May 14, 1963 G. NEUENDORF ETAL 3,089,298

ARRANGEMENT FOR CLOSING BAGS AND CONTAINERS

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FIG. 1

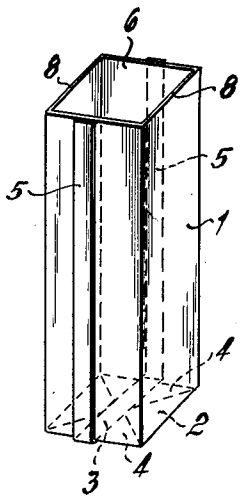


FIG. 2

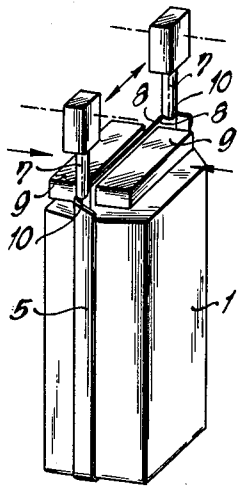


FIG. 3

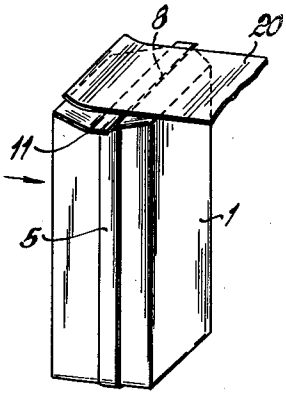


FIG. 4

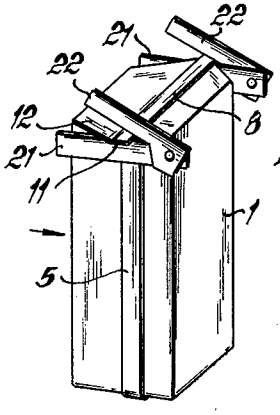


FIG. 5

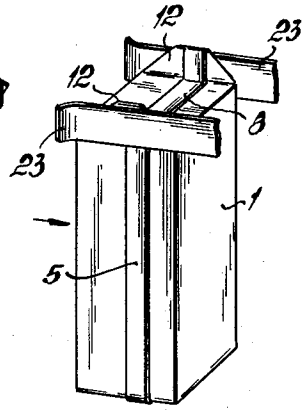


FIG. 6

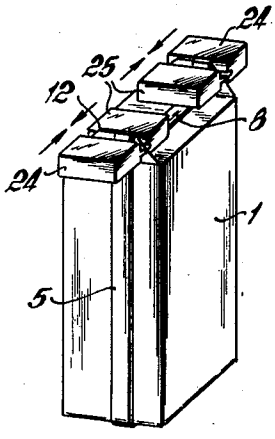
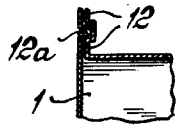


FIG. 6a



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Fig. 7

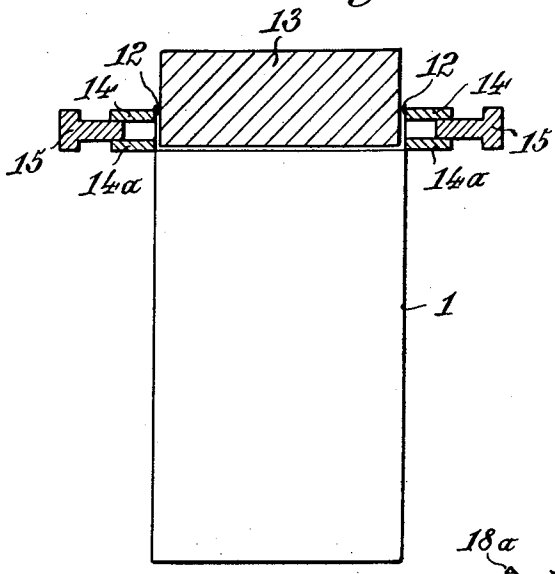


Fig. 8

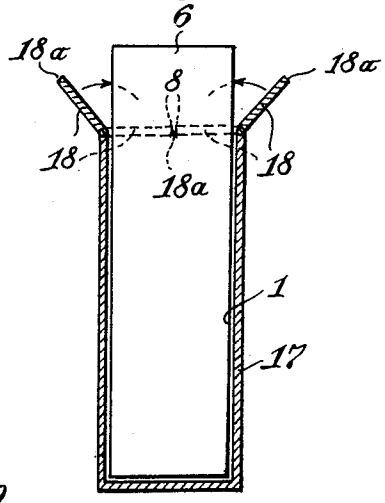
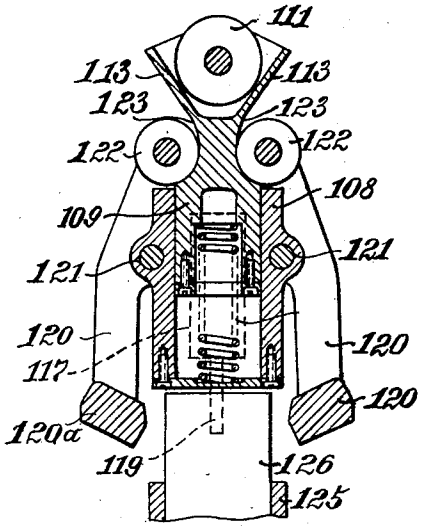


Fig. 10



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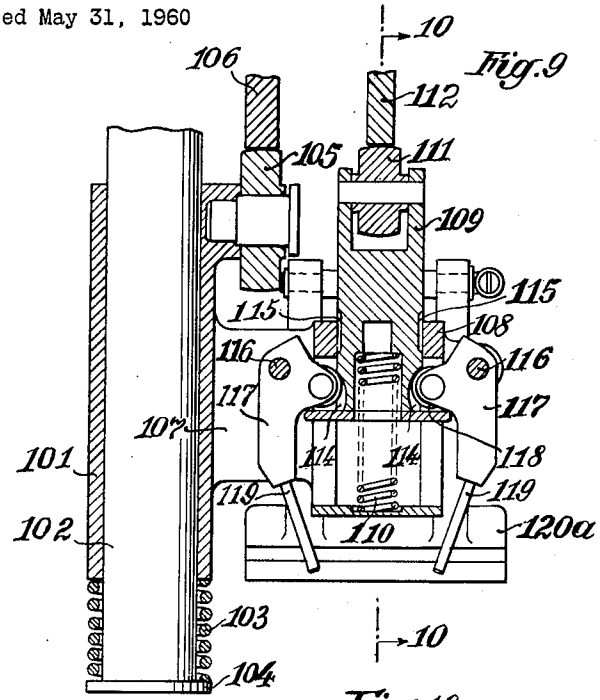
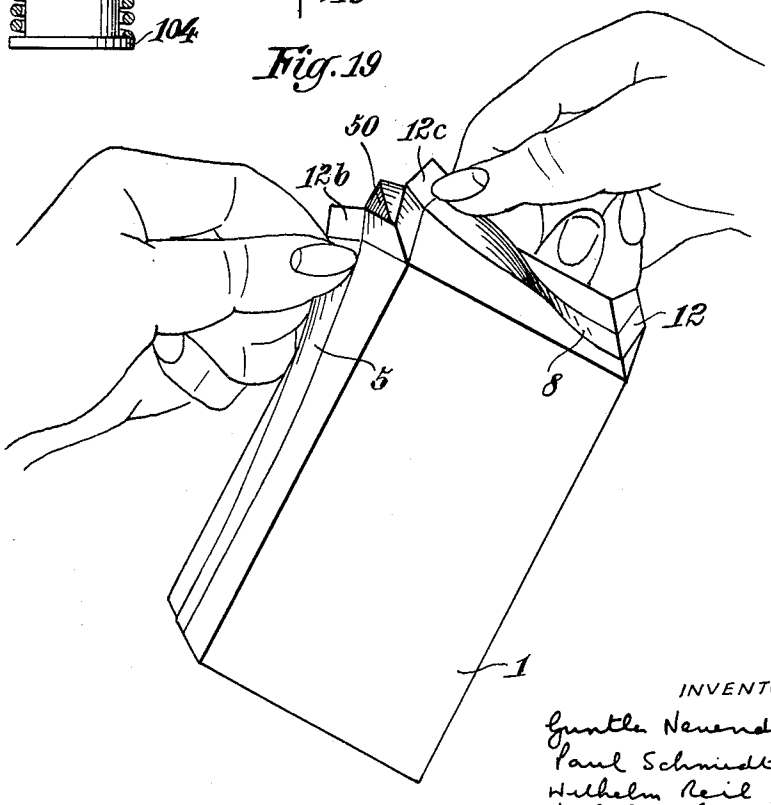


