Aug. 17, 1965 K. LIEDTKE 3,200,555

METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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Fig. 1

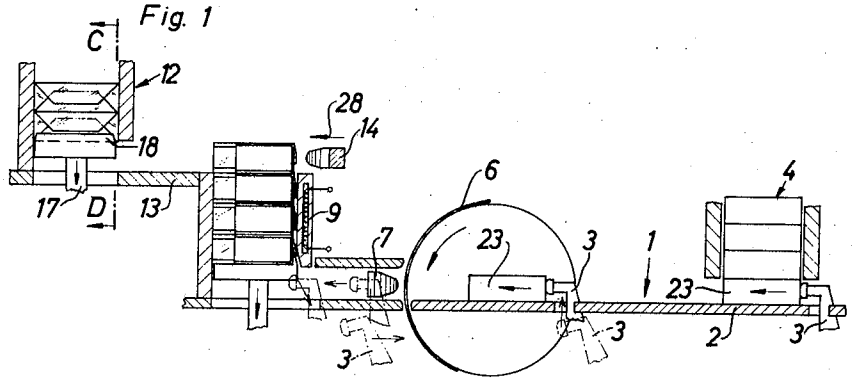


Fig. 2

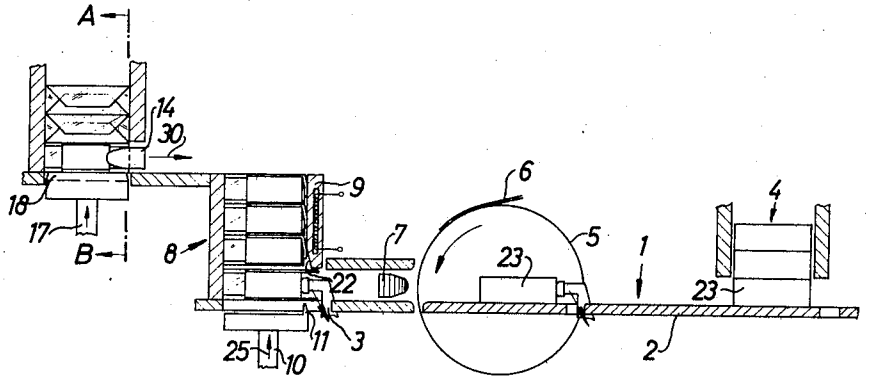
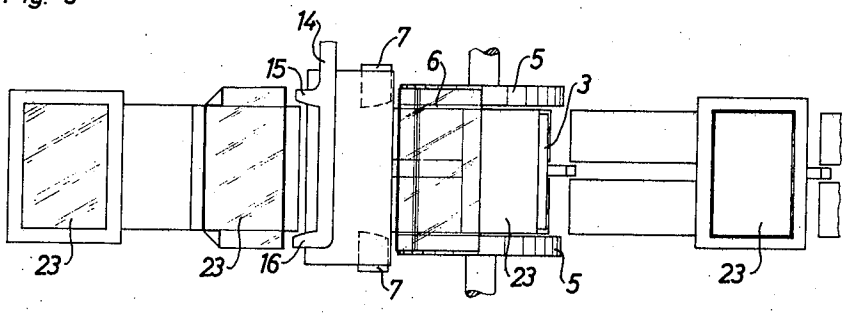


Fig. 3



METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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Fig. 4

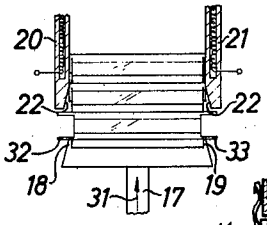


Fig. 5

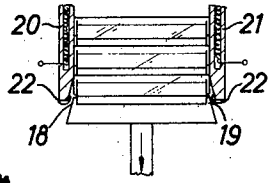


Fig. 10

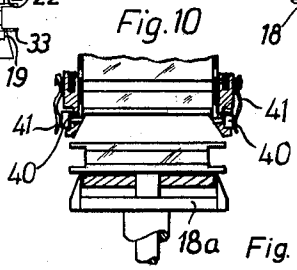


Fig. 6

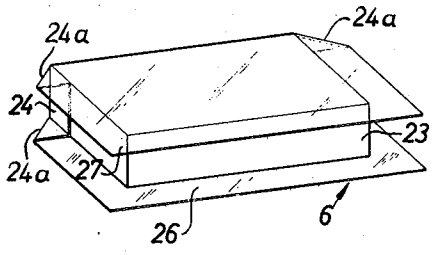


Fig. 7

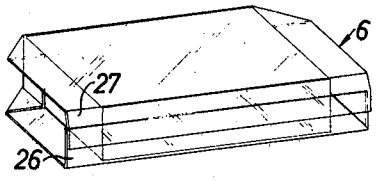


Fig. 8

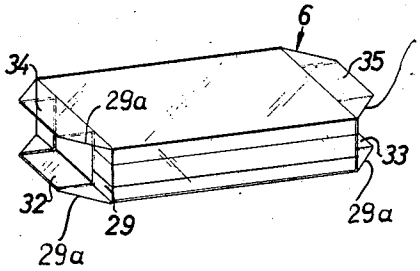
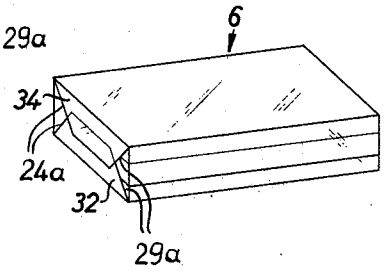


Fig. 9

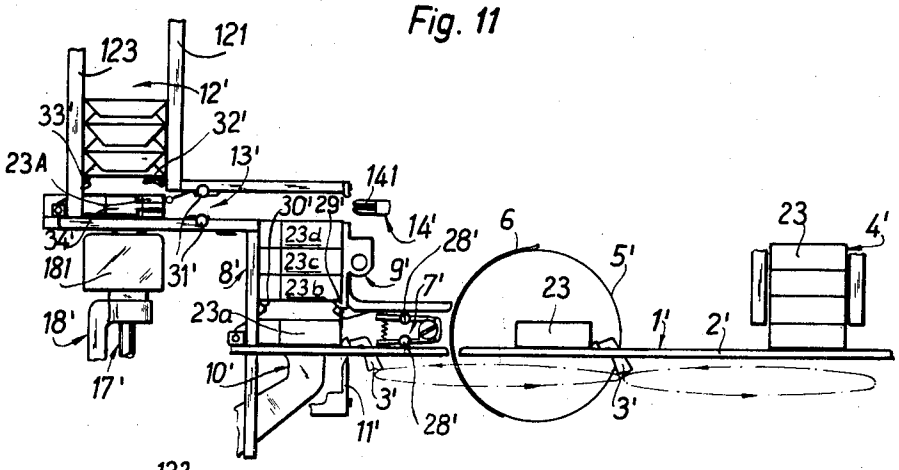


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METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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Fig. 11



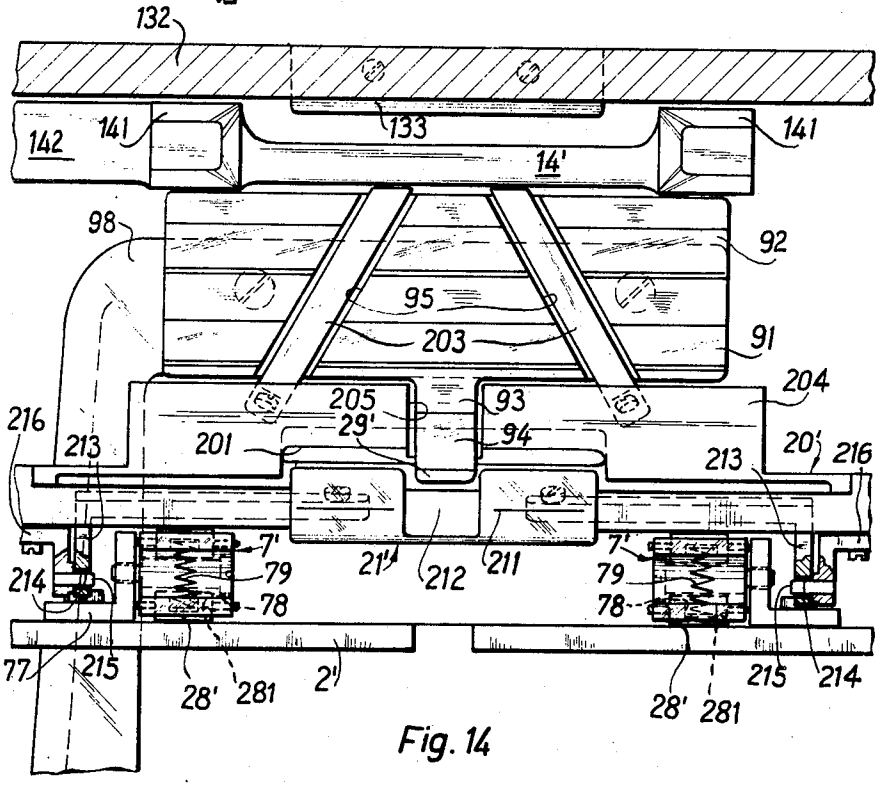
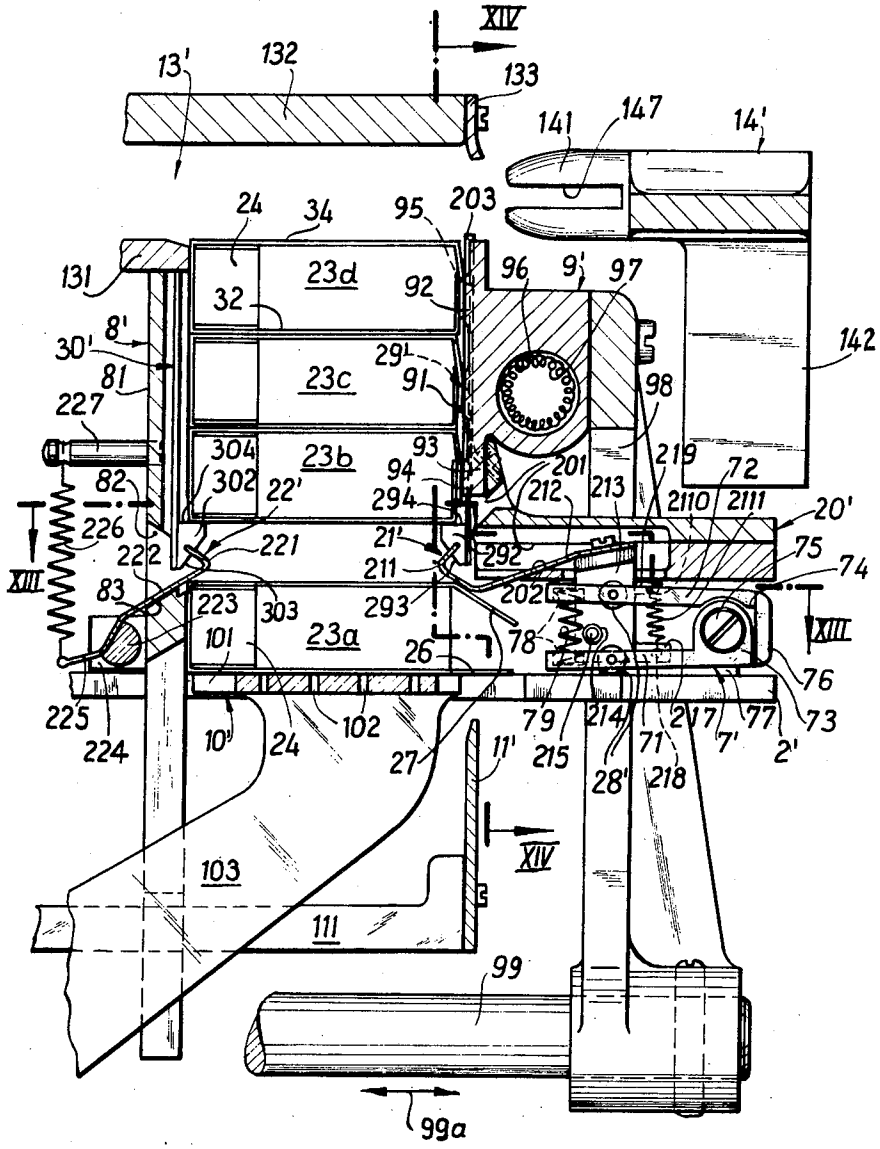


