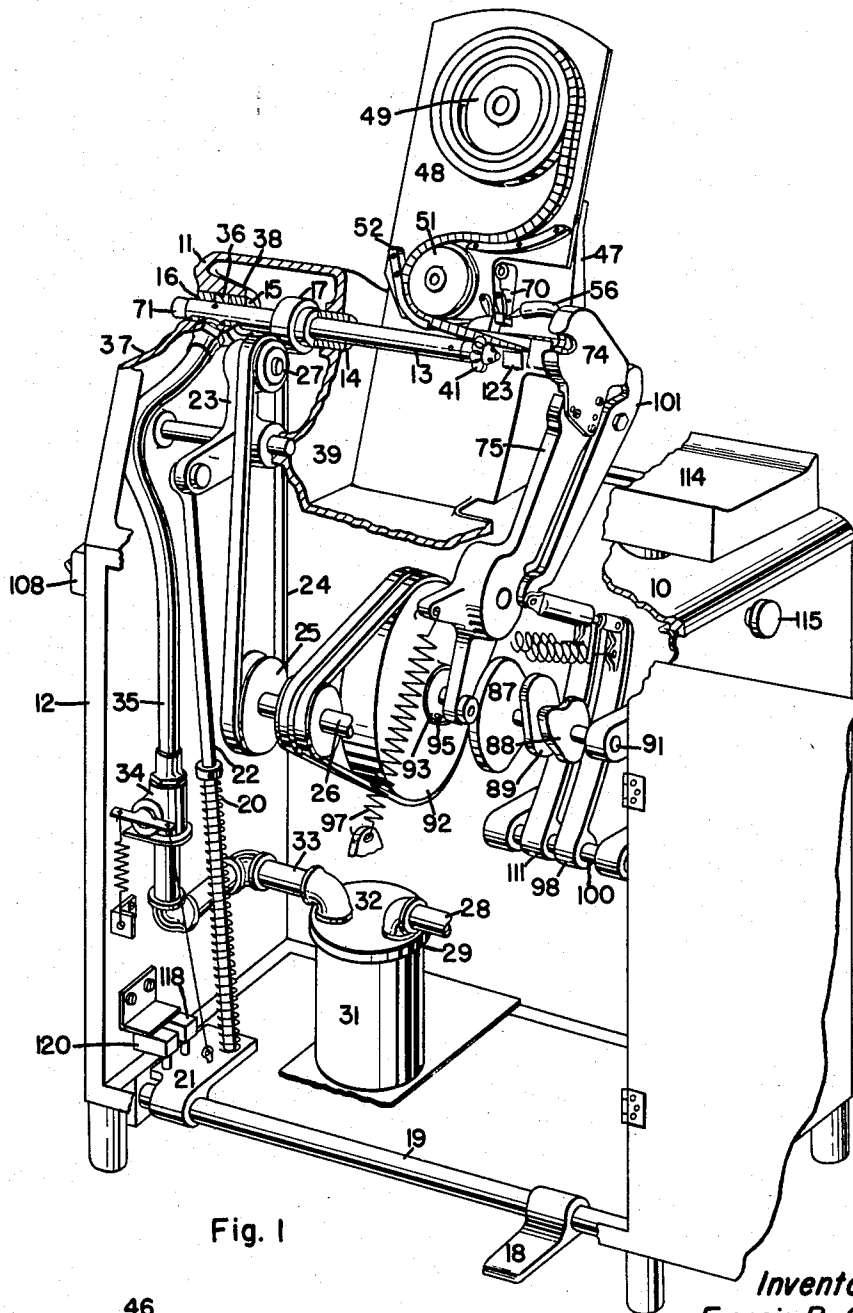


Fig. 1

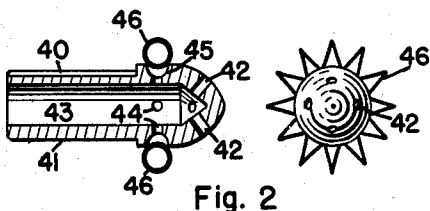


Fig. 2

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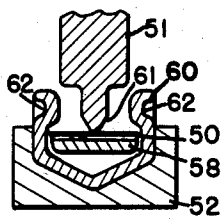


