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PROCEDURE AND APPARATUS FOR THE PRODUCTION OF CARDBOARD CASES NONCIRCULAR IN CROSS-SECTION

Filed June 14, 1963

FIG. 1

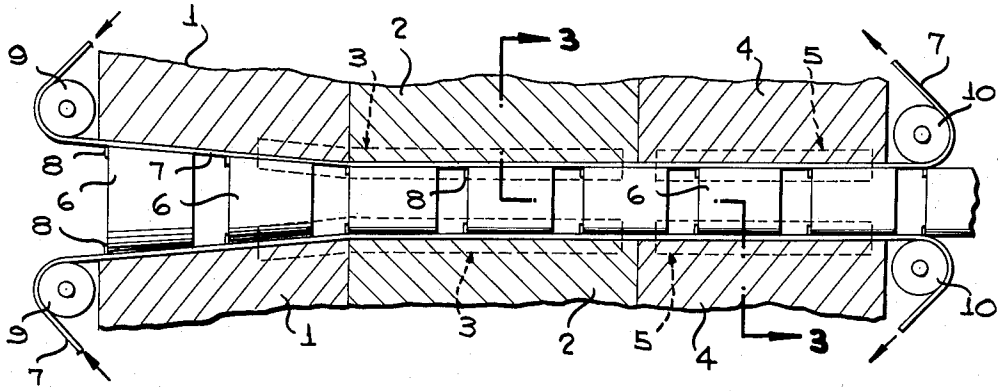


FIG. 2

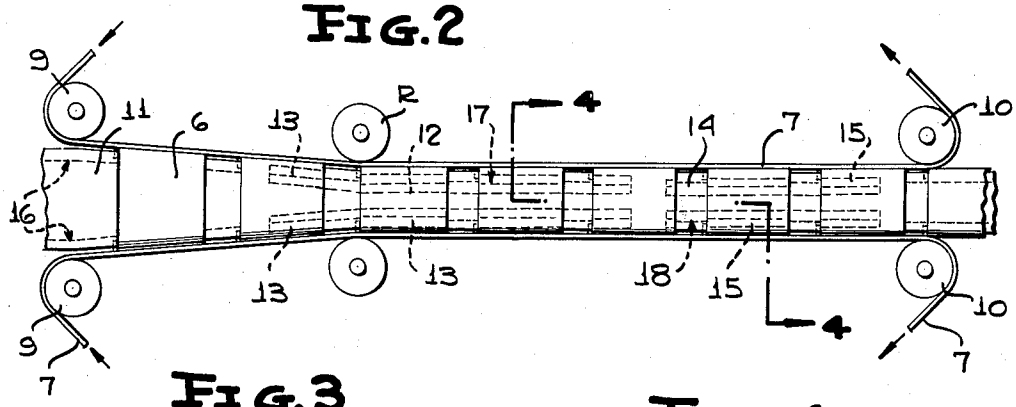


FIG. 3

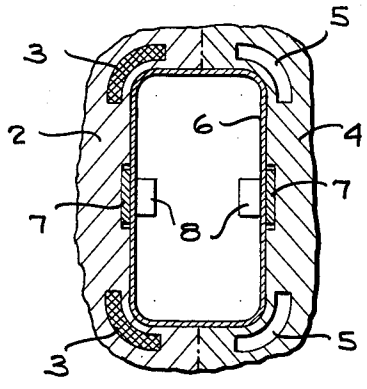
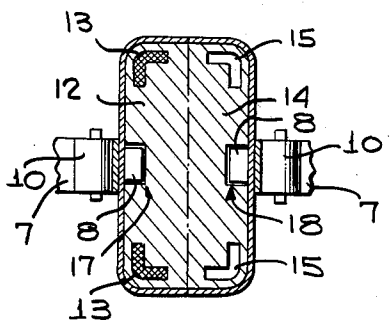


FIG. 4



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PROCEDURE AND APPARATUS FOR THE PRODUCTION OF CARDBOARD CASES NONCIRCULAR IN CROSS-SECTION

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The invention concerns a procedure and apparatus for the production of cases noncircular in cross-section, especially of noncircular cardboard containers.

How to produce cardboard cases with noncircular cross-section by wrapping on mandrel means corresponding in cross section, or by folding of cuttings around such mandrel means and joining of the edge is known. For this manner of production of cases comparatively expensive special machines are needed. Besides this, one must provide, with this kind of manufacture, separate storage for circular and noncircular cases, which is not required with the production of noncircular cases from circular cases.

It has become known how to produce cases noncircular in cross-section from circular cases by means of an expanding mandrel with the help of pressure rolling. However, this kind of production is also linked with a significant structural expenditure for the pertinent machines. Also, the production procedure is comparatively uneconomical as a result of the cyclic treatment.

The problem of the above invention is to create a procedure for the production of cases noncircular in cross-section, especially out of cardboard, which is distinguished from the known procedure by its special simplicity and which is essentially more economical in its practicability than the known production procedures described previously.

