Oct. 27, 1964 O. V. CHRISTENSSON 3,153,886

METHOD OF VACUUM CLOSING LINED PACKAGES OF CARDBOARD

Filed Sept. 28, 1959 3 Sheets-Sheet 1

Fig. 2.

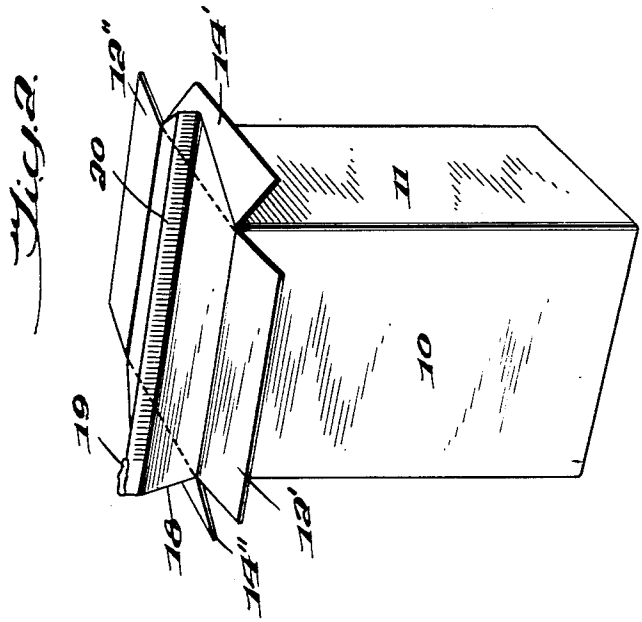
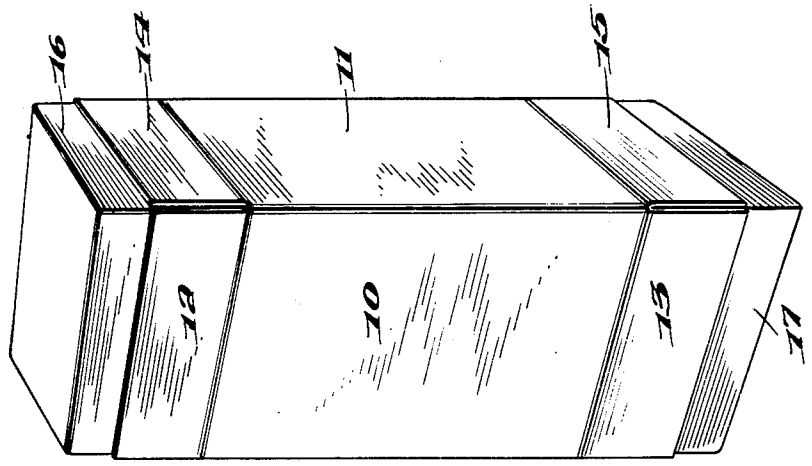



Fig. 1.




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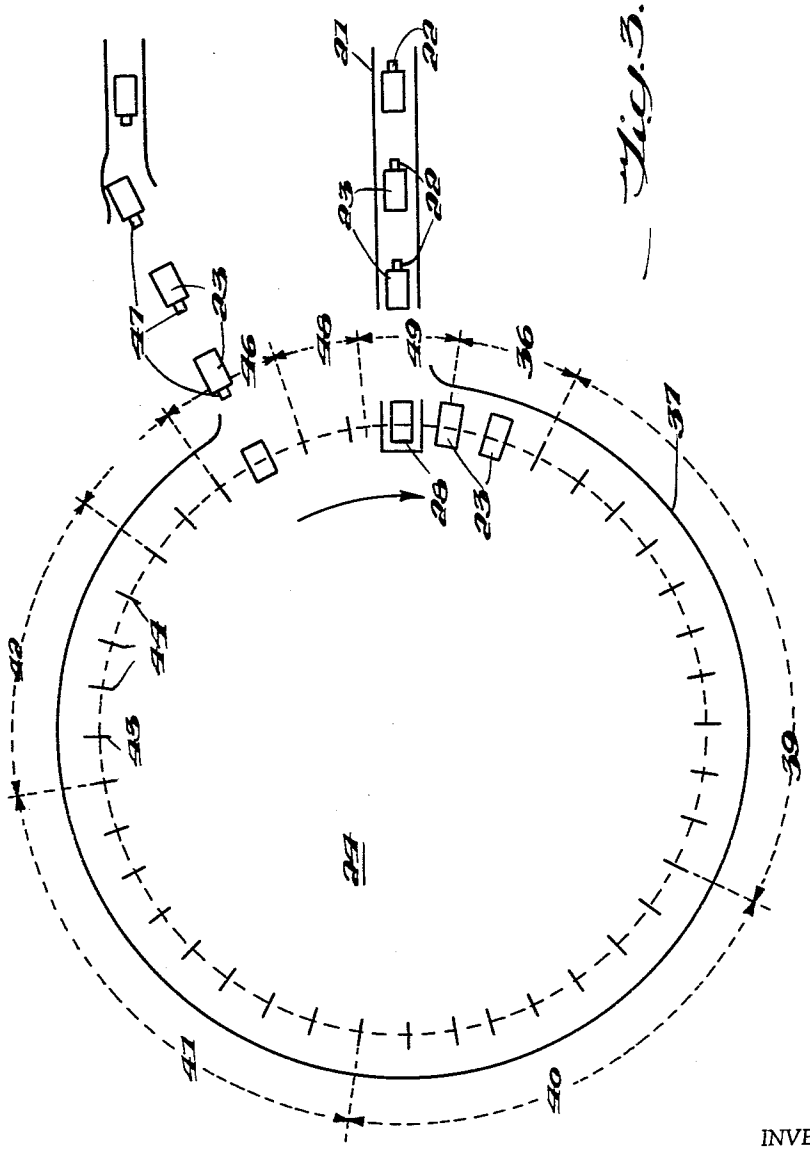
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Fig. 3.




