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[54] **PACKING METHOD AND APPARATUS**

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[52] **U.S. Cl.** **53/29,** 53/182, 53/390

[51] **Int. Cl.** **B65b 43/04,** B65b 67/08

[58] **Field of Search** ..... 53/28, 182, 29, 373, 390, 53/33; 229/69; 206/56 AB

[56] **References Cited**

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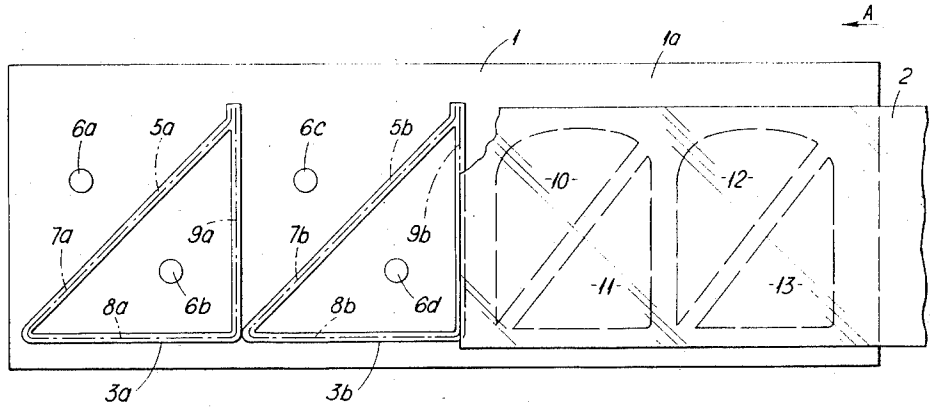
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Primary Examiner—Robert C. Riordon
Assistant Examiner—E. F. Desmond
Attorney, Agent, or Firm—John J. Toney; William D. Lee, Jr.

[57] **ABSTRACT**

The specification discloses packing articles, in this case sandwiches, where the articles are of a triangular form and packing is effected by placing at least two pairs of the articles side by side between the layers of a single web of centre-folded film. The articles are arranged to have the same orientation with one side of the triangle parallel to the film centre-fold. Sealing may be effected by bringing together sealing plates having co-operating heat seal elements arranged as a pair of similar triangles each larger than the triangular outline of the articles. One additional seal line is required but may comprise one of the seal lines of a similar preceding operation.

