March 28, 1967 H. E. HECKER 3,311,524

MACHINES FOR PRODUCING PACKAGING COMPONENTS

Filed Aug. 29, 1963 2 Sheets-Sheet 1

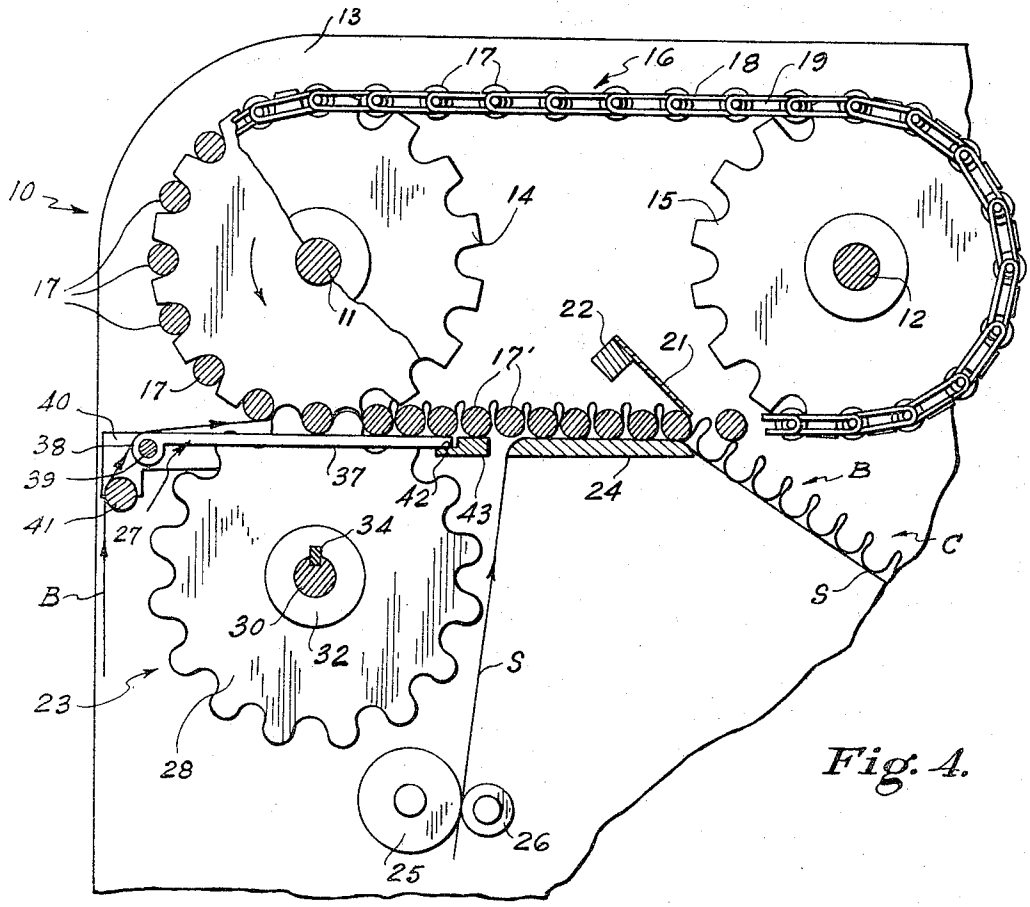

Fig. 4.

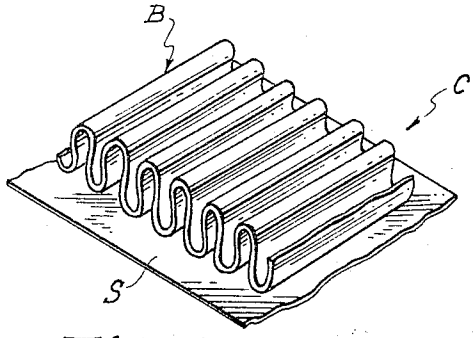

Fig. 1.

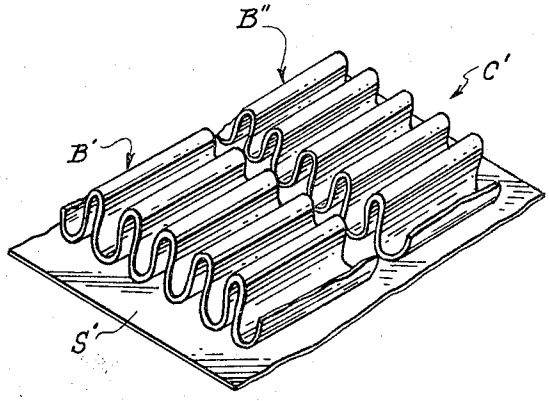

Fig. 2.

