

March 26, 1963

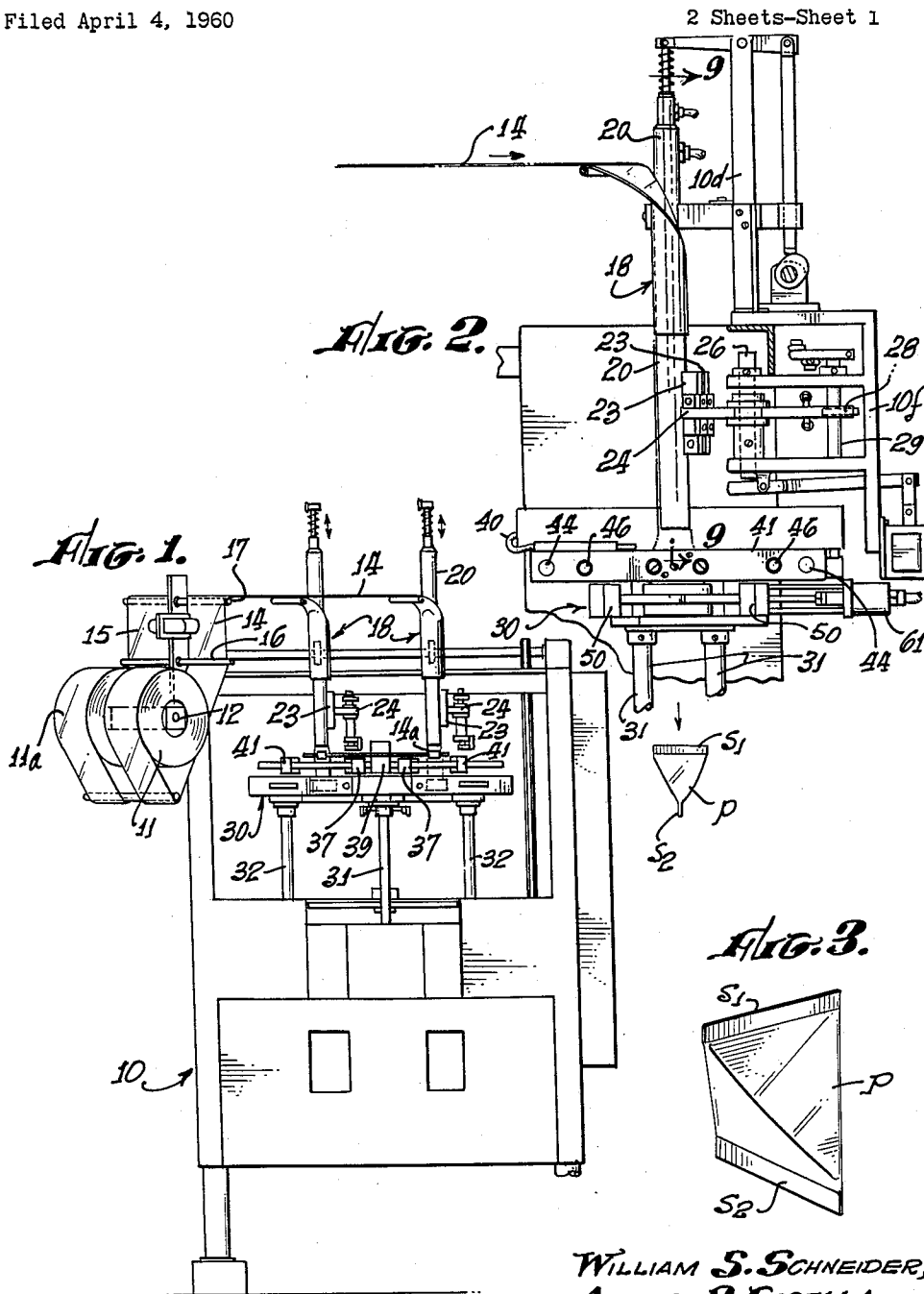
W. S. SCHNEIDER ETAL

3,082,586

PACKAGING MACHINE

Filed April 4, 1960

2 Sheets-Sheet 1



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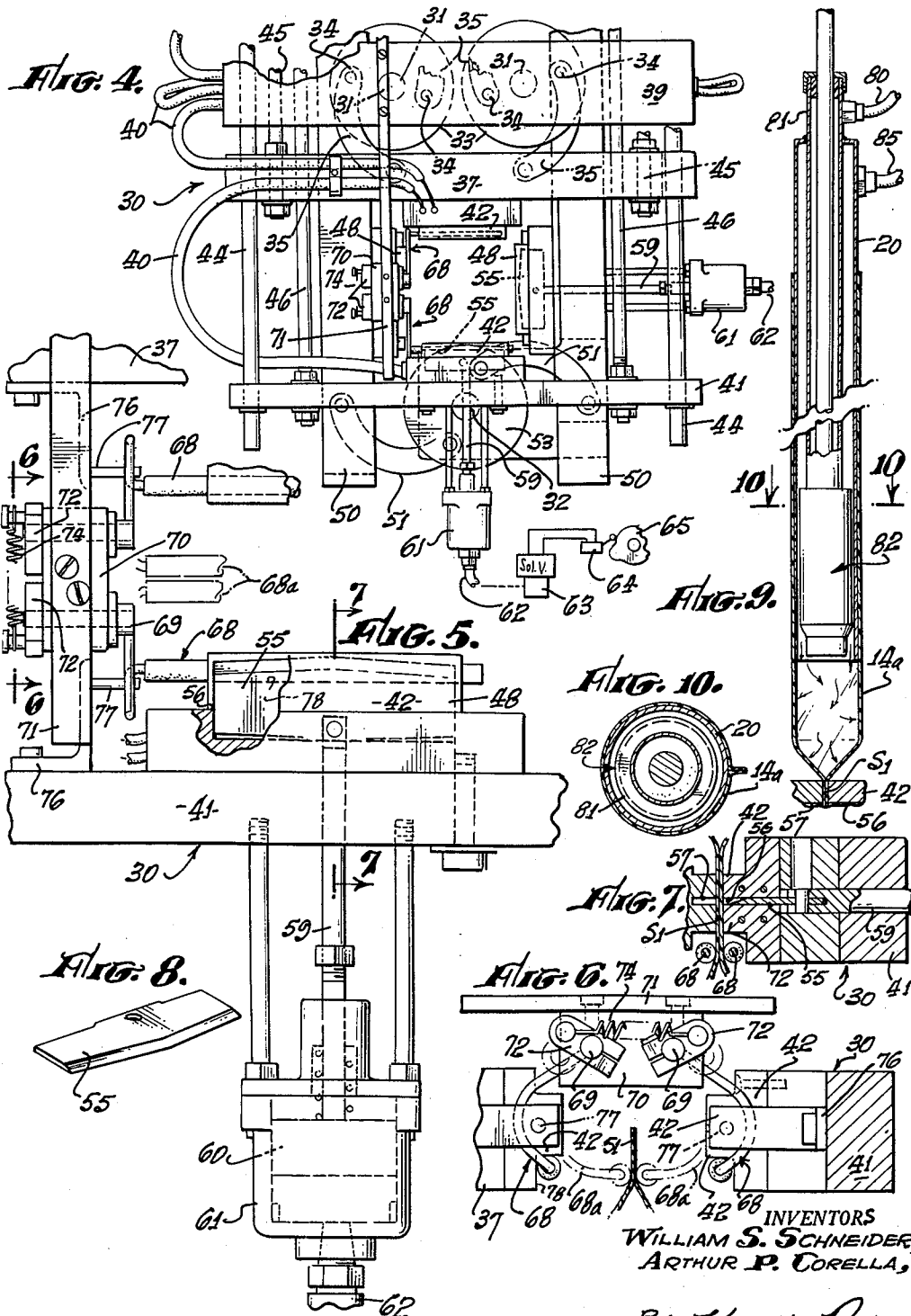
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PACKAGING MACHINE

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Filed Apr. 4, 1960, Ser. No. 19,857

9 Claims. (Cl. 53-182)

The present invention relates generally to packaging machines producing filled packages from a continuous web of sheet material, and more especially to machines for producing tetrahedral packages.

Packaging machines of this character start with a web of sheet material in flat form and shape it around the hollow filling mandrel into a tubular shape. The end of the tube is closed by a transverse seal which, when the material is of a heat sealable nature, can be applied by a pair of sealing heads which flatten the tube between them as they form a sealed area. When two successive transverse seals are in a common plane and define two ends of a package, the package is a flat or envelope type; but if the two seals are located in mutually perpendicular planes the package has the shape of a tetrahedron.

There are many different types of packaging machines, most of which are designed to produce flat or envelope type packages. These have been preferred for many reasons since the machines are simpler, and therefore easier, to design and build and have been more satisfactory and reliable in operation. The production of tetrahedral packages creates several serious design or operational problems because the end seals on each package lie in planes substantially 90° to each other. This fact gives rise to problems unique in machines for producing tetrahedral packages and not found in machines producing flat type packages. Accordingly relatively few machines successfully produce tetrahedral packages.

One of the important problems encountered is properly shaping the web tube in the zone where the seals are placed. In machines for producing flat type packages it is possible to use an oval mandrel since all seals are in a common plane. The shape of the mandrel determines the shape of the tube; and by having the long axis of the oval in the plane of the seals the web tube is maintained smooth and free of wrinkles. The placement of a seal in combination with the elongated shape of the mandrel eliminates wrinkles in the tube where the next seal is to be placed.