7 Claims, 4 Drawing Figures



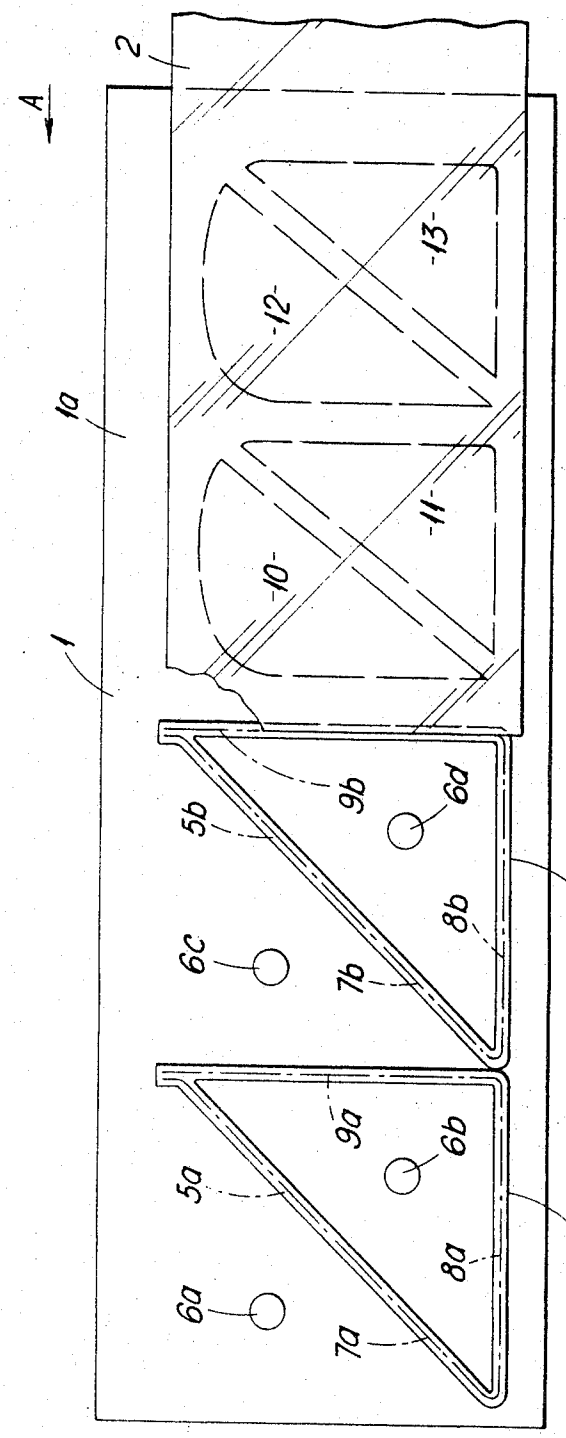


Fig. 1.

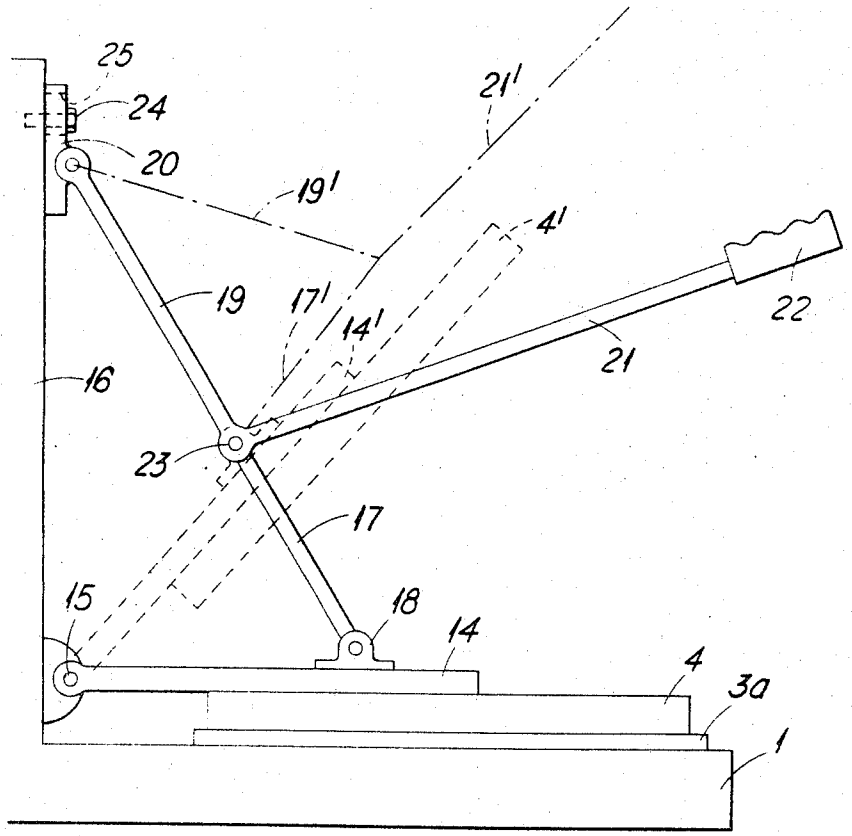


Fig. 2.

