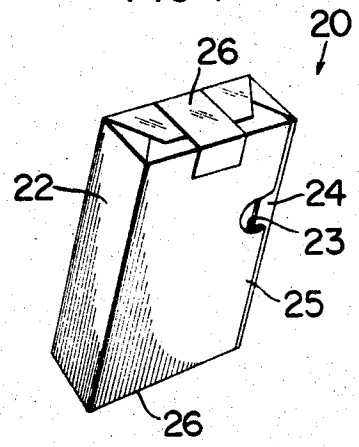
April 1, 1969 W. C. WHITAKER 3,435,735

APPARATUS FOR AND METHOD OF MAKING A CIGARETTE PACKAGE CONSTRUCTION OR THE LIKE

Filed March 13, 1967 Sheet 1 of 3

FIG-1



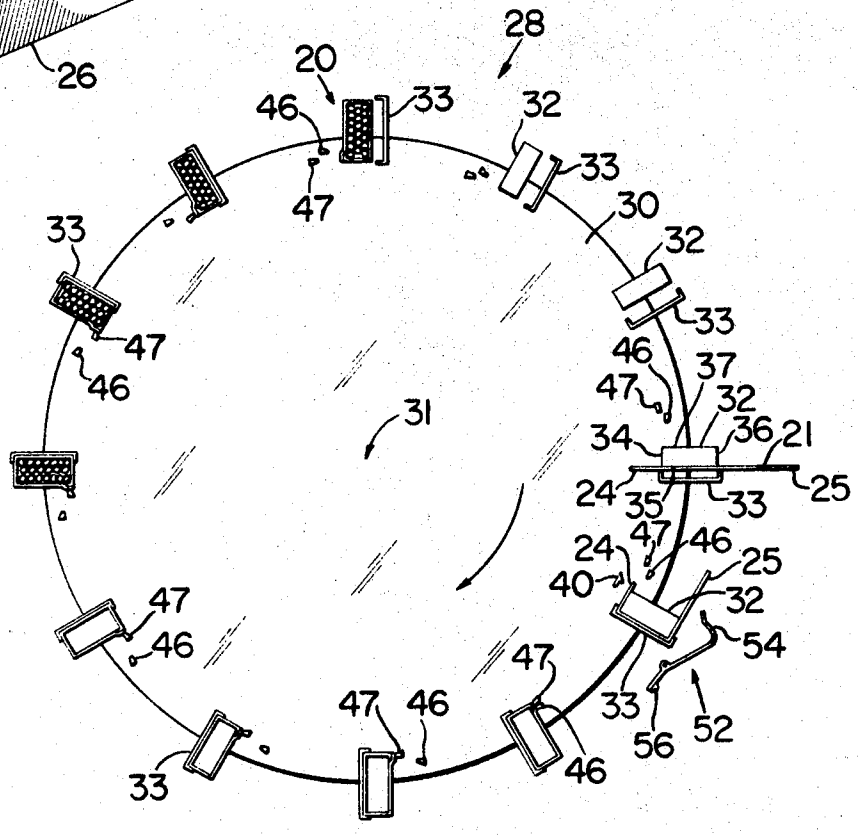


FIG-2

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April 1, 1969 W. C. WHITAKER 3,435,735