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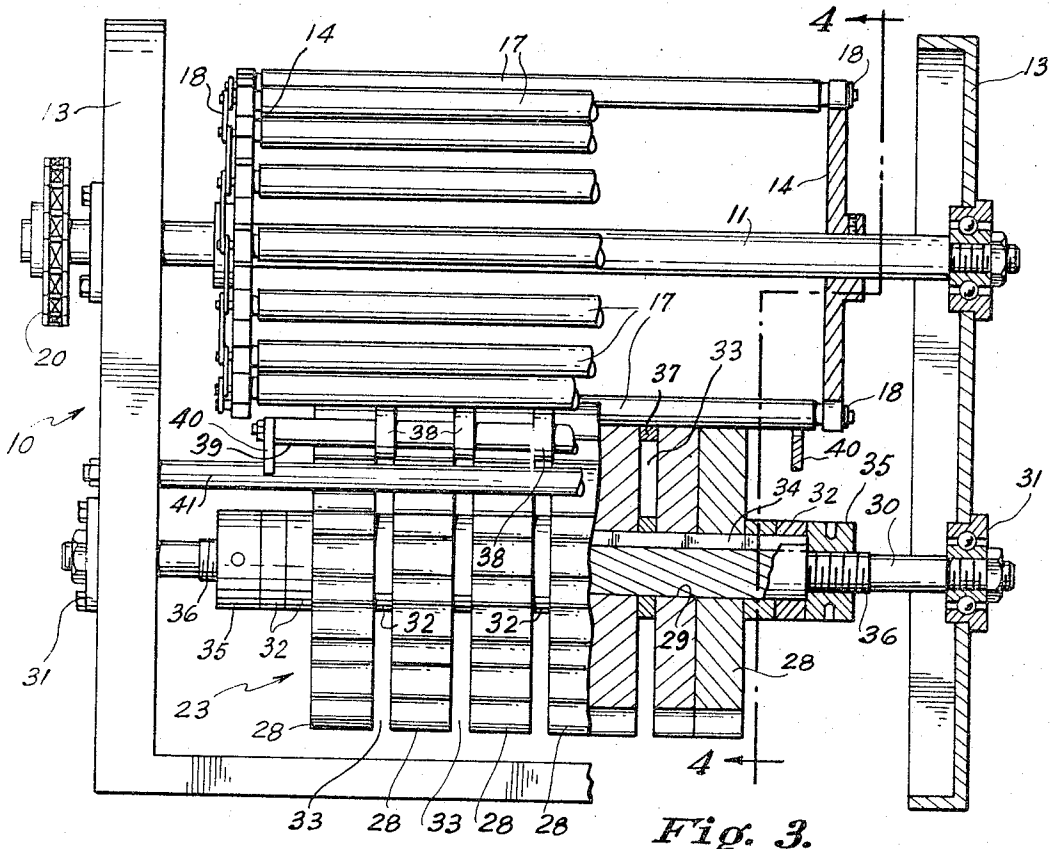

Fig. 3.

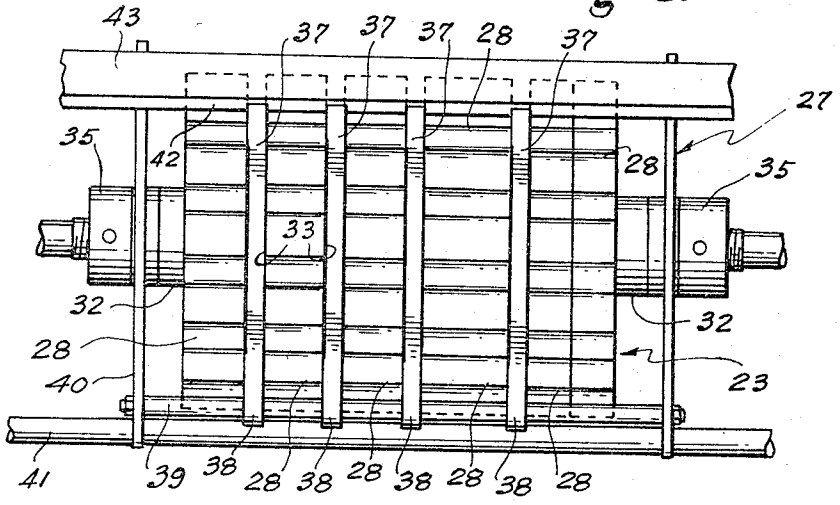

Fig. 5.