Fig. 14

METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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Fig. 12

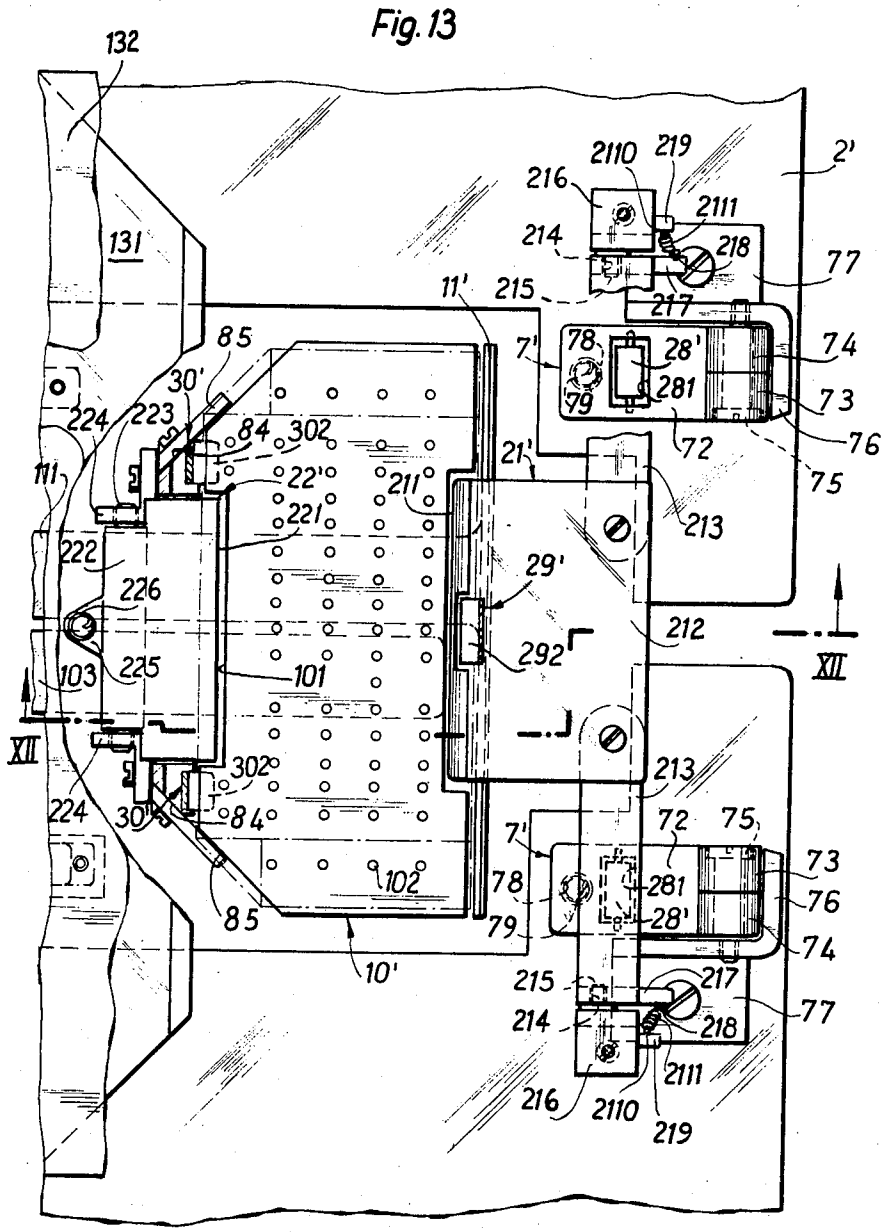


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METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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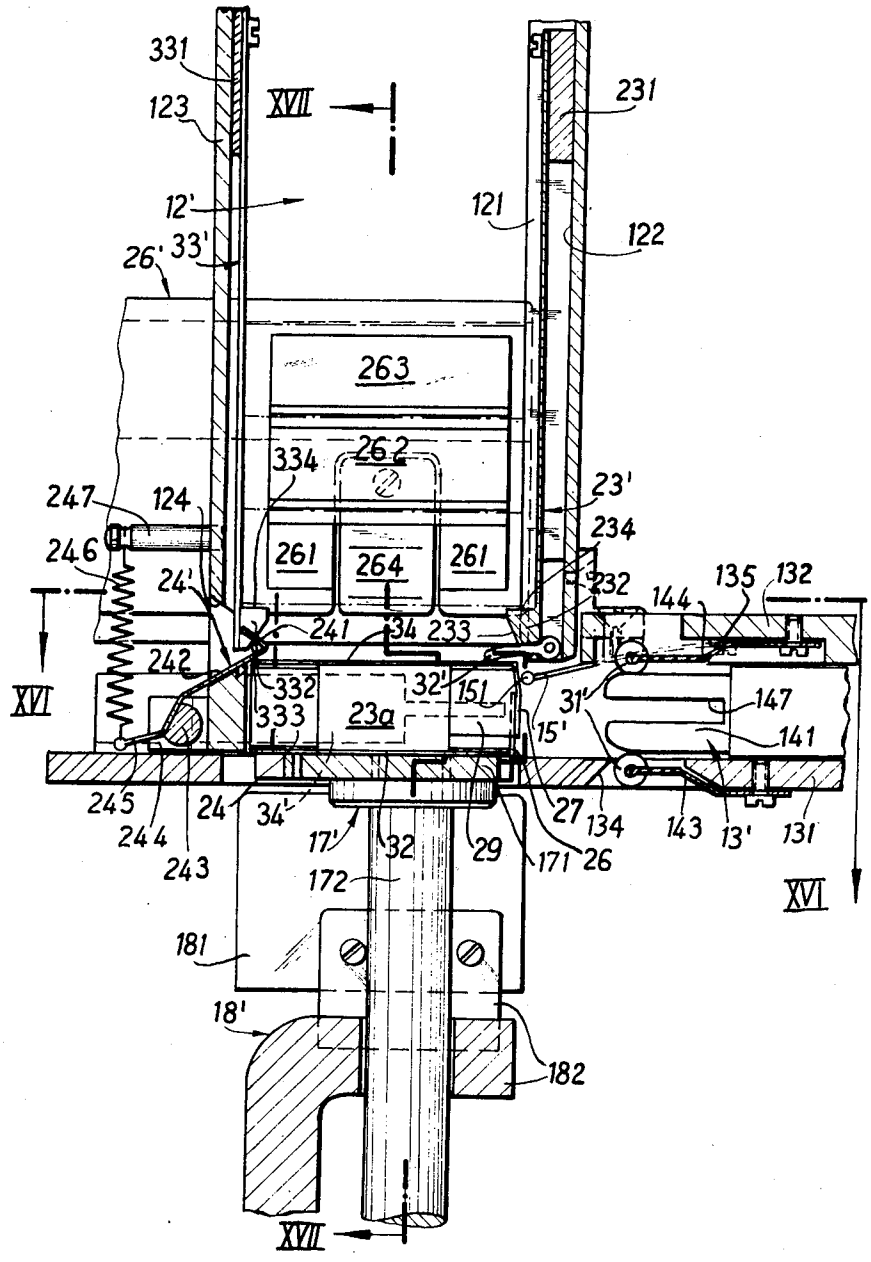
Fig. 13



METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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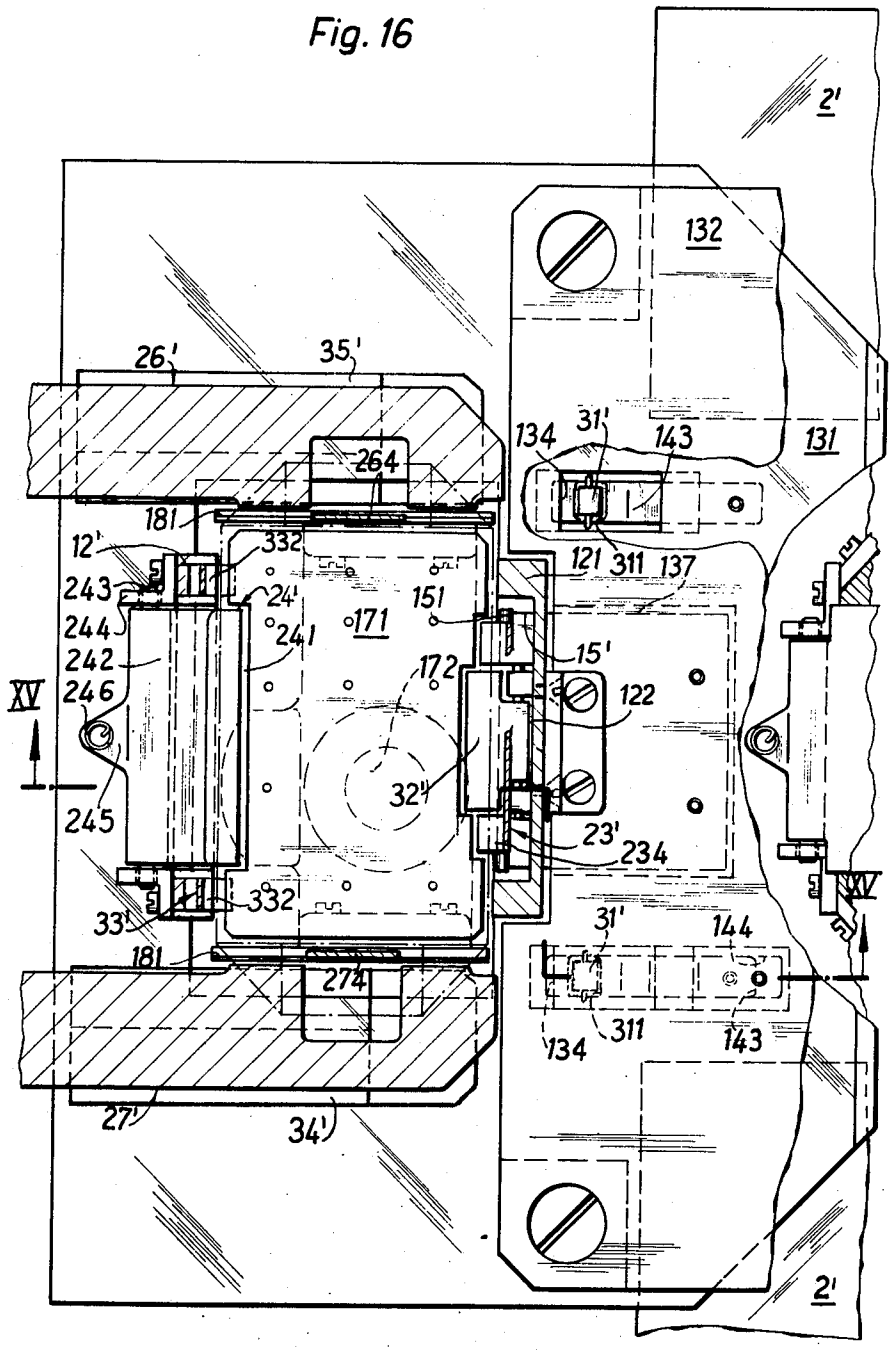
Fig. 15



METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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Fig. 16



METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

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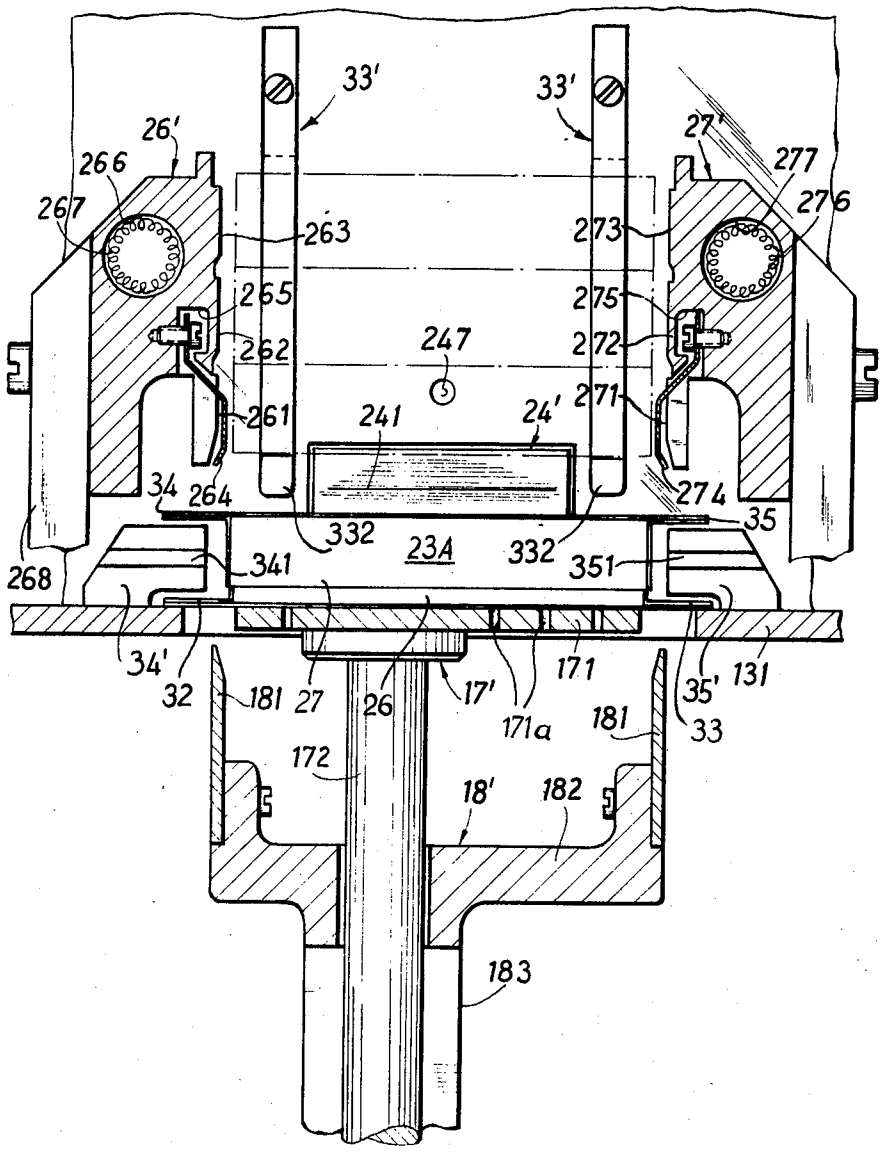


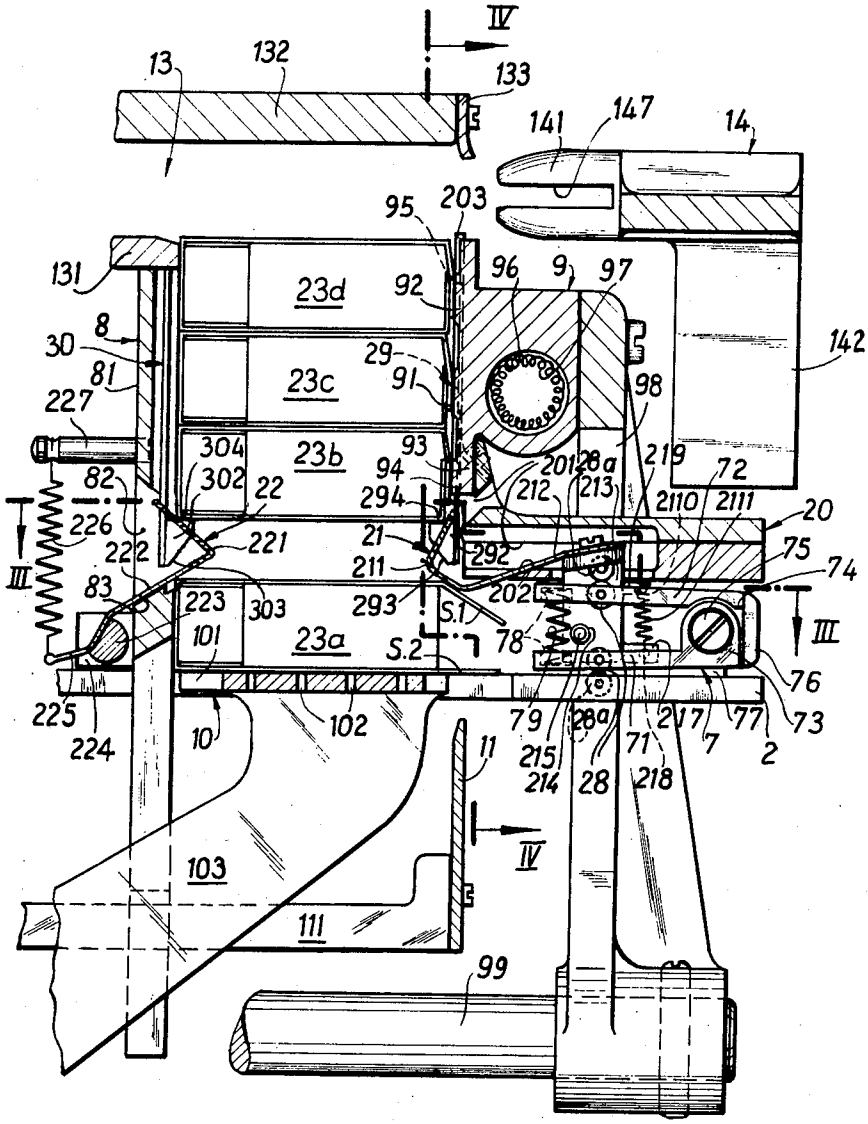
Fig. 17

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Fig. 18



United States Patent Office 3,200,555 Patented Aug. 17, 1965

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METHOD AND APPARATUS FOR WRAPPING CIGARETTE PACKS AND THE LIKE

Kurt Liedtke, Hamburg, Germany, assignor to Hauni Werke Korber & Co. KG., Hamburg-Bergedorf, Germany

Filed May 9, 1963, Ser. No. 279,670
Claims priority, application Germany, July 7, 1960, H 39,873; Great Britain, May 10, 1962, 17,999/62; Feb. 6, 1963, 4,814/63
55 Claims. (Cl. 53—33)

This is a continuation-in-part of my application Serial No. 119,186, filed June 23, 1961, and now abandoned.

The present invention relates to a method of and to an apparatus for wrapping cigarette packs and similar box-like articles, and more particularly to a method of and apparatus for applying heat-sealable or adhesive-coated transparent or translucent wrappers to cigarette packs or the like in a continuous operation and at high speed such as is necessary in mass-manufacturing tobacco processing plants.

It is an important object of my invention to provide a novel method of automatically applying, folding and sealing rectangular wrappers around consecutive box-like articles, particularly around cigarette packs, receptacles containing cigars, cigarillos, chewing or smoking tobacco and other types of products which must be sealed from the atmosphere.

It is another object of the invention to provide a method of wrapping and sealing cigarette packs and other types of box-like articles in a continuous operation and in such a way that the wrapper is formed with sharp edges and that the seams between overlapping flaps of the wrapper will not detract from the eye-pleasing appearance of the ultimate product.

A further object of the invention is to provide a method of applying, folding and sealing wrappers around box-like articles in such a way that the entire operation requires very short periods of time and that the intervals between the consecutive steps are reduced to a minimum.

An additional object of the invention is to provide an apparatus for the practice of my method and to construct the apparatus in such a way that the wrappers and the packs are fully controlled during each stage of the wrapping, folding and sealing operation.

A concomitant object of the invention is to provide an apparatus for wrapping and sealing cigarette packs and the like which is constructed and assembled in such a way that the flaps of the wrapper are formed with sharp creases and that at least some of the flaps are actually smoothed or ironed prior to and during the sealing operation to make sure that the wrapper forms a tight envelope around the pack.

An additional object of the invention is to provide improved folding, crease forming, supporting, pressing, advancing, transferring guiding, braking and retaining devices which engage the pack and/or the wrapper while the packs and the wrappers travel through the apparatus of my invention.

With the above objects in view, one feature of my invention resides in the provision of a method of wrapping rectangular box-shaped articles which comprises the steps of feeding an article along a horizontal path defined by a feed conveyor, feeding a sheet of wrapper material into the path of the article so that a central portion of the wrapper is engaged by the front face of the article and that the wrapper is automatically applied about the front, top and bottom faces of the article, folding the front end flaps of the wrapper while the article continues its movement along the horizontal path, arresting the article and folding the lower rear flap against the rear face of the article, moving the article upwardly in a vertical path and simultaneously folding the rear upper flap of the wrapper so that this flap overlaps the lower rear flap and may be heat-sealed or otherwise bonded thereto, thereupon moving the article in a second horizontal path and simultaneously folding the rear end flaps of the wrapper, arresting the article and folding the lower lateral flaps of the wrapper against the adjacent lateral faces of the article, and moving the article upwardly in a second vertical path by simultaneously folding the upper lateral flaps over the respective lower lateral flaps so that the upper and lower lateral flaps may be heat-sealed or otherwise bonded to each other.