When the transverse seals are in planes oriented 90° to each other, the oval mandrel cannot be used since its shape prevents making proper seals in one of the two planes. Consequently a cylindrical mandrel is used in making tetrahedral packages. This shape of a rigid mandrel may be regarded as a compromise since it does not facilitate placement of a wrinkle-free transverse seal in any given plane.

In former designs known to us of machines for making tetrahedral packages, the tubular web was distended by filling the web with a product to a height above the level at which the next seal is placed and then sealing through the column of product. This is practical only with certain types of liquids since it is impossible to make a satisfactory seal through powders, many liquids, and various solid articles such as hardware items. With such latter products it is necessary to feed the product intermittently, leaving a space above the product in the zone at which the seal is to be made to complete a package. In this zone the thin tubular web is unsupported from within and is free to collapse and assume any wrinkles or folds created by the last transverse seal or by the product itself. The tendency for the unsupported web to

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collapse, reduces the volume of the package and forms wrinkles across the sealed area that produce leaks at the end seals of the completed packages. The presence of these folds or wrinkles in the web tube has previously been inherent in most machines producing tetrahedral packages.

Since there has been no known means of eliminating the wrinkles in a tube not entirely filled with product, it is a primary object of our invention to provide novel means in a machine producing tetrahedral packages for distending the unfilled web tube in a manner to keep the walls smooth and wrinkle-free at the times and in the areas in which the transverse seals are placed.

Another problem peculiar to the tetrahedral packaging machines is that of obtaining proper location and orientation of the cut severing a filled package from the one following it. In the case of machines producing flat type packages the usual design involves establishing a cutter one package length below a single pair of sealing heads placing transverse seals. This simple arrangement is not possible in machines making tetrahedrons since it is necessary to have two cutting stations spaced apart vertically one package length and at which the blades operate in planes 90° apart. This makes the lower blade at least two package lengths, and sometimes more, below the sealing position. The practical result is that variations due to slippage of the web, imperfect electric eye control of web feed, and other variables cause the lower cutters to miss the center line of the sealed area. The result is an unpredictable difference in the width of the seals at the top and bottom of the package. When the machine is running at high speeds, there is an inevitable tendency for the two or more packages below the sealing heads to swing from side to side with the result that the cutting blades often cut at an improper angle across the sealed area. This problem is unique in machines for producing tetrahedral packages because of the necessary distance between sealing heads and cutting positions.

Thus it is also a primary object of our invention to provide novel means in a machine making tetrahedral packages for severing the packages from the web at an accurately predetermined position, thus insuring that each sealed area is accurately bisected to produce packages having end seals of equal width and that the cut is made perpendicular to the length of the package.

This has been achieved according to our invention by placing a cutting blade in one head of each pair of transverse sealing heads and actuating the blade while the two heads are in sealing position.

When the cutter blade is located in the sealing head in this manner, there is a tendency for the web at each side of the cut to stick to one or both of the sealing heads. This is a problem found chiefly in tetrahedron machines since in flat pack machines where the cutting station is well below the sealing heads the packages below the sealers disengage the web from the sealing heads. However, there are situations even in machines producing flat type packages where disengaging the sealing heads from the web is difficult. These occur with the use of certain sticky thermoplastic webs, such as saran coated cellophane and others.

Thus it becomes a further object of our invention to provide novel means associated with transverse sealing heads to strip the sealed area of the web from the sealing faces of the heads.

These objects of our invention have been attained in a machine producing tetrahedral packages and having a rigid hollow mandrel around which the web is wrapped to form a tube which is flattened at successive positions to place the transverse seals by means of sealing heads which move toward and away from each other, by pro-

viding means introducing air into the tubular web under pressure sufficient to distend fully the tube above the last transverse seal and below the end of the rigid mandrel. Escape of air from the tube is sufficiently restricted by wrapping the web tightly about the mandrel to keep the internal pressure high enough to distend the tube. The air pressure smooths out the walls of the distended tube and maintains them wrinkle-free in the zone where the transverse seal is to be placed and as the sealing heads flatten the tube to seal the two walls together. The result is a package that is smooth and free from any wrinkles or any imperfections in the sealed area.

We provide a cutter blade mounted for reciprocating movement in one sealing head of each pair of heads placing transverse seals. The cutter is mounted in a slot that opens at the face of the sealing head and is actuated in timed relation to movement of the heads to cut through the web at the sealed area while the heads are in sealing position. This construction has the advantage of eliminating numerous bulky parts required to properly operate and time the cutters when at stations below the sealing heads, thus resulting in a smaller, lighter, more efficient machine than has been heretofore possible.

Stripping means are provided to insure that the web at the sealed area is disengaged from the cutter heads. In a preferred embodiment of our invention, the stripping means comprises a pair of movably mounted gripping members located below the heads and moved by the sealing heads toward and away from each other. When moved toward each other, the gripping members engage the web or package at a position adjacent the cutters and hold it stationary as the sealing heads move away from sealing position. This causes positive disengagement of the web from the sealing heads. While it is possible to provide similar stripping means both above and below the heads, it is preferred to take advantage of the stiffness of the tubular web produced by the introduction of air under pressure to act as a stripping means. The air pressure in the tubular web gives to the tube sufficient stiffness to hold the lower end of the tube at the sealed area more or less stationary so that the sealed area is disengaged from the sealing heads as the heads move away from sealing position.