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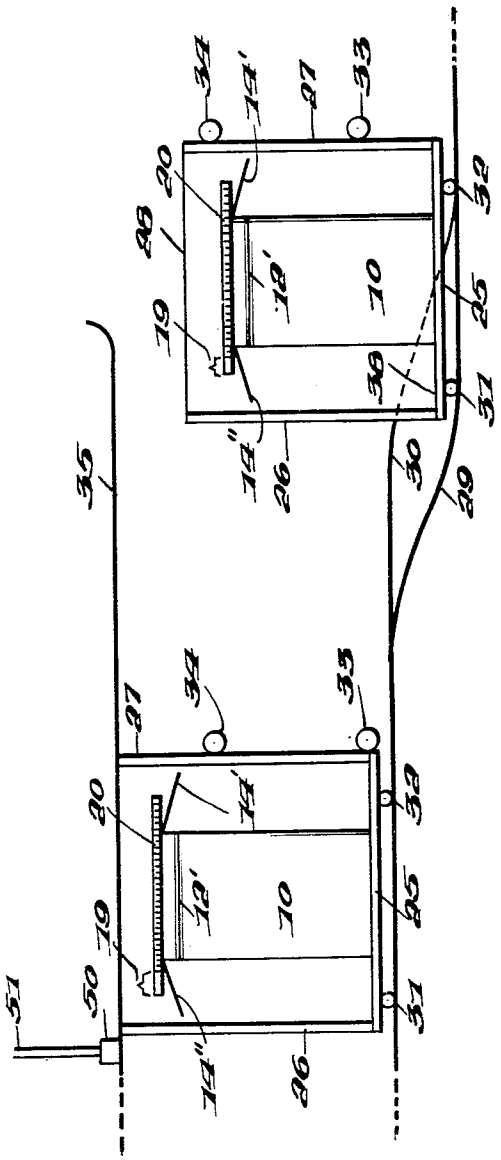
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Fig. 4.



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# METHOD OF VACUUM CLOSING LINED PACKAGES OF CARDBOARD

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2 Claims. (Cl. 53—22)

The present invention relates to a method and arrangement for vacuum closing of packages having an outer covering of cardboard or similar stiff material with a lining of material which is vacuum tight and can be closed by heat sealing. The packages, as a rule, are made in the form of a tubular outer package which has two short sides opposite each other and two long sides opposite each other, and at each end four closing flaps connected to each one of the sides. In this outer package a lining of a heat sealable material is provided, said material extending above the mouth between the package sides so that it can be closed by sealing. As a rule such packages are delivered by the manufacturer to the dealer who packs material in the package, which is thereafter sold. At the time of delivery the packages are usually collapsed.

When these packages are to be used, they are first unfolded into rectangular cross-section and the mouth of the lining is sealed together at one end of the package, hereinafter referred to as the bottom of the package. However, this end may also appear as the top end of the package, depending on the position of the label or the like. The outer part of the package is then closed at the bottom, and the package is filled with the material to be packed. After this step has been completed, according to the method previously used, the top end was then sealed leaving a space through the sealing joint for a pipe to be inserted to evacuate the package. After evacuation has taken place, the evacuation pipe is drawn out slightly preparatory to sealing of the remainder of the lining. Thereafter, the evacuating pipe is completely drawn out and the portion where the pipe has run through the mouth of the lining and which is not yet sealed is finally sealed together. The mouth of the lining is now folded in and the top part of the outer package is closed, the package then being completely assembled.

