METHOD FOR SECURING HANDLES TO SHEET MATERIAL

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ABSTRACT

A method and apparatus for automatically securing a handle in the form of a flexible strip to a web of sheet material, such as plastic. According to the method, the web of sheet material is fed intermittently to a handle securing station. The outer ends of the flexible handle strip are moved towards each other and into juxtaposition with the web of sheet material at the handle securing station and, while the web is stationary at the handle securing station, the outer ends of the handle strip are secured to the web of sheet material. The apparatus includes movable clamp means for releasably engaging the outer ends of the handle strip and for moving the ends towards each other and into juxtaposition with the adjacent web of sheet material. Securing means, such as an apparatus for heat welding thermoplastic is provided for fixing the outer ends of the strip to the web of sheet material while it is stationary at the handle securing station.

7 Claims, 15 Drawing Figures
METHOD FOR SECURING HANDLES TO SHEET MATERIAL

The present invention relates broadly to a method and an apparatus for securing handles to webs of sheet material. More particularly, the invention provides a method and apparatus for forming handles from webs of handle-forming material and for securing such handles in longitudinally spaced disposition to continuous webs of sheet material. Even more particularly, the invention relates to a method and apparatus for forming handles by severing continuous webs of thermoplastic sheet material such as polyethylene and then securing such handles in longitudinally spaced disposition to continuous webs of thermoplastic sheet material for the manufacture of inexpensive plastic handle bags.

The use of thermoplastic sheet materials in shopping bags, garbage bags, marketing packages and in numerous other packages presents several advantages compared to the use of other sheet materials such as paper. One important advantage of thermoplastic materials is that bags made from such materials are liquid-proof. In such products, the competitive material cost of the thermoplastic sheet material with, for example, conventional waterproofed paper sheet is very important. Unfortunately, previous methods for forming handles and securing such handles to such bags or to the continuous webs of thermoplastic sheet materials, such as polyethylene, from which such bags are made have proved to be so expensive that the manufactured bags were no longer competitive in cost with the corresponding paper products.

The present invention is based on the development of a novel method and apparatus for securing a handle to a web of sheet material which method and apparatus are particularly suited to use in the manufacture of inexpensive handle bags of thermoplastic sheet materials.

In its broadest scope, the present invention provides a method for securing a handle comprising a length of flexible handle-forming material having a first end and a second end to a web of sheet material, which method comprises feeding the web of sheet material to a handle-forming station, moving said first end and said second end of said length of handle-forming material towards each other and into juxtaposition with said web of sheet material at said handle-forming station and, while said web is stationary at said handle-forming station, securing said first end and said second end of said length of handle-forming material to said web.

The invention also broadly provides an apparatus for securing a handle comprising a length of flexible, handle-forming material having a first end and a second end to a web of sheet material fed to a handle-forming station. The apparatus according to the invention broadly comprises movable clamp means for releasably engaging the first and second ends of said length of handle-forming material and for moving these first and second ends towards each other and into juxtaposition with the web of sheet material, and securing means at the handle-forming station for securing the first and second ends of the length of handle-forming material to the web of sheet material while the web of sheet material is stationary at the handle-forming station.

Since the present invention involves the movement of the first and second ends of a length of handle-forming material towards each other so as to form a generally curved handle, it is essential that such a length is formed of a flexible material. Such lengths may be of different cross-sectional configuration but in the preferred case are in the form of strips or ribbons.

Since a very important consideration for an apparatus in accordance with the invention is that numerous functions must be performed at high speed and in proper synchronization, it has been found to be particularly advantageous to construct such apparatus so that as many moving components thereof as possible are operated mechanically from a single source of motive power. This does not mean, however, that the use of drive and transmission systems other than mechanical ones is precluded in apparatus according to the present invention.

In addition to the features of the invention hereinbefore specifically mentioned, the method of the invention may also include many optional and preferred operational steps. These steps will be described hereinafter in greater detail with reference to the accompanying drawings. Specific optional and preferred features of an apparatus according to the invention will also be described hereinafter with reference to the accompanying drawings.

The invention will now be described by way of illustration with reference to the accompanying drawings in which:

FIG. 1 is a schematic diagram illustrating the application of the method of the present invention to the forming and securing of longitudinally spaced-apart handles of a flexible thermoplastic material to both plies of a continuous two-ply web of thermoplastic sheet material;

FIG. 2 is a somewhat schematic longitudinal vertical section through one embodiment of an apparatus for securing longitudinally spaced-apart handles of a flexible thermoplastic material to both plies of a continuous two-ply web of thermoplastic sheet material;

FIG. 3 is a somewhat schematic transverse vertical section through the novel handle-forming and handle-securing stations of the invention as incorporated in the apparatus of FIG. 2;

FIG. 4 is a perspective view showing details of the mechanism provided in the apparatus of FIGS. 2 and 3 for feeding a pair of webs of flexible thermoplastic handle-forming material to the handle-forming station disposed behind the handle-securing station of the apparatus, certain parts having been omitted or shown only in part to facilitate comprehension of the illustrated structure;

FIG. 5 is an enlarged and simplified vertical section along the line 5—5 of FIG. 4 showing the web-feed drive mechanism for the handle-forming station with such mechanism in its position in which it does not drivingly engage the pair of webs passing therethrough;

FIG. 6 is a vertical section similar to that of FIG. 5 but showing the web-feed drive mechanism in its web-engaging position;

FIG. 7 is a detailed front perspective view on a slightly larger scale than that of FIG. 4 showing the handle-securing station of the apparatus of FIGS. 2 and 3;

FIG. 8 is an enlarged fragmentary perspective view of the cutting mechanism at the handle-forming station and of the movable clamps provided for transferring the ends of the strips of flexible handle-forming material.
al from the handle-forming station of the apparatus to the handle-securing station shown in FIG. 7.

FIG. 9 is an even more enlarged perspective view of one of the movable clamps of FIG. 8 showing in greater detail the structure provided for engaging one end each of the strips of handle-forming material;

FIG. 10 is a somewhat schematic perspective view on a smaller scale showing the movable clamps of FIG. 8 in their relative positions when they are disposed within the handle-securing station shown in FIG. 7;

FIG. 11 is a fragmentary, horizontal sectional view through the movable clamp of FIG. 9 taken along the line 11—11 of that figure;

FIG. 12 is a partial, vertical sectional view through one of the movable anvils provided at the handle-securing station of the apparatus, as viewed along the line 12A—12A of FIG. 7;

FIG. 13 is a somewhat diagrammatic illustration of part of the drive transmission system used in the apparatus illustrated in FIGS. 2 to 12;

FIG. 14 is a somewhat diagrammatic illustration of a further part of the drive transmission system used with the apparatus illustrated in FIGS. 2 to 12, and

FIG. 15 is a fragmentary perspective view of a plastic bag having a pair of handles secured to its side panels by means of the apparatus described with reference to FIGS. 2 to 14 after further manufacturing operations have been completed thereon.