Fig. 9

Fig. 10



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ARRANGEMENT FOR CLOSING BAGS AND CONTAINERS

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Fig. 11

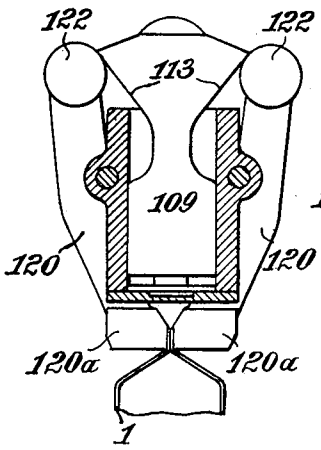


Fig. 12

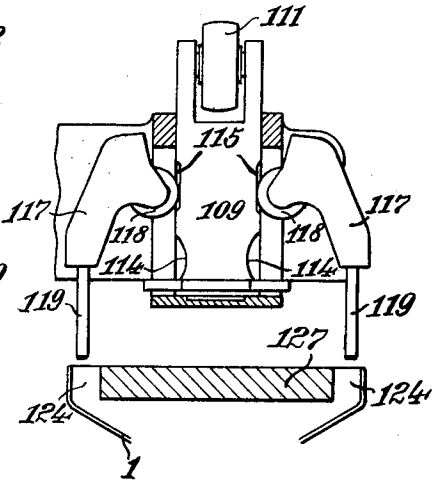


Fig. 13

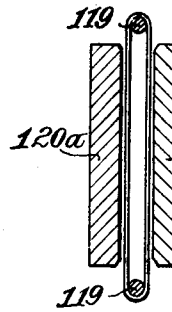


Fig. 14

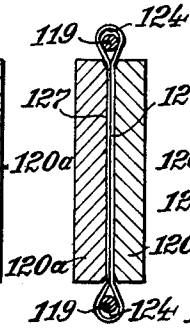
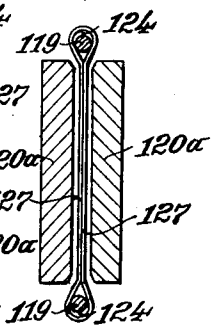


Fig. 15



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ARRANGEMENT FOR CLOSING BAGS AND CONTAINERS

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Fig. 17

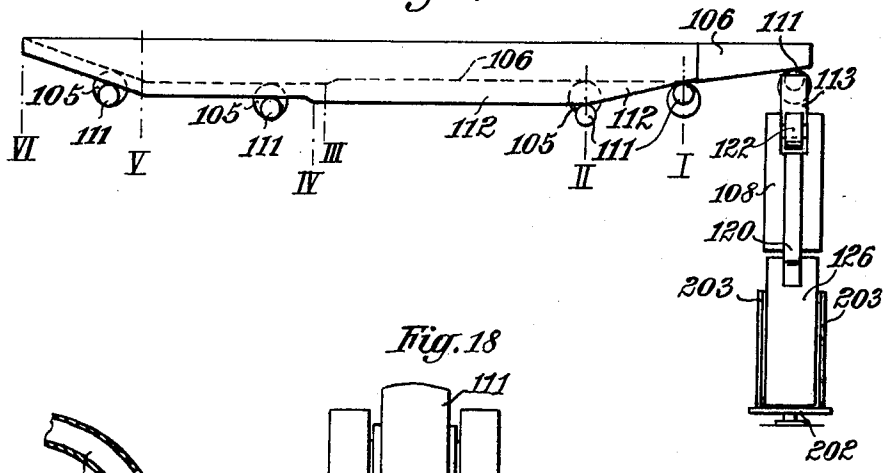
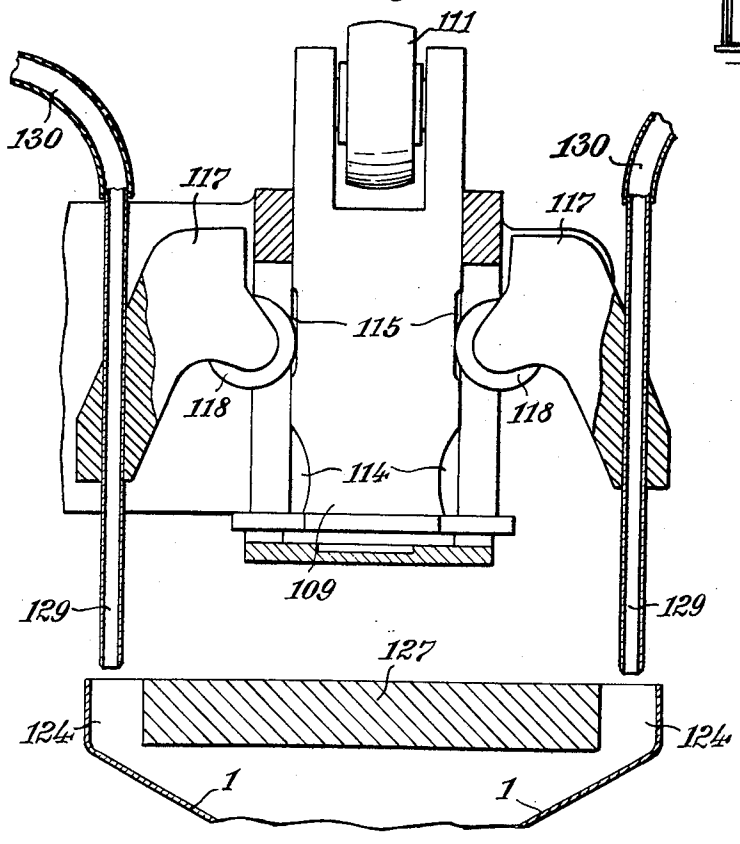


Fig. 18



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ARRANGEMENT FOR CLOSING BAGS AND CONTAINERS

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Fig. 20

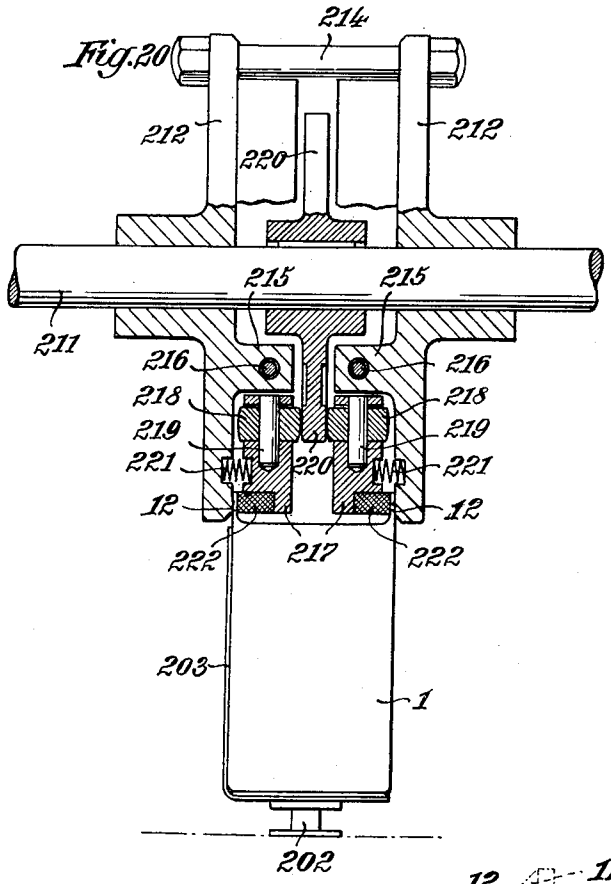
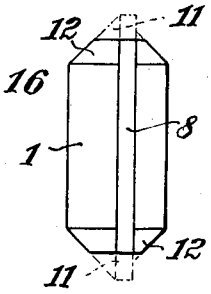