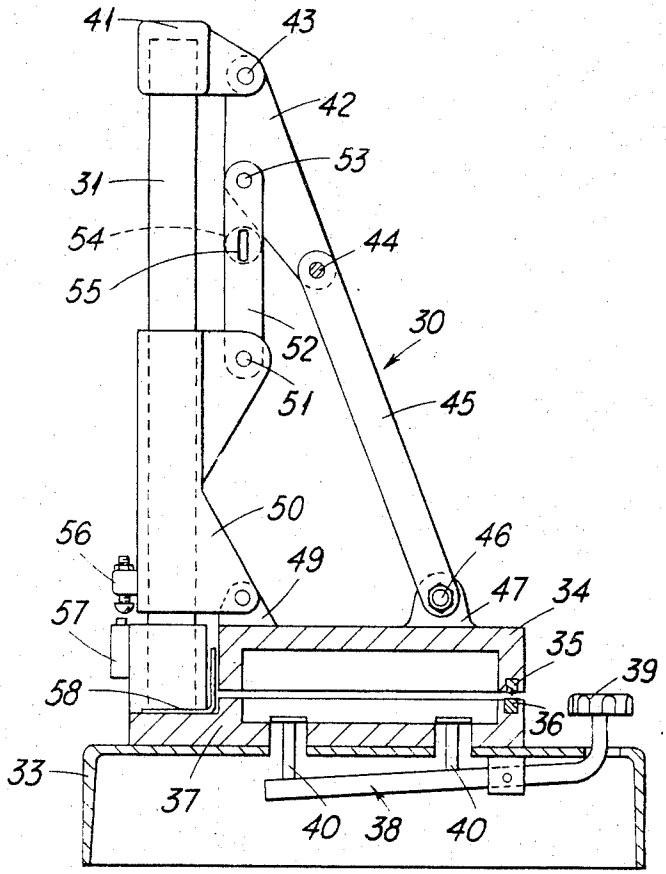

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Fig. 3.

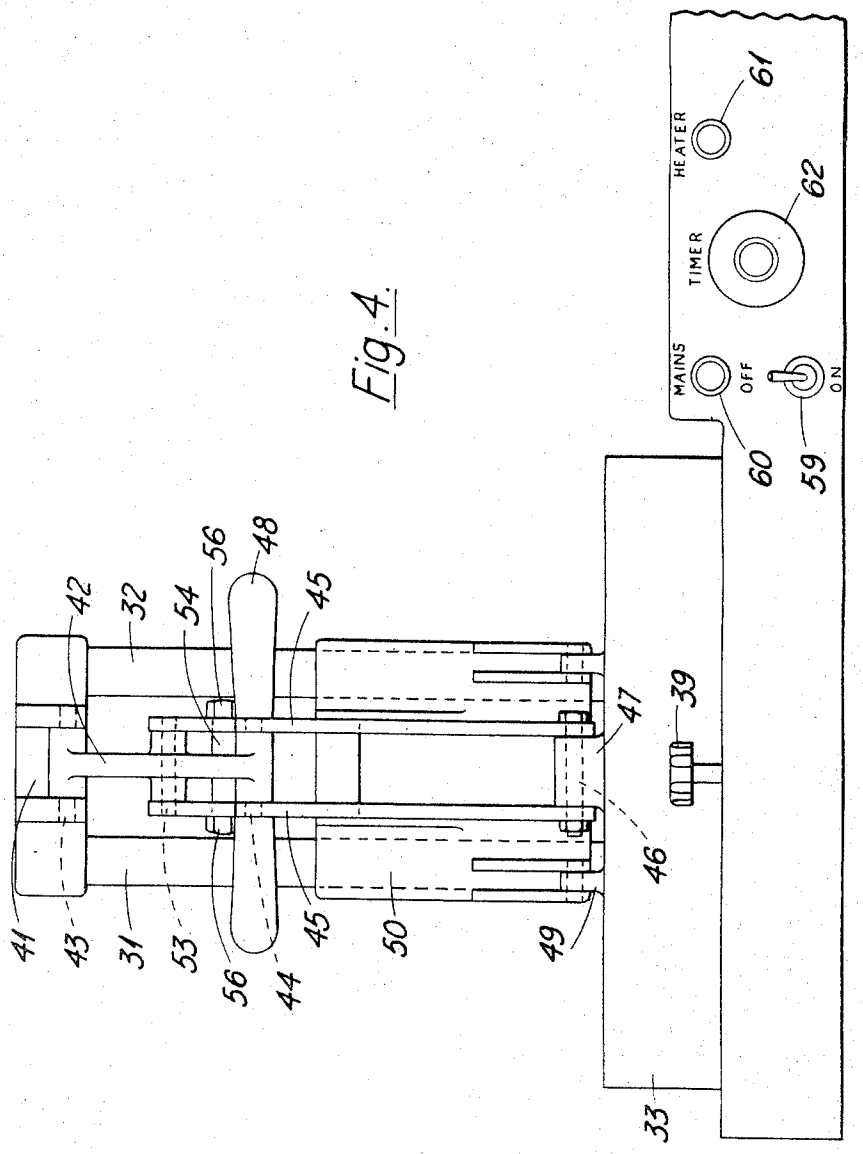

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Fig. 4.