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MACHINES FOR PRODUCING PACKAGING COMPONENTS

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3 Claims. (Cl. 156—471)

The present invention relates to improvements in machines for producing packaging trays, such as the well known "Rondo" tray or pack, and components in the form of fluted partitions or inlays having a series of parallel recesses presenting narrowed entries through which objects, such as ampoules, vials, etc., can be inserted in the recesses for cushioned retention in the latter.

Machines for producing packaging components of the above-described character are known, for example, as disclosed in United States Patent 2,525,202 issued Oct. 10, 1950, to Alfred Bossi. The machine disclosed in this patent comprises a pair of endless, parallel chain members constituting slotted guides for the ends of spaced apart cross-rods or rollers extending between the chains, pairs of rotatable sprockets on spaced apart shafts and around which the cross-rods or rollers travel, and a solid or one-piece forming roll having a toothed or axially corrugated surface and being rotatably mounted so that its teeth enter between the successive cross-rods or rollers carried by the chains for forming transversely extending corrugations in a band of material which is fed longitudinally between the forming roll and the rollers carried by the chains. The known machine further comprises a device for resisting movement of the cross-rods or rollers with the chains following the disengagement of the rollers from the forming roll, thereby decreasing the distance between adjacent cross-rods or rollers during movement of the latter through a working zone for narrowing the entries to the recesses defined by the corrugations of the band of material, and means for feeding a base strip into contact and adhesive attachment with the bottoms of the recesses of the formed band of material during movement of the latter through the working zone so that, upon withdrawal of the cross-rods or rollers from the recesses at the end of the working zone, the band of material is maintained in its formed condition by the base strip to which it is adhesively attached.

In commercial machines constructed in accordance with said patent, it has been found advantageous to provide a guide structure for ensuring that the band of material corrugated by the cooperation of the forming roll with the cross-rods or rollers carried by the chains moves with the cross-rods or rollers upon disengagement of the latter from the forming roll rather than adhering to the corrugated surface of the latter. Such guide structure has been in the form of a grate having parallel, fixedly spaced apart elongated guide elements extending tangentially with respect to the forming roller and engaging in suitably spaced apart circumferential grooves formed in the surface of the one-piece forming roll so that the corrugated band of material is engaged from below by the elongated guide elements of the grate and thereby stripped from the forming roll for continued travel with the cross-rods or rollers through the working zone. The desired uniformity of the packaging component produced by the described machine is achieved, particularly where the formed band of material has a relatively small transverse dimension, only when the elongated guide elements of the grate engaging the formed band of material are symmetrically disposed with respect to the longitudinal medial line of the latter. If the machine is continuously employed for producing packaging components or inlays of a single type, that is, having the same dimensions and disposition of the formed or corrugated band on the base strip, the guide elements of the grate and the circumferential grooves of the forming roll can be spaced apart so as to have the desired positional relationship to the band or bands of material to be formed or corrugated.

However, packaging components in the form of fluted inlays or partitions produced by machines of the described character are used for the protective packaging of a wide variety of articles, such as, for example, medical ampules and vials, electronic tubes and components, cosmetic containers, watch cases, tools, pens, crayons, and tubes of artist paints. The packaging components must have varying dimensions and dispositions of the fluted or corrugated band of material on the base strip for adaptation to the various different articles. If a machine is provided with the above described guide structure for stripping the formed band of material from the surface of the corrugated forming roll, such machine must be provided with sets of interchangeable grates and forming rolls having different spacings between their elongated guide elements and circumferential grooves, respectively, for accommodating the requirements of the various different packaging components to be produced by the machine. The need for stocking numerous sets of guide grates and forming rolls obviously increases the cost of the machine, and the necessity of replacing the guide grate and forming roll whenever a different type of packaging component is to be produced obviously increases the time and expense involved in setting up the machine for such operation.

Accordingly, it is an object of the present invention to provide a machine of the described character which is easily and inexpensively modified or adjusted for the production of packaging components or inlays made up of formed or corrugated bands of material having different lateral dimensions and different lateral positions on the base strips.