In accordance with a preferred embodiment of my method, the front end flaps and the rear end flaps are provided with sharp creases immediately following the folding thereof so as to prevent reopening of such flaps, and the wrapper is automatically smoothed or drawn taut as it moves in the horizontal and/or vertical paths.

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

FIG. 1 is a longitudinal vertical section through a wrapping apparatus which embodies one form of my invention, the parts of the apparatus being shown in positions they assume during lifting of packs in the respective stacking boxes;

FIG. 2 is a similar section through the wrapping apparatus and shows the parts in positions they assume when the lower zone of each stacking box receives a new pack;

FIG. 3 is a top plan view of the wrapping apparatus;

FIG. 4 is a vertical section as seen in the direction of arrows from the line A–B of FIG. 2;

FIG. 5 is a vertical section as seen in the direction of arrows from the line C–D of FIG. 1;

FIG. 6 is a perspective view of a pack and of a transparent wrapper which is assumed to be received in the bottom zone of the first stacking box;

FIG. 7 is a similar perspective view of a pack and of a partially folded wrapper which is assumed to be located above the first stacking box and is about to be transferred into the lower zone of the second stacking box;

FIG. 8 is a further perspective view of a pack and of a wrapper which is assumed to be received in the bottom zone of the second stacking box;

FIG. 9 is an additional perspective view of a pack and of a finished wrapper in the form it assumes while emerging from the second stacking box;

FIG. 10 is a transverse vertical section through a modified stacking box which comprises spring-biased holders for the packs;

FIG. 11 is a side elevational view of a modified wrapping apparatus;

FIG. 12 is an enlarged vertical section through the first stacking box as seen in the direction of arrows from the line XII—XII of FIG. 13 and taken in a plane parallel with the plane of FIG. 11;

FIG. 13 is a horizontal section as seen in the direction of arrows from the line XIII—XIII of FIG. 12;

FIG. 14 is a vertical section as seen in the direction of arrows from the line XIV—XIV of FIG. 12;

FIG. 15 is an enlarged vertical section through the second stacking box of the apparatus shown in FIG. 11, the section of FIG. 15 being taken in a plane parallel to the plane of FIG. 11 as seen in the direction of arrows from the line XV—XV of FIG. 16;

FIG. 16 is a horizontal section as seen in the direction of arrows from the line XVI—XVI of FIG. 15;

FIG. 17 is a vertical section as seen in the direction of arrows from the line XVII—XVII of FIG. 15 and

FIG. 18 is an enlarged vertical section through the first stacking box as seen in FIG. 12 with a modified form of the holder for the packs and additional rollers.

Referring to FIGS. 1, 2 and 3, there is shown a wrapping apparatus including a conveyor 1 which comprises a horizontal feed track 2 and reciprocating driver members 3. These driver members travel in elliptical paths in such a way that they advance an unwrapped pack 23 while moving in a direction to the left and that they descend to a level below the upper side of the feed track 2 while moving in the opposite direction. Such mode of operation of driver members is well known in the art and forms no part of this invention. A source of packs 23 here shown as a vertical magazine 4 is located at a level above the track 2 and contains a stack of packs with the lowermost pack 23 resting on the track so as to be located in the path of the rearmost driver member 3.

Two rotary suction wheels 5 which are disposed in vertical planes at the opposite sides of the feed track 2 serve to feed rectangular wrappers 6 of transparent synthetic plastic material into the path of the packs 23. The wheels 5 are formed with suction holes which terminate at the peripheries thereof, and the wrappers 6 are delivered thereto from a supply reel, not shown, in a manner as described in my copending application Serial No. 245,802.

The apparatus further comprises two stationary end folders 7 which are adjacent to the track 2 and which are located past the wheels 5. The left-hand end of the track 2 leads into a first stacking box 8 which has an electrically heated upright side wall 9. A plunger 10 which is normally located below the stacking box 8 serves to lift partially wrapped packs after the packs advance beyond the end folders 7. The plunger 10 carries a folder bar 11 which engages a wrapper just before the respective pack moves upwardly through the box 8. At the upper end of this box 8, there is provided a second horizontal track 13 which leads to the lower zone of a second stacking box 12 and which guides packs into the box 12 when the packs are advanced by a horizontally movable plunger 14 arranged to reciprocate back and forth in synchronism with the operation of the wrapping apparatus. The plunger 14 carries two folder projections 15, 16 which engage the wrapper 6 while the plunger moves to the left in order to engage the uppermost pack which is expelled from the box 8, see FIG. 1.

The second stacking box 12 is located at a level above a vertically reciprocable plunger 17 which serves to move the packs upwardly and through the second box and which comprises two folder bars 18, 19 (see also FIGS. 4 and 5).

The lower portion of the heated wall 9 is formed with an inclined guide surface 22 which serves as a folder for the upper rear flap of each consecutive wrapper 6. Similar guide surfaces 22 are provided at the lower ends of side walls 20, 21 (see FIGS. 4 and 5) which form part of the second box 12 and which are electrically heated in the same way as the wall 9.

The apparatus of FIGS. 1–3 operates as follows:

Unwrapped packs 23 are stacked in the magazine 4, and the lowermost pack of the stack is advanced along the track 2 whenever the rearmost driver member 3 moves in a direction toward the suction wheels 5 in synchronism with the operation of the apparatus. The next pack 23 then descends in a fully automatic way and is ready to be entrained by the following driver member. That pack which advances along the track 2 is caused to move through the space between the suction wheels 5 and its front face presses against the central portion

of the wrapper 6 so that the wrapper is withdrawn from the peripheries of the wheels 5 and is transformed into a U-shaped body which covers the front face, the top face and the bottom face of the moving pack. This U-shaped wrapper 6 is then advanced against the end folders 7 which fold the narrow vertical front end flaps 24 in such a way that the flaps 24 lie against the lateral faces of the pack. The flaps 24 are tucked between the upper and lower lateral flaps 32, 34 and 33, 35 in a manner shown in FIGS. 6, 7 and 8. Since the rear flaps 26, 27 are still located in horizontal planes, the end folders 7 slide along the lateral faces of the pack 23 and permit it to enter the lower zone of the stacking box 8 at a level above the plunger 10.

In the next step, the plunger 10 is caused to move upwardly (arrow 25 in FIG. 2) whereby the folder bar 11 engages the lower rear flap 26 and folds it against the rear face of the pack. As the pack moves upwardly and along the wall 9, the guide surface 22 of this wall folds the upper rear flap 27 so that the latter overlaps the flap 26 whereby the wrapper 6 is transformed into a tubular body which is shown in FIG. 7. The flap 27 is then bonded to the flap 26 while the pack 23 advances stepwise along the heated wall 9 and toward and beyond the upper end of the box 8. Friction between the wall 9 and the packs 23 is sufficient to insure that the packs cannot descend by gravity when the plunger 10 performs a return stroke in order to reassume the position of FIG. 2 in which it is ready to lift the next pack along the surface 22 of the wall 9 and to thereby lift the entire stack of packs in the box 8 so that the uppermost pack with a tubular wrapper therearound moves into the path of the plunger 14. This plunger then performs a stroke in the direction indicated by an arrow 28 (see FIG. 1) and its projections 15, 16 fold the vertical rear end flaps 29 by tucking these flaps between the lateral flaps 32, 34 and 33, 35 in a manner shown in FIG. 8.

The pack is now transferred into the lower zone of the stacking box 12 and is ready to be engaged by the plunger 17 as soon as the plunger 14 moves its projections 15, 16 ot of the box 12 by performing a return stroke in the direction indicated by an arrow 30, see FIG. 2.

FIGS. 4 and 5 illustrate the step which is carried out while the plunger 17 performs an upward stroke (arrow 31) whereby the folder bars 18, 19 fold the lower lateral flaps 32, 33 against the lateral faces of the pack. The ascending pack moves between the guide surfaces 22 of the walls 20, 21 whereby the surfaces 22 fold the upper lateral flaps 34, 35 and transform the wrapper into a rectangular body of the type shown in FIG. 9. The flaps 34, 35 respectively overlap the flaps 32, 33 and are bonded thereto while advancing along the heated walls 20, 21 so that the pack is fully surrounded by the material of the wrapper when it reaches the upper end of the stacking box 12. The manner in which the packs are withdrawn from the box 12 forms no part of this invention.

In accordance with a slight modification of my invention, each pack advancing along the feed track 13 may be rotated through 90 degrees in a horizontal plane so that the heated side walls 20, 21 of the second stacking box 12 may be parallel with the wall 9 of the first stacking box. Also, the folder bars 18, 19 are then parallel with the folder bar 11. This modification is so obvious that it will be readily comprehended without necessitating a separate illustration. For example, the feed track 13 may include a turntable which changes the angular position of each consecutive pack while the packs advance toward the lower zone of the second stacking box.

It will be noted that the vertical end flaps 24, 26 are folded while the packs advance in horizontal paths, that the lower flaps 26, 32, 33 are folded while or even before the packs begin to ascend in the stacking boxes, and that the upper flaps 27, 34, 35 are folded while the packs are caused to move upwardly toward and along the heated walls 9, 20, 21.

Of course, the apparatus of my invention is equally useful for the application of wrappers which are made adhesive by means of a solvent and wherein the overlapping flaps adhere to each other after evaporation of the solvent. When the apparatus is provided with heated walls, the heat-sealable material of the wrappers is a thermoplastic synthetic substance of the type disclosed in my application Serial No. 245,802.

Referring to FIG. 10, there is shown a portion of a slightly modified wrapping apparatus, and more particularly a modified second stacking box of the apparatus. A folder unit 18*a* is movable together with as well as with respect to the plunger 19*a* which latter corresponds to the plunger 17 of FIG. 4. The unit 18*a* is raised prior to raising of the plunger 19*a* so that the lower lateral flaps (corresponding to the flaps 32, 33 shown in FIG. 8) are folded against the lateral faces of the pack resting on the platform-like plunger 19*a*. The latter is then caused to perform an upward stroke and to move the upper lateral flaps (corresponding to the flaps 34, 35 shown in FIG. 8) along the inclined upwardly converging surfaces of two wedge-shaped holders 40 which are mounted on leaf springs 41 secured to heated side walls of the second stacking box. The springs 41 bias the holders toward each other but will yield when the plunger 19*a* performs an upward stroke so as to permit the pack to enter the duct between the side walls. The pack comes to rest on the horizontal upper surfaces of the holders 40 so that it remains in raised position when the plunger 19*a* descends even if the width of the duct defined by the heated side walls of the second stacking box is such that no friction exists between the side walls and the wrappers.

An important advantage of the construction shown in FIG. 10 is that the holders 40 constitute means for yieldably engaging the upper flaps of consecutive wrappers and that one need not rely on friction in order to make sure that the stack of fully wrapped packs cannot descend in the second box when the plunger 19*a* performs a return stroke.