As has been seen, it is a rather complicated procedure to evacuate such a package. Since an evacuating pipe is required for each package, a great number of such pipes must be provided for closing of packages by machine in a factory. The possibility of errors occurring is very great, especially since the evacuating pipe must either be drawn out from the mouth of the package before it has been sealed together, or left in the mouth of the package at least during the time of preparatory sealing. In both cases, there is the risk of atmosphere penetrating into the package during the time before it has been finally sealed at the top end.

The present invention relates to a method in an arrangement for avoiding these disadvantages.

In the method of this invention, the package, after it has been closed at the bottom and filled with packed material, is introduced into a pocket in a conveyor device which then moves through an evacuated chamber, and the closing of at least the upper mouth of the lining takes place within this evacuated chamber. In an especially advantageous form of execution of this method, the mouth of the lining is partially closed before the package is introduced into the evacuated chamber so that only a minor portion of the mouth of the lining remains unsealed, and this remaining portion of the mouth of the lining is then sealed within the evacuated chamber. To determine what portion of the mouth of the lining should be left unsealed during the preliminary closing, according



to a further form of execution of the invention, the closing of the lining is done by bringing the ends of the lining together into a straight line, the unsealed portion being left at one end which is situated outside of the circumference of the package itself.

In the arrangement of the present invention a complete machine for vacuum closing of packages comprises a first device for closing the package at the bottom and sealing one end of the lining, a device for filling the package with the product to be packed, and in sequence during the automatic movement of the package through the machine a device for incomplete sealing of the lining at its upper mouth, and a vacuum chamber provided with a conveyor device and arranged in such a way that the package will automatically be transported through the vacuum chamber under progressive evacuation. In the vacuum chamber a device is applied for completing the sealing of the upper mouth of the lining, and in the vacuum chamber or outside thereof, finally, a device is provided for closing of the outer package at its upper end.

The invention will be fully described below in connection with a chosen embodiment as shown in the attached drawings. It is, however, evident that the invention is not limited to this specific form, but that a number of different modifications may be made within the scope of the invention.

In the drawings, FIGURE 1 shows a package prior to closing in the manner according to the invention, which is of rectangular cross-section and is open at both the bottom and the top.

FIGURE 2 shows the same package after the bottom has been closed, the package has been filled with the packed material, and a preparatory closing of the mouth of the lining at the top has been made before the package is passed into the vacuum chamber.

FIGURE 3 shows a schematic view of a machine for closing the package.

FIGURE 4 shows a detail of some portions of the vacuum chamber.

The package, which is usually delivered by the package manufacturer in collapsed state is shown in FIGURE 1 after it has been folded out into a rectangular cross-section, but without any further closing steps having been taken. It consists of two opposite long sides, of which only side **10** is visible in FIGURE 1, and of two opposite upper and lower edges of side **11** are shown in FIGURE 1. At the upper as well as at the lower end of each of the four sides a closing flap is provided. Of these the closing flaps **12** and **13** at the upper and the lower edge of side **10** as well as the closing flaps **13** and **15** at the upper and lower edges of side **11** are shown in FIGURE 1. Inside this outer package, which is made of cardboard or other suitable stiff material, a lining is provided, said lining being made of plastic or other flexible, vacuum tight and heat sealable material. The lining extends above the sides **10** and **11** and preferably also above the upper edges of the flaps **12** and **15** by a distance **16**, and in a like manner extends below the sides **10** and **11** and preferably also below the lower edges of the closing flaps **13** and **15** by a distance **17**.

Packages of this type are commonly known, and therefore should not require further description. When the package is closed at the bottom, the mid-points of the lower edge on the portions of the lining corresponding to the short side flaps **15** is gripped by the use of a suitable tool and drawn apart so that the edges are brought into a straight line. This is then sealed together. This results in a triangular shaped portion of the lining extending outside the normal circumference of the package at each end. These portions are folded in over the lining when the short side flaps **15** are folded into their closed posi-

tions. Thereafter, paste or any other suitable adhesive is applied to the outside of the short side flaps and then the long side flaps are folded in. Usually the short side flaps are of such a length that they will come together edge against edge when folded inwards. If the long side flaps are high, they will overlap each other, which is an advantage, because the outer flap can then be pasted rigidly to the inner flap and the bottom of the package will be more rigid.