These features of our invention cooperate to produce a wrinkle-free package with accurately sized and shaped end seals. The distention of the tube eliminates wrinkles in the web and results in tight, leak-proof seals being made by the sealing heads. The cooperating cutters in the sealing heads make the cuts at an accurately predetermined position, eliminating damage to the end seals from imperfect cuts. The mechanical strippers and the distention of the tube contribute to making a perfect package by disengaging the sealed area from the heads as they withdraw from sealing position.

Since the present invention has been embodied in a packaging machine of the design shown in our copending application Serial No. 794,007, filed February 18, 1959, now Patent No. 3,026,258, issued March 27, 1962, for "Packaging Machine," we show and describe the present invention as an improvement on the machine of our said copending application; but it will be understood that the invention is not necessarily limited thereto in all of its aspects.

How the above objects and advantages of our invention, as well as others not particularly referred to herein, are attained will be more readily understood by reference to the following description and to the annexed drawings, in which:

FIG. 1 is a front elevation of a machine producing tetrahedral packages embodying our invention.

FIG. 2 is a fragmentary side elevation of the upper portion of the machine of FIG. 1 viewed from the right hand side thereof.

FIG. 3 is a perspective view of one of the tetrahedral packages produced by the machine.

FIG. 4 is an enlarged fragmentary plan view of the carriage for the sealing means showing one of the sets of sealing heads consisting of two pairs of heads with each pair mounted at a different elevation.

FIG. 5 is a further enlarged fragmentary plan view of the carriage illustrating the construction of the mechanical strippers associated with one pair of sealing heads.

FIG. 6 is a fragmentary elevation on line 6—6 of FIG. 5.

FIG. 7 is a fragmentary vertical section on line 7—7 of FIG. 5.

FIG. 8 is a perspective view of a cutter blade which is mounted in one of the sealing heads.

FIG. 9 is a vertical median section through the mandrel and material-feeding mechanism taken on line 9—9 of FIG. 2.

FIG. 10 is a horizontal transverse section on line 10—10 of FIG. 9.

Referring now to the drawings, there is shown therein a packing machine of the same design as that disclosed in our copending application Serial No. 794,007, referred to above, and to which reference may be had for additional details of construction, driving mechanism, and the like. Since the present invention has been developed primarily as an improvement upon the structure of that machine, only so much of the machine is described herein, in addition to the features of the present invention, as may be necessary to understand the operation of the present invention.

An open framework, indicated generally at 10, may be of any suitable construction and shape and provides a stationary supporting member for the various components of the machine. There are two rolls 11 and 11a of sheet material which are unrolled individually to provide separate webs from each of which packages are formed. These two rolls are mounted on a common axle 12 supported by a bracket attached to the frame. The sheet material unrolled from rolls 11 and 11a forms the webs 14 and 14a respectively. This material may be of any suitable character or type and is heat sealable on at least one side.

The present machine is designed to operate simultaneously upon a plurality of webs 14 and 15 to produce tetrahedral filled packages, there being two such webs here shown. In producing filled packages, the same steps in the package forming operation are carried on independently at each of the two webs, there being two paths or channels through which webs pass through the machine to produce filled packages. Since the same operations are performed simultaneously in both channels, only the sealing heads and other equipment pertaining to one channel are shown herein. It will be understood that the necessary parts described are duplicated at the other channel in order to operate on both webs 14 and 15 simultaneously and in a similar manner. Accordingly, reference to parts of the machine operating upon one web may be construed as a reference to other similar parts of the machine operating on the other web, even though not illustrated, although the invention may equally well be used with a single channel machine.

From the roll 11, the web passes around guide pins or rollers 16 and 17 and then to forming means 18 where starts the shaping of the web to form packages. Former 18 is associated with mandrel 20 which is a rigid, cylindrical tube with its axis vertical. Inside the mandrel is material feeding means which will be described later. Former 18 receives web 14 of sheet material in a flat condition and wraps it snugly around the outside of the cylindrical mandrel, thus giving to the web a tubular shape. Since the mandrel is circular in cross-section the tube leaving the lower end of the mandrel is also circular in cross-section.

As the width of web 14 is greater than the circumference of mandrel 20, former 18 brings the marginal portions of the web along the two longitudinal edges

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thereof into parallel, substantially radial positions with respect to the mandrel. These marginal portions of the web are brought together in inside-face-to-inside-face relation. This type of seal is preferred for various reasons but the present invention may also be used with the overlapping seal familiar to the art.