In accordance with this invention, the forming roll is made up of a series of gear-like discs, which may be of varying thickness, and have toothed peripheries and central apertures for mounting on a shaft, and spacing collars also mounted on the shaft and interposed between selected gear-like discs to define circumferentially extending grooves between the latter. The guide structure for stripping the formed band of material from such forming roll includes a plurality of fingers mounted slidably on a support rod extending laterally across the machine and intended to extend chordally through the circumferential grooves of the forming roll to underlie the corrugations formed in the band of material, whereby the gear-like discs and spacing collars can be rearranged on the shaft to vary the spacings and locations of the circumferential grooves and the guide fingers can be slidably moved along the supporting rod for registration with the grooves of the forming roll, so as to correctly position the guide fingers for any type of packaging component, components or inlays which is to be produced.

The above, and other objects, features and advantages of the invention, will be apparent from the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings, forming a part hereof, and wherein:

FIGURE 1 is a perspective view of a portion of a packaging component or inlay of a type that may be produced by a machine embodying this invention;

FIGURE 2 is a view similar to that of FIGURE 1, but showing another type of packaging component or inlay that may be produced by the machine;

FIGURE 3 is an end elevational view, partly broken away and in section, of a machine embodying this invention;

FIGURE 4 is a vertical sectional view taken along the line 4—4 of FIGURE 3; and

FIGURE 5 is a top plan view of the forming roll and guide structure of the machine constructed in accordance with this invention.

Referring to the drawings in detail, and initially to FIGURES 3 and 4 thereof, it will be seen that the illustrated machine **10** for producing packaging components or inlays generally includes two parallel, spaced apart, horizontal shafts **11** and **12** extending between, and having their end portions rotatably mounted in side frame members **13**. Pairs of axially spaced apart sprockets **14** and **15** are secured on the shafts **11** and **12**, respectively, to support and guide a caterpillar-like corrugating assembly which is generally identified by the reference numeral **16**. The corrugating assembly **16** includes a series of parallel, laterally extending cross-rods or rollers **17** in one embodiment shown in the drawings, their adjacent ends connected by endless chains **18** made up of links formed with elongated slots **19** so that adjacent rollers **17** can move toward and away from each other. The end portions of the rollers **17** are engageable between the teeth of the sprockets **14** on shaft **11** and the sprockets **15** on shaft **12**, and thus are movable with the chains **18** along a closed path having upper and lower runs extending between the two pairs of sprockets.

The endless chains **18** have an extended length, greater than the length of the closed path travelled by the assembly **16**. Thus, when shaft **11** is driven in the counterclockwise direction, as viewed on FIGURE 4, for example, by a chain and sprocket drive **20** (FIGURE 3), the rollers or cross-rods **17** engaging the sprockets **14** and **15** and moving along the upper run of the path of travel are relatively widely spaced apart by distance determined by the pitch of the teeth of the sprockets and the length of the slots **19**, while the rollers **17'** moving along the lower run from sprockets **14** toward sprockets **15** may have their movement braked or resisted, for example, by a blade spring **21** extending from a lateral supporting member **22** secured to side frame members **13**, thereby to bunch together or reduce the distances between the rollers **17'**.

The ends of the rollers **17** need not be connected together. The rollers **17** can be arranged in spaced relation for movement through the closed path having upper and lower runs, with the ends of the rollers not connected to each other but travelling in channels or other guides and guided thereby as they are moved in any suitable manner through the closed path. In their travel through this closed path from sprockets **14** toward the sprockets **15**, the rollers **17'** are bunched together, i.e., the spacing between adjacent rollers is reduced.

The machine **10** further comprises a forming roll **23** having a toothed or axially corrugated surface and being rotatably mounted below shaft **11** so that the teeth of the roll **23** enter between the successive cross-rods or rollers **17** at the bottom of the sprockets **14** for forming transversely extending corrugations in a band or bands B of paper board or other similar material fed longitudinally between forming roll **23** and the rollers **17** engaged therewith. As the rollers **17'** travel from the sprockets **14** toward the sprockets **15** and are bunched together, as described above and shown on FIGURE 4, the corrugations formed in band B between the rollers **17'** are narrowed and squeezed upwardly for narrowing the entries to the recesses defined by the corrugations of the band containing the rollers **17'**. The fluted band B engaged by the bunched together rollers **17'** travels over a support or pressure plate **24** defining a working zone where the undersides of the recesses of band B receiving the rollers **17'** are adhesively attached to a base strip S of paper board or the like. The base strip S is fed over the pressure plate **24** after passing between an adhesive applying roller **25** and a back-up roller **26**. Thus, the band B is secured in its fluted configuration to the base strip S to continuously form a packaging component C which is withdrawn along a downwardly inclined path in advance of the sprockets **15** for disengaging the cross-rods or rollers **17** from the recesses of the fluted band B, thereby permitting such rollers to return to their relatively widely spaced apart condition upon engagement with the sprockets **15**. The machine **10**, described above, is generally similar to that disclosed in U.S. Letters Patent No. 2,525,202.