A package shown in FIGURE 2 has been closed at the bottom in the manner just described. Furthermore, it has been filled with material which is to be packed, and the upper mouth of the lining has been closed in the same manner described above with respect to the bottom. However, for a purpose which will be evident from the following, the upper mouth of the lining has not been completely sealed but an opening has been left unsealed at the outermost edge of one of the triangularly extended lining flaps **18**, as shown at **19**, and the sealed portion is indicated at **20**.

In this state the package is introduced into the evacuation chamber to first be evacuated and then the opening **19** closed. The advantages of this method are many. Among these advantages is the fact that the final sealing takes place in a vacuum, which means that the space for the means required for the sealing is limited and for this reason the sealing means should be made as small as possible. Obviously, the means for sealing the remaining opening **19** are much smaller and lighter and therefore easier to handle than means for sealing the entire lining. In addition to this, it is difficult to inspect the work while within the vacuum chamber, and if an error should occur this must be repaired and the improperly closed package removed before the machine can again be put back into production. This usually means that the accumulated vacuum is lost and furthermore, that the vacuum chamber must be at least partially disassembled and then reassembled which involves considerable difficulty in ensuring that the chamber is air tight. One thing which should be considered in this regard is that the lining material is usually rather flexible and that it is difficult to get the two edges which form the sealed joint **20** to be in the proper alignment. This is not a problem if there is sufficient space for the proper equipment, but such space is certainly not available in the interior of the vacuum chamber.

An advantage which is at least as great also exists in the fact that the machine can be made to work more quickly if the sealing is divided in the manner stated above, which is particularly important in the packing of materials which are dependent for their existence on not being exposed to the atmosphere. For instance, finely ground coffee will lose its aroma if exposed too long to the atmosphere, as the oils will become rancid by oxidation. If a package containing such a material is evacuated before it has been at least partially closed as described above, then it is impossible to avoid sucking some of the grains upward into the area where the lining is to be sealed. The grains which stick to the lining in this area prevent the making of a perfectly airtight seal. However, this may be avoided by leaving a relatively small opening for the evacuation, as the current of evacuation air will be at a correspondingly higher speed and therefore will carry the grains more effectively so that they will not remain in contact with the parts of the lining which are to be sealed together. Furthermore, if the opening is left at one end of the mouth of the lining, as shown in FIGURE 2, the air will be conducted through the narrow slot of the lining part **18** before it reaches the opening **19**, and this slot will then function as a rather effective filter.

FIGURE 3 shows in schematic form a machine for complete vacuum closing of a package made in accordance with the present invention. It is assumed that in a manner not forming a part of the present invention, the packages have been folded from their collapsed state into rectangular cross-section, have been sealed and closed at the bottom and have been filled with the packed product, and the linings at the upper end sealed in a known manner. However, the sealing electrodes are so oriented, and are such a length, that they only seal together the portion of the lining mouth corresponding to the portion **20** of FIGURE 2, leaving the portion **19** unsealed. The closing flaps **14'**, **14''**, **12'** and **12''** are bent outwards to the sides, so that they do not interfere with the sealing of the upper mouth of the lining.

In this state the package is introduced into a continuous conveyor **21** by means of catchers **22**, each driving in advance one package **23**, either in a continuous or a discontinuous movement. By means of the catchers the packages **25** are brought in steps to a vacuum chamber **24** which is circular in form. The vacuum chamber contains a large number of cells, each having a capacity of one package which is taken from the conveyor band **21**. These cells, as shown in FIGURE 4, have a bottom **25**, two side walls **26** and **27**, and an end wall **28**. Each cell is driven on rails **29** and **30** around the periphery of the vacuum chamber **24**, the cells resting on sliding bars **31** and **32** and being driven by driving bars **33** and **34** which extend radially outward from the center of the chamber.