PACKING METHOD AND APPARATUS

The present invention relates to a method of and apparatus for packaging articles, and more particularly to packaging articles which have a substantially straight side disposed opposite to an apex postion. Such articles will be referred to herein as being "of the type specified" and in the invention will be exemplified with the article in the form of a diagonally cut sandwich.

Hitherto articles of this nature, for example diagonally cut sandwiches, have been individually packaged by hand, either by placing the article in a bag of paper or plastics material and then sealing the bag with adhesive tape, or by folding a single sheet of paper or plastics material around the article. Considering by way of example the packaging of diagonally cut sandwiches which are triangular in shape, the conventional method of placing the sandwich in a plastics bag has the disadvantage that a considerable flap of plastics material must be doubled over with consequent wastage of the bag material. There is also difficulty in providing a hermetic seal for the finished package. Similar problems arise in respect of wrapping the sandwich in a single sheet of paper in that the triangular shape of the article will necessitate the provision of three separate consecutively formed folds which will again lead to considerable overlap and wastage of the packaging material and also difficulty in providing a true hermetic seal.

According to the present invention there is provided a method of packaging articles of the type specified, such method comprising placing a pair of the articles between the juxtaposed portions of a folded sheet of heat sealable film, with the articles arranged to have their said substantially straight sides parallel and the apex portion of one article adjacent one end of the said straight side of the other article; and sealing together the said juxtaposed film portions to provide two separable packages, one of which has the film fold line running along one edge.

More specifically the seal lines may be arranged so that one of the articles is encompassed by a triangular array of three similtaneously formed seal lines and the other article is encompassed by one of the said three seal lines and also a fourth single seal line running perpendicular to the film fold line.

Preferably the triangular array of seal lines is in the form of a right angled triangle, and suitable the single seal lines are in the form of one of the seal lines of the triangular array formed during a previous packaging operation with a different part of the same centre-folded film. Conveniently the folded sheet of film may be a continuous web of centre-folded film which is advanced after one sealing operation to move one of the seal lines of the or one triangular array into a position into which it serves as the said single seal line for the next succesive operation. More conveniently the web may be advanced a distance such that said one line of the or one triangular array is arranged to intersect the or a triangular array formed at the next successive sealing operation.

Advantageously more than one pair of the articles may be disposed in series to form an array extending parallel to the film fold line, and the various pairs may be sealed simultaneously. Clearly, in this form of the invention the single seal line required for one of the pairs of articles comprises one of the three seal lines of the next adjacent simultaneously packaged pair of articles.

In this form of the invention it may be desirable for the centre folded film to be advanced by a distance substantially equal to the product of the number of pairs of articles sealed simultaneously and the extent of each pair of articles in a direction parallel to the film fold line.

In a particularly suitable form of the invention the articles are diagonally parted sandwiches and the film is polypropylene. If desired the final package may be subsequently shrink tidied.

A further aspect of the invention provides an apparatus for packaging articles of the type specified, which comprises a sealing unit including means for forming a triangular array of seal lines and means for supplying centre folded heat sealable film to the sealing unit past said seal forming means with the fold running across a corner of the triangle but parallel to a side opposite the said corner.

Preferably the array of seal lines is in the form of a right angled triangle one of the sides of which extends perpendicular to the fold line of the film. More preferably a plurality of such triangles may be provided.

The apparatus may also include means for advancing the film a distance substantially equal to the product of the number of triangles and the length of said opposite side of the triangle. Conveniently the sealing means may be in the form of a fixed base plate, a relatively movable sealing plate having heat seal elements, and a resilient bed on the base plate to cooperate with the heat sealing elements. Advantageously the movable sealing plate may be manually operable with a toggle mechanism in the linkage to ensure uniform contact pressure between the sealing elements and the resilient bed. In such a form of the apparatus it may be desirable to provide means for adjusting the contact pressure.