The packaging component C continuously produced by the machine **10** is cut into suitable lengths for use as fluted inlays or partitions in packages for a wide variety of different articles. However, the lateral dimensions and disposition of the fluted band B on the base strip S has to be varied for the different articles and base strips and fluted bands of different dimensions are frequently required for different articles. Thus, as shown on FIGURE 1, a packaging component C for use in packages containing certain articles may have a fluted band B with a transverse dimension only slightly smaller than that of the base strip S and having its longitudinal axis coincident with that of the base strip S, or the fluted band may be substantially narrower than the base strip and asymmetrically located with respect to the edges of the latter. Further, as shown on FIGURE 2, a packaging component C' for use in packaging certain articles may be made up of two fluted bands B' and B'' each having a transverse dimension less than one-half the width of the base strip S', with the fluted bands B' and B'' being adhesively secured to the base strip with spaces between the two fluted bands and also between the latter and the longitudinal edges of the base strip. For efficient operation the machine is commonly used to make two or more different types of components or inlays simultaneously, which can vary from day to day depending upon demand.

In order to ensure the uniform formation of the flutes in the band B or the bands B' and B'', it is necessary that the corrugations formed in the band or bands by the cooperation of the cross-rods or rollers **17** with the corrugated surface of the forming roll **23** be stripped from the latter and made to travel with the rollers through the working zone where the latter are bunched together, as at **17'** on FIGURE 4. In accordance with the present invention, the machine **10** is provided with a guide structure **27** for stripping the corrugations from the surface of forming roll **23**, and such guide structure **27** and the forming roll **23** are constructed and arranged, as hereinafter described in detail, so as to facilitate the adjustment of the machine **10** for the ready, reliable and uniform production of different types of packaging components, for example, as shown by FIGURES 1 and 2, respectively.

Referring to FIGURE 3, it will be seen that the forming roll **23** is made up of a plurality of gear-like discs **28**, which may have different axial thicknesses, and which have toothed peripheries and central apertures **29** for mounting on a shaft **30** extending between side frame members **13**. The ends of shaft **30** are rotatably supported by bearings **31** carried by the side frame members. The forming roll **23** further includes spacing collars **32** also mounted on the shaft **30** and being selectively disposed between gear-like discs **28** and at the ends of the forming roll. It will be apparent that the collars **32** disposed between discs **28**, and thus spacing apart the latter, serve to define circumferential grooves **33** in the forming roll. In order to axially align the toothed peripheries of the several gear-like discs **28**, the shaft **30** is provided with a key **34** (FIGURES 3 and 4) engageable with corresponding keyways formed in the central apertures **29** of the discs **28**. Further, the forming roll **23** made up of the assembled discs **28** and spacing collars **32** is axially located on the shaft **30** by means of internally threaded clamping sleeves **35** (FIGURE 3) screwed onto threaded portions **36** of shaft **30** so as to bear axially against the spacing collars **32** at the ends of the forming roll. It will be apparent that the arrangement of the discs **28** and spacing collars **32** on shaft **30** may be changed in order to alter the axial spacing and disposition of the circumferential grooves **33** in the forming roll.

Referring now to FIGURES 3, 4 and 5, it will be seen that the guide structure **27** in accordance with this invention includes a series of elongated guide fingers **37** extending generally in the direction of movement of the band or bands B between the rods or rollers **17** and forming roll **23**. Each of the guide fingers **37** is formed, at its forward end, with a laterally bored lug **38** which is pivotally mounted on, and axially slidable along a transversely extending support rod **39**. The ends of the support rod **39** may be secured to guide frames **40** (FIGURES 3 and 5) extending longitudinally through the machine outside the end discs **28** of the forming roll. The guide frames **40** are mounted on guide rods **41** which extend laterally between the side frame members **13** of the machine and such frames **40** may support the ends of rods **17'** as the latter move from sprockets **14** to sprockets **15**. The supporting rod **39** is vertically located in front of the forming roll **23** so that, when the guide fingers **37** extend horizontally from rod **39** in the direction of movement of rollers **17'** along the lower run of their path of travel, the upper surfaces of guide fingers **37** lie in a plane tangential to the bottom of the axial recess of forming roll **23** disposed at the top of the latter and also tangential to the bottom of the roller **17** received in such recess.