A flat disc **35** extends above the cells in the vacuum chamber and is disposed some distance above the upper edge of the walls **26**, **27** and **28** of the cell when it first receives the unevacuated package **23**. The rails **29** and **30** are formed in such a manner that the cell, during its movement through section **36**, will be lifted up into sealing engagement of the walls **26**, **27** and **28** with the disc **35**. Simultaneously, the cell comes into contact with a circular wall **37** which seals tightly against the vertical edges of the walls **26** and **27** and against the bottom **38** of the cell. The cell is thus hermetically sealed on all sides, as it moves from the section **36** into a following section **39** in the vacuum chamber. At evenly spaced distances around the disc **35** there are valves **50** connected by conduits **51** to a vacuum pump not shown in the drawing. These valves are so designed that they are automatically opened when a front wall **26** passes under them, and are automatically closed when a back wall **27** of a cell passes under them. At different stations within the vacuum chamber therefore, the packages are successively evacuated in stages. It is important that this evacuation does not take place all at once but is in smaller stages. The packed material is often finely divided, such as meal or the like, and has little resistance to the streaming out of the evacuation air. If the evacuation takes place all at one time, too much material would follow the air current out of the package. Moreover, because there are a number of stages between those during which the cell is connected to the vacuum conduit, a greater interior equalization of the air pressure takes place inside the package.

For the same reasons it is not suitable to immediately give full vacuum, that is the highest vacuum in the system to the cells. The vacuum conduits in section **39** are therefore connected to a source of rather low vacuum. After the cells have passed through the section **39** they enter a second section **40** which has a somewhat higher vacuum, and finally into a third section **41** with the highest vacuum existing in the system. By evacuating in this manner in stages within each of the sections, and having a vacuum of different degree in each of the sections, so that a stronger vacuum exists in the later sections than in the earlier ones, and because of the filter action of the triangular lining flap **18**, practically none of the contents of the package follow the air out of the package during evacuation and the packed material is not deposited on the sides of the opening **19**. The remaining portion of the upper lining mouth can then be sealed without danger that it is not air tight. No extensive apparatus is required for positioning the lining, because it is already sealed along the major part of its length. It is known that when the lining is sealed it

will stiffen up so that the edge 20 stands practically vertically up from the upper side of the package, and thus serves as a guide for the sealing of the opening 19. This sealing is done by means of a pair of rather small sealing electrodes which are just wide enough to seal the remaining opening 19.

This sealing takes place within section 42 at stage 43. Thereafter the package passes under a vacuum through a number of inactive stages 44 which allow the seal to cool so that it has sufficient resistance to pressure of the atmosphere when it is removed.

The package is removed from the cell within section 45, as the rails 29 and 30 are formed in such a way that the cell moves downwardly away from the disc 35. The cell is then moved to a further section 46 and removed by means of catchers 47 which carry the packages to a further section of the machine which closes the flaps 12', 12'', 14', 14'' in a known manner. This portion of the machine may also be combined with a device for stacking the packages or for labeling them or the like.

The cell is then moved through a section 48 where it is blown clean and then moved into section 49 where it receives a new package.

The apparatus shown in FIGURE 3 has a capacity of forty packages, but it is obvious that this number may be varied in accordance with need which is determined by a number of factors such as the volume of the packages, the type of packed material, and so forth. It is also possible to use a different number of vacuum chambers than that shown in the drawing.

What is claimed is:

1. In a method of closing a flexible, air-tight lining of weldable plastic, and contained inside an outer package of relatively stiff material, thus forming a vacuum package having a substantially tubular section by heat sealing the open end portion of the lining by plastic welding, the steps of dividing the open end portion into opposite edge sections each extending over approximately one-half perimeter and bringing said opposite edge sections into engagement along a straight line to form triangular ears at each end of the said line with the triangular ears each lying flat and substantially in the horizontal plane along the top of and outside of the outer package with a narrow slot formed thereinbetween, heat sealing the edges sections together by welding along said straight line except for a short segment thereof in one of the ears, placing the package in a chamber and closing and evacuating the chamber to evacuate air in the package through the narrow slot in the one said ear and said short segment of the sealing line and heat sealing the short segment by plastic welding to completely close the lining.



2. In a method for forming an air-tight vacuum package having an upright self-supporting outer package of relatively stiff material and an inner flexible lining of weldable plastic substantially tubular in shape and having a closed bottom end, the top end portion thereof being open; the steps of placing the package in a chamber, dividing the top open end portion into opposite edge sections each extending over one-half the perimeter, bringing said opposite edge sections into engagement along a straight line against the top of the outer package to form flat triangular ears extending outside the outer package at each end of the said line and in the plane of the top of the outer package with the triangular ears each lying flat and substantially in the horizontal plane along the top of and outside of the outer package with a narrow slot formed thereinbetween, heat sealing the edge sections together by welding along the straight line except for a short segment thereof in one of the ears, evacuating the air within the chamber and thereby the air in the package through the narrow slot in the one said ear and the said short segment of the sealing line, and then heat sealing the short segment by plastic welding to form the air-tight lining.


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