APPARATUS FOR AND METHOD OF MAKING A CIGARETTE PACKAGE CONSTRUCTION OR THE LIKE

Filed March 13, 1967 Sheet 2 of 3

FIG-3

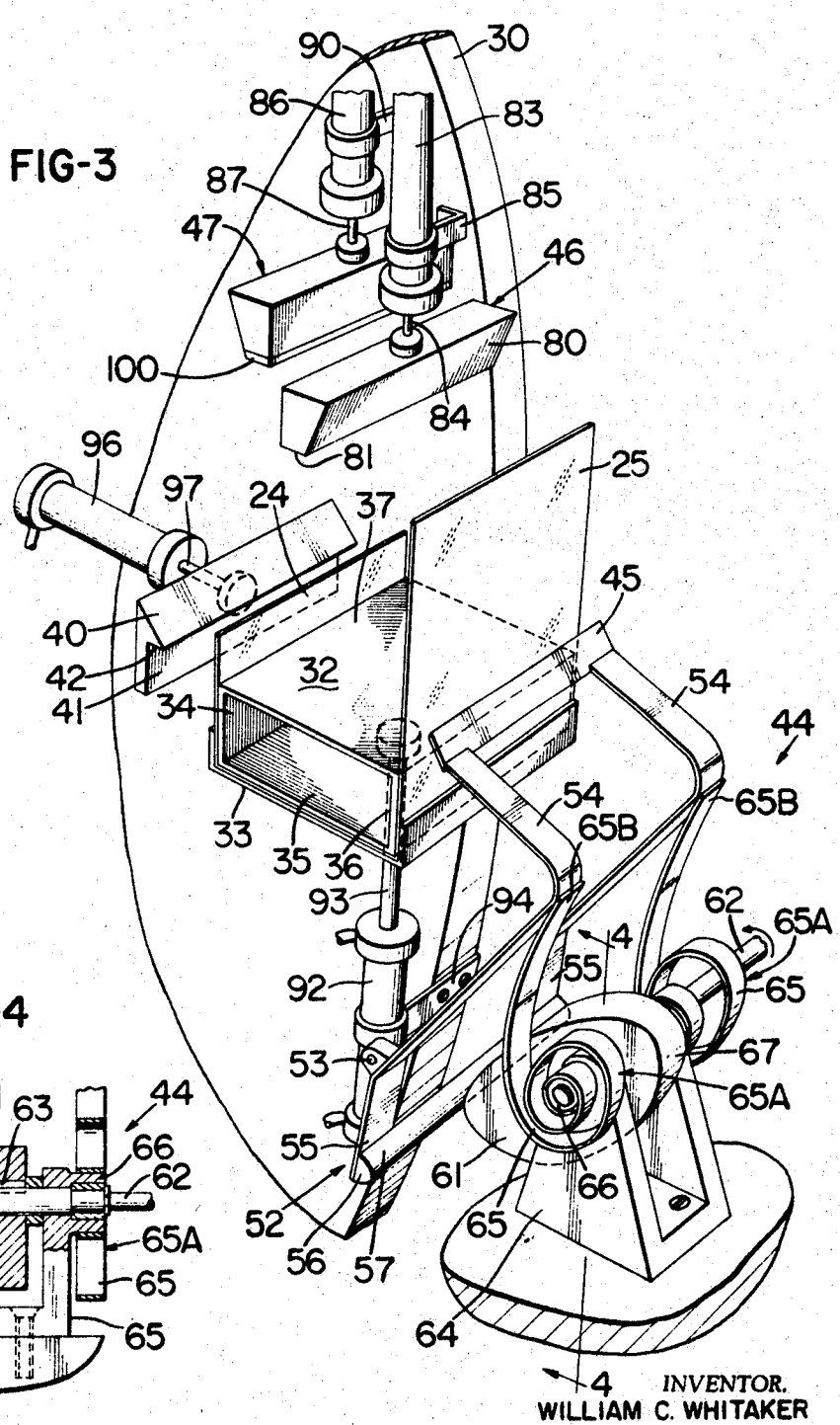
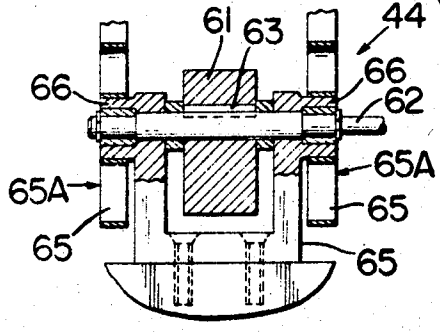


FIG-4



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April 1, 1969 W. C. WHITAKER 3,435,735