For the purpose of forming this longitudinal seal, there is provided side sealing means adjacent mandrel 20, comprising a pair of sealing heads 23, which are heated by electrical resistance elements inside the heads. The two sealing heads 23 are located externally of the mandrel and are mounted one on each of a pair of arms 24 mounted to swing about a common pivot 26 in a scissors-like arrangement. The vertically extending pivot pin 26 is mounted in frame bracket 10f. Arms 24 are given a pivotal motion around pin 26 to move toward and away from each other in order to bring heads 23 together intermittently to clamp between them the outstanding edges of web 14 to seal these portions of the web. This action of the heads draws the web tightly around mandrel 20. After a seal has been effected, the heads 23 separate and free the web. The mechanism for producing this oscillating motion of the arms includes a crank or cam 28 located between the two arms and mounted upon oscillating vertical shaft 29 which is oscillated by drive mechanism not shown in the drawing. Reference may be had to the above mentioned copending application for further details of the operation of these sealing heads and the mechanism for operating them.

Placement of the longitudinally extending side seal by heads 23 completes the tube 14a into which the web has now been formed. At a suitable distance below the mandrel, the web tube has applied to it successive transverse seals which bring together the walls of the tube over a relatively narrow, elongated area extending entirely across the tube. A transverse seal is of course completed at the bottom end of the tube prior to discharging material into it. After the product is delivered to the tube 14a a second seal is located at a position spaced above the first seal to complete formation of an individual package which is still attached to the web following. Severing the package from the web at the upper seal produces the tetrahedral package P shown in FIG. 3.

The means for effecting these successive transverse seals is shown generally in FIG. 1 and FIG. 2 and in greater detail in FIGS. 4, 5, 6 and 7. This mechanism consists of a carriage indicated generally at 30 mounted for vertical reciprocation. Because this machine is a twin-channel machine designed to operate upon two webs simultaneously, carriage 30 as seen in FIG. 2 has mounted upon it four pairs of heated sealing heads which are adapted to make transverse seals on the webs, there being two pairs of sealing heads associated with each of the two package forming channels of the machine and the webs therein which pass downwardly through the carriage. This carriage 30 is mounted upon the upper ends of four parallel, vertically extending shafts, there being a first pair of shafts 31 and a second pair of shafts 32. The four shafts move the carriage up and down in a vertical path and are themselves mounted for axial and angular motion in suitable guide bushings in frame 10. The mechanism for vertically reciprocating and rotating these shafts is not illustrated in the drawings but reference may be had to the above mentioned copending application for details of this drive mechanism.

At the upper end of each shaft 31 there is attached a disc crank 33 carrying a pair of crank pins 34 located at diametrically spaced positions on the disc. Pivotally connected to each one of these crank pins 34 is one end of an arcuate connecting link 35. The other end of each link 35 is pivotally connected to one of two bars 37 which extend across the carriage parallel to each other. Only

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one of these bars 37 is shown in FIG. 4, but the carriage is symmetrical about a vertical plane passing through the axes of the two vertical shafts 31.

Bars 37 are located at the upper portion of the carriage and are positioned one on either side of stationary member 39 which constitutes a portion of the carriage and is also a terminal strip for electrical conductors 40 which supply electricity to the resistance heating elements in the sealing heads described below. Spaced outwardly from each of the bars 37, that is downwardly in FIG. 4, are two other bars 41 which are parallel to each other and to bars 37. Mounted upon each of the two bars 37 and 41 is a heated sealing head 42 which is one of a cooperating pair of sealing heads which are adapted to effect a transverse seal on the tubular web by flattening the tube and sealing together the walls of the tube when clamped between the sealing heads. To effect relative motion of the two sealing heads 42 toward and away from each other, bars 37 and 41 are slidably mounted near their ends upon two horizontally extending guides 44 which are rigidly attached to the ends of frame member 39 of the reciprocating carriage.

Bar 37 is reciprocated along guides 44 by movement of one pair of links 35. A similar motion is imparted to the bar 41 at the opposite end of the carriage (and not shown in FIG. 4) by means of a pair of tie rods 45 which extend parallel to guides 44. A similar reciprocating motion is imparted by the other pair of links 35 to the bar 37 lying at the opposite side of central member 39 and therefore not shown in the drawing in FIG. 4. This motion is transferred from the latter bar 37 to the second bar 41, which is shown in the drawing, by means of a second pair of tie rods 46. By this mechanism, oscillating shafts 31 drive cranks 33 and through connecting links 35 impart reciprocating motion to the bars 37. These two bars are each tied to one of the bars 41, located at opposite ends of the carriage, by the tie rods just described; and as a result the pair of sealing heads 42 are reciprocated toward and away from each other.