Fig. 6

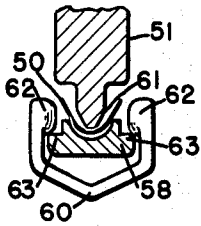


Fig. 7

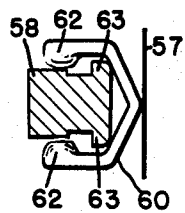


Fig. 8

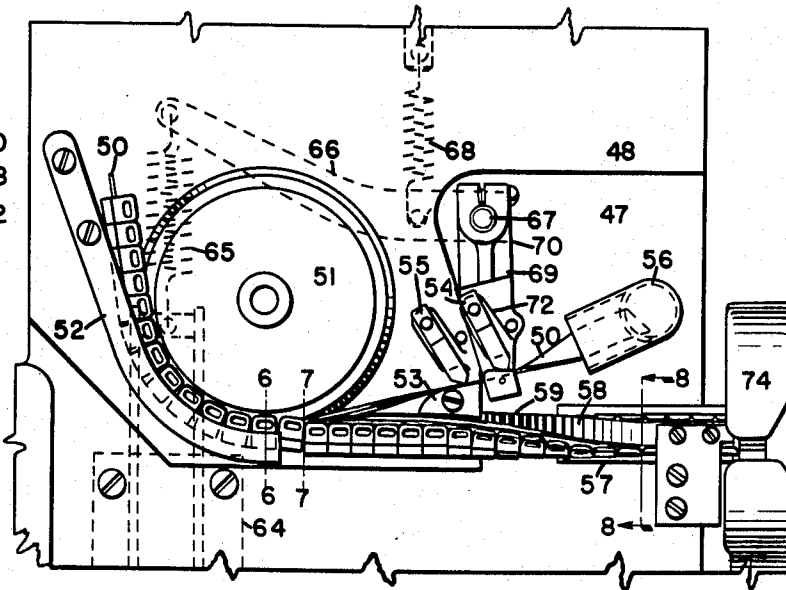


Fig. 3

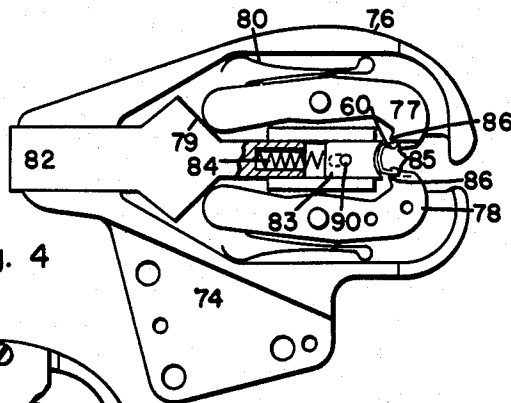


Fig. 4

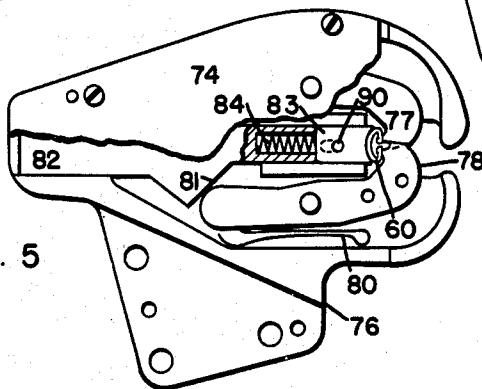


Fig. 5

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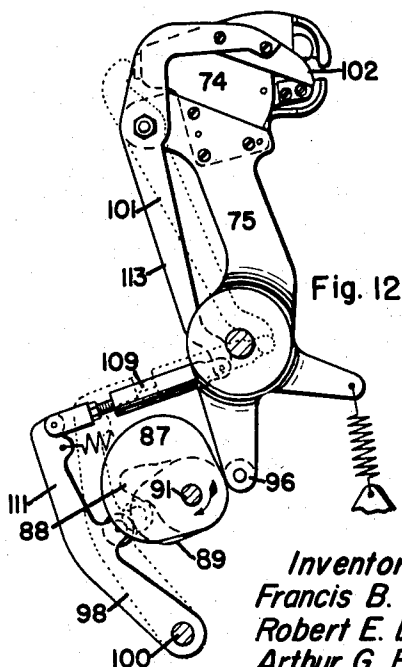