Referring first to FIG. 1, there is schematically shown therein an arrangement for forming handles and for securing such handles in spaced-apart longitudinal disposition to both webs of a continuous two-ply web 10 of thermoplastic sheet material, such as polyethylene, in proximity to one longitudinal edge thereof, and subsequently transversely heat-welding and severing the two plies (only the upper one of which is shown) of the web 10 to form individual plastic bags.

Two-ply web 10 is in the form of an elongated tube which is open along a first longitudinal edge 12 and closed such as by longitudinal folding, along a second longitudinal edge 14. As indicated by dotted line 20, the open ends 12 of each ply of web 10 may be backfolded and heat welded along the line 21 to provide a double thickness zone for attachment of the handles. Web 10 passes through a web-feeding draw means 18 adapted to move it intermittently and longitudinally in the direction of the arrow A under the control of a draw control means 16. The draw control means 16 is adapted to cause said longitudinal movement of the web 10 in the direction of the arrow A in a stepwise manner through a handle-securing station generally indicated at 19 in accordance with an operating sequence to be described hereinafter.

A first guide bar 26 disposed at the upstream end of the handle-securing station 19 and between the upper and lower plies of the two-ply web 10 serves to separate these two plies and to provide a space therebetween. A similar guide bar 28 is provided at the downstream end of the handle-securing station 19. It should be noted that, in the particular arrangement illustrated in FIG. 1, the two-ply web 10 is fed from a web supply roll 20 through a web-tensioning device 22 adapted to allow continuous feeding rotation of the supply roll 20 but intermittent movement of the web 10 through the handle-securing station 19.

Downstream of the handle-securing station 19, there is also provided a transverse welding and severing device 30 under the control of a control means 32 which is adapted to effect both a transverse heat welding together of the upper and lower plies of the web 10 and a transverse severing of the web 10 through the welds into individual bags 34.

The arrangement shown in FIG. 1 also comprises a web-feed control device 36 adapted to actuate a reciprocating drive clamp 38 in turn adapted to advance a pair of continuous webs 40 of flexible thermoplastic handle-forming material such as polyethylene intermittently in the direction of the arrow B to a handle-securing station generally indicated at 42, one only of the webs 40 being shown in FIG. 1.

At the handle-securing station 42, each continuous web 40 of handle-forming material is releasably engageable by first clamp means 44, the operation of which is controlled by a clamp control means 46. A web-cutting device 48 is provided downstream of and in proximity to the first clamp means 44 for the purpose of severing each web 40 of handle-forming material under the control of a cutter-control means 50 which is adapted to cause the, web-cutting device 48 in the two directions C" and C" of the double-headed arrow C.

A pair of clamps 52 and 54 are also provided at the handle-securing station 42. These clamps which may also be characterized as handle-supporting stations are actuated by clamp-control means 56 for releasably clamping the webs 40 before and after operation of the web-cutting device 48 and for moving the severed lengths 58 of webs 40 from their position at the handle-securing station 42 as shown in FIG. 1, to a position in which the ends of the severed lengths 58 are disposed between the upper and lower plies of the web 10 in the handle-securing station 19. For this purpose, the clamps 52 and 54 are mounted for reciprocating movement along the arcuate paths shown in broken lines in FIG. 1.

During such movement of the clamps 52 and 54 holding the two ends of the severed lengths 58 of the webs 40 from the handle-securing station 42 to the handle-securing station 19, these ends are not only moved towards each other but are also moved transversely so as to be in juxtaposition with the inner surface of the respective ply of the two-ply web 10.

At the handle-securing station 19, there is also provided a pair of heat-welding shoes 60 and 62 under the control of a shoe-control means 64. This shoe-control means 64 is adapted to move the shoes 60 and 62 between a raised retracted position as shown schematically in FIG. 1 and a lowered operative position, in which these shoes 60 and 62 engage the top surface of the upper ply of the two-ply web 10 so that this upper ply and each of the two ends of the upper severed strip 58 are clamped between the respective one of the shoes 60 and 62 and the respective one of the clamps 52 and 54 to permit a heat-welding operation therebetween to be effected. A similar pair of heat-welding shoes is provided for heat-welding the lower severed strip of handle-forming material to the lower ply of the two-ply web 10.

Before describing specific apparatus suitable for carrying out the novel method of the invention, the operation of the arrangement shown in FIG. 1 will briefly be described.
Assuming that the advance movement of the handle-forming webs 40 by the drive clamp 38 under the control of the web-feed control device 36 in the direction of the arrow B has continued until the free ends of these webs 40 have reached the clamps 52 and 54, web-feed control device 36 then operates to halt such advance movement of the webs 40. Clamp-control means 46 and 56 then operate to cause clamps 44 and 52, 54 respectively to engage the webs 40. Cutter-control means 50 next actuates web-cutting device 48 which makes a rapid reciprocating movement in the directions C' and then C'' to sever each of the webs 40, the severed lengths 58 still being firmly end-clamped by the clamps 52 and 54.

While the already described steps have been taking place, the two-ply web 10 has been advanced in the direction of the arrow A by draw means 18 under the control of control means 16 until the web 10 is correctly disposed longitudinally in the handle-securing station 19. Control means 16 then operates to halt further advance movement of the web 10 and, while the web 10 is stationary in the handle-securing station 19, clamp-control means 56 operates to cause clamps 52 and 54 to travel along their generally arcuate paths to the positions in which the ends of the severed strips 58 are disposed between the two plies of the web 10 in juxtaposition to the respective inner surface of the plies of this web 10. At this time, shoe-control means 64 operates to cause upper and lower heat-welding shoes 60 and 62 to move into their operative positions in contact with the outer surface of each ply of the web 10 and to apply sufficient localized heating thereto to cause the ends of the severed strips 58 to be heat-welded to the inner surface of the respective ply of the web 10. The shoe-control means 64 then causes shoes 60 and 62 to retract out of their engagement with web 10.