Located at a lower elevation on the carriage than the pair of sealing heads 42 is a second pair of heated sealing heads 48. These heads are so located with respect to heads 42 that all transverse seals formed by one pair of sealing heads are located in a plane lying substantially at 90° to the plane containing all seals formed by the other pair of sealing heads. Referring to the tetrahedral package shown in FIG. 3, if the upper heads 42 place seal S1 at the top of package P, the lower heads 48 place the other seal S2. The two sealing heads 48 are mounted one on each of two parallel bars 50 which are mounted on the carriage 30 and move sealing heads 48 toward each other to flatten and seal the tube 14a as it passes between them and then away from each other to release the tube. The drive mechanism for the bars 50 is similar to that just described and includes links 51 which are also pivotally connected to pins on disc 53. Disc 53 is mounted on the upper end of shaft 32, there being a similar disc and a pair of crank pins at the other end of carriage 30 but not shown in FIG. 4.

After the first transverse seal is placed closing the end of the tubular web, each succeeding transverse seal completes a single tetrahedral package. The package is severed from the web following it by means of a cutter blade 55. This blade is shown in detail in FIGS. 5, 7 and 8 and is mounted for horizontal reciprocation in a slot 56 in one sealing head of each pair of sealing heads, such slot opening to the sealing face of the head. The blade 55 and the slot 56 in a sealing head 42 are shown in detail in FIG. 7. The other sealing head of the pair has a recess 57 into which the blade may enter in order to insure a clean cut through the web which is held between the two heads 42. The cutter blade 55 is located in the sealing head 42 near the bottom of FIG. 4 and in the right hand sealing head 48 of the other pair of heads. Each blade is reciprocated back and forth by an oper-

ating rod 59 which is pivotally connected at one end to the cutter blade and at the other end to piston 60 reciprocable within air cylinder 61. The air cylinder 61 is connected to a suitable source of air under pressure by means of conduit 62, flow of compressed air through conduit 62 being regulated by solenoid valve 63, which may be of any suitable construction. Each solenoid valve is actuated at the proper point in the cycle of package forming operations by switch 64 which in turn is actuated by rotary cam 65, or other suitable means. Cam 65 is attached to a shaft driven in timed relation with the remaining drive mechanism in order that switch 64 is closed and the cutter blade is operated at the proper point in the package forming cycle.

The pairs of sealing heads 42 and 48 are heated by any suitable means such as electrical resistance elements. Each pair of sealing heads, when they come together, engage the tube and flatten it to place on the tube a transverse seal. While the heads are still in sealing position and engaging the tube, the cutter blade 55 is reciprocated in order to sever the package, preferably at the center of the sealed area, from the following web which extends above the sealing heads and around the mandrel. As a consequence of various conditions, such as the pressure applied by the sealing heads to the web, the presence of a small amount of the heat sealing material on the faces of the sealing heads, and other conditions, the web tends to adhere to the sealing heads. For rapid, trouble-free operation of the packaging machine we provide means for positively stripping the web in the sealed area from engagement with the heated sealing heads. One form of such stripping means is shown in detail in FIGS. 5 and 6 and comprises a pair of mechanical gripping members associated with each pair of the two pairs of sealing heads.

Referring particularly to FIGS. 5 and 6 there will be seen rods 68 that have sections that are straight and parallel to each other. At one end, each of the rods is bent and attached to a pivot 69 which is mounted in bearing block 70. The bearing block is supported from bar 71 which is a part of the framework of carriage 30. Each of the pivots 69 is fixed with respect to the other and with respect to the carriage 30, and the two rods 68 rotate about these relatively fixed axes. Rods 68 are movable between a retracted position shown in full lines in FIG. 6 in which the two rods are separated sufficiently that the tubular web can pass freely between them, and an advanced position 68a, shown in broken lines in FIG. 6 in which the straight sections of the rods approach each other to engage the web at a position immediately below the sealing heads 42. The rods 68 engage the package immediately below the sealed area, as below the sealed area S1 in FIG. 6. In order to reduce the possibility of the package adhering to the bars, the straight central sections of the bars are preferably covered with a sleeve of Teflon or other similar material which has a minimum tendency to adhere to the packages.

By reference to FIGS. 5 and 6, it will be seen that there is connected to one end of each pivot 69 a lever 72; and that the outer ends of the two levers are connected by spring 74 in tension. When the gripping members 68 are in the retracted position of FIG. 6, spring 71 is above and at one side of the axes of the two pivots 69. When the gripping members are in this position, the pull of the spring tends to rotate them about their pivots in a direction to move away from one another. Thus they normally are held in the retracted position.

When the two gripping members 68 are moved to the package engaging position 68a shown in the broken lines in FIG. 6, spring 71 is passed over the centers of the two pivots 69 and is at the opposite side of these centers so that the force it applies to the two lever arms 72 is now in a direction to rotate the gripping members about their pivots in a direction opposite to that when in the retracted position. Consequently the two gripping members are

now urged by spring 74 to approach each other and grip the package between them. Thus the over-center type of mechanism provided by the two lever arms 72 and the spring 74 urges the gripping members in a direction to hold them at each extreme of their travel toward and away from each other, and yet allow the members to be moved from one extreme to the other.