Fig. 16



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ARRANGEMENT FOR CLOSING BAGS AND CONTAINERS

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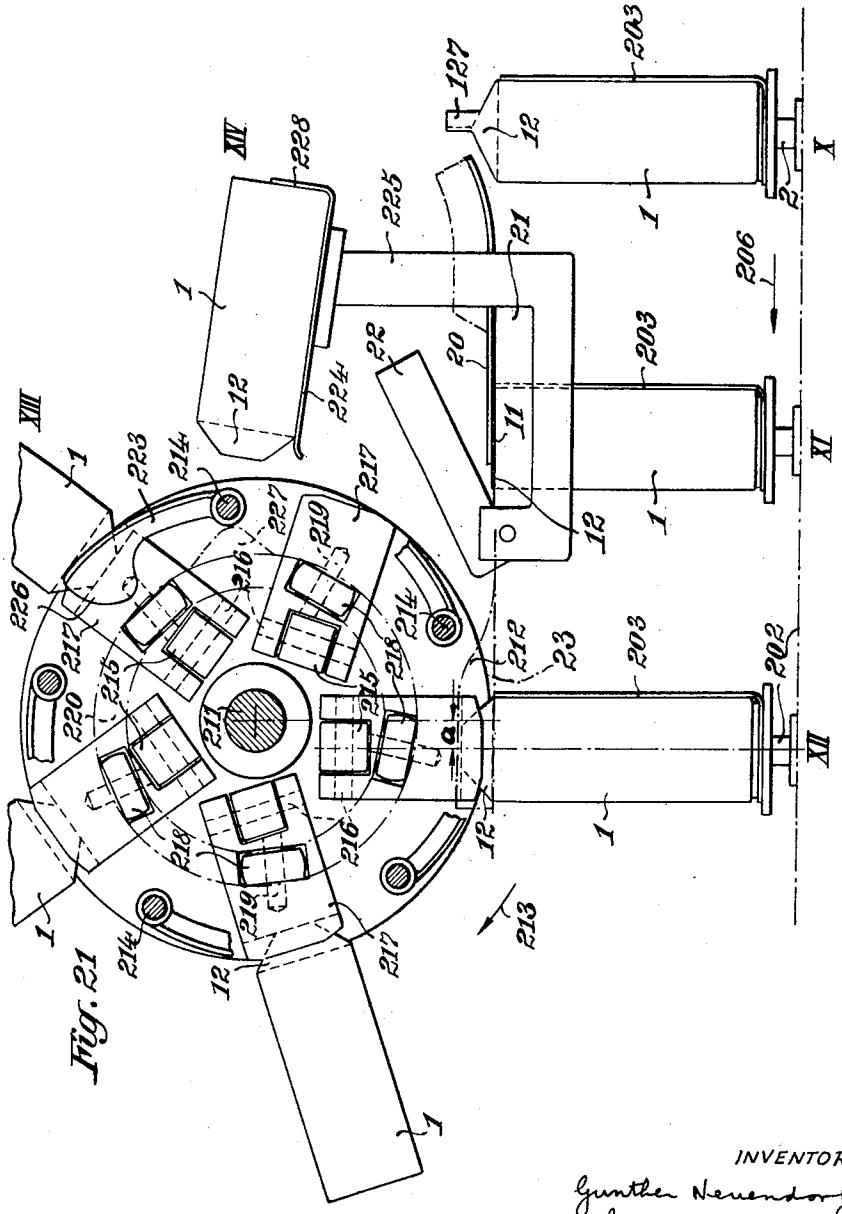


Fig. 21

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United States Patent Office 3,089,298 Patented May 14, 1963

3,089,298

ARRANGEMENT FOR CLOSING BAGS AND CONTAINERS

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Claims priority, application Germany June 2, 1959
19 Claims. (Cl. 53—112)

The present invention relates to an arrangement for closing bags and containers, and more particularly to an apparatus and a method for closing and sealing the open end of a prismatic container consisting of a sealable sheet material, such as a synthetic plastic material, paper with a sealable layer, and so forth.

The type of containers with which the present invention is concerned is generally used for liquid, semi-liquid or paste material.

The present invention is particularly concerned with the closing of the open end of a container, whose bottom and side walls were previously formed and sealed.

According to known arrangements, the open container is filled, whereupon the walls of the container end are spread apart by a pair of spreading members. When two side wall portions of the container are superimposed, the spreading members are withdrawn, whereupon the superimposed side wall portions of the container are sealed along the entire length thereof along a single line.

This method has the disadvantage that the side wall portions are not fully superimposed where the spreading members were withdrawn, so that the sealing seam is not perfect at these points. Folds and wrinkles may develop between the sealing members, and preclude a tight closure of the container.

Other known arrangements provide tubular members which are inserted into the open end of the filled container to remove the air, or to introduce a suitable gas. Since the tubular members have to remain in the container until the sealing is completed, it is necessary to provide rubber sealing jaws which are compressed by the inserted tubular members between the sealing jaws, and only after the container walls are pressed together by the sealing jaws, the tubular members are withdrawn. This operation frequently resulted in imperfect sealing of the filled container.

It is one object of the present invention to improve the apparatus and method of the prior art, and to provide an arrangement for closing the open end of a filled bag or container by which a tight and reliable closure is obtained.

Another object of the present invention is to provide a method and apparatus for closing a container in such a manner, that a short sealing seam can be opened for discharge of the contents of the container.

Another object of the invention is to provide a method and apparatus permitting evacuation of air, or introduction of a suitable gas into the container, while nevertheless tight sealing seams are produced.

A related object of the present invention is to apply tubular spreading member through which the air can be removed from the container, or replaced by a suitable gas.

Another object of the present invention is to close and seal a container in such a manner that open flaps are formed of superimposed wall portions, whereupon such flaps are independently sealed to permit later discharge of the contents of the container by opening only one of the independently sealed flaps.

Another object of the present invention is to provide a sealed opening on the closed container which, when

opened, permits the insertion of a straw through a small opening, without requiring full opening of the container.

With these objects in view, the present invention mainly consists in a method and apparatus for closing the open end of a container. In accordance with one method of the present invention, a pair of opposite narrow portions of the side walls of the container are spread apart to superimpose the remaining wider portions of the side walls. The superimposed portions have triangular flaps laterally projecting from the main body of the container and including the narrow portions. Thereupon, the superimposed portions are sealed to each other intermediate the flaps, which remain open, and finally the flaps are sealed by independent sealing seams so that only one of the flaps has to be opened for discharge of the contents of the container.

Preferably, the tips of the flaps are first cut off, and the flaps are transversely collapsed so that they assume a trapezoidal shape permitting short transverse sealing seams to be formed. The flaps are then flattened and then superimposed on the sealed side wall portions so that a flat top wall is formed on the container.