Referring now to FIG. 11, there is shown a modified wrapping apparatus which comprises a conveyor or feeder 1' including a feed track 2' and reciprocable driver members 3'. The members 3' are actuated in such a way that each thereof travels in an elliptical path which is indicated by phantom lines. Thus, when they travel in a direction to the left, as viewed in FIG. 11, the heads of the driver members 3' extend above the level of the feed track 2' whereas, during their return movement, the heads are located at a level below the upper side of the feed track.

A source of cigarette packs 23, here shown as a magazine 4', is located at a level above the right-hand end of the feed track 2' and is constructed in such a way that the lowermost pack 23 is permitted to rest on the feed track in order to be engaged by the head of the right-hand driver member 3' when the latter enters the upper half of its elliptical path. It will be readily understood that the packs 23 may be fed onto the track in a number of different ways, for example, the conveyor 1' may be connected directly with the filling machine (not shown) which introduces cigarettes into the packs 23 and which closes the non-transparent inner wrappers or receptacles of the packs.

The wrapping apparatus further comprises two suction wheels 5' which are disposed in vertical planes at the opposite sides of the feed track 2' and which serve to feed into the path of each pack 23 a transparent or translucent sheet or wrapper 6. The manner in which the wrappers 6 are withdrawn from a reel and in which the material of the wrappers is thereupon severed by a pair of cooperating knives is disclosed in my copending application Serial No. 245,802 to which reference may be had if necessary. It suffices to say that the suction wheels 5' rotate at the speed necessary to deliver a wrapper 6 into the path of each pack 23 in such a way that the front face of the pack engages a central portion of the wrapper and causes the latter to be withdrawn from the peripheries of the wheels 5' in order to form a U-shaped body which is thereupon folded and sealed in a manner to be described later.

Two stationary end folders 7' are located past the suction wheels 5' and serve the same purpose as the end folders 7 of FIGS. 1 to 3 with the exception that they comprise additional means capable of forming sharp creases between the front end flaps 24 and the lateral flaps 32–35 to make sure that the tucked flaps 24 retain their positions along the lateral faces of the packs.

The first stacking box 8' is located at the lefthand end of the feed track 2' and includes an electrically heated upright wall 9' whose construction will be described in more detail in connection with FIGS. 12 to 14. A plunger or lifter member 10' serves to engage the lowermost pack 23*a* and to lift this pack toward and along the inner side of the wall 9' whereby the packs already contained in the stacking box 8' advance toward the upper end of this box. The plunger 10' is associated with a separately controlled folder bar 11'. A second horizontal feed track 13' leads from the upper end of the stacking box 8' and serves to guide the packs into the lower zone of a second stacking box 12'. The means for advancing the packs along the upper side of the feed track 13' comprises a U-shaped plunger 14' which includes two pairs of folder projections 141 each defining a horizontal slot 147 whose open end faces the second stacking box 12'. A third plunger or lifter member 17' is normally disposed at a level below the stacking box 12' and serves to advance the packs through and toward the upper end of the duct defined by the box 12'. This plunger 17' cooperates with a folder member 18' which comprises two folder bars 181 best shown in FIG. 17.

FIG. 12 illustrates in more detail the first stacking box 8', the plunger 10', the folder bar 11', the electrically heated wall 9', portions of the feed tracks 2', 13', the plunger 14', and one of the end folders 7'. A two-piece cover plate 20' is located at a level above the end folders 7' so as to define with the feed track 2' a horizontal passage in which the packs 23 travel in a direction toward the lower zone of the stacking box 8'. Each end folder 7' assumes the form of a U-shaped body and comprises a series of parts including two crease forming fingers 71, 72 which are respectively provided with aligned bearing sleeves 73, 74 mounted on a bearing pin 75. The pin 75 is mounted on a bracket 77 which is fixed to the feed track 2' and which also supports a folder plate 76, the latter being located ahead of the crease forming fingers 71, 72 in order to deflect a front end flap 24 against the adjacent lateral face of the pack 23. The leading ends of the fingers 71, 72 (as seen in the direction in which the packs 23 advance along the feed track 2') are formed with aligned blind bores 78 which receive the ends of a helical expansion spring 79. Each finger is also formed with a cutout 281 for a roller 28', and these rollers are respectively biased against the upper side of the feed track 2' and against the underside of the cover plate 20'. Thus, the rollers 28' actually constitute the crease-forming elements of the end folders 7' by engaging the lateral flaps 32–35 when the packs 23 advance toward the stacking box 8'. The springs 79 bias the rollers 28' against the parts 2', 20' with a force which is sufficient to form a clean crease when the rollers engage the lateral flaps of a wrapper 6 which is advanced through the passage in which the end folders 7' are mounted.

The duct defined by the first stacking box 8' accommodates a pair of specifically configurated support means 21', 22'. The support means 21' includes an angular support member 211 which is connected with a holder 212, the latter being fixed to a pair of spaced angle brackets 213, see also FIGS. 13 and 14. The lower end portion of the brackets 213 are provided with bores 214 for pivot pins 215 which are fixed to angular mounting members 216 (see FIG. 14). These members 216 are fixed to

the cover plate 20' which is formed with recesses 201 for the support member 211 and holder 212. The brackets 213 are provided with downwardly extending projections 217 each of which carries a pin 218. The mounting members 216 are provided with similar projections 219 for pins 2110. Helical springs 2111 are secured to pins 218, 2110 in such a way that the brackets 213 are biased in a counterclockwise direction, as viewed in FIG. 12, whereby the holder 212 of the support means 21' normally abuts against an inclined stop surface 202 of the cover plate 20'. Consequently, the support member 211 extends into the path of packs 23 which advance into the lower zone of the stacking box 8'.

The other support means 22' comprises an angular support member 221 which includes a holder 222 mounted on a rockable shaft 223 which is journalled in a pair of spaced angular supports 224. The supports 224 are fastened to the upright wall 81 of the box 8' and this wall is formed with an aperture 82 for the support member 221 and holder 222. The holder 222 normally rests on a bevelled stop surface 83 which bounds the lower portion of the aperture 82. The lower portion of the holder 222 carries a projection 225 which is secured to one end of a helical spring 226 whose other end is secured to a support pin 227 carried by the wall 81. Thus, the holder 222 is biased against the stop surface 83 and the support member 221 extends into the duct defined by the walls of the stacking box 8', see FIG. 12.

The electrically heated wall 9' which is disposed opposite the wall 81 comprises at its inner side a pair of horizontally extending heater fins 91, 92, a heating tongue 93 and a heater bar 94 best shown in FIG. 14. The inner side of this wall 9' is also formed with two symmetrically arranged grooves 95 which converge upwardly and which may receive two resilient guides in the form of leaf springs 203. These guides are fixed to a carrier or holder 204 which is mounted on the cover plate 20' and each guide 203 is accommodated in one of the grooves 95 when the wall 9' is caused to move in a direction toward the wall 81. The holder 204 has a recess 205 which may receive the tongue 93, the latter having a vertical extension in the form of a leaf spring 29' which is located above and which extends downwardly toward the support means 21'. The lower end portion of the spring 29' (hereinafter called support spring) carries an inwardly projecting holder in the form of a finger 292 with an inclined guide portion 293 and a horizontal supporting surface 294. The finger 292 is analogous to one of the holders 40 shown in FIG. 10. A second support spring 30' disposed at the level above and at both sides of the support means 22' comprises a second holder in the form of a projecting finger 302 having a guide portion 303 and a horizontal supporting surface 304.

The wall 9' is provided with a horizontal bore 96 (see FIG. 12) which receives a heating element 97, and this wall is fixed to a lever 98 mounted on a spindle 99 which is reciprocated in synchronism with the operation of the wrapping apparatus so as to move the wall 9' toward or away from the wall 81, see the arrow 99*a*, in FIG. 12.

The plunger 10' is located below the stacking box 8' and its perforated plate 101 constitutes a platform for the lowermost pack 23*a*. This plate is formed with apertures 102 which prevent the plunger 10' from adhering to the wrapper of the pack 23*a* because air passing through the apertures 102 will enable the plate 101 to move downwardly without entraining the lower portion of the wrapper 6. The plate 101 is secured to a lever 103 which is movable up and down in synchronism with the operation of my wrapping apparatus. The folder bar 11' is secured to a lever 111 which is also movable up and down in such a way that this bar 11' may fold the flap 26 of the pack 23*a* when the lever 111 moves upwardly.

The fixed upright wall 81 is formed with inclined side surfaces 84 (see FIG. 13) to which are secured aligning rails 85 serving to engage the leading edges of the tucked flaps 24 and to insure that the pack 23*a* is properly centered in the lower zone of the duct defined by the stacking box 8'. The upper end portion of the wall 81 is fixed to a base member 131 which forms part of the second feed track 13', and this base member cooperates with a fixed cover plate 132 to form a horizontal passage for partially wrapped packs 23 which advance along the base member 131 toward and into the lower zone of the duct defined by the second stacking box 12'. The distance between the cover plate 132 and the base member 131 approximates the height of a pack 23. The right-hand end portion of the cover plate 132 carries a detachable entry guide 133, see particularly FIGS. 12 and 14. The cover plate 132 is secured to the frame of the wrapping apparatus.

The plunger 14' is mounted on a lever 142 which is reciprocated in synchronism with the operation of the wrapping apparatus to move in a plane which is parallel with the base member 131. The latter is formed with two cutouts 134 which are located close to the entrance into the box 12' and which respectively accommodate portions of folder springs 143. Similar recesses or cutouts 135 are formed in the cover member 132 above the cutouts 134 and each thereof accommodates a portion of a folder spring 144. The springs 143, 144 carry crease forming rollers 31' which extend into the passage defined by the members 131, 132 so as to engage the wrappers of packs which travel toward the lower zone of the box 12'. The rollers 31' are accommodated in cutouts 311 provided in the respective springs 143, 144. These rollers will travel along the folder projections 141 when the plunger 14' moves in a direction to the left, as viewed in FIG. 12 or 15. As shown in FIG. 15, the trailing end portions of the springs 143, 144 are secured to the members 131, 132 by means of screw bolts or the like so that the rollers 31' may be removed for the purpose of inspection or to be replaced by differently dimensioned rollers if the operator desires to convert the apparatus for wrapping of differently dimensioned packs. The purpose of the rollers 31' is analogous to that of the rollers 28' in that the rollers 31' form sharp creases between the rear end flaps 29 and the adjacent lateral flaps 32, 34 and 33, 35 of the wrappers.

The median portion of the cover member 132 supports a spring catch lever 15', see FIG. 15, which extends into a recess 137 provided at the underside of the member 132 and whose front portion is bent downwardly so as to extend into the passage above the feed track 13' just in front of the entrance into the duct defined by the second stacking box 12'. The front portion of the lever 15' carries a horizontal catch bar 151 which is substantially flush with the inner side of an upright side wall 121 forming part of the box 12'.