As shown in FIGS. 5 and 6, there is mounted on each of bars 41 and 37 an angle bracket 76 carrying pin 77 engageable with one of the gripping members at the bent portion. As the sealing heads move toward each other, a bumper 78 on each of bars 41 and 37 engages a gripping member at the bent portion, and pushes them toward one another. As the spring 74 passes over the centers of pivots 69, the central portions of the two gripping members are pulled by the spring toward each other to engage the package as shown in FIG. 6. As the sealing heads move away from each other, at the sealing position, there is at first no movement of the gripping members 68 and they hold the web, which is now the severed package, stationary. The sealing heads thus pull away from and disengage the sealed area on the package. After enough movement of the heads to release the web, pins 77 engage the gripping members to pull them away from gripping position. Again as the spring 74 passes over the centers of pivot 69, the gripping members move with a snap action away from the gripping position to the retracted position.

Although there has been so far described and illustrated in detail in the drawings only one pair of gripping members 68 which are shown as associated with the sealing heads 42, it will be realized that a second pair of gripping members is likewise associated with the second pair of sealing heads 48. The construction and operation of the other pair of gripping members is the same as that already disclosed.

After the bottom of the tubular web has been closed by placing a transverse seal, as seal S1 indicated in FIG. 9, the tube is ready to receive a measured charge of product which is to be enclosed within the completed package. At this time tube 14a extends for some distance below the circular mandrel so that for the distance between the upper sealing heads 42 and the lower end of rigid mandrel 20 the tube 14a is unsupported by any mechanical means.

Powders, liquids, pastes, tablets, and so on are packaged by machines of the type herein disclosed. Since liquids are a very commonly packaged product, the filling means illustrated in FIG. 9 is particularly adapted to handling liquids; but it will be understood that this filling means is only typical of filling means which may be used with this invention. The liquid product to be packaged is introduced through conduit 80 into tube 81 which enters the upper end of mandrel 20. This liquid passes through tube 80 and is discharged from the lower end of mandrel 20 by nozzle 82, into the tubular web. After the product is discharged into the tubular web, another transverse seal is placed across the tubular web at a position above the product, this second seal forming the upper end of the package P.

Many substances which are packaged have a relatively low density and do not fully distend the tubular web. Under these circumstances, we introduce air into the interior of the tubular web in order to keep the web fully distended to its tubular shape so that in cross-section it is circular like the mandrel. Such air is introduced through conduit 85 into mandrel 20 and flows downwardly within the mandrel and around the tube 81 and nozzle 82 containing the product. It will be noted in FIG. 10 that there is a small annular clearance between the mandrel and the nozzle 82 through which this air can flow. Only a small pressure above atmospheric is required to keep the tubular walls fully distended, approximately one p.s.i. being satisfactory for this purpose. The web is wrapped snugly around the outside surface of mandrel 20 and there is

sufficient resistance to flow of air out of the lower end of the tube 14a between the web and the mandrel to insure an adequate internal pressure is maintained within the tube.

The internal air pressure within the web tube establishes a cylindrical shape for the tube a short distance above the sealing heads in the zone where the next transverse seal is to be placed. This eliminates any folds or wrinkles in the web caused by the lower transverse seal already made that would adversely affect the placement of the next higher transverse seal. Without distending the web by the internal air pressure, folds or wrinkles formed by one seal can extend upwardly of the tubular web for a sufficient distance to reach the location of the next transverse seal. Such wrinkles or folds mar the appearance of the package, and, if large enough, prevent the formation of a tight seal at the end of the package so that the package leaks.

Another advantage of distending the tubular web by internal pressure is that this introduction of air under pressure can be used as a part of the stripping means for disengaging the web from the heated sealing heads. It is of course possible to use mechanical strippers both above and below the sealed area formed by the heated sealing heads. The mechanical strippers already described below the heads hold the web stationary below the cutting blade but, because of the cut severing the package, have no influence on the web above the cutting blade. When slight air pressure is maintained internally of the tubular web, the length of tube between the mandrel and a pair of transverse sealing heads acquires sufficient stiffness that the end of tube 14a at the seal tends to remain stationary and disengage from the sealing heads as they move away from sealing position.

These characteristics of the tubular web when distended under internal air pressure contribute not only to easier and quicker filling of the packages but also make it possible for the packaging machine, to run at higher speeds without malfunctioning.

It will be evident from the foregoing disclosure that various changes in the arrangement and construction of the mechanisms forming part of our invention can be made without departing from the spirit and scope of the invention. Accordingly it is to be understood that the foregoing description is considered as being illustrative of, rather than limitative upon, the invention as defined by the appended claims.