APPARATUS FOR AND METHOD OF MAKING A CIGARETTE PACKAGE CONSTRUCTION OR THE LIKE

Filed March 13, 1967 Sheet 3 of 3

FIG-5

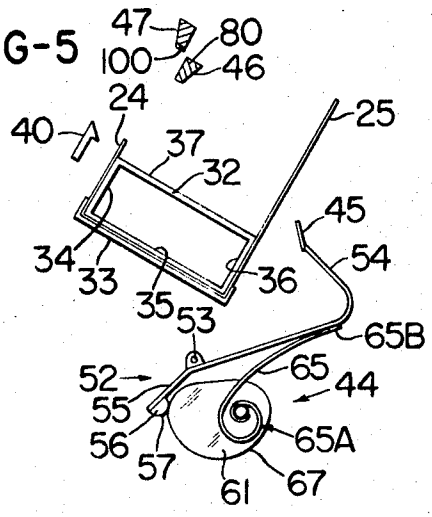


FIG-6

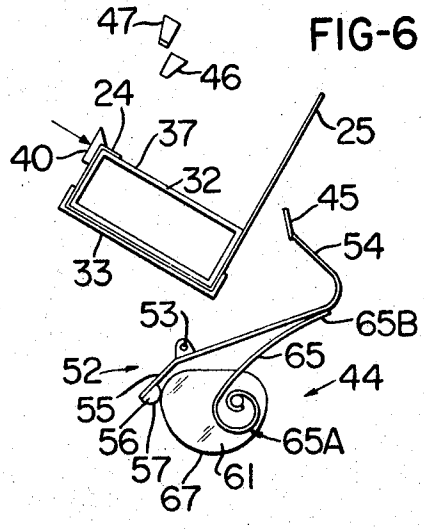


FIG-7

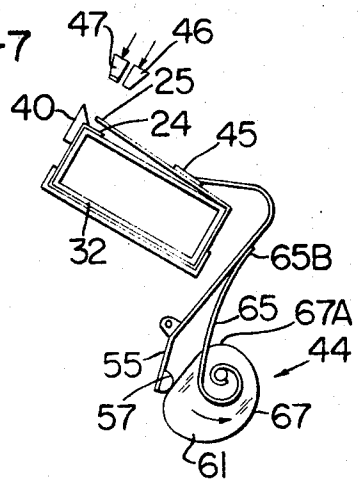


FIG-8

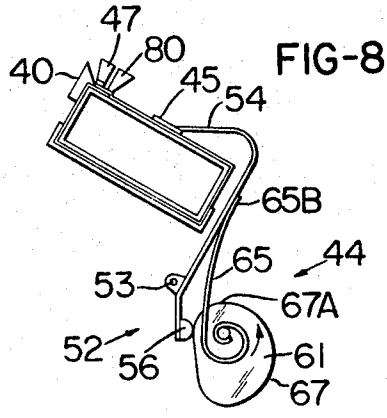


FIG-9

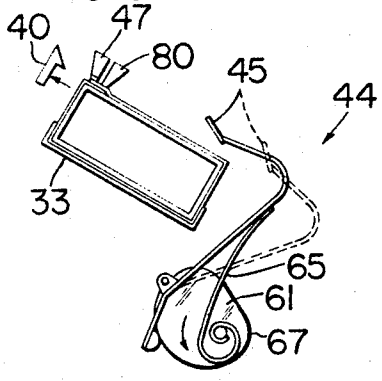


FIG-10

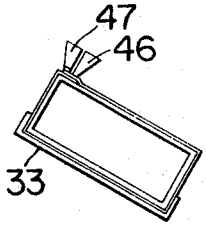
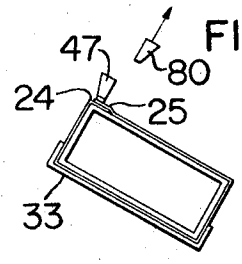


FIG-11



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United States Patent Office 3,435,735 Patented Apr. 1, 1969

3,435,735

APPARATUS FOR AND METHOD OF MAKING A CIGARETTE PACKAGE CONSTRUCTION OR THE LIKE

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Filed Mar. 13, 1967, Ser. No. 622,649
Int. Cl. B31b 1/28, 49/04
U.S. Cl. 93—12 14 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to an improved apparatus for and method of making container means such as a cigarette package, for example, in which each package is made from a foldable blank in an automatic sequence on an indexing device comprising such apparatus. Each blank is folded about a suitable arbor carried on such indexing device using folding means provided on such indexing device and externally thereof. Separate heating means is carried on such indexing device and provided for heat sealing overlapped opposite end portions of each blank in position during the forming of each package. Each heating means operates together with an associated clamping means for each package which is also carried on such indexing device and the heating and clamping means are operated to provide an optimum seal for each package.

This invention pertains to container means and more particularly to an improved apparatus for and method of making container means from a blank of material or the like.

Container means such as cigarette packages in current use today are often formed from a flat blank of material comprised of a plurality of layers such as aluminum-containing foil, or the like, and/or paper and having an exposed surface or layer of a plastic material which is heat-sealable. Apparatus and methods have been previously proposed for forming such cigarette packages by heat sealing the overlapping edges of such blank together. The apparatus and methods in current use generally employ heating means requiring stopping of a substantially continuous operation for a sufficient time interval for each package being formed to enable moving such heating means in position, heating and heat sealing the desired areas, and withdrawing such heating means. Inherently the above procedure, although effective, limits the total output of the apparatus while providing packages in which the heat sealed areas are not provided with an optimum bond.

Accordingly, it is a feature of this invention to provide an improved apparatus for making cigarette packages, or the like, which is of simple construction and capable of providing an improved bond between overlapped heat-sealed end portions of a blank used to form such cigarette packages.

Another feature of this invention is to provide an improved apparatus which is of simple and economical construction and readily adaptable to be used in combination with currently available equipment to increase the total output of such equipment and yet provide an improved package construction.

Another feature of this invention is to provide an improved method of making cigarette packages, or the like, having improved structural characteristics.

Another feature of this invention is to provide an improved method of making such improved packages by modifying currently used techniques to enable the provision of an improved bond between overlapped heat sealed end portions of each package.

Accordingly, it is an object of this invention to provide an improved apparatus for and method of making container means from a blank of foldable material having one or more of the novel features of this invention as set forth above or hereinafter shown or described.

Other objects, uses, and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIGURE 1 is a perspective view illustrating the improved container means of this invention with a portion thereof broken away.

FIGURE 2 is a schematic end view illustrating an exemplary apparatus of this invention used to make cigarette packages.

FIGURE 3 is an enlarged perspective view with parts broken away illustrating the principle operating components of the improved apparatus of this invention and particularly showing heat sealing means carried on an indexing wheel comprising the exemplary apparatus of this invention and the arrangement of folding means and clamping means relative to such heating means.

FIGURE 4 is a sectional view on the line 4—4 of FIGURE 3.

FIGURES 5–11 are schematic end views illustrating the sequence used to form the improved cigarette package construction of this example of the invention and particularly illustrating the action and relative positions of the various moving components.

While the various features of this invention are hereinafter illustrated and described as being particularly adaptable for forming container means such as a package for cigarettes, or the like, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide container means for other uses as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

An improved exemplary container means or cigarette package **20** of this invention is illustrated in FIGURE 1 of the drawings. Package **20** is formed from a generally rectangular blank **21** preferably having a layer of aluminum-containing metallic foil **22** defining its outside surface and an inside surface made of a plastic material which is a heat-sealable material and indicated by the numeral **23**. Blank **21** is suitably folded so that opposed end portions thereof indicated by the numerals **24** and **25** are placed in overlapping relation. The overlapped end portions **24** and **25** are heat sealed together using the improved apparatus and method of this invention to provide an improved bond therebetween, as will be described in detail subsequently, to initially form a tubular structure having open ends. After inserting cigarettes within such open end structure, using conventional equipment, such open ends are folded closed and sealed in a known manner to define end walls each designated by the numeral **26** and shown in the drawings as the top and bottom wall of the improved package **20** of this example. The improved apparatus and method of this invention enable the provision of cigarette packages in a more rapid and efficient manner than is currently possible using existing equipment and methods.