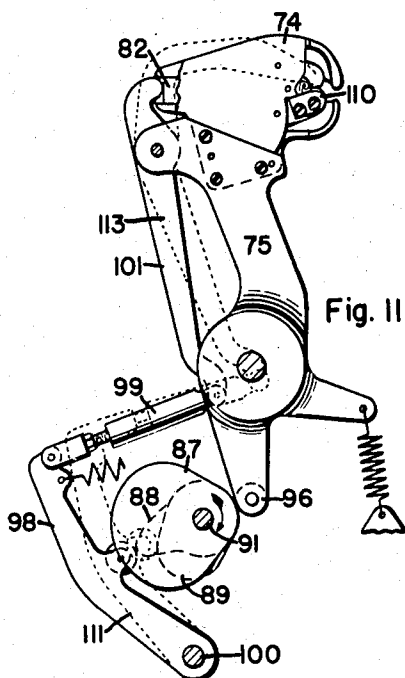
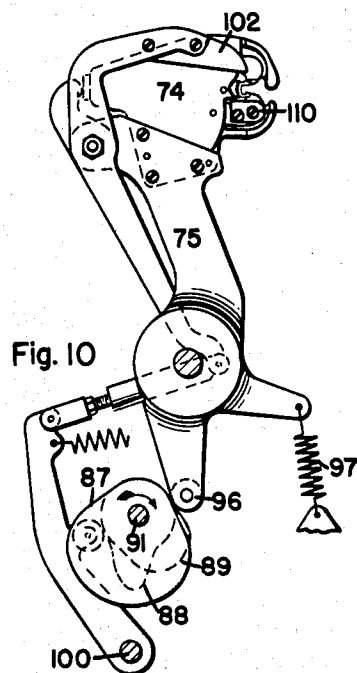
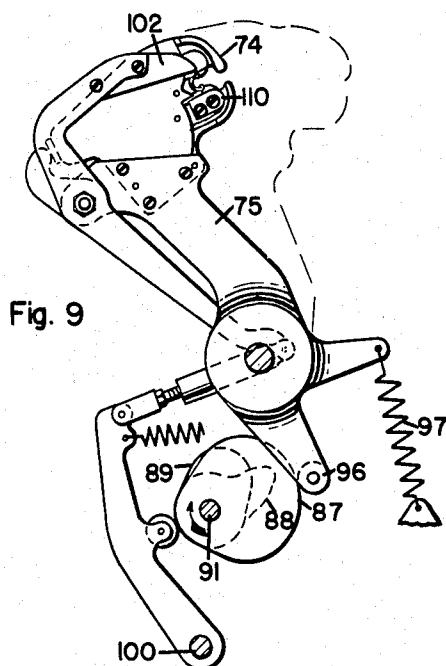
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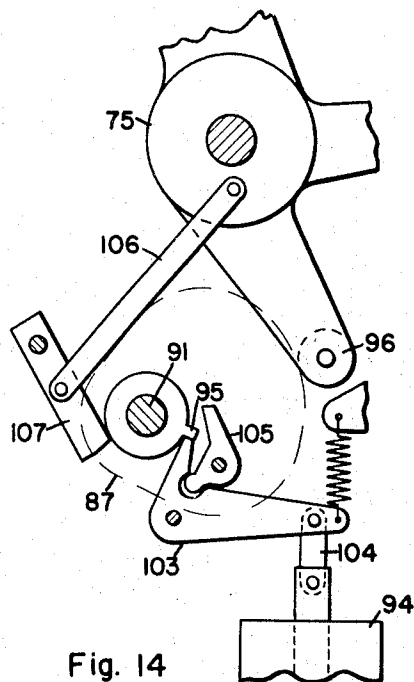
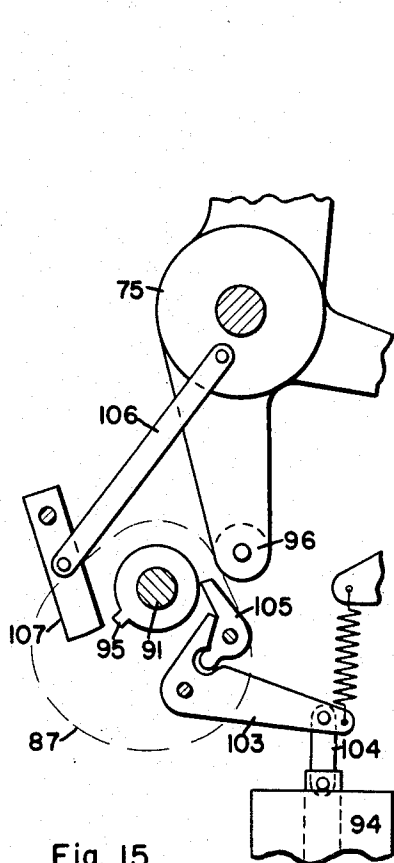
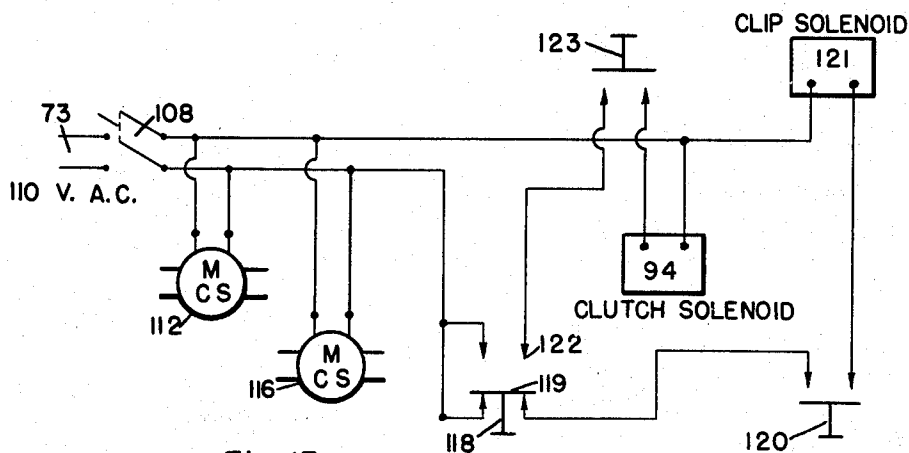
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2,733,442