For the solution of this problem, the invention provides that round cases, preferably cardboard cases, are moved through an at least partially heated transforming station with output adapted to the final cross-section, and after the final form is obtained, through a heating and connected cooling zone.

Accordingly, in the new procedure one proceeds from noncircular cases, especially cardboard cases, which, as is well known, can be prepared in a continuous or segmented production process, for example by wrapping or overlap gluing so that transformation into the noncircular form can follow the production process of the round cardboard cases directly. Hereby a work flow results which is decisive for the economy so that the costs of production of the cardboard cases produced according to the new process can be kept very small.

Through the warming effect provided toward the end after the transformation, the containers or cardboard cases transformed to the noncircular cross-section form retain the form obtained in the transformation station and do not spring back in the direction of the circular cross-section form. Since a decrease in the stiffness of the raw material occurs during the heating in the warmed zone, a cooling area is connected (at the outlet side), in which the transformed cases again get their original stiffness.

In the newly formed process, it is recommended that the cases be continuously pushed through the transformation station as well as through the heating and cooling zone to obtain the work flow already mentioned above. The pushing movement has the advantage that the pushing forces uniformly divided on the back edge of the case can be brought into effect without imparting the formation of the cross-section and without damaging the case walls.

The apparatus for carrying out the new type of process

is characterized, according to the invention, by the fact that the transformation station is equipped with an at least partially heated transformation tunnel or transformation mandrel and that, for the preferentially continuous movement of the cases, driving conveyors including carriers engaging the back edges of the cases are provided.

In order to ascertain that the carriers lie close to an adequate working surface of the cases and in order to prevent a slipping off or disengagement of the carriers from the back edges of the cases, the invention further provides that, upon use of a transformation mandrel, the mandrel as well as the guiding walls in the heating and cooling zone are provided with recesses to receive and accommodate movement of the carriers, said recesses lying in the movement direction of the cases.

The heating equipment in the new type of apparatus can take effect on the case walls either from the outside or from the inside. Whereby an external heating is generally used in connection with a transformation tunnel, an internal heating may be found to serve more advantageously with a transformation mandrel. The heating temperature can be adjusted to the permissible values in the known way and can thereby be adapted to the conditions at the time.

It is recommended that the heating elements be arranged in the region of greatest form change.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing:

In the drawings:

FIGURE 1 is a horizontal sectional view showing an apparatus in which the noncircular cases can be produced from cardboard cases previously circular in cross-section by means of a transformation tunnel.

FIGURE 2 is a horizontal sectional view showing an apparatus in which a transformation mandrel is provided instead of a transformation tunnel.

FIGURES 3 and 4 are vertical cross sectional views taken on the lines 3—3 and 4—4 on FIGURES 1 and 2, respectively.

In FIGURE 1, the transformation tunnel, which can be formed as pipe or solidly, is designated by **1**. To the tunnel is connected in the conveying course of the cases a casing **2** corresponding to the final form the cases are to assume, as shown in FIGURE 3. The casing **2** is equipped with heating devices **3** which extend into the output end of the transformation tunnel **1**. The heating elements **3**, as best shown in FIGURES 1 and 3, are arranged in the region of greatest form change of the case, i.e. in the region of the smallest radii of curvature.

A cooling zone is connected to casing **2**, which also consists of a casing **4** with cooling means **5** arranged in it. According to the kind of raw material of which the cases are made, special casings equipped with cooling elements can be provided.

The cardboard cases **6** are pushed through the individual stations of the apparatus by means of driving conveyors **7**, which are equipped with carriers **8**, whereby the driving conveyors are formed as endless conveying means, which may take the form of chains or belts laid over the friction rollers or guiding pulleys **9** and **10** as well as pin guides, guiding pulleys and tension rollers.

Through molding of the converter funnel or tunnel the cases which initially are circular in cross-section are converted to the noncircular form and later, in this noncircular form, are continuously pushed through the heating and cooling zones. The carriers **8** are so formed and placed that they cause no damage to the case ends during the pushing and reshaping of the cases.

In the form of construction shown in FIGURE 2, a transformation mandrel 11 is provided for transforming the round cases 6. While being moved along on the mandrel the cases can be gradually converted during their advancement to the desired noncircular cross-section shown in FIGURE 4. A heating section or mandrel portion 12 extends from the transformation mandrel 11, and is equipped with heating elements 13, arranged in the peripheral region at the places where the body to be converted experiences the greatest change of form. Here again, the heating elements 13 extend into the delivery end of the transformation station, i.e. of the transformation mandrel. A cooling mandrel section 14 extends from the heating mandrel portion 12, and the cooling of the mandrel portion 14 is brought about either by cooling elements or ducts 15 arranged on the inside, as shown in FIGURE 2 and 4, or through cooling equipment working externally.