Blank **21** may be made of any suitable foldable material having an exposed surface or layer made of a plastic heat-sealable material. In this example of the invention plastic layer **23** forms the inside surface of the improved package **20**. Blank **21** may have any number of layers

using materials such as metallic foil, paper, plastic, and the like provided one outside surface or layer of blank **21** is made of a heat-sealable material. It will be appreciated that the use of heat-sealable plastic material not only makes possible the improved package construction of this invention but also provides a substantially moisture-proof barrier assuring the cigarettes within package **20** maintain their freshness.

The exemplary apparatus of this invention is designated generally by the numeral **28** in the drawings, see FIGURE 2, and comprises an indexing device such as a wheel-like structure or wheel designated generally by the numeral **30** which is rotatable about an axis shown at **31** which extends normal to the plane of the drawings. Wheel **30**, in this example, has a plurality of twelve stations arranged about its periphery in a clock-like manner and means is provided to enable forming of a separate cigarette package **20** at each station.

An arbor **32** of generally rectangular cross-sectional outline and having the general overall shape of a parallelepiped is fixed in position at each station about the periphery of wheel **30**, and a movable U-shaped folding device **33** is supported on wheel **30** at each station for rotation therewith while being adapted to move toward and away from an associated arbor **32**. The dimensional configuration of each U-shaped folding device **33** is closely controlled and corresponds to an arbor **32** associated therewith and the thickness of an associated blank **21** to enable forming such blank thereabout as will be described in detail later.

Wheel **30** is suitably rotated about its axis **31** in a clock-wise manner in indexing steps and at a position which will be referred to as the three o'clock station a substantially rectangular blank **21** is inserted between a coperating arbor **32** and folding device **33**, see FIGURE 2. Each rectangular arbor **32** has four walls or sides designated respectively by the numerals **34, 35, 36**, and **37** about which blank **21** is folded to define a tubular structure having open ends. As shown in FIGURE 3 of the drawings, side **37** is illustrated as the top side or top wall of arbor **32**.

Blank **21** is inserted between arbor **32** and folding device **33** at the three o'clock station so that it extends radially inwardly toward the center of wheel structure **30** a predetermined amount and positioned so as to define the location along top wall **37** that end portions **24** and **25** of blank **21** will be brought in overlapping relation. Having thus inserted blank **21** in position, the folding device **33** is moved or urged toward fixed arbor **32** thereby folding blank **21** therebetween around three sides **34, 35,** and **36** of rectangular arbor **32**.

The terminal end portions **24** and **25** of blank **21** are then folded in overlapping relation at the four o'clock position using suitable folding means supported independently of indexing wheel **30**. Clamping means and heat sealing means caried by rotatable wheel **30** are then moved into engagement with overlapped end portions **24** and **25** and operated in a controlled manner to provide an improved heat seal between such overlapped portions.

Arbor **32** and folding device **33** are maintained in their urged together position until wheel **30** is indexed to what is illustrated as the twelve o'clock position in the drawings, at which position the completed package **20** with cigarettes sealed therein is ejected. The clamping means which holds end portions **24** and **25** of each package **20** clamped together is also held clamped from the four o'clock position to the twelve o'clock position to allow heat sealed end portions to cool while being held firmly clamped together.

Exemplary apparatus **28** of this invention includes means for folding the remainder, i. e. terminal opposite end portions, of blank **21** not previously simultaneously folded around walls **35–36** against top side or fourth side **37** of arbor **32**. The folding action takes place at the four o'clock position and will be understood readily by first referring to FIGURES 3 and 4 of the drawings showing the principal components in enlarged view and then referring to the sequential operating steps taking place at the four o'clock position and illustrated in FIGURES 5 through 9.

As U-shaped folding device **33** engages blank **21** and folds it around sides **34, 35,** and **36** of arbor **32**, end portion **24** projects above top edge of side **34** and hence above top **37** of arbor **32**. In a similar manner the end portion of blank **21** having portion **25** adjoining its terminal edge extends beyond the top edge of wall **36** a sufficient amount to overlap end portion **24** adjacent the corner defined by sides **34** and **37** once blank **21** is finally folded in position about arbor **32**.

With folding device **33** in its fully extended or actuated position, folding means provided to fold and initially hold the terminal end portions of blank **21** in overlapped relation against top side **37** of arbor **32** are actuated. Such folding means comprises a first device shown as an elongated folding bar **40** having a surface **41** which is arranged to cooperate with wall **34** and a surface **42** arranged at right angles thereto and adapted to cooperate with top wall **37** of arbor **32**. As seen in FIGURES 6 and 7 of the drawings, folding bar **40** engages blank **21**, at the four o'clock position, and positions end portion **24** against top side **37** of arbor **32**.

Simultaneously with the folding of end portion **24** in position, action is commenced to fold and hold the remainder of blank **21** and particularly end portion **25** thereagainst in overlapping relation. The folding and holding action for the remainder of blank **21** is accomplished by use of a second device indicated generally by the numeral at **44**, see FIGURES 3 and 4.

Device **44** has a holding member of arm **45** which in this example of the invention is formed as an elongated rectangular strip or bar which extends substantially across the full width of blank **21**. Holding arm **45** is moved into engagement with and away from blank **21** in a manner as will be described in detail subsequently.

Folding arm **45** engages the portion of blank **21** adjoining end portion **25** and holds it in position overlapped on top of end portion **24**. Arm **45** is held in this position for a fraction of a second allowing sufficient time for end portions **24** and **25** to be engaged by an associated heating means and clamping means designated generally by the respective numerals **46** and **47**.