PACKAGE SEALING MACHINE

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Original application November 30, 1951, Serial No. 259,084. Divided and this application February 19, 1954, Serial No. 412,924

4 Claims. (Cl. 1—187)

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.

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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 spring 46. Holes 42—42 leading into the closed 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 an Allen 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 adjusted 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 individual turns of the helix 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 30 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 dips 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, 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 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 nest of 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 horse-shoe 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

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the jaws are horizontal, the small recesses form the forward wall or clip stops 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 countershaft 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 die spring 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, die spring 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. At 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, die springs 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, die spring 109 compresses while the cam 89 completes the circle. Die spring 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

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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 S. P. 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 soap 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 per minute; 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 co-pending application, Serial No. 259,084, filed November 30, 1951.

We claim:

1. In a machine of the class described, clip crimping apparatus for applying generally U-shaped deformable sealing clips to the twisted neck of flexible containers comprising a casing, a pair of opposed sealing jaws journaled in the casing having a jaw portion and a lever portion, a plunger slidably mounted between said jaws bearing opposed cam faces adapted to engage the lever end of said jaws and to control the opening and closing thereof, a floating punch slidably mounted for limited travel within the casing adapted to be engaged by the plunger, a spring to urge the punch to its forward position which defines the rear wall of a clip receiving nest, the terminal portions of the jaws extending rearwardly and adapted to engage the open arms of said clips whereby said jaws close along inwardly directed curved paths first bending the arms of the clip about the twisted neck of a container placed within the clip and then forming a buttress against which the punch may compress the clip.

2. A device for deforming generally U-shaped clips so as to substantially surround an object located in said clip comprising a casing having an object receiving slot, opposed sealing jaws adapted to close transversely across said slot, each of said jaws having a lever portion and a working portion, the ends of said working portion providing locating stops for the open arms of a clip and having rearwardly extending projections, a floating punch slidably mounted for limited travel between said jaws, said punch and the stops of said jaws forming a clip receiving nest, spring means to maintain the jaws in a normally open position, and means engaging the lever por-

tion of the jaws to close the jaws and cause the rearward projections to fold the arms of a clip loosely about an object in said clip and thereafter act to advance the punch to crimp the clip.

3. A device for deforming generally U-shaped clips so as to substantially surround and compress an object located in said clip comprising a casing having an object receiving slot, a pair of opposed sealing jaws adapted to close transversely across said slot journaled in said casing and having a jaw portion and a lever portion, the terminal portion of said jaws extending rearwardly and normally overlying the open arms of a clip, a plunger slidably mounted between said jaws bearing opposed cam faces adapted to engage the lever portion of said jaws and to control the opening and closing thereof, a floating punch slidably mounted for limited travel within the casing between the jaws adapted to be engaged by the plunger, a spring member between said punch and said plunger to urge the punch to its forward position, said punch and a stop on said jaws forming a clip receiving nest, and spring means to maintain the jaws in a normally open position, said jaws in closing swinging the projections along inwardly directed curved paths to bend the arms of the clip about the object, and finally forming a buttress against which a clip is compressed as the plunger in its forward travel engages the punch.

4. In a machine of the class described a clip crimping head comprising a casing having a neck receiving slot, opposed sealing jaws adapted to close transversely across said slot, the jaws having a power receiving lever portion and a working portion, a floating punch slidably mounted for limited travel between said jaws, spring means to maintain the jaws in normally open position, the terminal of each working portion being provided with a rearwardly directed projection machined to provide a locating stop for the open arm of a clip when the jaws are in open position, a plunger located between said jaws having oppositely directed cam faces adapted to engage the lever portions of said jaws and to force them into closed position, a floating punch slidably mounted for limited travel between said jaws actuated by said plunger, the punch when urged into its forward position and the clip locating stops forming a clip receiving nest, the rearwardly directed projections being operative as the jaws close to fold the open arms of a clip about an object positioned between said arms and to force the clip and punch rearwardly until the end of the arms clear said projections and thereafter to form abutments against which the clip may be compressed as the punch is driven forward by said plunger.

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