The several guide fingers **37** are axially located along rod **39** so that such fingers are aligned with, and extend chordally through the circumferential recesses **33** of forming roll **23**. Further, the guide fingers **37** are longitudinally dimensioned so that the free ends thereof project out of the grooves **33** of the forming roll, as is apparent on FIGURE 4, and such free ends of the guide fingers slidably rest on a ledge **42** formed on a cross-bar **43** supported by guide frames **40** between forming roll **23** and the plate **24** defining the working zone.

It will be apparent that the guide fingers **37** extend horizontally immediately under the corrugations formed in the band or bands B by the cooperation of rollers **17** and forming roll **23** and thereby serve to strip the corrugations from the forming roll and ensure the continued engagement of the corrugated band with the rollers **17'** as the latter move through the working zone where the rollers are bunched together. Further, when the arrangement of the discs **28** and spacing collars **32** of the forming roll is altered in order to change the spacing and axial location of the circumferential grooves **33** of the forming roll, the guide structure **27** can be immediately accommodated to the altered forming roll **23** merely by sliding the fingers **37** along the supporting rod **39** so as to dispose the guide fingers in the relocated grooves **33**; as noted these fingers **37** are freely slidable on the supporting rod **39**. Thus the assembly of the discs **28** and spacing collars **32** to produce a desired packaging component, inlay or tray or a series thereof automatically properly positions the fingers **37** by the simple expedient of locating each finger in a groove **33**.

The machine **10** having a forming roll **23** and guide structure **27** constructed in accordance with this invention can be easily and quickly modified or adjusted for the production of different types of packaging components or fluted inlays having different lateral dimensions and dispositions of the fluted band or bands on the base strip. Such adjustment or modification of the forming roll and guide structure ensures that the guide fingers **37** are always symmetrically located with respect to the longitudinal median line of the band or bands being corrugated by the rollers **17** and forming roll **23**, which condition is of particular importance for the uniform production of packaging components having relatively narrow corrugated or fluted bands.

Although a particular embodiment of the invention has been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment, and that various changes and modifications may be effected therein, by one skilled in the art, without departing from the scope or spirit of the invention. Hence this invention is not to be limited to the above description or the showing of the drawings except as defined in the appended claims.

What is claimed is:

1. In a machine for producing packaging inlays having parallel bands of article-retaining convolutions formed of corrugated sheet material, wherein said machine includes a corrugating assembly comprising a series of parallel rollers arranged to travel along a closed path and being movable toward and away from each other, and means for bunching together said rollers during movement of the latter through a working zone extending along a portion of said path, the improvement which comprises: corrugation forming roll means including a rotatable shaft, a series of peripherally toothed discs removably mounted on said shaft in a selected order, and spacing collars removably mounted on said shaft between selected discs, thereby to define circumferentially extending grooves in the forming roll means at selectively determined locations along the axis of the latter; said forming roll means being located so that the peripheral teeth of said discs enter between successive rollers of said corrugating assembly in advance of said working zone for forming corrugations in bands of said sheet material fed in parallel between said forming roll and corrugating assembly; and a guide structure including a plurality of fingers extending chordally in said circumferential grooves of the forming roll means under said rollers between which said peripheral teeth of said discs enter for stripping the corrugated bands from the forming roll means and for ensuring the continued travel of said corrugated bands with the rollers bunched together in said working zone, thereby narrowing the entries to the convolutions of the corrugated bands receiving the rollers; and means supporting said fingers for free movement parallel to the axis of said forming roll means so that, when the locations of said grooves are altered by rearrangement of said discs and collars on the shaft, said fingers can be moved laterally into respective coincidence with the relocated grooves.

2. A machine as defined in claim **1**, which includes a laterally extending support rod and means at one end of each of said fingers which is pivotally and axially slidable on said support rod to suspend said fingers from the latter, whereby said fingers can be pivoted out of said grooves and then moved axially along said support rod for disposition in differently located grooves when the latter are formed by rearrangement of said discs and collars on said shaft.

3. A machine as defined in claim **2**, wherein said guide structure further includes a laterally extending member on which the free ends of said fingers rest to limit the depth of penetration of said fingers into said grooves of the forming roll means.

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