Each heating or heat sealing means **46** of this improved apparatus heats a predetermined area of end portions **24** and **25** and is held in its heating position after a particular associated package **20** which is being formed is indexed beyond the four o'clock folding station to assure the provision of an improved bond between end portions **24** and **25**. Heating device **46** and clamping device **47** are moved into heating and clamping position respectively in a substantially simultaneous manner. However, in this exemplary illustration, heating device **46** is removed at the six o'clock station while device **47** is held in clamping engagement until the twelve o'clock station when the completely formed, filled, and sealed package is ejected.

As previously mentioned, folding and holding device **44** has a folding and holding arm **45** which accomplishes its entire function at the four o'clock station. The detailed presentation will now proceed with a description of the remainder of the operating components comprising device **44**.

Device **44** comprises a lever-like structure or assembly **52** which is pivoted about a fixed axis defined by a pin **53** supported generally outside the periphery of wheel **30**. Structure **52** has an upper portion extending in one direction from pivot pin **53** which includes a pair of substantially parallel members each designated by the numeral **54**. Folding and holding arm **45** is suitably fastened to and extends between the terminal outer ends of members **54** and is adapted to engage blank **21** adjacent end portion **25**.

Structure **52** has a lower portion extending in the oppo-

site direction from pin 53 and such lower portion includes another pair of substantially parallel members each designated by the numeral 55 and a transverse bar 56 which is fastened between the terminal end portions of members 55. Bar 56 has an arcuate surface 57 which is engaged by a rotatable cam 61 to move members 54 toward and away from wheel 30 and thereby move folding and holding arm 45 into and out of engagement with blank 21.

Cam 61 is supported on a rotatable shaft 62 and is keyed thereto using a key 63. Shaft 62 is supported for rotation on a mount 64 therefor and is rotated in any suitable manner preferably using an electric motor, or the like.

Arm 45 is moved into folding and holding engagement against blank 21 adjacent end portion 25 using any suitable moving means and in this example of the invention the previously described cam 61 is used cooperating with spring means or a pair of springs 65. The action of springs 65 and cam 61 will be better understood by referring particularly to FIGURES 3 and 4 and the detailed description will now proceed referring only to one spring it being understood the description is fully applicable to both springs 65.

Spring 65 is constructed and arranged to cooperate with cam 61 to apply a holding force of substantially constant magnitude. Spring 65 has a coiled portion 65A at its base which assures a substantially constant force being exerted at its outer end as such spring is flexed. Inner coiled portion 65A of spring 65 is fixed to a support 66 comprising the upper end portion of mount 64 while the outer portion 5B of each spring exerts a force against an associated member 54 to thereby exert the above mentioned force of constant magnitude against holding arm 45. However, it will be seen from the drawings that cam 61 engages arcuate surface 57 of bar 56 to assure that blank 21 is engaged by arm 45 only during the folding and holding procedure at the four o'clock station.

The action of cam 61 and arm 45 will be readily understood by referring to FIGURES 5–9. Cam 61 has an outer configuration indicated generally by the numeral 67 and such configuration is such that it engages arcuate surface 57 of bar 56 to pivot lever assembly 52 about pin 53. This pivoting action moves arm 45 toward and away from blank 21 at the four o'clock position. It is seen, therefore, that cam 61 overrides constant force springs 65 at all times except during the folding and holding interval when such springs are allowed to exert their controlled force.

The holding arm 45 is assured of being in constant force engagement with blank 21 because cam surface 67 has a constant radius arc portion 67A which holds such arm in position as desired during the time interval that end portion 25 of blank 21 is folded and held against portion 24. Basically then, it is merely necessary to rotate shaft 62 in timed sequence with movement of wheel 30 into and out of the four o'clock position to achieve the desired folding and holding action by arm 45. Also, shaft 62 is rotated in cooperation with the action of the other folding components and heat sealing members actuated into position at the four o'clock position.

Arm 45 is held in engagement with blank 21 for a sufficient time to enable heating means 46 and clamping means 47 to be moved into position as previously mentioned. The description will now proceed with a detailed description of first heating device or means 46 and then clamping device or means 47 and the operation of each. The description will be made of only one heating device 46 and clamping device 47 and associated members; however, it will be appreciated that apparatus 28 has a plurality of cooperating sets of such devices. Thus, as seen in FIGURE 1 a heating device 46 and a clamping device 47 is provided at each of the twelve positions on wheel 30. Only a few representative ones of devices 46 and 47 have been designated by their appropriate reference numerals in FIGURE 2.

Each heating means 46 preferably comprises a heater bar 80 having a heated terminal outer surface 81 which is adapted to be moved into engagement with end portion 25 of an associated blank 21 to heat seal portions 24 and 25 together by heating a predetermined area thereof corresponding to heated surface 81. Heating means 46 is heated in any suitable known manner. For example, electrical heating elements may be suitably embedded within bar 80 adjacent surface 81 and provided with suitable control means to control the temperature of heated surface 81.

First actuating means shown as a separate actuator 83 for each heating means 46 is provided for moving each associated heater bar 80 toward and away from arbor 32. Actuator 83 has a telescoping rod end 84 which is suitably attached to bar 80. A bracket 85 supports actuator 83 to wheel 30 in a fixed manner.