The side wall 121 is formed with a recess 122 which accommodates a support spring 23' and a spacer member 231, the latter serving to maintain the spring 23' at a small distance from the bottom surface of the recess 122. The spring 23' is normally located in a vertical plane and its lower end portion carries a holder is the form of a wedge-shaped finger 232, see particularly FIG. 15. This finger comprises a bevelled guide portion 233 and a horizontal supporting surface 234. A pivoted presser member 32' which is located at a level beneath the holder 232 serves to engage the upper side of a wrapper which is located in the lower zone of the duct defined by the box 12' and presses the lowermost pack 23*a* against the plate 171 of the plunger 17'. The manner in which the presser member 32' is mounted at the lower end of the wall 121 is shown in FIG. 16.

A second side wall 123 of the stacking box 12' faces the side wall 121 and its inner side is formed with recesses for two spaced support springs 33'. The upper end portions of the springs 33' are fixed to spacer members 331 which are mounted on the wall 123, and the lower end portions of the springs 33' carry holders in the form of

wedge-shaped fingers 332 having inclined guide portions 333 and horizontal supporting surfaces 334.

The lower portion of the side wall 123 is formed with a cutout or window 124 for a portion of a support means 24', the latter comprising an angular support member 241 and a holder or carrier 242. The carrier 242 is fixed to a rockable shaft 243 whose ends are journalled in angular brackets 244 secured to the feed track 13'. The carrier 242 includes a projection 245 which is fixed to the lower end of a helical spring 246, the latter having its upper end fixed to a support pin 247 which is mounted on the wall 123. The purpose of the spring 246 is to bias the support member 241 in a clockwise direction, as viewed in FIG. 15, and to thereby maintain the carrier 242 in abutment with an inclined stop surface which bounds the lower portion of the cutout 124. The function of the support means 24' is analogous to that of the support means 22', and the purpose of the presser member 32' is analogous to that of the support means 21'. Furthermore, the support springs 23', 33' respectively perform functions which are analogous to the functions of support springs 29', 30'.

The plunger 17' includes a perforated lifter plate or platform 171 and a rod 172, see particularly FIG. 15. The folder member 18' includes two folder bars 181 which are secured to a U-shaped holder 182 mounted on a lever 183. This lever 183 may be raised and lowered in synchronism with the operation of the wrapping apparatus in the same way as the rod 172. As shown in FIG. 17, the platform 171 is formed with apertures 171*a* whose purpose is the same as that of apertures 102 in the platform 101 of the plunger 10'.

In addition to the side walls 121, 123, the second stacking box 12' comprises two electrically heated side walls 26', 27' which are disposed in vertical planes and which make right angles with the planes of the walls 121, 123. The walls 26', 27' are arranged in mirror symmetry with reference to a horizontal plane which is perpendicular to the plane of FIG. 16. The wall 26' comprises at its inner side three heater fins 261, 262 and 263. The lowermost fin 261 is cut away to form a slot for a smoothing spring 264, see FIG. 17, which extends into the duct defined by the walls 26', 27', 121, 123. The upper end portion of the spring 264 extends into a recess 265 defined by the wall 26' behind the median fin 262 and is fixed to this wall by means of one or more screw bolts or the like. The wall 26' is formed with a horizontal bore 266 which accommodates a heating element 267, and this wall is fixed to a lever 268 which is reciprocable in directions toward and away from the wall 27'.

The parts 271 to 278 of the second electrically heated wall 27' are analogous to the parts 261–268. This second wall 27' is reciprocable in directions toward and away from the wall 26'.

FIG. 17 illustrates two folder blocks 34', 35' which are secured to the base member 131 of the second feed track 13' and which are respectively located beneath the heated plates 26', 27'. These folder blocks are respectively provided with tongues or strips 341, 351 which will extend into the slots 147 when the plunger 14' assumes one of its end positions in which the folder projections 141 extend into the bottom zone of the box 12'. The blocks 34', 35' are slightly spaced from the lowermost pack 23*a* so that they provide room for the folder member 181 when the lever 183 is caused to perform an upyard stroke.

The wrapping apparatus of FIGS. 11 to 17 operates as follows:

Packs 23 supplied by the magazine 4' are withdrawn in sequence by the driver members 3' and advance along the feed track 2' between the suction wheels 5'. Each pack 23 draws a wrapper 6 from the peripheral surfaces of the wheels 5' and thereby transforms the wrapper into a U-shaped body which extends along and conceals the front face, the top face and the bottom face of the pack. While the wrapper 6 is being stripped off the wheels 5', the folder members 76 of the end folders 7' engage the vertical front end flaps 24 and fold these flaps against the lateral faces of the pack. As the pack continues to advance toward the first stacking box 8', the flaps 32, 33, 34, 35 are engaged by the rollers 28' and are pressed against the underside of the cover plate 20' and against the upper side of the feed track 2' so that the rollers form sharp creases between the end flaps 24 and the flaps 32, 34 and 33, 35, such sharp creases being indicated in FIG. 6 by reference numerals 24*a*. Consequently, the tucked-in flaps 24 remain in abutment with the lateral faces of the pack while the latter continues to advance into the lower zone of the first stacking box 8'. Since the rollers 28' are free to rotate, friction between the rollers and the wrapper is minimal so that the wrapper is not shifted while its flaps 32, 33, 34, 35 respectively pass above and below the fingers 71, 72. The pressure created by springs 79 is sufficient to insure the formation of very sharp creases which enhance the appearance of the ultimate product and which facilitate the folding of lateral flaps 32, 33, 34, 35 at the time the wrapper is caused to advance through the duct of the second stacking box 12'.

When the pack 23 assumes the position 23*a* and rests on the platform 101 of the plunger 10', the wrapper is engaged by the support members 211, 221 so that the pack 23*a* is pressed against the platform 101 in response to the bias of springs 2111, 225. The inclination of the support member 211 is such (see FIG. 12) that the upper rear flap 27 is partially folded at the time the front portion of the wrapper 6 abuts against the wall 81 of the stacking box 8'. Thus, the members 211, 221 serve to hold the pack 23*a* against displacement with respect to the platform 101 and the member 211 simultaneously serves to partially fold the flap 27 and to simultaneously form a crease along the upper edge of the flap 27. Of course, the support members 211, 221 also exert an important braking action to arrest the pack 23*a* as soon as the latter is released by the driver member 3'.

In the next step, the lever 111 performs an upward stroke and moves the folder bar 11' into the box 8' so that this bar engages and folds the lower flap 26 into abutment with the rear face of the pack 23*a*. The platform 101 remains in the position of FIG. 12 and begins its upward stroke as soon as the flap 26 is properly folded whereby its lower edge portion forms a crease along the lower rear edge of the pack 23*a*. As the platform 101 rises, the pack 23*a* pivots the support members 211, 221 out of the duct so that the member 211 completes the folding of the flap 27 whereby the latter overlaps the flap 26 and the wrapper is ready to be sealed in order to form a tubular body similar to the one shown in FIG. 7. The stroke of the platform 101 is selected in such a way that the pack 23*a* comes to rest on the supporting surfaces 294, 304 of the holders 292, 302 and, as soon as the platform 101 returns to the position of FIG. 12, the support members 211, 221 are free to follow the bias of the springs 2111, 226 and to reenter the duct of the stacking box 8'. The pack 23*a* now occupies the position previously occupied by the preceding pack 23*b*, this latter pack takes the position of the preceding pack 23*c*, and the pack 23*c* moves to the position of the pack 23*d* which latter is expelled from the box 8' and enters the passage defined by the members 131, 132 to be located in the path of the plunger 14'.

An important advantage of the holders 292, 302 is that they relieve the support members 211, 221, i.e., that the support members need not actually carry the pack 23*a* when this pack assumes the position 23*b*. Furthermore, such construction of the box 8' insures that the apparatus may be readily converted for wrapping of differently dimensioned packs as long as the height of the pack is less than the height of the passage defined by the parts 2', 20' and as long as the height of the pack

is less than the distance between the upper side of the feed track 2' and the supporting surfaces 294, 304.

While a pack moves from the position 23*a* to the position 23*b*, the wrapper engages the bevelled guide portions 293, 303 and moves the holders 292, 302 away from each other in order to provide room for the passage of the pack. The support springs 29', 30' snap back as soon as the underside of the wrapper reaches the level of the supporting surfaces 294, 304 whereupon the plunger 10' is free to descend without any danger that the stacked packs contained in the duct of the box 8' would follow such movement. The space in the lower zone of the box 8' is ready to receive a new pack as soon as the pack 23*a* assumes the position of the pack 23*b* and as soon as the platform 101 returns to the position of FIG. 12. Thus, the packs already contained in the box 8' and located at a level above the supporting surfaces 294, 304 cannot hinder the entry of a new pack.

The pack 23*b* is adjacent to the heater bar 94 and is engaged by the resilient guides 203 so as to be pressed against the inner side of the wall 81 regardless of the position of the heated wall 9'. The bar 94 tacks a median portion of the flap 27 to the overlapped flap 26 before the pack advances to the position 23*c* in which the flap 27 is adjacent to the lower heater fin 91. This fin seals a substantial length of the wrapper by causing the major part of the flap 27 to adhere to the flap 26, i.e., the sealing operation along the flap 27 is practically completed save for such portions of the flap 27 which are adjacent to the guides 203. However, and because the guides converge upwardly and toward each other, the second fin 92 will complete the sealing action as soon as the pack assumes the position 23*d*. In other words, the inclination of the guides 203 is such that the remainder of the flap 27 is sealed to the flap 26 when the pack assumes the position 23*d* to insure that the heated wall 9' forms an airtight seal along the full length of the pack and that the wrapper assumes the form of a tubular body at the time it is about to be expelled from the box 8'.

An important advantage of the heater bar 94 is that it tacks the flap 27 to the flap 26 whereby the wrapper is prevented from shifting while the pack advances toward the upper end of the box 8'. Otherwise, friction between the wrapper and the guides 203 would cause some shifting of the wrapper such as would result in creasing, crinkling and similar deformation and which would reduce the eye-pleasing appearance of the ultimate product. Furthermore, since the guides 203 do not conceal the entire flap 27, certain portions of this flap are subjected to repeated sealing action, particularly along the ends, to insure that the sealing action is very satisfactory and that there is no likelihood of unsealing while the pack continues its advance toward and through the second stacking box 12'.

The heated wall 9' is moved back when the pack 23*a* reaches the position 23*d* so that the pack (in the position 23*d*) is held solely by the guides 203 which press it against the rear end face of the member 131 until the plunger 10' completes the next upward stroke so that the pack 23*d* enters the passage in front of the plunger 14'. As a rule, the heated wall 9' moves away from the packs whenever the plunger 10' performs an upward stroke. This is advisable because, otherwise, the wrappers would slide along the fins 91, 92 and would undergo at least some deformation. The width of the fins 91, 92 is just sufficient to insure the formation of a satisfactory seal between the overlapping portions of flaps 26, 27 but the remainder of the flaps 26, 27 should not be subjected to excessive heating. In other words, the wrappers are heated only when the packs are at a standstill; whenever the packs move in response to upward strokes of the plunger 10', the heated wall 9' is moved away from the wall 81.