Suitably the toggle is connected between on the one hand the movable sealing plate and on the other hand the upper end of at least one movable support column, means being provided for adjusting the vertical position of the support column with respect to a fixed sealing plate. Conveniently the toggle linkage is also adjustable to control the angular relationship between the planes of the fixed and movable sealing plates.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings in which:

FIG. **1** is a top plan view of the fixed sealing plate of a packaging apparatus in accordance with the present invention:

FIG. **2** is a side elevational view of the apparatus of FIG. **1**;

FIG. **3** is a side elevational view of a modified embodiment of sealing apparatus; and

FIG. **4** is a front elevational view of the apparatus of FIG. **3.**

Referring now to the drawings, there is shown a fixed base plate **1** along which a web of centre-folded polypropylene film **2** is passed along the direction of the arrow A in FIG. **1.** A suitable supply roll for the polypropylene film is provided but not illustrated.

The base plate **1** is provided with two similar right angled triangular arrays **3***a*, **3***b* of cushioning material which will cooperate with similarly arranged heat sealing elements of a relatively movable sealing plate **4,**

shown in FIG. 2 but missing from FIG. 1. The disposition of the heat sealing elements of the movable sealing plate is illustrated by the use of chain dotted lines 5*a* and 5*b* shown in FIG. 1. From the chain dotted lines 5*a* and 5*b* it can be seen that the triangular arrays of heat scaling elements are arranged so that each triangle comprises a single bent element the ends of which are disposed at one corner of the triangle. Each element is carefully connected to the movable sealing plate 4 so that the corners of the triangle are permitted outward movement to take up expansion of the heat sealing elements in use of the apparatus.

The fixed base plate is also provided with four package objecting elements 6*a*, 6*b*, 6*c* and 6*d* which are connected to a common ejector mechanism (not shown) for discharging packaged sandwiches. The ejector elements have been omitted from FIG. 2 to assist in clarifying that view.

In order to assist in subsequent explanation of the packaging operation of three sides of each triangular array of heat sealing elements have been separately referenced 7*a*, 7*b*; 8*a*, 8*b*; and 9*a*, 9*b*.

Also shown in FIG. 1 are four diagonally-cut sandwiches referenced 10, 11, 12 and 13, positioned on a loading area 1*a* of the base plate 1.

Referring now to FIG. 2, the movable sealing plate 4 can be seen to be secured to an arm 14 pivotally mounted at 15 for movement about a horizontal axis.

The pivot axis at 15 is fixed in relation to both the fixed base plate 1 and a fixed vertical support bracket 16.

Pivotal movement of the arm 14 is achieved by way of a toggle mechanism comprising a first toggle member 17 pivotally secured to a boss 18 formed on the arm 14, and a second toggle member 19 pivotally secured to a boss 20 which is vertically movable with respect to the vertical support bracket 16. The second toggle member 19 has a toggle operating lever 21 extending substantially perpendicularly thereto and the end of the operating lever 21 is provided with a hand grip 22. FIG. 2 shows that the operating lever 21 is joined to the second toggle member 19 at the point of articulation 23 between the first and second toggle members 17 and 19 respectively.

As indicated above, the boss 20 is vertically movable with respect to the support bracket 16 and may be clamped by means of a bolt 24 threadedly engageable in the support bracket 16 but co-operating with a vertically extending slot 25 formed in the boss 20. Vertical adjustment of the position of the boss 20 will provide adjustment of the contact pressure between the movable sealing plate 4 and the resilient beds 3*a*, 3*b*.

The solid line positions shown in FIG. 2 denote the positions of the various elements of the drawing when the movable sealing plate 4 is in sealing contact with the fixed base plate 1. However, FIG. 2 also shows in broken line form the open or "loading" positions 4' and 14', respectively, of the movable sealing plate 4 and its support arm 14. The corresponding "loading" positions of the first and second toggle members 17 and 19 and the operating lever 21 are shown by chain-dotted lines at 17', 19' and 21', respectively.