The spreading step is preferably carried out by a pair of tubular spreading members, through which the air can be removed from the container. After withdrawal of the tubular spreading members, the flaps are closed by transverse sealing seams.

The apparatus of the present invention comprises a pair of spreading members which can be inserted into and withdrawn from the open end of a container, and a pair of sealing members movable transverse to the spreading members to a sealing position in which the sealing members are located between the spreading members. Since the sealing members are shorter than the distance between the spreading members, container wall portions superimposed by the action of the spreading members can be sealed by the sealing members while the spreading members are still within the container walls. Control means are provided for operating the spreading and sealing members in the required sequence.

The sealing members and spreading members form laterally projecting triangular flaps, whose tips are cut off by cutting means, and in one embodiment of the present invention the flaps are flattened and clamped between other sealing means which simultaneously transport the closed container and seal the flaps.

In the preferred embodiment of the present invention, the spreading members and sealing members have cam followers and are mounted on a carrier element. A shiftable element having cam tracks thereon is moved by other cam means relative to the carrier member, so that the spreading members and sealing members are operated. Other cam means move the carrier member for placing the spreading members and the sealing members in the proper position relative to the container to be sealed.

The thus sealed containers have still open triangular flaps, and are conveyed to cutting means which cut off the tips of the flaps to enlarge the openings through which the spreading members were withdrawn. Thereupon, the flaps are gripped by other sealing members which are mounted on a turnable member, and while the container is transported by the turnable member, the other sealing members thereon seal the flaps.

Preferably, the spreading members do not remain in fully spread position while the sealing members seal the superimposed wall portions of the container. Before the sealing members assume the sealing position, the spreading members are slightly moved toward each other to release the container walls, so that the sealing members can clamp the superimposed container walls without producing tension in the superimposed walls or on the spreading members.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIGS. 1 to 6 are perspective views illustrating consecutive operations in accordance with the present invention for closing the open end of a prismatic container;

FIG. 6*a* is a schematic fragmentary sectional view illustrating a particular sealing seam on the container;

FIG. 7 is a fragmentary sectional view illustrating one embodiment of a sealing arrangement;

FIG. 8 is a fragmentary sectional view illustrating another modified embodiment;

FIG. 9 is a sectional view illustrating a preferred embodiment of the present invention;

FIG. 10 is a sectional view taken on line **10—10** in FIG. 9;

FIG. 11 is a schematic fragmentary sectional view taken on line **10—10** in FIG. 9 and illustrating another operational position;

FIG. 12 is a fragmentary schematic sectional view corresponding to FIG. 9 but illustrating another operational position of the device;

FIGS. 13, 14 and 15 are cross-sectional views of the spreading and sealing members illustrating consecutive operational positions of these members during the closure of the open end of a container;

FIG. 16 is a top view of a partly sealed container whose flaps were cut off;

FIG. 17 is a schematic side view of the cam means by which the device of FIGS. 9 and 10 is operated;

FIG. 18 is a fragmentary side view, partly in section illustrating a modified apparatus according to the present invention;

FIG. 19 is a perspective view illustrating the opening of a sealed container according to the present invention;

FIG. 20 is an axial sectional view illustrating a device for completing the sealing of the container; and

FIG. 21 includes a cross-section of the device shown in FIG. 20, and a side elevation of cutting means, and transporting means for the containers.

Referring now to the drawings, and more particularly to FIGS. 1 to 6, which schematically illustrate the consecutive operations for closing an open prismatic container after filling, FIG. 1 shows the container in the condition in which it is filled. The container is of prismatic shape, has side wall means **1** and a bottom **2**. The container is sealed along a longitudinal seam **5**, and flaps **4** and **4'** which are formed when the flat bottom is made, are laid flat onto the bottom **2** and are bonded to the same. The container has an open end **6**. A pair of spreading members **7** is inserted in a closely spaced inoperative position into the open end **6** of the container, and when the spreading members **7** are moved apart in the direction of the arrow in FIG. 2, they engage narrow side wall portions, and spread the same apart so that wider portions **8** of the side wall means **1** are superimposed. At the same time, sealing members **9** are placed on both sides of the superimposed side wall portions **8**. This position is also illustrated in FIG. 13 in which the spreading members **119** cooperate with sealing members **120***a*, while the side wall portions are designated by reference numeral **127**. As FIGS. 2 and 13 clearly show, the transverse length of the sealing members is less than the distance between the spreading members in spreading position, so that the sealing members can be moved to a sealing position clamping the superimposed side wall portions of the container, and forming a sealed seam thereon.

As shown in FIG. 14, spreading members **7**, or **119**, are first moved slightly toward each other to release the previously engaged narrow side wall portions **124** so that

no stress is caused by the clamping action of the sealing members. As shown in FIG. 15, the sealing members are retracted after the seal has been formed, whereupon the sealing members and the spreading members are withdrawn from the container. After this operation, the superimposed side wall portions have lateral substantially triangular flaps which project from the main body of the container, and have openings **10** from which the spreading members **7** were withdrawn. These openings are not sealed, since the sealing members **9** do not extend into the region of the spreading members.

The container is now transported in the direction of the arrow in FIG. 3 and passes under a flattening member **20** which flattens the superimposed and sealed portions **8** so that the flaps **12** laterally project, as also shown in the top view of FIG. 16. The corresponding side walls of the container are preferably constrained at this point, so that the prismatic shape of the container is re-established throughout its height.

The container is now transported to cutting means **21, 22** which cut off the tips of the flattened flaps **12**, as shown in FIGS. 4 and 16, so that trapeze-shaped flaps are formed which have openings **11**.

As shown in FIG. 5, the conveyor is transported to pass between a pair of shaping members **23** which turn up flaps **12**. Pairs of other sealing members **24** and **25** are now applied to the flaps **12**, to form transverse sealing seams on the same by which the openings **11** are closed. Sealing members **24, 25** are preferably formed with a projecting ridge and a corresponding groove, to make the sealing seam **12***a* in the form of a bead as shown in FIG. 6*a*.

In a modified arrangement of the present invention, a single sealing block **13** is substituted for the inner sealing members **25**, as shown in FIG. 7. The sealing members **15** are guided between pairs of guide members **14** and **14***a* to press the flaps **12** against the sealing block **13**.

In the modified arrangement of FIG. 8, the container is placed in a holder **17** of matching shape, which has two pivoted plate members **18**. After the opened container is inserted into the holder **17**, plate members **18** are inwardly turned, and the edges **18***a* are spaced a distance corresponding to two wall thicknesses of the container so that a pair of superimposed portions **8** is formed which have triangular lateral flaps, as described with reference to FIG. 2. Plate members **18** are heated by suitable means, not shown, as are the previously mentioned sealing members **9** and **120***a*, so that a seam is formed at the center of the superimposed wall portions **8**. The other operations are performed in the same manner as described with reference to FIGS. 1 to 6, and 13 to 15.

The operations described with reference to FIGS. 1 to 6 are preferably carried out by the apparatus illustrated in FIGS. 9 to 21. A first support member is provided for transporting a plurality of containers, and this support member preferably includes a conveyor belt **202**, and open holders **203** mounted on the conveyor belt, as shown in FIG. 21. A second support member **104, 102**, shown in FIG. 9 moves along a second path parallel to the path of the containers **1**. The paths may be straight, or circular, depending on the construction of the conveying means, but the two supporting members must move at the same speed, or be at a standstill at the same time.

A carrier element is mounted on the support element **102**, and includes a sleeves **101** urged by a spring **103** to assume a position in which a first cam follower roller **105** engages a stationary cam **106**, also shown in FIG. 17. In the event that the movement takes place along a circular path, cam **106** would have a substantially circular shape.

The carrier element includes an arm **107** secured to sleeve **102**, and a cylindrical bearing **108**. A shiftable member **109** is mounted in bearing **108** and is urged by

a spring **110** into a position in which a second cam follower roller **111** rolls on a stationary cam **112**, also shown in FIG. 17.