While the web 10 is stationary, the control means 32 causes transverse welding and severing of the web 10 to provide an individual bag 34.

The operating sequence in completed by clamp-control means 56 causing clamps 52 and 54 to release the ends of the now welded strips 58 and then to move to their initial retracted positions. Clamp-control means 46 then causes first clamp means 44 to release their hold on the webs 40 and the web-feed control means 16 and 36 then actuate web feed means 18 and 38 respectively to re-apply advance drive movement to webs 10 and 40 respectively. This further drive movement continues until the free ends of webs 40 are disposed over clamps 52 and 54 and until the web 10 has advanced the correct distance through the handle-securing station 19. The complete cycle hereinbefore described is then repeated.

Having outlined generally the features of the present invention by reference to FIG. 1, the present description will now proceed with reference to the remaining figures of the accompanying drawings for the purpose of explaining specific features and components for use in an apparatus according to the invention.

The specific embodiment of an apparatus according to the invention, as illustrated in FIGS. 2 to 14 of the accompanying drawings, has many general features in common with the apparatus already described with reference to FIG. 1. As in the case of the arrangement shown in FIG. 1, the apparatus of FIGS. 2 to 14 is specifically intended for use with a continuous two-ply web of thermoplastic sheet material such as polyethylene and is provided with heat-welding means for securing flexible, handle-forming strips simultaneously to both the plies of such a continuous two-ply web.

Referring to FIG. 2, it will be seen that the apparatus shown therein comprises web-draw means indicated schematically at 110 and of any conventional type for drawing an upper continuous web 112 and a lower continuous web 114, both of thermoplastic sheet material, in a stepwise manner from a web-storage roll 116 in the direction of the arrow D to a handle-securing station generally indicated at 120. In the arrangement illustrated, the upper and lower webs 112 and 114 are integrally formed by a longitudinal folding of a single ply web and the exposed longitudinal edges 117 and 119 are folded over to form upper and lower reinforced edge bands 121 and 123 (FIG. 3). Such folding, of course, is not essential and other means of reinforcement, such as use of webs having a thicker gauge along the edges to which the handles are secured, may be utilized. Also in some applications no reinforcement of the edges may be required.

Referring further to FIG. 2, it will be seen that a guide rod or vane 122 is disposed between the webs 112 and 114 to maintain a required separation between these webs as they enter the handle-securing station 120. A similar guide vane 124 is provided between the webs 112 and 114 at the downstream end of the handle-securing station 120.

In the particular apparatus shown in FIG. 2, the twoply web of sheet material is drawn continuously from storage roll 116 through a web-tensioning device generally indicated at 126, but intermittently through the handle-securing station 120. In particular, the web passes from roll 116 over guide rollers 128 and 130 to the tensioning device 126 from which the web passes intermittently over roller 132 to the handle-securing station 120. In the typical construction shown for the tensioning device 126, the web is disposed in a series of generally vertically oriented reaches 134 over upper fixed rollers 136 and lower rollers 138 mounted on an arm 140 pivotally secured as at 142 to a fixed member indicated schematically at 144 for pivoting movement as indicated by the arrows E.

The ends 146, 148 of a strip 147 (FIG. 2) of flexible, handle-forming material which are to be secured to the underside of the upper web 112 and the ends 150, 152 of an elongated strip 151 (FIG. 2) of flexible, handle-forming material which are to be secured to the top surface of the lower web 114 are moved into the space between the double thickness bands 121 and 123 of the webs 112 and 114 respectively at the handle-securing station 120 by movable clamps 154 and 156 which, we will be explained in greater detail hereinafter, are mounted for arcuate movement along paths between a handle-forming station 157 and the handle-securing station 120. Upper and lower anvils 158 and 160 respectively mounted for reciprocating vertical movement in the directions F' and F'' of the double-headed arrow F at the handle-securing station 120 are provided for the purpose of holding the upper web 112 against the ends 146 and 148 and for holding the lower web 114 against the corresponding ends 150 and 152 while
heat-welding operations between the ends 146 and 148 and the band 121 and between the ends 150 and 152 and the band 123 are effected. After such heat-welding operations are complete, the web-draw means 110 is adapted to move the webs 112 and 114 a further longitudinal unit distance through the handle-securing station 120. The apparatus is then ready for securing a further paid of handles to the webs 112 and 114.

Referring now to FIG. 3 in which the movable clamp 156 is shown disposed in the handle-forming station generally indicated at 157, it will be seen that, at such time, the upper and lower anvils 158 and 160 respectively are retracted out of contact with the upper and lower webs 112 and 114 respectively.

Upper and lower continuous webs 164 and 166 respectively of flexible, thermoplastic handle-forming material are fed from upper and lower storage rolls 168 and 170 respectively in the direction of the arrows G by upper and lower web-feed means generally indicated at 172 and 174 respectively which both cooperate in a manner which will be explained hereinafter with a movable anvil block 176 disposed between the upper and lower webs 164 and 166 respectively, the lower web 166 passing over a guide roller 171.

The webs 164 and 166 are fed intermittently by the web-drive means 172 and 174 respectively through fixed upper and lower clamp means generally indicated at 178 and 180 respectively, each of which is adapted releasably to hold the webs 164 and 166 respectively against a fixed anvil block 182 disposed between the webs 164 and 166. From the fixed clamps 178 and 180, the webs 164 and 166 pass forwardly through an elongated opening 179 through the front wall 181 of the apparatus to cover the top and undersurfaces respectively of both the movable clamps 154 and 156. For a reason which will be explained hereinafter, upper and lower clamp means 183, 184 and 185, 186 respectively (FIG. 2) are provided for holding the webs 164 and 166 respectively against the top and undersurfaces of the movable clamps 154 and 156.

Immediately to the left of the clamp means 183, 184, 185 and 186 (FIG. 3), upper and lower reciprocating cutters 188 and 190 respectively are shown schematically. These cutters are provided for transversely severing the webs 164 and 166 respectively, as will be explained in greater detail hereinafter.

Referring now to FIGS. 4, 5 and 6, it will be seen that the upper web-feed drive means 172 comprises a horizontal transversely extending bar 192 pivotally mounted in brackets 194 and 196 each of which is secured to the top surface of the transversely projecting ends of the movable anvil block 176. A web-engaging elongated plate 198 is secured to the bar 192, for example by screws 200 and is urged to rotate in a clockwise direction (FIGS. 5 and 6) by a helical spring 211 coaxially disposed about bar 202 and engaging the plate 208 so as to hold the web 166 against the undersurface of the movable anvil block 176.