The toggle structure 17, 19 is provided with a suitable stop mechanism (not shown) for ensuring that the point of articulation 23 between the two toggle members 17 and 19 can never move further left than the position shown in FIG. 2. Thus the toggle members 17 and 19 will, in the closed or "sealing" position of the movable sealing plate 4 always be collinear.

The heat sealing elements of the movable sealing plate 4 are electrically heated and are connected to an appropriate timer unit which will ensure that the heating elements are energised only for sufficient time to ensure a good seal between the two juxtaposed portions of the centre-folded film 2. The temperature of the heat sealing elements will also be controlled by a suitable temperature stabilising arrangement.

By way of further explanation, the operation of the illustrated and above described embodiment of sandwich packaging apparatus will now be described in detail.

As a fresh web of centre-folded film 2 is loaded onto the supply reel (not shown) the free edge of the film is pulled across the loading area 1*a* of the fixed base plate 1 and is laid on the resilient bed 3*b* so that the web of film material can be heat sealed by means of the sealing element portion 9*b*. The movable sealing plate 4 is then brought downwards by means of the operating lever 21 to seal the juxtaposed portions of the film 2 along the line 9*b*.

The scaling plate 4 may then be raised and by means of the operating lever 21, the previously formed end seal and the fold line of the film will intersect to form two sides of a triangular package enclosing the sandwich 10 and the sealing element 7*a* will seal together the two juxtaposed film portions along the line which intersects both the previously formed seal line and the fold line thereby enclosing the sandwich 10 completely. Similarly, the sandwich 12 will be completely enclosed by the film fold line, the seal line of the element 9*a*, and the seal line formed by the sealing element 7*b*, which will intersect both of the first mentioned lines. Although the seal element portions 8*a* and 9*a* do not touch or intersect the seal element portions 7*b* and 8*b* the respective points of intersection of these two pairs of sides are so close together that the heat of the sealing element will be dissipated at the two points of intersection with the result that the film in that area will be fused and will facilitate subsequent separation of the three packages containing the sandwiches 11, 12 and 13 respectively.

The packaging operation is finally completed by operation of the ejector mechanism to raise the ejector elements 6*a*, 6*b*, 6*c* and 6*d* to eject the sandwiches.

Clearly, the seal line formed by the element 9*b* will not only assist in sealing hermetically the sandwich 13 but will provide the starting seal line for the next set of similar sandwiches.

The heat sealing elements 5*a* and 5*b* are so constructed and controlled that they serve as both severing and sealing elements. Thus the four packaged sandwiches 10, 11, 12 and 13 are readily detachable from each other and from the remaining portion of the centre-folded film.

In practice the width of the centre-folded film will be such that there will be a slight wastage in the form of a strip of the order of 1 to 2 cm wide disposed outside the sealing element portions 8*a* and 8*b* (i.e., below the line of these element portions as viewed in the drawings). Naturally, although this wastage can be reduced to an absolute minimum it is desirable to provide a slight excess of film width so that any outsize sandwiches, i.e., sandwiches having too much filling mate-

rial, or formed from too thickly cut slices, or formed from too large a loaf, may still be packed by taking up the reserve of surplus material along the edges **8***a*, and **8***b*.

If the operator fails to ensure that the previously formed line of seal and cut at **9***b* does not intersect the location of the sealing elements **7***a* and **8***a* then the sandwich **10**, although neatly packaged, will not be hermetically sealed. Thus, means may be provided for ensuring that the previously formed line of seal and cut may be disposed in the correct positioning, for example by providing a guide upto which the line of cut must be moved during each loading operation or by providing a control unit on the supply reel for ensuring that only the exact length of film required may be withdrawn in one advancing movement before the supply reel is locked temporarily.

It may also be preferably to provide a suitably formed loading arrangement on the loading area **1***a* of the base plate **1** to ensure that the sandwiches **10, 11, 12** and **13** may be rapidly and readily disposed in the correct positioning while the previous sandwiches are being sealed. However, in such an arrangement it may be important that the sealing element portion **9***b* is disposed substantially at the edge of the sealing plate **4** in order to ensure that the sandwich **10** may be pushed up against the seal line formed by the element **9***a*.