Clamping means 47 of this example is preferably in the form of an elongated bar which extends the full length of package 20 to assure end portions 24 and 25 are firmly held together across such full length. Clamping bar 47 is actuated into clamping position by second actuating means shown as an actuator 86 having a telescoping rod 87 extending therefrom. Clamping bar 47 is fixed to the terminal end of rod 87 in any suitable manner and actuator 86 is suitably supported on wheel structure 30 by a bracket assembly 90 in a fixed manner.

Thus, it is seen that actuators 83 and 86 for heating means 46 and clamping bar 47 respectively are mounted on a common structure which in this case is wheel 30 and such actuators are also actuated independently yet in a cooperating manner.

Each U-shaped folding device 33 in this example of the invention is extended into folding position by associated actuating means or an actuator 92 having a telescoping rod end 93 which is suitably attached to folding device 33. A bracket 94 supports actuator 92 to wheel 30 in a fixed manner. Each arbor 32 is, of course, fixed about the periphery of wheel 30 at spaced apart intervals as previously mentioned. After each blank 21 is inserted between a cooperating arbor 32 and U-shaped device 33 at the three o'clock position, an associated actuator 92 is actuated and such blank is folded around the three sides 34–36 of arbor 32 as seen in FIGURE 5.

Folding bar 40 used to fold end portion 24 in position is also provided at the four o'clock position and operated in predetermined timed sequence with folding arm 45. Bar 40 is extended by an actuator 96 having a telescoping rod end 97 which is suitably fastened to bar 40. Actuator 96 is supported independently of wheel 30.

Thus, as each package construction 20 is indexed to the four o'clock position, actuator 96 is actuated to fold end portion 24 in position aganist top surface 37 of arbor 32, see FIGURE 6. With end portion 24 positioned against top surface 37, end portion 25 is placed in overlapping relation thereagainst by arm 45 of folding and holding device 44, as seen in FIGURE 7.

With such end portions thus folded the preferred heat sealing action which was previously mentioned, is to actuate actuators 83 and 86 separately yet in a simultaneous manner to move associated bars 80 and 47 into simultaneous engagement with overlapped end portions 24 and 25 of blank 21 while arm 45 is still held in position, see FIGURE 8. Arm 45 is then withdrawn as seen in FIGURE 9 and bars 80 and 47 remain clamped in position enabling heater bar 80 to heat seal portions 24 and 25 together. Bar 80 is withdrawn at station six as previously mentioned while bar 47 remains clamped allowing end portions 24 and 25 to cool while being firmly clamped.

Three components associated with the folding and heat sealing of blank 21 are carried on wheel 30, namely, folding device 33, clamping bar 47, and heating means 46. The remainder of the folding structure comprising the folding bar 40 and device 44 are supported independently of wheel structure 30 adjacent the four o'clock position.

As will be apparent from FIGURE 3 of the drawings,

clamping bar **47** preferably has a resilient end portion or tip designated by the numeral **100**. Resilient tip **100** is deformable and will conform with the adjoining outside surface of arbor **32**, for example, its top surface **37**. It will be appreciated that through wear and in the process of repetitive manufacture of cigarette packages **20** that top surface **37** of arbor **32** beneath heater bar **80** may become slightly warped, or slightly deformed. By providing a resilient portion **100** on clamping bar **47** the terminal end portions **24** and **25** are held in more positive overlapping relation to thereby provide an improved bond therebetween.

As seen in FIGURE 2 of the drawings, as container means or package **20** with its heat-sealed end portions moves away from the four o'clock position clamping bar **47** is held firmly in position against overlapped end portions **24** and **25**. As previously mentioned, the clamping action is maintained until the twelve o'clock position is reached to assure an optimum bond between heat sealed end portions **24** and **25** and the completed package **20** is ejected at such twelve o'clock position.

Heating means **46** is mounted on wheel **30** so that its heater bar **80** is kept spaced apart from clamping bar **47** to assure minimum heat transfer from heater bar **80** to clamping bar **47**, see FIGURE 3. It will be appreciated that separate heating and clamping units are required because of the rapid manner in which apparatus **28** forms package **20**. It is common practice in a machine of this type to run 120 packages a minute. It would be practically impossible to use a single device both as a heating and cooling-clamping unit because such single device would not lose heat fast enough during the time interval between one heat sealing operation and the next to enable the heat sealed portions to cool properly. The provision of separate heating and clamping devices which are kept substantially thermally isolated (by an air space) makes operation of the machine much more efficient while providing each package **20** with an improved bond between its overlapped end portions.

The mounting of heating means **46** on rotating wheel **30**, in effect, makes it possible to speed up the operation of apparatus **28**. In fact, it has been possible through the use of the improved apparatus and method of this invention to completely package generally of the order of 180 packages per minute.

In known apparatus of this type the heat sealing of overlapped end portions of a blank used to make a package similar to package **20** generally is achieved at a single fixed position with rotary wheel **30** stopped. The heat sealing must be rapidly achieved and generally the more rapid the heat sealing the greater the chances are of providing a poor bond. Efforts were previously made to provide a larger heat sealed area and provide more intense heat to compensate for the short heat sealing time.

The present invention avoids these previous problems because the heating means **46** is carried on indexing wheel **30**. Thus, heater bar **80** of heating means **46** is applied upon stopping wheel **30** to accomplish the folding action; however, this folding is accomplished comparatively rapidly. Heater bar **80** may then be held actuated as long as desired to provide an optimum heat seal between overlapped end portions **24** and **25** of each package.