We claim:

1. In a machine for producing filled packages of tetrahedral shape, said machine comprising a vertical mandrel, means for forming a tube of packaging material around the mandrel, the tube being heat-sealable on the inside, a vertically reciprocable carriage below the mandrel, first and second pairs of heat-sealing heads carried by the carriage for reciprocation with the carriage and movement relative to the carriage toward and away from each other to flatten the tube and to form transverse heat seals across the tube at package length intervals with successive transverse seals in different planes and alternate seals in the same plane so as to produce packages of tetrahedral shape, means for opening both said pairs of heads on each upward stroke of the carriage and for closing first one and then the other of said pairs of heads on successive downward strokes of the carriage, each pair of heads when closed and upon a downward stroke of the carriage acting to grip the tube and pull a package length thereof downward: first and second pairs of grippers associated respectively with the first and second pairs of heads and carried by the carriage for reciprocation with the carriage and for movement relative to the carriage, each pair of grippers being positioned to clamp the tube on a line extending transversely across the tube adjacent the heat seal formed by the respective pair of heads, and means for controlling each pair of grippers to clamp the tube upon closure of the respective pair of heads when the carriage

moves downward and to maintain the grippers clamped on the tube until after respective heads have started to open at the termination of a downward stroke of the carriage.

2. In a machine as set forth in claim 1, the means for controlling each pair of grippers comprising overcentering spring means adapted to overcenter in response to opening and closing of the respective pair of heads.

3. In a machine as set forth in claim 1, means for introducing a gas under pressure into the tube through the mandrel.

4. In a machine for producing filled packages of tetrahedral shape, said machine comprising a vertical mandrel, means for forming a tube of packaging material around the mandrel, the tube being heat-sealable on the inside, a vertically reciprocable carriage below the mandrel, first and second pairs of heat-sealing heads carried by the carriage for reciprocation with the carriage and for movement relative to the carriage toward and away from each other to flatten the tube and to form transverse heat seals across the tube at package length intervals with successive transverse seals in different planes and alternate seals in the same plane so as to produce packages of tetrahedral shape, means for opening both said pairs of heads on each upward stroke of the carriage and for closing first one and then the other of said pairs of heads on successive downward strokes of the carriage, each pair of heads when closed and upon a downward stroke of the carriage acting to grip the tube and pull a package length thereof downward: a first cutter associated with the first pair of heads for cutting the tube across the transverse seal made thereby, a second cutter associated with the second pair of heads for cutting the tube across the transverse seal made thereby, means for actuating the first cutter at the termination of alternate downward strokes of the carriage during which the tube is gripped by said first pair of heads, and means for actuating the second cutter at the termination of alternate downward strokes of the carriage during which the tube is gripped by said second pair of heads.

5. In a machine as set forth in claim 4, means for introducing a gas under pressure into the tube through the mandrel.

6. In a machine as set forth in claim 4, first and second pairs of grippers associated respectively with the first and second pairs of heads, and carried by the carriage for reciprocation with the carriage and for movement relative to the carriage, each pair of grippers being positioned to clamp the tube on a line extending transversely across the tube adjacent the heat seal formed by the respective pair of heads, and means for controlling each pair of grippers to clamp the tube upon closure of the respective pair of heads when the carriage moves downward and to maintain the grippers clamped on the tube until after the respective heads have started to open at the termination of a downward stroke of the carriage.

7. In a machine as set forth in claim 6, the means for controlling each pair of grippers comprising overcentering spring means adapted to overcenter in response to opening and closing of the respective pair of heads.

8. In a machine as set forth in claim 6, means for introducing a gas under pressure into the tube through the mandrel.

9. In a machine for producing filled packages of tetrahedral shape, said machine comprising a downwardly extending mandrel around which packaging material may be formed into a tube, the tube being sealable on the inside, means for intermittently feeding the tube downward off the lower end of the mandrel in package length increments and for forming transverse seals across the tube below the lower end of the mandrel at package length intervals with successive transverse seals in different planes and alternate seals in the same plane so as to produce packages of tetrahedral shape, said means including first and second pairs of sealing heads, the heads of the first pair being reciprocable toward and away from

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one another in a straight-line path to flatten the tube and form transverse seals in a first plane, and the heads of the second pair being reciprocable toward and away from one another also in a straight-line path to flatten the tube and form transverse seals in a second plane, a first cutter reciprocable with one of the first pair of sealing heads in its path and reciprocable relative to said one of the first pair of sealing heads in said path, means operable after the first pair of sealing heads has flattened the tube and formed a transverse seal in said first plane to reciprocate said first cutter relative to said one of the first pair of sealing heads to cut the tube across said transverse seal, a second cutter reciprocable with one of the second pair of sealing heads in its path and reciprocable relative to said one of the second pair of sealing

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heads in this path, and means operable after the second pair of sealing heads has flattened the tube and formed a transverse seal in said second plane to reciprocate the second cutter relative to said one of the second pair of sealing heads to cut the tube across this transverse seal.

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