If it is found that the contact pressure of the sealing elements **5***a* and **5***b* on the resilient beds **3***a* and **3***b* decreases during the life of the apparatus, for example by a loss of resilience of the beds **3***a* and **3***b*, the pressure may be increased by slackening off the bolt **24**, moving the boss **20** downwardly by the required amount and then retightening the bolt **24** so that, in future, the resilient beds **3***a* and **3***b* will be subjected to a greater degree of depression and will therefore be able to exert a stronger resistance force.

Although the illustrated arrangement of the toggle mechanism and the movable sealing plate will operate quite satisfactorily, it may be desired to provide much more ready access to the fixed base plate when the sealing plate is raised, for example by mounting the sealing plate **4** on a support bracket **16** which can be tilted backwards (anti-clockwise as viewed in FIG. **2**), in order to provide a much greater clearance between the fixed base plate **1** and the sealing plate **4** in its open condition.

It has been found that sandwiches packed with the method and apparatus described and using polypropylene films are hermetically sealed to such an extent that the condition of the bread is still quite fresh even three days after packaging. Hence the preferred embodiment of packaging method provides an extremely advantageous form of sandwich wrapping system and offers a distinct technical advance over the crude prior art methods of forming such packages.

FIGS. **3** and **4** show side and front elevational views, respectively, of a second embodiment of sandwich packing machine generally referenced **30** and comprising a pair of upright columns **31** and **32** adjustably secured to the base **33** so as to be vertically movable to vary the vertical position of the movable sealing plate **34**, thereby effecting an increase or decrease in the sealing force between the sealing strips **35** and **36** on the movable sealing plate **34** and the fixed base plate **37**, respectively.

The ejector mechanism **38** is shown quite clearly in FIG. **3** and requires no detailed explanation other than to point out that a single ejector control **39** operates all four ejector pins **40**.

A cross head **41** extending between the upper ends of the two columns **31** and **32** has one end of a bell crank **42** pivotally connected thereto by means of a pivot pin **43**. A further pivot pin **44** extending transversely the bell crank **42** engages with the upper ends of each of a pair of parallel links **45** which extend obliquely downwardly towards respective ends of a pivot pin **46** securing the links to a lug **47** on the front edge of the movable sealing plate **34**.

An operating handle **48** is secured to the linkage so as to be coaxial with the pivot pin **44** and thus raising of the handle **48** will pivot the bell crank **42** in the anti-clockwise sense (as viewed in FIG. **3**) and cause the front edge of the movable sealing plate **34** to be raised.

The rear edge of the movable sealing plate **34** is provided with lugs **49** which are pivotally attached to a slide **50** carried by the columns **31** and **32** for movement vertically therealong. The other part of the slide **50** is connected by pivot pins **51** to further links **52** which extend upwardly to the mid point of the bell crank **42** and are secured thereto by a common pivot pin **53**.

The two links **52** are joined by a horizontal bar **54** which serves as an abutment to prevent the bell crank **42** from rotating too far in the clockwise direction during closing of the movable sealing plate **34**. Each of the links **52** has a vertically orientated elongate slot **55** through which threaded narrow diameter end portions of the bar **54** may extend to be clamped in any position along the length of the slot by means of nuts **56** shown in FIG. **4**.

Clearly, as the handle **48** is lowered the bell crank **42** will rotate in a clockwise direction causing simultaneous downward movement of the pivot pins **44** and **53** but in such a manner that the pivot pin **44** descends more rapidly than the pivot pin **53** (by virtue of the different spacings of the pivot pins **44** and **53** from the fixed pivot pin **43** on the cross head **41**). Downward movement of the pivot pin **53** will cause the links **52** to thrust the slide bracket **50** downwardly thereby lowering the rear edge of the sealing plate **34**, but simultaneously the descending movement of the pivot pin **44** will cause the links **45** to thrust the front edge of the movable sealing plate **34** downwardly with a greater speed so that, when the bell crank **42** is in its extreme clockwise position the two sealing plates are in contact with the desired degree of compression of the sealing strips **35** and **36**.

A study of the opening movement of the sealing plates will show that the movable sealing plate **34** rises and pivots in the anti-clockwise sense as viewed in FIG. **3** so as to provide the maximum possible access for loading unpacked sandwiches on the base plate **37**.