In this example of the invention heater bar **80** of heating means **46** is shown as being withdrawn from heating engagement at the six o'clock position. However, it will be appreciated that such heater may be kept in heating engagement as long as desired even beyond the six o'clock position.

To help provide more effective cooling of the heat-sealed end portions, clamping bar **47** may employ means for circulating cooling fluid, such as cooling air, or the like, to carry away the heat. However, the surface area of clamping bar **47** is generally sufficient to transfer enough heat to the surrounding air as wheel **30** moves to the twelve o'clock position. Also, it may be desirable in some applications to provide extended heat transfer surfaces as an integral part of bar **47** to provide even better cooling without the provision of a separate cooling fluid.

The various actuators **83**, **86**, **92**, and **96** may be of any suitable type such as mechanical, hydraulic, pneumatic, electrical, or any suitable combination thereof to accomplish the actuating function. The sequence of actuation of such actuators and of cam **61** is achieved in a controlled manner as determined by the operating cycle of apparatus **28** so that each respective actuator moves its associated component into position at the proper time in the cycle.

Most of the various actuators of this disclosure have been shown as cylindrical and having telescoping rod ends. However, it is to be understood that such actuators may be of any suitable shape or size and driven by any suitable power source.

Terms such as "top," "bottom," "side," certain references to clock positions, and the like, have been used in this disclosure for ease of description and are not to be considered as limiting the scope of this invention in any way.

Thus, it is seen that an improved apparatus and method have been provided for economically producing improved heat sealed container means having an optimum bond between overlapped heat sealed end portions of such container means while providing such container means at a higher production rate than is presently possible using similar machines.

While the form of the invention now preferred has been disclosed as required by statute, other forms may be used, all coming within the scope of the claimed subject matter which follows.

What is claimed is:

1. An apparatus for forming container means from a blank comprising, a rotatable indexing device, folding means for folding and holding opposite end portions of said blank in overlapped relation, said folding means comprising first and second devices for folding and holding said end portions in position for a limited time interval, clamping means for engaging and clamping together said end portions during said time interval prior to withdrawal of said second device, said clamping means being supported on said indexing device for movement therewith, heating means for heat sealing said overlapped end portions together by heating a predetermined area thereof, said heating means being supported on said rotatable indexing device for movement therewith, and first actuating means operatively connected to said heating means, said first actuating means being supported on said indexing device and being constructed and arranged to enable moving said heating means into a heating position substantially simultaneously with said clamping means, then holding said heating means in said heating position during movement of said indexing device and for a sufficient time period to assure heat sealing, and then withdrawing said heating means prior to withdrawal of said clamping means, said substantially simultaneous clamping by said clamping means and heat sealing by said heating means for said sufficient time enabling the provision of said container means having an improved heat seal yet without interrupting the overall operating performance of said apparatus.

2. An apparatus as set forth in claim **1** in which, said heating means and clamping means are supported on said rotatable indexing device in spaced apart relation to avoid heat transfer from said heating means to said clamping means, said heating means has heated contacting means defining said predetermined area, and said heated contacting means is moved into said heating position by said first actuating means by being brought into contact with one of said end portions.

3. An apparatus for forming container means from a blank comprising, a rotatable indexing device, folding means for folding and holding opposite end portions of

said blank in overlapped relation, said folding means comprising first and second devices for folding and holding said end portions in position for a limited time interval, clamping means for engaging and clamping together said end poritions during said time interval prior to withdrawal of said second device, said clamping means being supported on said indexing device for movement therewith, heating means for heat sealing said overlapped end portions together by heating a predetermined area thereof, first actuating means operatively connected to said heating means, and second actuating means supported on said indexing device and operatively connected to said clamping means for actuating said clamping means independently of said heating means, said first actuating means being supported on said indexing device and being constructed and arranged to enable moving said heating means into a heating position substantially simultaneously with said clamping means, then holding said heating means in said heating position a sufficient time period to assure heat sealing, and then withdrawing said heating means prior to withdrawal of said clamping means, said substantially simultaneous clamping by said clamping means and heat sealing by said heating means for said sufficient time enabling the provision of said container means having an improved heat seal yet without interrupting the overall operating performance of said apparatus.

4. An apparatus for forming container means from a blank comprising, a rotatable indexing device, folding means for folding and holding opposite end portions of said blank in overlapped relation, said folding means comprising first and second devices for folding and holding said end portions in position for a limited time interval, clamping means for engaging and clamping together said end portions during said time interval prior to withdrawal of said second device, said clamping means being supported on said indexing device for movement therewith, heating means for heat sealing said overlapped end portions together by heating a predetermined area thereof, first actuating means operatively connected to said heating means, said first actuating means being supported on said indexing device and being constructed and arranged to enable moving said heating means into a heating position substantially simultaneously with said clamping means, then holding said heating means in said heating position a sufficient time period to assure heat sealing, and then withdrawing said heating means prior to withdrawal of said clamping means, said substantially simultaneous clamping by said clamping means and heat sealing by said heating means for said sufficient time enabling the provision of said container means having an improved heat seal yet without interrupting the overall operating performance of said apparatus, and said apparatus further comprising, arbor means fixed on said indexing device and having a generally rectangular cross-sectional outline and four supporting surface means, said folding means further comprises an elongated roughly U-shaped device supported on said indexing device and which is movable relative to said arbor means and cooperates therewith to simultaneously fold said blank around three of said four supporting surface means, said first and second devices being supported independently of said indexing device and arranged to enable folding and holding said opposite end portions in overlapped relation against the fourth of said supporting surface means, said heating means and clamping means are supported on said indexing device in spaced apart relation to avoid heat transfer from said heating means to said clamping means, and said heating means has heated contacting means defining said predetermined area and is moved into said heating position by said first actuating means by being brought into contact with one of said overlapped end portions, whereby said first actuating means holds said heated contacting means against said overlapped end portions through subsequent indexing movement of said indexing device for said sufficient time to assure an adequate heat seal and said clamping means fidmly urges and holds said end portions together and against said fourth supporting surface means through subsequent indexing of said indexing device after withdrawal of said heating means to thereby allow adequate cooling time to provide an improved bond between said end portions.