As shown in FIG. 9, shiftable member **109** has a pair of cam tracks including recessed cam track portions **114**, and spaced therefrom less recessed cam track portion **115**, the recess cam shaft portion being separated by a higher portion of the cam track.

As best seen in FIG. 10, shiftable member **109** has another pair of cam track portions **113** which are angularly displaced at an angle of 90 degrees with respect to the cam track portions **114** and **115**. The portion **107** of the carrier member has a pair of pins **116** on which a pair of cam follower elements **117** is turnably mounted. Cam follower elements **117** include rollers **116** which cooperate with the pair of cam tracks **114**, **115**. A pair of spreading members **119** is secured to the cam follower elements **117** and are normally in the closely spaced inoperative position illustrated in FIG. 9 since cam follower rollers **118** are located in the recessed cam portion **114**. However, when shiftable member **109** is lowered by a projecting portion of cam means **112**, rollers **118** pass to the higher intermediate cam portions, and effect spreading of the spreading members **119** to a farther spaced spread position in which spreading members **119** are slightly farther spaced than shown in FIG. 12. This spreading position is illustrated in FIG. 13, from which it will become apparent that the open end of the container is spread and flattened to form two opposite portions. When shiftable member **109** is further downward moved to the position shown in FIG. 12, rollers **118** enter into the slightly depressed cam track portions **115**, so that the spreading members **119** perform a slight inward movement to the positions illustrated in FIGS. 12 and 14, in which they release the side wall of the container.

As shown in FIG. 10, the carrier member and more particularly the bearing sleeve **108** turnably supports a pair of cam follower elements including levers **120** and rollers **122**. Sealing members **120***a* are secured to the ends of the levers **120** and are normally in the inoperative position illustrated in FIG. 10, since rollers **122** engage the most depressed portion of cam tracks **123**.

When a projecting portion of cam **112**, see FIGS. 9 and 17, engages the second cam follower roller **111**, the shiftable member is downwardly moved, as described above, and if the carrier member **101**, **107**, **108** is not displaced at the same rate, rollers **122** will travel along the cam tracks **113**, effecting a turning movement of levers **120** so that sealing members **120***a* move inwardly toward each other to the position illustrated in FIG. 14 in which the side wall portions **127** of the open container ends are pressed against each other, and sealed by the heated sealing members **120***a*. The spring **110** abuts on a bottom plate of the carrier part **108** and against a recessed shoulder in shiftable member **109**, so that the shiftable element **109** tends to assume the position shown in FIGS. 9 and 10 in which the spreading members **119** and the sealing members **120***a* are inoperative. It will be appreciated that the pair of cam tracks **114**, **115**, and the pair of cam tracks **113** are designed in such a manner as to obtain a desired sequence of movement of the spreading member **119** and sealing members **120***a*, as illustrated in FIGS. 13 and 14. When rollers **122** engage the highest portions of cam tracks **113**, as shown in FIG. 11, the sealing members **120***a* firmly press superimposed container wall portions **127** against each other and seal the same by application of heat. After the sealing has been completed, the sealing members **120***a* move apart to the position shown in FIG. 15.

FIG. 18 illustrates a modified embodiment which corresponds to the above described apparatus, and consequently, corresponding parts are designated by the reference numerals used in FIGS. 9 and 10. In the modified embodiment of FIG. 18, the spreading members **129** are tubular, and have rear ends attached to flexible tubes **130** which are connected to suitable pump means by which air can be evacuated from the container while the spreading members **129** are still in the openings **124**. Such removal of the air is either carried out by sucking out the air, or by introducing a suitable gas through at least one of the tubular spreading members **129** which effects removal of the air from the container, and replacement of the air by a suitable gas. The pumps used for this purpose are not shown in FIG. 18, since they are of a conventional construction well-known to those skilled in the art.

The above-described apparatus is operated in the following manner: At the beginning of the operation, the cam follower rollers **105** and **111** are in the position illustrated at the right end of FIG. 17, with at least cam follower roller **105** engaging cam track **106** under the action of spring **103**. Spreading members **119**, or **129** in the embodiment of FIG. 18, are in the inoperative position shown in FIG. 9, and furthermore above the open end of a container which is transported and moves at the same speed along cam **106**. Sealing members **120***a* are also in the open inoperative position shown in FIG. 10. The container has the shape shown in FIG. 1.

During movement toward station I in FIG. 17, the carrier member **101**, **107**, **108** is downwardly moved by the pressure of cam means **106** on the roller **105**. Consequently, the spreading member **119** in closely spaced inoperative position is moved into the open end of container **6**, while the sealing member **120***a* is placed on opposite sides of a container **126** which is located in a holder **203**, as shown in FIG. 10.

Between stations I and II, cam track **106** does not rise, while cam track **112** rises. Consequently, carrier member **101**, **107**, **108** remains in the same position, while shiftable member **109** is downwardly urged by cam follower roller **111** engaging cam means **112**. During such downward movement of shiftable member **109**, rollers **118** will move out of the depressed cam track portions **114** and be located on the highest cam track portion adjacent thereto. This effects pivotal movement of spreading members **119** to the farthest spaced spreading position illustrated in FIG. 13. The top portion of the container is deformed, and two side wall portions are located opposite each other, while in the region of the spreading members **119**, two laterally projecting substantially triangular flaps are formed of the superimposed wall portions which project from the main body of the container. The downward movement of the shiftable member **109** also effects movement of the sealing member **120***a* toward each other. Shortly before station II is reached, shiftable member **109** is downwardly urged, to such extent that rollers **118** are located in the depressed cam track portions **115**, see FIG. 12, in which the spreading members move slightly toward each other to release the container wall portions **124**, as shown in FIG. 14. When the device is at the station II, spreading members **119** are in the position of FIG. 12, while the sealing members have assumed the sealing position shown in FIG. 14 in which the container wall portions **127** are fully superimposed and pressed against each other, while heat is applied by the sealing members **120***a* to form a sealing seam on wall portions **127**. Due to the release of the container wall by the slightly inwardly moved spreading member **119**, the spreading members **119**, and the walls of the container are not subjected to any stress. The device moves now from station II to station III while the position of FIG. 14 is maintained and the container walls are heated and sealed by sealing members **120***a*. During movement between stations II and III, cam follower **105** preferably releases cam **106**.

At the station III, a raised portion of cam **106** slightly depresses carrier member **101**, **107**, while between stations IV and V cam means **112** is slightly recessed so

that sealing members 120*a* are slightly spaced apart, as shown in FIG. 15. The depressed cam track portions 115 are long enough so that rollers 118 remain in the depressed cam track portions 115 during movement of the device from station IV to station V, and the spreading members 119 remain in the position shown in FIGS. 14 and 15. The sealing seam formed by sealing members 120*a* is sufficiently cooled at the station V, where the cam means 106 and 112 permit rising of the carrier member under the action of spring 103, and of the shiftable member 109 under the action of spring 110, so that the spreading members 119 and the sealing members 120*a* are withdrawn from the region of the top end of the container, while simultaneously moving to the inoperative positions shown in FIGS. 9 and 10, which are again obtained at the station VI.

The operations take place in exactly the same manner when the modification of FIG. 18 is substituted. However, between stations IV and V, suction is applied to the tubular spreading members 129, or a gas is introduced through the same into the container. After the air has been removed from the container, the tubular spreading members 129 are retracted between stations V and VI, as explained above.

FIGS. 12 and 18 show in the lower portion thereof the triangular flaps with openings 124 which project from the main body of the container and are located on opposite ends of the sealed seam indicated by hatching and formed on the superimposed container walls 127.