The web-feed assembly comprising the movable anvil block 176 carrying the upper and lower web-feed drive means 172 and 174 respectively is mounted for longitudinal reciprocating movement in the directions of the arrows H and J along longitudinally extending bars 212 and 214 suitably supported in a manner (not shown) by the framework of the apparatus. Such reciprocating movement is transmitted to the web-feed assembly by a pair of longitudinal connecting rods 216 and 218 terminating at their rearward ends in slotted plates 220 and 222 respectively. Cams 224 and 226 keyed on a drive shaft 228 are adapted to engage cam-followers 230 mounted on each of the plates 220 and 222 whereby rotation of the shaft 228 causes the aforementioned longitudinal reciprocating movement of the web-feed assembly.

The drive shaft 228 is journaled in bearings 232 and 234 suitably mounted on the framework of the apparatus in a manner not shown and the saft 228 is keyed to a sprocket 236 driven by a drive chain 238 which is in turn driven in the direction of the arrow Z.

A central cam 240 also keyed to the drive shaft 228 engages cam-followers 242 secured to a slotted plate 244 provided at the rearward end of a connecting rod 246 extending longitudinally forwardly between the webs 164 and 166 and slidingly through a central hole in the movable anvil block 176. At its forward end, the connecting rod 246 is secured to a transverse yoke 248 on which are mounted a pair of forwardly extending rack gears 250 and 252 for moving the movable clamps 154 and 156 respectively between the handle-forming station 157 and the handle-securing station 120 in a manner to be described hereinafter.

Reference will now be made to FIG. 7 which is a front perspective view of the handle-securing station 120. The movable clamps 154 and 156 disposed in the handle-forming station 157 are visible in FIG. 7 as is the opening 179 in the front wall 181 of the apparatus, through which opening the handle-forming webs 164 and 166 pass from the upper and lower fixed clamps 178 and 180, the former being shown in broken lines.

From FIG. 7, it will also be seen that the upstream and downstream guide vanes 122 and 124 respectively are supported by rods 256 and 258 respectively, which rods are anchored at their rearward ends to horizontal frame members 260 and 262 respectively.

Reference to FIGS. 7 and 12 will show that the upper and lower anvils 158 and 160 respectively comprise platens 264 and 266 respectively which are carried by shoes 268 and 270 respectively in a manner which will be described in greater detail hereinafter with reference to FIG. 12. The upper shoe 268 is carried by a vertically movable shaft 276 which is mounted for reciprocating sliding movement in the directions F and F' of the double-headed arrow A through two forwardly projecting brackets 278 and 280 carried by an upright member 282 secured to brackets 284 and 286 on the front wall 181 of the apparatus. The upper end of the shaft 276 carries a cam-follower 288 which engages a cam 290 keyed to a cam shaft 292 extending rearwardly through the front plate 181 and forming
part of the drive transmission system. A helical compression spring 294 coaxially disposed around the shaft 276 between the bracket 280 and a pin 296 radially projecting from the shaft 276 in proximity to its upper end serves to urge the shaft upwardly and to ensure that the cam-follower 288 remains at all times in engagement with the cam 290.

The lower shoe 270 is similarly mounted for movement in the directions F' and F'' on a shaft 298 slindingly mounted through brackets 300 and 302 carried by upright member 304 secured in turn to brackets 306 and 308 on the front wall 181. Similarly, at its lower end, the shaft 298 carries a cam-follower 310 which engages a cam 312 carried by a cam shaft 314. A helical compression spring 316 coaxially disposed around shaft 298 between bracket 302 and a radially projecting pin 318 on shaft 298 serves to hold cam follower 310 continually in engagement with the cam 312.

It can also be seen from FIGS. 7 and 8 that the upper clamp means 183 and 184 comprise two identical structures for clamping the upper handle-forming web 164 in proximity to each of its transverse edges. The left-hand assembly 183 comprises a clamping plate 320 non-rotatably mounted on the lower end of a shaft 322 mounted for vertical sliding movement in the directions L' and L'' of the double-headed arrow L through a bracket 324 secured to a cross-plate 326 which in turn is secured through a narrower cross-plate 328 to the front wall 181. The upper end of the shaft 322 is flattened as at 330 and carries a cam-follower 332 which engages a cam 334 carried by a cam shaft 336 (FIG. 13). A helical compression spring 338 coaxially disposed about shaft 322 between plate 320 and bracket 324 serves to maintain the cam follower 332 continually in engagement with the cam 334.

Similarly, the upper right-hand clamping assembly 184 comprises a clamping plate 340 mounted on a shaft 342 slindingly mounted for movement in the directions of arrow L through a bracket 344 which is also secured to the cross-plate 326. A flattened upper end 346 of shaft 342 carries a cam-follower 348 which is maintained in engagement with a cam 350 carried by a cam shaft 352 (FIG. 13) by a helical compression spring 354 coaxially surrounding shaft 342 between the plate 340 and the bracket 344.

Referring further to FIGS. 7 and 8, it will be seen that the left-hand and right-hand lower clamping assemblies 185 and 186 respectively comprise clamping plates 356 and 358 respectively mounted on the upper ends of shafts 360 and 362 respectively. These shafts 360 and 362 are slindingly mounted for vertical reciprocating movement in the directions of the arrow L through brackets 364 and 366 respectively both of which are mounted on a cross-plate 368 which is secured through a narrower cross-plate 370 to the front wall 181 of the apparatus. The lower end of shaft 360 is flattened as at 372 and carries a cam-follower 374 which is maintained in engagement with a cam 376 carried by a cam shaft 378 (FIG. 13) by a helical compression spring 380 coaxially disposed about shaft 360 between bracket 364 and plate 356. Similarly, the lower end of shaft 362 is flattened and carries a cam-follower which is maintained in engagement with a cam 382 on a cam shaft 384 (FIG. 13) by a helical compression spring 386 disposed about the shaft 362 between the plate 358 and the bracket 366.