The pack which has entered the passage defined by the members 131, 132 is then engaged by the plunger 14'. However, even before the plunger 14' engages the median portions of the flaps 26, 27, the end portions of these flaps which form the rear end flaps 29 are engaged by the pairs of folder projections 141 whereby the flaps 29 are tucked between the flaps 32, 34 and 33, 35 in a manner as shown in FIG. 9. In other words, the tucking of flaps 29 is completed at the time the pack begins to move along the feed track 13' and, the flaps 32, 33, 34, 35 are thereupon engaged by the spring-biased rollers 31' which form sharp creases 29*a* (see FIG. 9) to insure that the flaps 29 retain their positions and remain in abutment with the lateral faces of the pack. The rollers 31' are free to rotate in the respective springs 143, 144 so that, despite strong pressure to which the material of the wrapper is subjected on its way into the lower zone of the second stacking box 12', there is no shifting of the wrapper and the rollers 31' actually "iron" or press the flaps 32–35 to facilitate the next folding operations which take place in the box 12'.

When the folder projections 141 enter the lower zone of the second stacking box 12', the tongues 341, 351 enter the slots 147 while the tucked-in front end flaps 24 pass along the folder blocks 34', 35' and while the wrapper advances toward the support means 24'. The blocks 34', 35' hinder the flaps 24 from moving away from the lateral faces of the pack 23*a* at the time the parts of the second stacking box complete the folding of the lower lateral flaps 32, 33. Moreover, once the flaps 32, 33 are folded, the blocks 34', 35' hold these lower flaps against unfolding while the pack moves from the position 23*a* to the position 23*b*.

When the plunger 14' moves away from the box 12' (see FIG. 15), the catch bar 151 of the catch lever 15' holds the pack 23*a* against movement away the support means 24' by bearing against the flap 27. The pivoted presser member 32' which is biased by a suitable spring urges the underside of the wrapper against the platform 171 so that the pack 23*a* is held between the angular support member 241, the presser member 32', the catch bar 151, and the platform 171. In addition, the catch bar 151 and the presser member 32' exert a braking action and reduce the speed of the pack 23*a* as soon as the plunger 14' completes its forward stroke. Excessive lateral displacements of the pack 23*a* are prevented by the blocks 34', 35'.

In the next step, the folder bars 181 are moved upwardly to fold the lower lateral flaps 32, 33 against the lateral faces of the pack 23*a* by forcing these flaps to enter the spaces between the blocks 34', 35' and the adjacent faces of the pack. As shown in FIG. 17, the width of the spaces between the pack 23*a* and the blocks 34', 35' is sufficient to permit entry of folder bars 181 when the lever 183 is caused to perform an upward stroke. The bars 181 will draw the wrapper taut to insure clean edge formation along the lower lateral edges of the pack 23*a*.

When the plunger 17' is caused to move upwardly, the pack 23*a* deflects the support means 24' and the presser member 32' so that the pack may rise to pass along the smoothing springs 264, 274 which fold the upper lateral flaps 34, 35 so that these flaps respectively overlap the flaps 32, 33 whereby the wrapper assumes the form shown in FIG. 9. The stroke of the plunger 17' is such that the pack 23*a* is moved to the level of the supporting surfaces 234, 334 (see FIG. 15) which thereupon retain the pack 23*a* in lifted position regardless of the position of the platform 171. Of course, as the pack 23*a* rises, its wrapper slides along the bevelled guide portions 233, 333 to move the support springs 23', 33' apart but these springs snap back as soon as the underside of the wrapper on the pack 23*a* reaches the level of the surfaces 234, 334. FIG. 15 shows that the distance between the platform 171 (in the lower end position of the plunger 17') and the supporting surfaces 234, 334 exceeds the height of a pack so that a new pack may enter the lower zone of the duct

defined by the second stacking box 12' as soon as the pack 23*a* comes to rest on the surfaces 234, 334. The heated walls 26', 27' are then caused to move toward each other whereby the lowermost heater fins 261, 271 tack the overlapping flaps 34, 35 to the overlapped flaps 32, 33. The walls 26', 27' then move away from each other while the plunger 17' performs the next upward stroke to lift a new pack onto the supporting surfaces 234, 334. The pack 23*a* rises a notch and reaches the level of the heater fins 262, 272 which seal the flaps 34, 35 to the flaps 32, 33 when the walls 26', 27' perform the next movement in a direction toward each other. In the final step, the pack 23*a* is lifted to the level of the heater fins 263, 273 which complete the sealing action so that the fully wrapped and properly sealed pack may be discharged from the box 12'.

Since the platform 171 is perforated, its upper side will not adhere to the underside of the wrapper when the plunger 17' is caused to perform a return stroke. This is of importance because any adhesion between the platform 171 and the wrapper could cause deformation of the wrapper or shifting of the entire pack. It is to be borne in mind that the apparatus of my invention normally operates at high speeds so that even small displacements of a single pack or wrapper could disrupt the operation and could result in reduced output or damage to the parts.

It will be noted that, in the formation of sharp edges, as by the members 28' or 31', the actual folding step (by the folder member 76 or by the members 141) precedes the crease forming step to make sure that any inaccuracies in the positioning of flaps are eliminated during the crease forming step so that each properly folded and ironed flap retains its position during the later stages of the wrapping, folding and sealing operation. As a rule, flaps which are merely folded down tend to reassume their original positions and such tendency of the flaps to "reopen" is especially pronounced when the wrapping operation is carried out at high speed because there is no time to maintain the folding members in long-lasting engagement with the flaps such as would be sufficient to cause the flaps to remain permanently in their folded-down positions. This will be readily understood by considering that the apparatus of my invention may be used for wrapping of 300 or more box-like articles per minute. Thus, and referring to FIGS. 11 and 12, the interval of time during which the folding members 76 are in actual contact with the front end flaps 24 is extremely short (i.e., a small fraction of a second) so that the flaps 24 tend to return to their unfolded positions. However, by resorting to crease forming rollers 28', I insure that the flaps 24 remain tucked in between the flaps 32, 34 and 33, 35 because the creases 24*a* are formed not by elastic deformation but by permanent deformation of the wrapper material. In other words, instead of folding the flaps in such a way that the material of the wrapper undergoes temporary deformation, the rollers 28' bring about permanent deformation of the wrappers such as will prevent the flaps 24 from returning to their original positions. The same applies to the action of rollers 31' which form creases 29*a* by permanently deforming the material of the wrappers. In addition, the flaps which are folded or tucked in by simultaneous formation of sharp creases will prevent undesirable shifting of the wrapper because they abut against the respective faces of the box-like article and thereby insure that the article cannot change its position with respect to the partly folded wrapper.

The apparatus of FIGS. 11 to 17 is capable of forming wrappers of eye-pleasing appearance because each wrapper is smoothed or drawn taut prior to completion of the sealing operation. Thus, and as a pack which is engaged by the foremost driver member 3' moves into the lower zone of the first box 8', the upper portion of the wrapper is engaged by the support member 211 which slides along the upper side of the wrapper and flattens the wrapper to eliminate all wrinkles, folds or similar irregularities. As the pack 23*a* thereupon moves toward the supporting surfaces 294, 304, the support member 211 continues to prevent wrinkling of the upper portion of the wrapper and causes the flap 27 to lie flat against the rear face of the pack and against the overlapped portion of the flap 26 because the bias of the springs 2111 is sufficient to maintain the support member 211 in compressive contact with the wrapper and particularly with the flap 27 at the time the pack 23*a* moves upwardly to take the position of the pack 23*b*.

The spring-biased catch bar 151 is of particular advantage when the plunger 14' assumes the form of a U-shaped body because the projections 141 tend to withdraw the pack 23*a* by friction from the lower zone of the box 12' when the plunger 14' performs a return stroke. The springs 264, 274 perform the same function as the support members 211, 221 by smoothing and by drawing taut the wrapper (and particularly the upper lateral flaps 34, 35) at the time the pack 23*a* moves upwardly toward the supporting surfaces 234, 334.

As a rule, the wrapper consists of heat-sealable regenerated cellulose sheet or other suitable synthetic plastic material. However, and as explained hereinbefore, the method and apparatus of my invention may be resorted to in connection with wrappers which are coated with an adhesive substance so that the sealing action may be carried out without the application of heat but merely by application of mechanical pressure.

The apparatus of FIGS. 11 to 17 may be simplified by omitting the support springs 29', 30', 23' and 33', especially if the apparatus is intended for wrapping of a single type of box-like articles. In such apparatus, the support members 211, 221 carry the packs 23*b*–23*d*, and the support member 241 (by itself or together with a non-illustrated similar support member at the entrance of the box 12') carries the packs which are lifted above the level of the pack 23*a* shown in FIG. 15. Thus, the support means 21', 22', 24' may actually carry entire stacks of packs in addition to performing a braking, retaining, aligning, pressing and smoothing action upon the packs and wrappers which are accommodated in the lowermost zones of the respective ducts. Such packs remain stationary while the lower rear flaps 26 and the lower lateral flaps 32, 33 are being folded against the adjacent faces of the packs.

The FIG. 18 is another modification of the stacking box 8 in which additional to the rollers 28 counter rollers 28*a* are accommodated in cutouts provided in the feed track 2 and cover plate 20 and are free to rotate. Hereby the wrapping material is guided between to plains of rotation and therefore can be more sharply folded.

Into the stacking box 8 support means 21, 22 are gripping from two sides. Theire support members 211, 221 are supporting packs 23*b* inside the stacking box 8.

This modification will be used by an adjustable lifting of the plunger 10. In this case those kind of means as the support springs 29 and 30 in the drawing to FIG. 18 can be neglected because the longer parts 211 and 221 of the support means 21 and 22 supports the pack 23*b*. The support means 21 and 22 which can be of the same arrangement instead of means in the second stacking box, have three kinds of functions to lead out:

(1) to brake packs which have been shifted into the stacking box during reducing the speed of the driver member which conveys the packs.

(2) to press the packs onto the bottom of the stacking box.

(3) to support the first pack of the pile of packs that has been shifted into the stacking box.

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

to be comprehended within the meaning and range of equivalence of the following claims.

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

1. A method of wrapping cigarette packs and similar box-shaped articles, comprising advancing the articles in a substantially horizontal path; feeding flexible wrappers in front of consecutive articles so that the front face of each article engages a central portion of the respective wrapper and transforms the wrapper into a U-shaped body which extends beyond the front, lateral, top and bottom faces of the article whereby the wrapper forms two front end flaps, two upper and two lower lateral flaps, and an upper and lower rear flap; folding the front end flaps of consecutive wrappers by tucking such flaps between the respective lateral flaps as the articles continue to advance in said path; folding the lower rear flaps against the rear faces of the respective articles; consecutively moving the articles upwardly in a substantially vertical path and folding the upper rear flaps over the lower rear flaps of the respective wrappers whereby the end portions of such rear flaps form a pair of rear end flaps which extend beyond the lateral faces of the articles; bonding the upper rear flaps to the lower rear flaps while the articles remain in said vertical path; consecutively advancing the articles in a second substantially horizontal path and simultaneously folding the rear end flaps against the respective lateral faces of the articles by tucking such flaps between the respective lateral flaps; folding the lower lateral flaps against the respective lateral faces of the articles; consecutively advancing the articles upwardly in a second substantially vertical path and folding the upper lateral flaps over the lower lateral flaps; and bonding the upper lateral flaps to the lower lateral flaps while the articles remain in said second vertical path.