Referring now to FIG. 21, the conveyor 202 with open holders 203 is shown to transport containers 1. At the station X, the container is in the condition in which it left station VI in FIG. 17. As a container moves from station X to station XI, the projecting portion 127, 124 passes under a flattening member 20, and is flattened as previously explained with reference to FIG. 3. At the same time, parallel blades 21 of cutting means engage the side walls of the container, and restore the same to prismatic form, while triangular flaps project from the side walls of the container. The movable blades 22 are actuated to cut off the tips of the triangular flaps, as shown in FIG. 16, so that trapeze-shaped flaps 12 are formed which have substantial corresponding openings 11. The openings 122, which were previously left by the spreading members 119, are thereby removed.

This operation corresponds to the schematic showing of FIG. 4, and thereupon the container is guided between a pair of shaping members as shown in FIG. 5 which turn up the trapeze-shaped flaps 12.

As explained with reference to FIG. 6, it is now desired to form transverse sealing seams closing the openings 11 in flaps 12. A device serving this purpose is illustrated in FIGS. 20 and 21.

A stationary shaft 211 turnably carries a member which includes a pair of circular plates 212 connected by bolts 214. Pairs of sealing members 217 are mounted on the inner sides of plates 212 for pivotal movement about pins 216 which are supported in lugs 215 on the inside of plates 212. Sealing members 217 preferably have elastic inserts 222 which are located opposite corresponding portions of the plates 212. Cam follower rollers 218 are turnably mounted on pins 219 of sealing members 217 and cooperate with a circular cam track on a stationary cam means 220. Springs 221 urge sealing members 217 away from the respective sections of plates 212 and into a position in which cam rollers 218 roll along the cam tracks of cam means 220 during turning movement of plates 212 in direction of the arrow 213 in FIG. 21. Member 212, 214, with the attached sealing members 217, is turned by conventional drive means, not shown, for example, a gear may be secured to the hub of one plate 212, and driven through a suitable transmission from an electric motor. Such turning movement is synchronized with the movement of conveyor 202 so that the speed of the containers 1 at station XII in FIG. 21 is substantially equal to the peripheral speed of the sealing members 217, 222.

Preferably, the plates 212 are heated by suitable electric heating means, not shown, so that the sealing members 217, 222 are heated by convection.

In the embodiment illustrated in FIGS. 20 and 21, five pairs of sealing members 217 are provided. The diameter of plates 212, and the number of the sealing members 217 depends on the desired output of the machine, on the number of containers supplied by conveyor 202 in a time unit, on the desired sealing time, and on the preferred sealing temperature.

Each pair of sealing members 217 is associated with ejector member 223 which is turnably mounted on a bolt 214, and has a cam follower portion 226 cooperating with a radial cam lug 227 on the stationary cam means 220. Each ejector member 223 is located between a pair of sealing members 217, and is outwardly moved when cam follower portion 226 engages cam lug 227 which occurs once each revolution of blades 212. Cam lug 227 is located opposite a receiving means including a substantial horizontal member 224 and a rear wall 228 which is advantageously mounted on the support of the cutting means 21.

The apparatus illustrated in FIGS. 20 and 21 operates in the following manner: Containers 1 with upturned flaps 12 are transported to station XII where the upturned flaps project between the plates 212. The movement of the turnable member 212, 214 is synchronized with the movement of conveyor 202, so that a pair of sealing members 217 is located at station XII when a container arrives at this station. Cam 220 has such a shape that sealing members 217 are widely spaced from the corresponding matching portions of plates 212, permitting flaps 12 to enter between the respective pair of sealing members 217 and the corresponding sealing portions of plates 212. Directly thereafter, cam followers 218 engage a raised cam portion of the circular cam track of cam means 220, and are moved to a clamping and sealing position shown in FIG. 20 in which the flaps 12 are clamped between sealing members 217, 222 and plates 12. Consequently, the turning member 212, 214, 217 will lift the container 1 out of the open holder 203, and will carry the container along a circular path toward station XIII. During such movement, sealing members 217 remain in sealing position, so that the containers are not only firmly held, but also provided with transverse seals across the trapeze-shaped flaps 12 which effect closing of the opening 211 formed by the cutting means 21, 22.

When the respective pair of sealing members 217 has passed station XIII after a time sufficient for effecting a perfect sealing seam, projection 226 engages cam lug 227, and the respective ejector member 223 is outwardly pivoted, while the cam track of cam means 220 tapers to permit springs 221 to open the sealing members 217. The outward movement of ejector member 223 pushes the thus released container away from the sealing members 217 so that it is deposited on receiving means 224, 228 provided at station XIV.

This operation corresponds to the schematic showing of FIG. 6, and it will be understood that the sealing faces on the inner surface of plates 212 are provided with projecting ridges for forming a beaded seam as shown in FIG. 6*a*.

The flaps 12 are now flattened by suitable means similar to flattening member 20. When it is desired to open the container, only one of the seams formed in the flaps 12 has to be opened so that it is possible to discharge the contents of the container through the respective opened flap portion 12, which acts as a spout. It is also very convenient to insert a straw into the opened flap. A corresponding arrangement is shown in FIG. 19 where the opening 50 is formed by pulling apart the sealing seams 12*b* and 12*c*.

It will be understood that each of the elements de-

scribed above, or two or more together, may also find a useful application in other types of container closing arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in a method and apparatus for sealing a container, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A container-making apparatus, comprising, in combination, a first support member for supporting a container having an open end; a second support member, one of said support members being movable toward and away from the other support member; a pair of spreading members mounted on said second support member movable between an inoperative position closely spaced from each other and a farther spaced spreading position; a pair of sealing members mounted on one of said support members movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position; control means operatively connected to said one support member and to said spreading and sealing members for first moving said one supporting member to a position in which said spreading members are located in the open end of a container supported on said first supporting member, for then moving said spreading members to said spreading position and for thereupon moving said sealing members to said sealing position for sealing superimposed container wall portions spread by said spreading members whereby lateral flaps are formed, and for moving said spreading and sealing members in reverse order to said inoperative positions and said one supporting member away from the other supporting member, means for cutting said flaps, and means for collapsing and sealing said flaps so that each of said flaps can be independently opened for discharge of the contents of the container.

2. A container-making apparatus, comprising, in combination, a first support member for supporting a container having an open end; a second support member, one of said support members being movable toward and away from the other support member; a pair of spreading members mounted on said second support member movable between an inoperative position closely spaced from each other and a farther spaced spreading position; a pair of sealing members mounted on said second support member movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position; control means operatively connected to said one support member and to said spreading and sealing members for first moving said one supporting member to a position in which said spreading members are located in the open end of a container supported on said first supporting member, for then moving said spreading members to said spreading position and for thereupon moving said sealing members to said sealing position for sealing superimposed container wall portions spread by said spreading members whereby lateral flaps are formed, and for moving said spreading and sealing members in reverse order to said inoperative positions, and said one supporting member away from the other supporting member; means for cutting off the tips of the flaps of the superimposed container wall portions; means for collapsing and flattening the flaps; and other sealing members for sealing said flaps so that the flaps can be independently opened for discharge of the contents of the container.

3. A container-making apparatus, comprising, in combination, a first support member for supporting a container having an open end; a second support member, one of said support members being movable toward and away from the other support member, said support members being movable at the same speed and in the same direction; a pair of spreading members mounted on said second support member movable between an inoperative position closely spaced from each other and a farther spaced spreading position; a pair of sealing members mounted on said second support member movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position; and control means including stationary cam means and cam follower means operatively connected to said one support member and to said spreading and sealing members for first moving said one supporting member to a position in which said spreading members are located in the open end of a container supported on said first supporting member, for then moving said spreading members to said spreading position and forthereupon moving said sealing members to said sealing position for sealing superimposed container wall portions spread by said spreading members whereby lateral flaps are formed, and for moving said spreading and sealing members in reverse order to said inoperative positions, and said one supporting member away from the other supporting member.