With further reference to FIGS. 7 and 8, it will be seen that the upper and lower reciprocating cutters 188 and 190 respectively are in the form of downwardly and upwardly directed blades 388 and 390 respectively carried on the ends of upper and lower horizontal arms 392 and 394 respectively which are retained in guide-ways formed by cross-plates 326, 328 and 368, 370 respectively and which are connected together by a vertically vertical yoke 396. A connecting rod 398 pivotally connected to the yoke 396 by a U-shaped shackle 400 and pin 402 is driven by a pneumatic cylinder 403 for reciprocating movement in the directions M' and M'' of the double-headed arrow M (FIG. 7). The point of blade 388 is vertically disposed so as to sever the upper handle-forming web 164 when this blade is moved in the direction M' while the blade 390 is similarly disposed so as to sever the lower handle-forming web 166 transversely when this blade is moved in the direction M''.

FIGS. 9 and 11 show in detail the left-hand movable clamp generally indicated at 154 disposed in the handle-forming station 157 and shown somewhat schematically in FIG. 10 are the left-hand and the right-hand movable clamps 154 and 154 respectively disposed in the handle-securing station 120. Referring further to FIG. 9, it will be seen that the clamp 154 is pivoted about a generally vertical axis for limited rotation between its positions shown in FIGS. 9 and 10. To this end, the clamp 154 has a pair of vertically separated flanges 404 and 406 which are keyed to a shaft 408 pivotally mounted in a pair of forwardly extending ears 410 and 412 carried by the main frame of the apparatus. A circular spur gear 414 is keyed to the shaft 408 between the flanges 404 and 406 for engagement with the rack gear 250.

The clamp 154 is also provided on its front and rear surfaces (FIG. 9) with upper and lower straps 416 and 418 respectively secured to the body of the clamp 154 by screws 420 to provide slide-ways for side plates 422 with which there is integrally formed an end plate 423 having inwardly directed web-engaging upper and lower lips 424 and 426 respectively. These lips 424 and 426 are provided with bevelled edges at as 428 for engaging the longitudinal edges of the webs 164 and 166. Internally, the clamp 154 is provided with pneumatically controlled actuating means 429 for causing reciprocating movement of the assembly comprising plates 422 and 423 and lips 424 and 426 in the directions N' and N" of the double-headed arrow N.

On its forward face, the clamp 154 also has a yoke 430 rigidly connected to a piston rod 432 extending into the body of the clamp within which pneumatic means 433 are provided for causing reciprocating movement through the piston rod 432 of the yoke 430 in the directions P' and P'' of the double-headed arrow P. At the upper and lower ends of the yoke 430, there are pivotally mounted upper and lower dogs 434 and 436 respectively which are mounted in such a way that as they are moved by the aforementioned pneumatic means in the direction P', such dogs 434 and 436 initially move upwardly and downwardly respectively away from the body of the clamp so as to clear the leading edges of the webs 164 and 166 respectively and then move downwardly and upwardly respectively towards the body of the clamp so as finally to engage the edges of the webs 164 and 166.
The structure of the right-hand movable clamp 156 is identical to that of the left-hand clamp 154 except of course for its opposite handedness. It is, for example, provided with flanges 405 and 407 (FIG. 8) keyed to a shaft 409 pivotally mounted in an upper ear 411 and a similar lower ear. A circular spur gear 415 keyed to the shaft 409 engages rack gear 252. Since the structure of the clamps 154 and 156 are shown somewhat schematically in FIG. 8, primed legends are used in the latter figure for the structural components which are shown therein in a schematic manner. For example, the yoke 430 is shown schematically at 430' and is shown as having upper and lower web-engaging lips or dogs 434' and 436' respectively. Similarly, the right-hand clamp 156 is provided with an internally actuated end plate integrally formed with an upper web-engaging lip 438 and a similar lower web-engaging lip (not shown). These lips are adapted for reciprocating movement in the direction N' and N'' of the double-headed arrow N. Similarly, the right-hand clamp 156 has a yoke 442' with upper and lower web-engaging lips or dogs 444' and 446' respectively for movement in the directions P' and P'' of the double-headed arrow P.

The internal structures of the upper and lower anvils 158 and 160 will now be described in greater detail with reference to FIG. 12 which is a vertical sectional view through the lower anvil 160. Description of the lower anvil 160 should suffice since the two anvils are identically formed except that one is inverted with respect to the other. From FIG. 12, it will be seen that a heating block 448 including an electrical heating element 450 is mounted on the shoe 270 through an insulating layer 452. Extending upwardly from the heating block 448, there are provided four heat-conducting legs 454, two of which are also visible in FIG. 7. These legs 454 slantly extend through the plate 266 which comprises a rigid plate 456 having a passage 458 therethrough and communicating with a water inlet 460 and a water outlet 462 by means of which cooling water may be pumped through the plate 456. A resilient cover 464 is suitably secured over the upper surface of the plate 456. Plate 266 is mounted on shoes 270 by means of helical compression springs 466 in such a manner that with springs 466 in their normal, extended position, the outer ends of legs 454 are substantially flush with the surface of plate 456 and a gap 467 is defined between the upper surface of heating element 450 and the undersurface of plate 456. Thus, pressure on the face of plate 456 when it is forced into contact with clamps 154, 156 causes legs 454 to extend beyond the face of plate 456 to effect the heat welding operation.

Referring further to FIG. 13, it will be seen that the left-hand and right-hand upper cam shafts 336 and 352, the rotation of which serves to actuate the upper clamp means 183 and 184, also carry additional cams 468 and 470 respectively. These cams 468 and 470 cooperate with suitable cam-followers, such as cam-follower 472 (FIG. 7), to control the vertical reciprocating movement of the upper fixed clamps 178. Similarly, additional cams 474 and 476 on cam shafts 378 and 384 respectively serve to control the vertical reciprocating movement of the lower fixed clamps 180.

The manner in which drive motion is applied to the cams 290, 312, 334, 350, 376, 382, 468, 470, 474 and 476 as well as to the shaft 228 (FIG. 4) will best be understood by reference to FIGS. 13 and 14. From these figures, it will be noted that chain 238 is entrained around a sprocket 478 carried at one end of a shaft 480. A bevel gear 482 keyed to the other end of shaft 480 is in driven engagement with a bevel gear 484 keyed to a main drive shaft 486. The main drive shaft 486 is driven from a suitable motive power source through a chain 488 entrained around driving sprocket 490 on a shaft 487 and around driven sprocket 492 keyed to the main drive shaft 486. A further sprocket 494 is keyed to the main drive shaft 486 intermediate bevel gear 484 and sprocket 492 and a drive chain 496 is entrained around sprocket 494 and driven sprockets 498, 500, 502, 504, 506 and 508 keyed to the rear ends of the cam shafts 384, 352, 292, 336, 378 and 314 respectively. An idler sprocket 510 is provided to maintain the desired tension in the chain 496 which is adapted to be driven continuously in the direction of the arrows T.