2. A method as set forth in claim 1, wherein the upper rear flaps are folded over the rear faces of the respective articles while the articles move upwardly in said vertical path.

3. A method as set forth in claim 1, wherein the upper lateral flaps are folded over the lower lateral flaps while the articles move upwardly in said second vertical path.

4. A method as set forth in claim 1, comprising the step of forming creases between the front end flaps and the respective lateral flaps while the articles advance in said first horizontal path.

5. A method as set forth in claim 1, comprising the step of forming creases between the rear end flaps and the respective lateral flaps while the articles advance in said second horizontal path.

6. A method as set forth in claim 1, comprising the step of smoothing that portion of each wrapper which extends along the upper face of the respective article while the articles advance in said first horizontal path.

7. A method as set forth in claim 1, comprising the step of yieldably supporting the wrappers while the articles are located in at least one of said vertical paths.

8. A method of wrapping articles in wrappers of heat-sealable material as set forth in claim 1, wherein said rear flaps and said lateral flaps are respectively bonded to each other by stepwise application of heat.

9. A method as set forth in claim 8, wherein said rear flaps are tacked to each other by application of heat to small portions thereof and wherein the bonding of said rear flaps is completed by stepwise application of heat to selected portions thereof.

10. A method as set forth in claim 8, wherein said rear flaps are bonded to each other by simultaneous application of mechanical pressure against the upper rear flaps.

11. A method as set forth in claim 1, comprising the step of consecutively arresting the articles and of holding the articles against movement while the lower rear flaps are being folded against the rear faces of the respective articles.

12. A method as set forth in claim 1, comprising the steps of consecutively arresting the articles and of holding the articles against movement while the lower lateral flaps are being folded against the respective lateral faces of the articles.

13. A method as set forth in claim 1, wherein the articles remain parallel to themselves while moving in said horizontal and vertical paths.

14. A method as set forth in claim 1, wherein the articles are turned through 90 degrees in a horizontal plane while advancing in said second horizontal path.

15. A method as set forth in claim 1, wherein the articles are moved upwardly in stepwise fashion while in said vertical paths and wherein the length of the first stepwise movement exceeds the length of the next stepwise movements.

16. A method as set forth in claim 15, wherein the length of the first stepwise movement in each of said vertical paths exceeds the height of an article.

17. A method as set forth in claim 1, wherein the rear flaps and the lateral flaps are coated with adhesive and wherein such flaps are bonded to each other by application of mechanical pressure.

18. A method as set forth in claim 17, wherein the adhesive contains an evaporable solvent.

19. A method as set forth in claim 1, wherein the wrappers consist of transparent material and wherein said articles contain tobacco.

20. A method as set forth in claim 1, wherein the articles are moved upwardly by perforated platforms which are reciprocated plungers so that the platforms cannot adhere to the wrappers when the plungers perform return strokes.

21. A method of wrapping box-like articles, comprising moving the articles in a single file along an elongated path; feeding wrappers into said path in front of consecutive articles so that the articles engage the respective wrappers and transform such wrappers into substantially U-shaped bodies; folding the front end flaps of consecutive wrappers against the lateral faces of the moving articles; folding the upper and lower rear flaps of consecutive wrappers over each other and sealing such flaps to each other to transform the wrappers into tubular bodies; moving the articles in a single file in a second elongated path and folding the rear end flaps against the laeral faces of the respective articles while the articles move in such second path; and folding the upper and lower lateral flaps of consecutive wrappers over each other and sealing such flaps to each other.

22. A method as set forth in claim 21, wherein said second path is parallel with and is offset from said first path.

23. A method as set forth in claim 21, wherein each flap is folded by pivoting through 90 degrees with reference to the adjacent portion of the respective wrapper.

24. A method as set forth in claim 21, wherein the articles are stacked during sealing of the rear flaps.

25. A method as set forth in claim 21, wherein the articles are stacked during sealing of lateral flaps.

26. An apparatus for applying and sealing flexible wrappers around box-like articles, comprising conveyor means arranged to advance a row of articles in an elongated path; feeding means for delivering wrappers into said path so that the front face of each article engages and deforms a wrapper into the form of a U-shaped body while advancing in said path; first folder means adjacent to said path and arranged to automatically fold the front end flaps of consecutive wrappers against the respective lateral faces of the articles while the articles advance in said path; second folder means located past said first folder means for folding one rear flap of each consecutive wrapper against the rear face of the respective article; moving means for advancing consecutive articles in a second path which is substantially perpendicular to said first path; third folder means for folding the other rear flap of each consecutive wrapper over the one rear flap

so that such wrappers assume the form of tubular bodies; and sealing means adjacent to said second path for securing the rear flaps of consecutive wrappers to each other.

27. An apparatus as set forth in claim 26, wherein said first folder means comprises spring biased members which form sharp creases between the front end flaps and the respective lateral flaps of consecutive wrappers.

28. An apparatus as set forth in claim 26, wherein said moving means comprises a reciprocable plunger having a perforated portion arranged to engage consecutive wrappers and to transfer the articles from said first path into said second path.

29. An apparatus as set forth in claim 28, wherein said first path is a horizontal path, wherein said second path is a vertical path, and wherein said plunger is arranged to lift consecutive articles while transferring the articles from said first path into said second path.

30. An apparatus for applying and sealing of heat-sealable wrappers as set forth in claim 29, further comprising a stacking box having a vertical duct which defines said second path, said sealing means constituting one vertical wall of said stacking box and further comprising means for heating said wall and for moving said wall toward and away from the rear flaps of the wrappers which are received in said duct.

31. An apparatus as set forth in claim 30, further comprising resilient support means for biasing consecutive articles against said plunger.

32. An apparatus as set forth in claim 30, further comprising support spring means normally extending into said duct and having supporting surfaces arranged to support the undersides of consecutive wrappers which are advanced by said plunger when the plunger performs an upward stroke.

33. An apparatus as set forth in claim 32, wherein the distance between said supporting surfaces and said first path exceeds the height of an article so that a new article may be introduced into said duct while the preceding articles are supported by said support spring means.

34. An apparatus as set forth in claim 30, wherein said wall comprises a plurality of heating fins and a heater bar located at a level beneath said fins, said heater bar tacking the rear flaps of consecutive wrappers to each other while the articles are moved in stepwise fashion through said duct.

35. An apparatus as set forth in claim 34, further comprising resilient guides for engaging the rear flaps of the wrappers in said duct so as to hold the articles against return movement in said stacking box.

36. An apparatus as set forth in claim 35, wherein said resilient guides are inclined with reference to each other and wherein said wall is provided with recesses which accommodate said guides when the wall is moved into heating engagement with the rear flaps.

37. An apparatus as set forth in claim 36, wherein the inclination of said guides is such that they expose selected portions of the rear flaps while the wrappers are advanced in stepwise fashion along said fins so that the fins may form complete seams along the full length of the rear faces of the articles.

38. An apparatus as set forth in claim 26, further comprising second conveyor means arranged to advance the articles in a third path which is substantially parallel with and which is offset with respect to said first path, said second conveyor means comprising reciprocable plunger means arranged to advance consecutive articles from said second path into and along said third path, fourth folder means secured to said plunger means for folding the rear end flaps of consecutive wrappers against the respective lateral faces of the articles while the articles advance in said third path, fifth folder means for folding one pair of lateral flaps on consecutive wrappers against the respective lateral faces of the articles, second moving means for advancing the articles in a fourth path which is substantially perpendicular to said third path, sixth folder means for folding the other pair of lateral flaps on consecutive wrappers over the one pair of lateral flaps while the articles advance in said fourth path, and second sealing means for securing the lateral flaps of consecutive wrappers to each other.

39. An apparatus as set forth in claim 38, wherein said second conveyor means comprises a pair of spaced plate-like members defining a passage for the articles which advance along said third path, and further comprising spring biased crease forming members secured to said plate-like members and cooperating with said fourth folder means to form sharp creases between the rear end flaps and the respective lateral flaps of consecutive wrappers.

40. An apparatus as set forth in claim 39, wherein said crease forming members are rollers.

41. An apparatus as set forth in claim 38, further comprising a second stacking box having a vertical duct which defines said fourth path, said second moving means comprising a plunger which is arranged to reciprocate from below into and out of said duct so as to transfer consecutive articles from said third path into said fourth path.

42. An apparatus for applying and sealing heat-sealable wrappers as set forth in claim 41, wherein said second sealing means comprises two upright walls which comprise heating means and which form part of said box, and further comprising means for reciprocating said walls toward and away from each other so that the walls may engage the lateral flaps of wrappers in said duct.

43. An apparatus as set forth in claim 42, wherein each of said walls comprises a plurality of vertically spaced heating fins arranged to engage and to seal consecutive lateral flaps in response to stepwise advance of articles in said duct.

44. An apparatus as set forth in claim 42, further comprising resilient support means mounted on said stacking box and arranged to engage the wrappers on the lowermost articles in said duct so as to bas the articles against said second moving means.

45. An apparatus as set forth in claim 44, further comprising resilient presser means arranged to cooperate with said support means and to yield when the articles are moved in said duct.

46. An apparatus as set forth in claim 44, further comprising resilient catch means for preventing return movement of articles whose wrappers are engaged by said support means.

47. An apparatus as set forth in claim 42, wherein said walls comprise smoothing springs which engage the upper lateral flaps of consecutive wrappers when the articles are advanced in said duct.

48. An apparatus as set forth in claim 41, wherein said stacking box comprises spring supports having supporting surfaces arranged to support the stack of packs in said duct subsequent to each transfer stroke of said plunger.

49. An apparatus as set forth in claim 48, wherein the distance between said supporting surfaces and said third path exceeds the height of a pack.

50. An apparatus as set forth in claim 41, wherein said fifth folder means comprises a pair of reciprocable folder bars which are movable independently of said plunger.

51. An apparatus as set forth in claim 41, wherein said fifth folder means comprises a pair of folder bars which are rigid with said plunger.

52. An apparatus as set forth in claim 41, further comprising a pair of folder blocks each adjacent to one lateral face of the lowermost pack in said duct, said blocks being slightly spaced from the lateral faces of the lowermost articles so that said fifth folder means may be moved between the blocks and the wrapper in order to fold the lower lateral flaps.

53. An apparatus as set forth in claim 52, wherein said blocks have tongues extending toward said plunger means and wherein said fourth folder means comprises pairs of folder projections which define slots arranged to receive with some play said tongues when the plunger means performs a forward stroke.

54. An apparatus as set forth in claim 26, further comprising resilient braking means for slowing down the articles while the articles approach the end of said first path.

55. An apparatus as set forth in claim 38, further comprising braking means for slowing down the articles while the articles approach the end of said third path.

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