5. An apparatus as set forth in claim 4 in which said heating means comprises a heater bar having heated terminal outer surface means defining said heated contacting means.

6. An apparatus as set forth in claim 5 in which said clamping means has resilient clamping surface means which compensates for any imperfection of said fourth supporting surface means to assure firm clamping action over said entire area.

7. A method of forming container means from a blank comprising the steps of, providing a rotatable indexing device, providing folding means comprising providing first and second devices, folding said blank in position including folding and holding opposite end portions of said blank in overlapped relation for a limited time interval with said first and second devices, providing clamping means supported on said indexing device, engaging and clamping together said end portions with said clamping means during said time interval to enable withdrawal of said first and second devices, providing first actuating means supported on said indexing device, providing heating means operatively connected to said first actuating means, heat sealing a predetermined area of said overlapped end portions together by moving said heating means into heating position with said first actuating means substantially simultaneously with engaging said end portions with said clamping means, holding said heating means in said heating position a sufficient time period to assure heat sealing, withdrawing said heating means with said first actuating means while keeping said clamping means clamped in position to allow adequate cooling of said heat sealed area with said end portions clamped together, and then withdrawing said clamping means, whereby said substantially simultaneous clamping by said clamping means and heat sealing by said heating means for said sufficient time enables the provision of said container means having an improved heat seal yet without interrupting the forming speed of said apparatus.

8. The method as set forth in claim 7 in which said heating means and clamping means are supported on said indexing device in spaced apart relation to avoid heat transfer from said heating means to said clamping means, and comprising the further steps of providing said heating means with heated contacting means defining said predetermined area, said heated contacting means being brought into said heating position by said first actuating means during said heat sealing step and into contact with one of said end portions.

9. The method as set forth in claim 8 in which said step of providing heating means with heated contacting means comprises providing a heater bar having heated outer surface means defining said heated contacting means.

10. The method as set forth in claim 9 comprising the further steps of providing second actuating means supported on said indexing device, operatively connecting said second actuating means to said clamping means, and actuating said clamping means with said second actuating means independently of said heating means.

11. The method as set forth in claim 7 comprising the further steps of providing arbor means having support surface means and fixing said arbor means on said indexing device, said step of providing folding means comprises providing a third device supported on said indexing device, and said folding step further comprises folding said blank around said arbor means first with said third device and then with said first and second devices to place said end portions in overlapped relation against

said support surface means, whereby upon folding said opposite end portions against said support surface means during said folding step and clamping said clamping means thereagainst during said clamping step substantially simultaneously with moving said heating means into said heating position during said heat sealing step said support surface means provides a stable clamping surface during said heat sealing of said end portions to assure an improved bond therebetween.

12. The method as set forth in claim **7** comprising the further steps of, providing arbor means having a generally rectangular sectional outline and having four supporting surface means and fixing said arbor means on said indexing device, said step of providing folding means further comprises providing an elongated roughly U-shaped device supported on said indexing device and which is movable relative to said arbor means, said folding step comprises folding said blank around three of said four supporting surface means with said U-shaped device, said first and second devices being supported independently of said indexing device and said first and second devices folding and holding said opposite end portions in overlapped relation against said fourth surface means during said folding step, said heating and clamping means being mounted on said indexing device for movement therewith and in spaced apart relation to avoid heat transfer from said heating means to said clamping means, and said heating means having heated contacting means defining said predetermined area and being moved into said heating position during said heat sealing step by said first actuating means by being brought into contact with one of said overlapped end portions, whereby upon folding and holding said end portions against said fourth supporting surface means during said folding step said first actuating means moves

and holds said heated contacting means against said end portions for a number of subsequent indexing movements and for said sufficient time to assure an adequate heat seal and said clamping means firmly urges said end portions together and against said fourth supporting surface means and holds said end portions together through subsequent indexing of said indexing device after withdrawal of said heating means to thereby allow adequate cooling time to provide an improved bond between said end portions.

13. The method as set forth in claim **12** comprising the further steps of providing second actuating means supported on said indexing device, operatively connecting said second actuating means to said clamping means, and actuating said clamping means with said second actuating means independently of said heating means.

14. The method as set forth in claim **13** in which said step of providing heating means with heated contacting means comprises providing a heater bar having heated outer surface means, and said step of providing clamping means comprises providing clamping means having resilient clamping surface means which compensates for any imperfection of said fourth supporting surface means to assure firm clamping action over said entire area.

References Cited

UNITED STATES PATENTS

2,971,442	2/1961	Engleson	93—12
3,311,034	3/1967	Whitaker	93—44.1
3,385,176	5/1968	Whitaker	93—12

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93—35, 44.1