Clearly, by rising the rod **54** in the slots **55**, the extreme clockwise position of the bell crank **42** will be displaced slightly in the anti-clockwise sense as compared to the illustration of FIG. **3**. Conversely, lowering and locking of the bar **54** will allow the bell crank to move even further clockwise.

Adjustment of the bar **54** will therefore enable alignment of the upper sealing plate **34** in a closed configuration in which it will be truly parallel to the fixed base

plate **37**, and it then merely remains to raise or lower the columns **31** and **32** so that the sealing strips **35** and **36** are compressed to the required degree when the two sealing plates **34** and **37** are closed.

The slide **50** carries an abutment screw **56** threadedly received in an associated lug to serve as a trip for a limit switch **57** to start the heater timer control once the slide **50** has reached its lowermost position, corresponding to the closed condition of the movable and fixed sealing plates **34** and **37** respectively. A suitable time delay circuit is actuated by the limit switch **57** and during operation of the delay circuit the heater is in operation. Once the delay circuit trips, the heater is switched off and a suitable pilot light may either ignite or extinguish (as desired) in order to indicate that the required time for sealing has elapsed.

The abutment screw **56** is, of course, vertically adjustable within the lug by means of the lock nut shown in FIG. **3** to effect adjustment of the working of the limit switch to ensure that, upon re-adjustment of the height of the columns **31** and **32**, the abutment screw **56** will trip the limit switch **57** only when the slide **50** reaches its lowermost position.

FIG. **3** also shows a guide **58** for guiding the fold line of film web as it is moved across the base plate during a re-leading operation.

The front elevational view of FIG. **4** shows a mains "on-off" switch **59** and accompanying pilot light **60**, and the pilot light **61** which will light up while the heater circuit is energized. Thus, in this embodiment, the heater pilot light **61** will extinguish once the sealing operation is complete. A further selector control **62** serves for selecting the desired heating time commensurate with the particular film dimensions and type used.

We claim

1. A method of packaging articles which have a substantially straight side disposed opposite to an apex portion, said method comprising the steps of:

a. placing pairs of the articles in a longitudinal array between the juxtaposed portions of a folded sheet of heat sealable film, said longitudinal array extending parallel to the film fold line with the articles arranged to have their substantially straight sides parallel and the apex portion of one article diagonally opposite the apex portion of the other article; and,

b. sealing together the said juxtaposed film portions in a triangular array along three seal lines to form separable packages, the three seal lines forming a right triangle with one line being perpendicular to said fold line, said triangle encompassing one article in each of said pairs, one of said seal lines forming a seal line for the next succeeding article; and, the other of said articles in said pair being encompassed by a seal line formed in the previous sealing step, the film fold line, and one of said seal lines forming said right triangle.

2. A method as set forth in claim **1**, wherein the folded sheet of film is a continuous web of centrefolded film which is advanced after one sealing operation to move one of the seal lines of the triangular array into a position into which it serves as the previous seal line for the next successive operation.

3. A method as set forth in claim **2**, wherein the web is advanced a distance such that siad one line of the triangular array is arranged to intersect the triangular array formed at the next successive sealing operation.

4. Apparatus for packaging articles of the type having a substantially straight side disposed opposite an apex portion comprising:

a. a sealing unit including means for forming a plurality of right triangular arrays simultaneously,

b. means for supplying center folded heat sealable film to the sealing unit past said seal forming means with the fold running across a corner of the triangular array but parallel to a side of the triangular array opposite said corner; and,

c. means for advancing the film a distance substantially equal to the product of the number of triangles and the length of said opposite side of the triangle.

5. Apparatus as set forth in claim **4**, wherein the seal forming means is in the form of a fixed base plate, a relatively movable sealing plate having heat seal elements, and a resilient bed on the base plate to co-operate with the heat sealing elements.

6. Apparatus as set forth in claim **5**, and including manually operable means for positioning said movable sealing plate, said manually operable means comprising a toggle mechanism in the linkage to ensure uniform contact pressure between the sealing elements and the resilient bed.

7. Apparatus according to claim **6**, and including means for adjusting the said contact pressure.

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