Referring now to FIG. 15, it will be seen that a plastic bag generally indicated in FIG. 15 at 512 and having handles secured thereto using the apparatus shown in FIGS. 2 to 14 comprises a front wall 514 having its upper edge folded over to provide a double thickness top band 516 heat-welded at 518. Similarly, the bag has a rear wall 520 having a double thickness top band 522 with a heat-weld as indicated at 524. Flexible handles 525 and 528 are heat-welded as at 530 and 532 respectively to the double thickness top bands 516 and 522 respectively while the sides of the bags are sealed by heat-welds 534 and 536.

The operation of the apparatus described with reference to FIGS. 2 to 14 of the accompanying drawings for the manufacture of bags such as bag 512 will now be described.

In such operation, the web-draw means 110 (FIG. 2) is operated intermittently to feed the upper and lower webs 112 and 114 respectively in the direction of the arrows D from the web-tensioning device 126 to the handle-securing station 120. During this movement of the webs 112 and 114, the arm 140 swings upwardly about the pivot 142. Since movement of the webs 112 and 114 from the web-storage roll 116 is continuous, the arm 140 pivots downwardly to the position shown in FIG. 2 while the webs 112 and 114 are stationary at the handle-securing station 120.

The webs 112 and 114 remain stationary and vertically spaced apart in the handle-securing station 120 while the upper and lower strips 147 and 151 are secured thereto. When this stage of the operation is complete, the web-draw means 110 operates again to move the webs 112 and 114 through the handle-securing station 120 in the direction of the arrows D a distance corresponding to the longitudinal separation between the handles of a pair of adjacent bags.

As previously explained, the webs 112 and 114, after leaving the handle-securing station 120, may be transversely heat-welded and transversely severed by means 125 to provide side seams such as side seams 534 and 536 of the bag 512 of FIG. 15. The means 125 for transversely heat-welding and severing the webs 112 and 114 to form the individual handle bags may comprise any of the known apparatus for effecting this function and, since such apparatus does not form any
part of the present invention, it will not be described in further detail here.

Assuming that the apparatus has reached the stage of its operating cycle in which a previous operation of securing a pair of handles to the webs 112 and 114 has been completed and that the movable clamps 154 and 156 have moved so as to be disposed in the handle-forming station 157 as shown in FIGS. 2, 3 and 7 to 9, the upper and lower clamp means 183, 184, 185 and 186 respectively are disposed at the limit of their movement in the directions L" (FIG. 8), and the fixed clamps 178 and 180 (FIGS. 3, 5 and 6) are disposed at the limit of their movements away from the fixed anvil block 182 and consequently are not engaging the webs 164 and 166 respectively.

Immediately subsequent to the operation stage just described, continued rotation of the main drive shaft 486 effects engagement of the upper and lower cams 468, 470 and 474, 476 respectively (FIG. 13) with their respective cam-followers causing fixed clamps 178 and 180 (FIG. 5) to move downwardly and upwardly respectively to hold the webs 164 and 166 respectively securely against the fixed anvil block 182.

When the webs 164 and 166 are firmly engaged by the fixed clamps 178 and 180, continued rotation of shaft 228 (FIG. 4) by chain 238 causes cams 224 and 226 engaging the cam-followers 230 to move the connecting rods 216 and 218 rearwardly in the direction H. This rearward motion is transmitted to the web drive means 172 and 174 to move these means rearwardly in the same direction. During this movement, the upper and lower rods 192 and 202 respectively with their attached plates 198 and 208 respectively are caused to rotate into the positions shown in FIG. 5 against the action of their associated helical springs 201 and 211 respectively. These rotations are caused by the engagement of the plates 198 and 208 with the webs 164 and 166 respectively. Consequently, the web-draw means 172 and 174 and the movable anvil block 176 move slidingly rearwardly with respect to the webs 164 and 166 in the direction of the arrow H.

When the drive means 172 and 174 reach the limit of their rearward movement, the cam shafts 336, 352, 378 and 384 (FIG. 13) have rotated sufficiently to cause the fixed clamps 178 and 180 to be retracted upwardly and downwardly respectively through the action of a cams 468, 470 and 474, 476 respectively to release their engagement with the webs 164 and 166. The simultaneous action of the fixed clamps 434, 350, 376 and 382 with their respective cam-followers under the action of helical compression springs 338, 354, 380 and 386 respectively (FIG. 7) causes plates 320, 340, 356 and 358 respectively (FIG. 8) to be moved in the directions L".

At this time, the webs 164 and 166 respectively against the movable anvil block 176. As a result of the engagement of the webs 164 and 166 between the movable anvil block 176 and the plates 198 and 208 respectively, the webs 164 and 166 are fed forwardly in the direction of the arrow J (FIG. 6). This forward movement of the webs 164 and 166 continues until the leading edges of these webs are disposed at the forward edges of the movable clamps 154 and 156 as actually shown in FIG. 6.

As soon as the webs 164 and 166 are disposed in this position, further rotation of the cam shafts 336, 352, 378 and 384 (FIG. 13) causes fixed clamps 178 and 180 to move towards the fixed anvil block 182 in the manner already described to engage the webs 164 and 166 firmly thereagainst. Similarly, the clamp means 183, 184, 185 and 186 are moved in the directions L' (FIG. 8) to hold the webs 164 and 166 securely against the top-surface and the under-surface respectively of the movable clamps 154 and 156.

As soon as the webs 164 and 166 are firmly engaged by the fixed clamps 178 and 180 and by the clamp means 183, 184, 185 and 186, the pneumatically controlled actuated means 429 within movable clamps 154 and 156 are actuated to cause the upper and lower bevelled lips 424 and 426 respectively (FIG. 9) of the clamp 154 and the upper bevelled lip 438 and the corresponding lower lip of the clamp 156 to move in the directions N' (FIG. 8) so as to engage the left-hand edges 146 and 150 and the right-hand edges 148 and 152 of the upper and lower webs 164 and 166 respectively (FIG. 2) and to hold these ends firmly on the movable clamps 154 and 156. Simultaneously, the pneumatic means 433 provided within the clamps 154 and 156 operate to move the yokes 430 (FIG. 9) and 442' (FIG. 8) in the direction P; this movement causes the upper and lower dogs 434, 436 and 444, 446 of the two yokes 430 and 442 respectively first to engage the leading edges of the webs 164 and 166 to further increase the engagement thereof with the movable clamps 154 and 156.