4. A container-making apparatus, comprising, in combination, a first support member for supporting a container having an open end; a second support member, said first support member being movable toward and away from the other support member, said support members being movable at the same speed and in the same direction; a pair of spreading members mounted on said second support member movable between an inoperative position closely spaced from each other and a farther spaced spreading position; a pair of sealing members mounted on said second support member movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position; control means including stationary cam means and cam followers means operatively connected to said first support member and to said spreading and sealing members for first moving said one supporting member to a position in which said spreading members are located in the open end of a container supported on said first supporting member, for then moving said spreading members to said spreading position and for thereupon moving said sealing members to said sealing position for sealing superimposed container wall portions spread by said spreading members whereby lateral flaps are formed, and for moving said spreading and sealing member in reverse order to said inoperative positions, and said one supporting member away from the other supporting member; means for cutting off the

tips of the flaps of the superimposed container wall portions; means for collapsing and flattening the flaps; and other sealing members for sealing said flaps so that the flaps can be independently opened for discharge of the contents of the container.

5. A container-making apparatus, comprising, in combination, a first support member for supporting a container having an open end; a second support member, one of said support members being movable toward and away from the other support member; a pair of tubular spreading members mounted on said second support member movable between and inoperative position closely spaced from each other and a farther spaced spreading position; a pair of sealing members mounted on said second support member movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position; control means operatively connected to said one support member and to said spreading and sealing members for first moving said one supporting member to a position in which said spreading members are located in the open end of a container supported on said first supporting member so that a gaseous medium may be introduced into, or sucked out from the container through said tubular spreading members, for then moving said spreading members to said spreading position and for thereupon moving said sealing members to said sealing position for sealing superimposed container wall portions spread by said spreading members whereby lateral flaps are formed, and for moving said spreading and sealing members in reverse order to said inoperative positions and said one supporting member away from the other supporting member; and other sealing members for sealing said flaps.

6. A container-making apparatus, comprising, in combination, a first support member for supporting a container having an open end; a second support member, one of said support members being movable toward and away from the other support member; a pair of spreading members mounted on said second support member movable between an inoperative position closely spaced from each other and a farther spaced spreading position; a pair of sealing members mounted on said second support member movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position; and control means operatively connected to said one support member and to said spreading and sealing members for first moving said one supporting member to a position in which said spreading members are located in the open end of a container supported on said first supporting member, for then moving said spreading members to said spreading position, then moving said spreading members a short distance toward each other to release the container wall, and for thereupon moving said sealing members to said sealing position for sealing superimposed container wall portions spread by said spreading members whereby lateral flaps are formed, and for moving said spreading and sealing members in reverse order to said inoperative positions, and said one supporting member away from the other supporting member.

7. An apparatus as set forth in claim 2 and including a turnable member supporting said other sealing members for movement along a circular path; stationary cam means cooperating with said other sealing members along a circular cam track to move the same to a sealing position in which said triangular flaps are clamped and sealed so that the container is carried by said turnable member along a circular path, said cam means releasing said other sealing members at the end of said path; and means for receiving the container at the end of said path.

8. An apparatus as set forth in claim 7 and including ejector means mounted on said turnable member and operated by a cam portion of said cam means to move the container at the end of said path toward said receiving means.

9. An apparatus as set forth in claim 8 and including a support supporting said cutting means and said receiving means.

10. An apparatus as set forth in claim 9 wherein said first support member includes a conveyor band and a plurality of holders open at least on one side and adapted to support containers, respectively, said conveyor band moving the containers thereon first to said cutting means and then into the region of said other sealing means on said turntable member.

11. A container-making apparatus comprising, in combination, a first support member for transporting a plurality of containers having open ends along a first path; a second support member including a support element movable along a second path parallel to said first path, a carrier element mounted on said support element for movement toward and away from said first path and having a first cam follower, and a shiftable element mounted on said carrier element for movement toward and away from said first path and having a second cam follower and two pairs of cam tracks; a pair of spreading members mounted on said carrier member for pivotal movement between an inoperative position closely spaced from each other, and a farther spaced spreading position, said spreading member having cam follower elements cooperating with one pair of said cam tracks, respectively, so that said spreading members are moved to said spreading position when said shiftable element moves relative to said carrier element whereby said spreading members spread apart within the open end of a container on said first support member; a pair of sealing members mounted on said carrier element movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position, said sealing members having other cam follower elements cooperating, respectively, with the other pair of said cam tracks so that said sealing members are moved to said sealing position when said shiftable element moves relative to said carrier element whereby said sealing members move to said sealing position to seal superimposed wall portions at the open end of a container spread by said spreading members in said spreading position whereby lateral flaps are formed; and a pair of cam means engaging said first and second cam followers, respectively, during movement of said second support member along said second path, one of said cam means cooperating with said first cam follower to move said carrier element and thereby said sealing members and spreading members simultaneously into the region of, and away from the open end of a container, and the other of said cam means cooperate with said second cam follower for moving said shiftable element and said pairs of cam tracks relative to said cam follower elements of said spreading members and sealing members for first moving said spreading members to said spreading position and thereupon said sealing members to said sealing position, and for moving said spreading and said sealing members in reverse order to said inoperative positions.

12. A container-making apparatus comprising, in combination, a first support member for transporting a plurality of containers having open ends along a first path;

a second support member including a support element movable along a second path parallel to said first path, a carrier element mounted on said support element for movement toward and away from said first path and having a first cam follower, and a shiftable element mounted on said carrier element for movement toward and away from said first path and having a second cam follower and two pairs of cam tracks; a pair of spreading members mounted on said carrier member for pivotal movement between an inoperative position closely spaced from each other, and a farther spaced spreading position, said spreading member having cam follower elements cooperating with one pair of said cam tracks, respectively, so that said spreading members are moved to said spreading position when said shiftable element moves relative to said carrier element whereby said spreading members spread apart within the open end of a container on said first support member; a pair of sealing members mounted on said carrier element movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller then the spacing between said spreading members in said spreading position, said sealing members having other cam follower elements cooperating, respectively, with the other pair of said cam tracks so that said sealing members are moved to said sealing position when said shiftable element moves relative to said carrier element whereby said sealing members move to said sealing position to seal superimposed wall portions at the open end of a container spread by said spreading members in said spreading position whereby lateral flaps are formed; a pair of cam means engaging said first and second cam followers, respectively, during movement of said second support member along said second path, one of said cam means cooperating with said first cam follower to move said carrier element and thereby said sealing members and spreading members simultaneously into the region of, and away from the open end of a container, and the other of said cam means cooperate with said second cam follower for moving said shiftable element and said pairs of cam tracks relative to said cam follower elements of said spreading members and sealing members for first moving said spreading members to said spreading position and thereupon said sealing members to said sealing position, and for moving said spreading and said sealing members in reverse order to said inoperative positions; cutting means located along said first path for cutting the tips of lateral flaps of said superimposed and sealed wall portions; and other sealing members for sealing said flaps so that the flaps can be independently opened for discharge of the contents of the container.