Driving conveyors 7 are also provided here with the proper carriers 8 and guide rollers as well as friction rollers 9 and 10, and additional pressure rollers R in order to assure a continuous guiding of the cases through the individual stations. The carriers 8 slide in corresponding recesses 16 in the mandrel 11 as well as in recesses 17, 18 in the guiding walls of the heating and cooling mandrel sections or portions 12 and 14, so that they can engage with adequate working surfaces on the back edges of the cases for the purpose of pushing them through the individual stations.

I claim:

1. A method of producing cases which are noncircular in cross-section, especially of noncircular cardboard containers comprising the steps of moving round cases preferably card board cases, through an at least partially heated transformation station having a receiving portion to receive the initial round section of the cases and an output portion shaped to the final desired cross-section and forming the cases to their final form while in the transformation station, passing the formed containers through a heating zone and passing the formed containers through a connected cooling zone.

2. The method of claim 1, said cases being continuously pushed through the transformation station as well as through the heating and cooling zones.

3. The method of claim 1 wherein the cases are continuously embraced and supported externally while they are being reshaped in and passing through the transformation station and the heating and cooling zones.

4. The method of claim 1 wherein the cases are continuously supported internally while they are being reshaped in and passing through the transformation station and the heating and cooling zones.

5. The method of claim 1 wherein the cases are continuously embraced and supported externally while they are being reshaped in and passing through the transformation station and the heating and cooling zones, and wherein the external support at the transformation station gradually transforms the cases from a round section to the final desired cross-section the cases are to assume.

6. The method of claim 1 wherein the cases are continuously supported internally while they are being reshaped in and passing through the transformation station and the heating and cooling zones, and wherein the internal support at the transformation station gradually transforms the cases from a round section to the final desired cross-section the cases are to assume.

7. Apparatus for the production of cases which are noncircular in cross-section, especially of noncircular cardboard containers, said apparatus including means for moving round containers preferably cardboard containers, through an at least partially heated transformation station; said transformation station having a receiving portion to receive the initial round section of the cases and an output portion shaped to the final desired cross-section

wherein the cases are formed to their final form; said apparatus further including a heating zone and a cooling zone.

8. The apparatus of claim 7 the transformation station being equipped with an at least partially heated transformation tunnel and means being provided for imparting continuous movement to the cases, said last named means comprising driving conveyors with carriers engaging the back edges of the cases.

9. The apparatus of claim 7 the transformation station being equipped with an at least partially heated transformation mandrel and means being provided for imparting continuous movement to the cases, said last named means comprising driving conveyors with carriers engaging the back edges of the cases.

10. The apparatus of claim 7 the transformation station being equipped with an at least partially heated transformation tunnel and means being provided for imparting continuous movement to the cases, said last named means comprising driving conveyors with carriers engaging the back edges of the cases, and wherein the heating and cooling zones are provided in tunnel extensions from the transformation tunnel, said transformation tunnel and heating and cooling zone tunnel extensions being shaped to embrace and support the cases externally as they are being conveyed therethrough and having recesses therein to accommodate movement of the conveyor carriers.

11. Apparatus as defined in claim 10 wherein the heating zones have heating elements therein disposed at the portions thereof whereat the greatest form changes are imparted to the cases.

12. The apparatus of claim 7 the transformation station being equipped with an at least partially heated transformation mandrel and means being provided for imparting continuous movement to the cases, said last named means comprising driving conveyors with carriers engaging the back edges of the cases, and wherein the heating and cooling zones are provided in mandrel extensions from the transformation mandrel, said transformation mandrel and heating and cooling zone mandrel extensions being shaped to internally support the cases as they are being conveyed thereover and having recesses therein to accommodate movement of the conveyor carriers.

13. Apparatus as defined in claim 12 wherein the heating zones have heating elements therein disposed at the portions thereof whereat the greatest form changes are imparted to the cases.

14. The apparatus of claim 7 the transformation station being equipped with an at least partially heated transformation tunnel and means being provided for imparting continuous movement to the cases, said last named means comprising driving conveyors with carriers engaging the back edges of the cases, and wherein the heating and cooling zones are provided in tunnel extensions from the transformation tunnel, said transformation tunnel and heating and cooling zone tunnel extensions being shaped to embrace and support the cases externally as they are being conveyed therethrough and having recesses therein to accommodate movement of the conveyor carriers, the external support at the transformation station gradually changing from a round section to a rectangular section with rounded corners, and wherein the heating zones have heating elements therein following the contours of said rounded corners.

15. The apparatus of claim 7 the transformation station being equipped with an at least partially heated transformation mandrel and means being provided for imparting continuous movement to the cases, said last named means comprising driving conveyors with carriers engaging the back edges of the cases, and wherein the heating and cooling zones are provided in mandrel extensions from the transformation mandrel, said transformation mandrel and heating and cooling zone man-

drel extensions being shaped to internally support the cases as they are being conveyed thereover and having recesses therein to accommodate movement of the conveyor carriers, the internal support at the transformation station gradually changing from a round section to a rectangular section with rounded corners, and wherein the heating zones have heating elements therein following the contours of said rounded corners.

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