When the webs 164 and 166 are engaged in this manner, the upper and lower reciprocating cutters 188 and 190 respectively (FIGS. 7 and 8) are actuated to move from the positions shown in FIG. 7 in the direction M' through the position shown in FIG. 8 until the webs 164 and 166 are transversely severed to provide upper and lower strips 147 and 155 respectively (FIG. 2) of flexible, handle-forming material. The upper and lower cutters 188 and 190 then rapidly return in the direction M" to the positions actually shown in FIG. 7.

The next step in the operation of the apparatus involves the simultaneous movement of the fixed clamps 178 and 180 and of the clamp means 183, 184, 185 and 186 out of their web-engaging positions and into their retracted positions in which they do not engage the webs 164 and 166. This step is effected in the manner already described.

As soon as the last mentioned operation is complete, further rotation of shaft 228 (FIG. 4) causes the cam followers 242 on plate 244 to engage the appropriate portion of cam 240 in turn to cause the connecting rod 246 and consequently the rack gears 250 and 252 to move in the direction H. The engagement of the rack gears 250 and 252 with the circular spur gears 414 and 415 respectively (FIG. 8) causes the movable clamps
154 and 156 respectively to pivot from the positions shown in FIGS. 7 and 8 to the positions shown in FIG. 10 in which these clamps holding the ends 146, 148 and 150, 152 of the upper and lower elongated strips 147 and 151 respectively are disposed in the space between the upper and lower webs 112 and 114.

By the time that the movable clamps 154 and 156 are disposed in the handle-securing station 120, the web-draw means 110 (FIG. 2) has operated to move the webs 112 and 114 longitudinally through the handle-securing station 120. At this instant, the webs 112 and 114 are stationary and the drive chain 496 (FIGS. 13 and 14) then causes rotation of the upper and lower cam shafts 292 and 314 respectively to the point where engagement of the cams 290 and 312 with the cam-followers 288 and 310 respectively (FIG. 7) moves the upper and lower anvils 158 and 160 respectively (FIG. 3) in the directions F’ so that the upper and lower platens 264 and 266 respectively abut the top and undersurfaces of the webs 112 and 114 respectively in alignment with the ends of the elongated strips 147 and 151 held by the clamps 154 and 156 on the opposite sides of the webs 112 and 114. At the same time, the heat-conducting fingers 454 are forced into firm engagement with the web surface.

Heat is then conducted from the respective heating element 450 (FIG. 12) through the associated heat-conducting fingers 454 to effect heat-welding between the ends 146 and 148 of the upper elongated strip 147 and the upper web 112 and between the ends 150 and 152 of the lower elongated strip 151 and the lower web 114. Further rotation of the upper and lower cam shafts 292 and 314 respectively causes movement of the upper and lower anvils 158 and 160 respectively in the direction F” so that they disengage the webs 112 and 114.

The next step in the operating sequence involves movement of the upper and lower bevelled lips 424 and 426 respectively of the movable clamp 154 (FIG. 9) in the direction N”, movement of the upper bevelled lip 438 and of the corresponding lower lip of the movable clamp 156 in the direction N” (FIG. 8), movement of the dogs 434 and 436 of the movable clamp 154 (FIG. 9) in the direction P”’ (FIG. 11), and movement of the dogs 444 and 446’ of the movable clamp 156 (FIG. 8) in the direction P”’. All these movements are actuated by the pneumatic means 429 and 433 provided within the movable clamps 154 and 156. When these movements are complete, the movable clamps 154 and 156 are no longer in engagement with the handles which are now heat-welded to the webs 112 and 114.

The final stage in a single operating cycle involves retraction of the movable clamps 154 and 156 from the handle-securing station 157 as a result of forward movement of the rack gears 250 and 252 (FIG. 4) consequential to the appropriate engagement of cam-followers 242 with the cam 240.

At this instant, the handles are secured to the webs 112 and 114 and the latter are now advanced by the web-draw means 110. The hereinafter described operational sequence is then repeated.

These operational stages are summarized below commencing at the instant where the securing of one pair of handles to the webs 112 and 114 has been completed and where the movable clamps 154 and 156 have been retracted to the handle-forming station 157.

Step 1a: Fixed clamps 178 and 180 move towards the fixed anvil blocks 182 to engage webs 164 and 166 thereagainst (FIG. 5);

Step 1b: Clamp means 183, 184, 185 and 186 move in directions L’ (FIGS. 5 and 8);

Step 2: Web-drive means 172, 174 and 176 slide rearwardly with respect to the webs 164 and 166 in the direction H (FIG. 5);

Step 3a: Fixed clamps 178 and 180 move away from the fixed anvil block 182 to release webs 164 and 166 (FIG. 6);

Step 3b: Clamp means 183, 184, 185 and 186 move in the directions L’’ (FIGS. 6 and 8);

Step 4: Web-drive means 172, 174 and 176 move towards web-forming station 157 to feed webs 164 and 166 forwardly in the direction J (FIG. 6);

Step 5a: Fixed clamps 178 and 180 move towards fixed anvil block 182 to engage webs 164 and 166 thereagainst (FIG. 3);

Step 5b: Clamp means 183, 184, 185 and 186 move in the directions L’’’ to hold webs 164 and 166 against movable clamps 154 and 156 (FIGS. 3 and 8);

Step 6: Pneumatic means 429 and 433 in clamps 154 and 156 cause lips 424 and 426 to move in the direction N’ (FIG. 9), the upper lip 438 and the corresponding lower lip of clamp 156 to move in the direction N’’ (FIG. 8), dogs 434 and 436 (FIG. 9) to move in the direction P’ (FIG. 11), and dogs 444’ and 446’ to move in the direction P’’ (FIG. 8);

Step 7: Cutters 188 and 190 move in the direction M’ transversely to sever webs 164 and 166 and then in the direction M”’ (FIGS. 3, 7 and 8);

Step 8a: Fixed clamps 178 and 176 move away from fixed anvil block 182 to release webs 164 and 166 (FIG. 6);

Step 8b: Clamp means 183, 184, 185 and 186 move in the directions L’”’ to release webs 164 and 166 (FIG. 8);

Step 9: Movable clamps 154 and 156 move from the handle-forming station (FIGS. 7 and 8) to the handle-securing station (FIG. 10);

Step 10: Upper and lower anvils 158 and 160 move in the directions F’ to clamp the ends of the elongated strips 147 and 151 against the webs 112 and 114 (FIGS. 3 and 7)*;

Step 11: Heat-welding of the ends of the elongated strips 147 and 151 to the webs 112 and 114 respectively (FIGS. 7 and 12)*;

Step 12: Upper and lower anvils 158 and 160 move in the directions F’’ (FIGS. 3 and 7)*;

Step 13: Pneumatic means 429 and 433 in movable clamps 154 and 156 cause the lips 424, 426, 428 and the corresponding lower lip of movable clamp 156 and the dogs 434, 436, 444’ and 446’ to release the ends of the heat-welded elongated strips 147 and 151*; (*During Steps 10, 11, 12 and 13, the webs 112 and 114 are stationary, the advancement of these webs in the direction D (FIG. 2) being effected by web-feed draw means 110 during Step 14 and/or Steps 1 to 9).