13. A container-making apparatus comprising, in combination, a first support member for transporting a plurality of containers having open ends along a first path; a second support member including a support element movable along a second path parallel to said first path, a carrier element mounted on said support element for movement toward and away from said first path and having a first cam follower, and a shiftable element mounted on said carrier element for movement toward and away from said first path and having a second cam follower and two pairs of cam tracks; a pair of tubular spreading members mounted on said carrier member for pivotal movement between an inoperative position closely spaced from each other, and a farther spaced spreading position, said spreading member having cam follower elements cooperating with one pair of said cam tracks, respectively, so that said spreading members are moved to said spreading position when said shiftable element moves relative to said carrier element whereby said spreading members spread apart within the open end of a container on said first support member; a pair of sealing members mounted on said carrier element movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position, said sealing members having other cam follower elements cooperating, respectively, with the other pair of said cam tracks so that said sealing members are moved to said sealing position when said shiftable element moves relative to said carrier element whereby said sealing members move to said sealing position to seal superimposed wall portions at the open end of a container spread by said spreading members in said spreading position whereby lateral flaps are formed; a pair of cam means engaging said first and second cam followers, respectively, during movement of said second support member along said second path, one of said cam means cooperating with said first cam follower to move said carrier element and thereby said sealing members and spreading members simultaneously into the region of, and away from the open end of a container, and the other of said cam means cooperating with said second cam follower for moving said shiftable element and said pairs of cam tracks relative to said cam follower elements of said spreading members and sealing members for first moving said spreading members to said spreading position and thereupon said sealing members to said sealing position so that air may be removed from the container through said tubular spreading members; and other sealing members for sealing said flaps so that the flaps can be independently opened for discharge of the contents of the container.

14. A container-making apparatus comprising, in combination, a first support member for transporting a plurality of containers having open ends along a first path; a second support member including a support element movable along a second path parallel to said first path, a carrier element mounted on said support element for movement toward and away from said first path and having a first path and having a first cam follower, and a shiftable element mounted on said carrier element for movement toward and away from said first path and having a second cam follower and two pairs of cam tracks; a pair of spreading members mounted on said carrier member for pivotal movement between an inoperative position closely spaced from each other, and a farther spaced spreading position, said spreading member having cam follower elements cooperating with one pair of said cam tracks, respectively, so that said spreading members are moved to said spreading position when said shiftable element moves relative to said carrier element whereby said spreading members spread apart within the open end of a container on said first support member, said one pair of cam tracks having the highest track portions spaced from the ends thereof; a pair of sealing members mounted on said carrier element movable in a direction transverse to the movement of said spreading members between a farther spaced inoperative position and a closely spaced sealing position, said sealing members being located in said sealing position between said spreading members in said spreading position and having a length smaller than the spacing between said spreading members in said spreading position, said sealing members having other cam follower elements cooperating, respectively, with the other pair of said cam tracks so that said sealing members are moved to said sealing position when said shiftable element moves relative to said carrier element whereby said sealing members move to said sealing position to seal superimposed wall portions at the open end of a container spread by said spreading members in said spreading position whereby lateral flaps are formed; and a pair of cam means engaging said first and second cam followers, respectively, during movement of said second support member along said second path, one of said cam means cooperating with said first cam follower to move said carrier element and thereby said sealing members and spreading members simultaneously into the region of, and away from the open end of a container, and the other of said cam means cooperating with said second cam follower for moving said shiftable element and said pairs of cam tracks relative to said cam follower elements of said spreading members and sealing members for first moving said spreading members to said spreading position and thereupon said sealing members to said sealing position so that air may be removed from the container through said tubular spreading members; and other sealing members for sealing said flaps so that the flaps can be independently opened for discharge of the contents of the container.

ing said first and second cam followers, respectively, during movement of said second support member along said second path, one of said cam means cooperating with said first cam follower to move said carrier element and thereby said sealing members and spreading members simultaneously into the region of, and away from the open end of a container, and the other of said cam means cooperating with said second cam follower for moving said shiftable element and said pairs of cam tracks relative to said cam follower elements of said spreading members and sealing members for first moving said spreading members to said spreading position when the respective cam follower elements engage said highest cam track portions, and for then moving said spreading members a short distance toward each other to release the container wall and thereupon said sealing members to said sealing position, and for moving said spreading and said sealing members in reverse order to said inoperative positions.

15. An apparatus as set forth in claim 12 and including a turnable member supporting said other sealing members for movement along a circular path; stationary cam means cooperating with said other sealing members along a circular cam track to move the same to a sealing position in which said lateral flaps are clamped and sealed so that the container is carried by said turnable member along a circular path, said cam means releasing said other sealing members at the end of said path; and means for receiving the container at the end of said path.

16. An apparatus as set forth in claim 15 wherein said turnable member includes two fixedly connected plates, pairs of said other sealing members being pivotally mounted on the insides of said plates, respectively, and having cam followers; and wherein said stationary cam means is located between said sealing members of said pair of other sealing members and urges the same toward said plates, respectively, and into a sealing position.

17. A container-making apparatus comprising, in combination, a pair of spreading members having a closely spaced inoperative position and a farther spaced spreading position; a pair of sealing members having a farther spaced inoperative position and a closely spaced sealing position; said sealing members having a length slightly smaller than the spacing between said spreading members in said spreading position; supporting means for supporting said spreading members, said sealing members, and a container having an open end; control means for first placing said spreading members in said inoperative position in said open end of said container, for then moving said spreading members to said spreading position, for then moving said spreading members a short distance toward each other to release the container wall, for placing said sealing members between said spreading members in said spreading position, for moving said sealing members to said sealing position to form a seal between wall portions at said open end of said container spread by said spreading members whereby lateral unsealed flaps are formed at the ends of said seal in the region of said spreading members, and for finally moving said sealing and spreading members to said inoperative positions so as to be spaced from said container; and means for collapsing and sealing said flaps so that at least one of said flaps can be opened for discharge of the contents of the container.

18. A container-making apparatus comprising, in combination, a pair of spreading members having a closely spaced inoperative position and a farther spaced spreading position; a pair of sealing members having a farther spaced inoperative position and a closely spaced sealing position, said sealing members having a length slightly smaller than the spacing between said spreading members in said spreading position; supporting means for supporting said spreading members, said sealing members, and a container having an open end; control means for first placing said spreading members in said inoperative position in said open end of said container, for then moving said spreading members to said spreading position, for then moving said spreading members a short distance toward each other to release the container wall, for placing said sealing members between said spreading members in said spreading position, for moving said sealing members to said sealing position to form a seal between wall portions at said open end of said container spread by said spreading members whereby lateral unsealed flaps are formed at the ends of said seal in the region of said spreading members, and for finally moving said sealing and spreading members to said inoperative positions so as to be spaced from said container; cutting means for cutting the tips of said flaps; and means for collapsing and sealing said flaps so that at least one of said flaps can be opened for discharge of the contents of the container.

19. A container-making apparatus comprising, in combination, a pair of tubular spreading members having a closely spaced inoperative position and a farther spaced spreading position; a pair of sealing members having a farther spaced inoperative position and a closely spaced sealing position, said sealing members having a length slightly smaller than the spacing between said tubular spreading members in said spreading position; supporting means for supporting said tubular spreading members, said sealing members, and a container having an open end; control means for first placing said tubular spreading members in said inoperative position in said open end of said container so that a fluid may be introduced into, or sucked from said container through said tubular spreading members, for then moving said spreading members to said spreading position, for then moving said spreading members a short distance toward each other to release the container wall, for placing said sealing members between said spreading members in said spreading position, for moving said sealing members to said sealing position to form a seal between wall portions at said open end of said container spread by said spreading members whereby lateral unsealed flaps are formed at the ends of said seal in the region of said spreading members, and for finally moving said sealing and spreading members to said inoperative positions so as to be spaced from said container; and means for collapsing and sealing said flaps so that at least one of said flaps can be opened for discharge of the contents of the container.

References Cited in the file of this patent

UNITED STATES PATENTS

2,168,241	Robinson	Aug. 1, 1939
2,243,805	Knapp	May 27, 1941
2,292,295	Royal	Aug. 4, 1942
2,634,562	Mueller et al.	Apr. 14, 1953
2,692,074	Mueller et al.	Oct. 19, 1954
2,881,573	Hensgen	Apr. 14, 1959
2,949,715	Tarleton et al.	Aug. 23, 1960