Step 14: Movable clamps 154 and 156 move from the handle-securing station 120 to the handle-forming station 157.
It will be understood that the foregoing sequence of operations must take place repeatedly and very rapidly in order to ensure efficient and economic production of handle-bags. The particular apparatus described herein, for example, is capable of completing sequence of operations in 0.5 second or less. Thus, handle bags may be produced at the rate of 120 per minute or faster if desired.

It will also be understood that the invention contemplates other methods and means for providing the lengths of handle-forming material. For example, handle strips may be provided in pre-cut lengths which are fed automatically from a supply source to the handle clamping members 154, 156 by any suitable delivery means. Also, handles can be supplied by severing lengths of handle material from an elongated roll of handle-forming material which has the same transverse width as the handle lengths.

It is also to be understood that the handle securing method and apparatus of the invention can be utilized to secure handles to preformed bags. That is, it is not essential that the bag material be supplied as a continuous web and that the longitudinal edges of the bags be formed and severed after the handle securing operation. The invention contemplates that preformed bags can be positioned in a handle securing station for attachment of handles. Such bags can be positioned and removed manually or by means of automatic equipment.

What we claim as new and desire to protect by Letters Patent of the United States is:

1. A method of securing a pair of handles comprising first and second lengths of flexible, handle-forming sheet material which lengths each have first and second ends to a first and second ply respectively of a two-ply web of sheet material, which method comprises feeding said two-ply web of sheet material to a handle-securing station, separating the first and second plies of said two-ply web of sheet material so that they are spaced apart at said handle-securing station to define a space therebetween, feeding said first and second lengths of handle-forming material to said handle-securing station, maintaining said first and second lengths spaced apart from one another, temporarily clamping each of said first and second lengths of handle-forming material in proximity to both said first end and said second end of each such that portions of each said first and second lengths in proximity to the ends thereof are in the same plane, and, while maintaining said portions in the same plane and permitting central portions of said lengths to twist freely and without restraint, moving said clamped ends of each said length toward each other and into the space between said two plies such that one surface of each said portion contacts a handle-supporting station and another length surface oppositely facing said one surface is in juxtaposition with a surface of a respective one of said first and second plies of said two-ply web of sheet material and, while said two-ply web of sheet material is stationary at said handle-securing station and while said handle-supporting station is immobile, moving heat sealing means into contact with said first and second plies so as to compress said first and second lengths of handle-forming material and said first and second plies respectively between said heat sealing means and said handle-supporting station whereby said portions of the first and second lengths are secured to said first and second plies respectively of said two-ply web of sheet material.

2. A method of forming pairs of handles and of securing such pairs of handles in longitudinally spaced dispositions respectively to a first ply and a second ply of a continuous two-ply web of sheet material, which method comprises feeding said two-ply web of sheet material longitudinally and intermittently through a handle-securing station, separating said first and second plies of said two-ply web of sheet material so that they are spaced apart at said handle-securing station to define a space therebetween, intermittently feeding a first web and a second web of flexible, handle-forming material to a handle-securing station, severing said first web and said second web of handle-forming material at said handle-securing station to provide a first strip of handle-forming material and a second strip of handle-forming material, each of said strips of handle-forming material having a first end and a second end and a central portion disposed intermediate said ends, maintaining said first and second strips spaced apart from one another and temporarily clamping said strips in proximity to both said first and said second end of each such that portions of said first and second strips in proximity to the ends thereof are in the same plane, and, while maintaining said portions in the same plane and permitting said central portions of said strips to twist freely and without restraint, moving said first and second ends of each of said first and second strips of handle-forming material towards each other and into the space between said two plies such that one surface of each said portion contacts a handle-supporting station and another strip surface oppositely facing said one surface is in juxtaposition with a surface of a respective one of said first and second plies of said two-ply web of sheet material and, while said two-ply web of sheet material is stationary at said handle-securing station and while said handle-supporting station is immobile, moving heat sealing means into contact with said first and second plies so as to compress said first and second strips of handle-forming material and said first and second plies respectively between said heat sealing means and said handle-forming station whereby said portions of the first and second strips of handle-forming material are secured to said first and second plies respectively of said two-ply web of sheet material.

3. A method as claimed in claim 2 in which said first web and said second web of flexible, handle-forming material are transversely severed at said handle-forming station to provide said first and second strips of handle-forming material.

4. A method as claimed in claim 3 in which said first and said second ends of each of said first and second strips of handle-forming material are transversely offset with respect to a longitudinal edge of said two-ply web of sheet material when said strips of handle-forming material are disposed at said handle-forming station and in which said first and second ends of each of said strips of handle-forming material are moved along arcuate paths towards each other and transversely inwardly with respect to said two-ply web of sheet material into said juxtaposition with said respective one of said first and second plies of said two-ply web of sheet material.
5. A method as claimed in claim 4 in which said first and second ends of each of said strips of handle forming material are moved towards each other along said arcuate paths into said space between said two plies of said two-ply web of sheet material so as to be in juxtaposition with said respective one of said first and second plies of said two-ply web of sheet material.

6. A method as claimed in claim 2 which comprises temporarily clamping said first and second webs of flexible handle-forming material at said handle-forming station during said severing thereof and temporarily end-clamping said first and second strips of handle-forming material for the purpose of moving said first and second ends of said strips of handle-forming material towards each other and into said juxtaposition with said respective one of said first and second plies of said two-ply web of sheet material.

7. A method as claimed in claim 2 in which said first and second ends of said first and second strips of handle-forming material are secured to said respective one of said first and second plies of said two-ply web of sheet material by heat-welding.