Oct. 7, 1941. H. W. BRUKER 2,258,443

CORRUGATING ROLLER CONSTRUCTION

Filed March 25, 1939

Fig. 1.

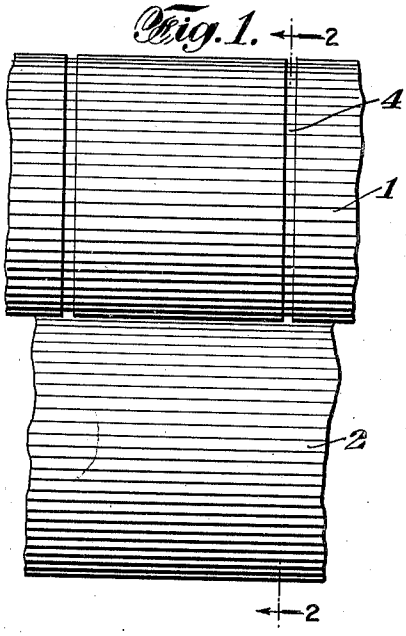


Fig. 2.

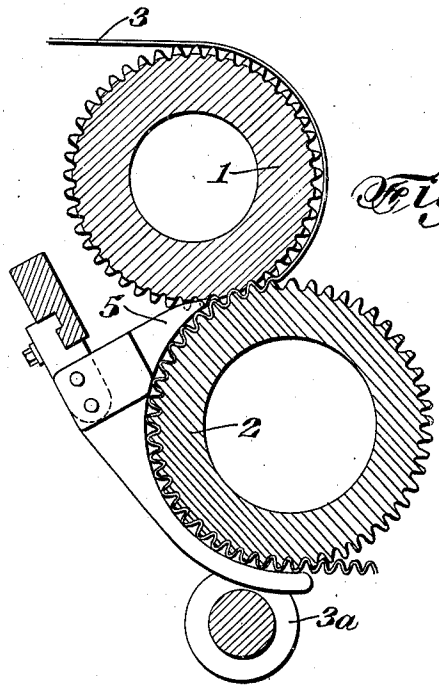


Fig. 3.

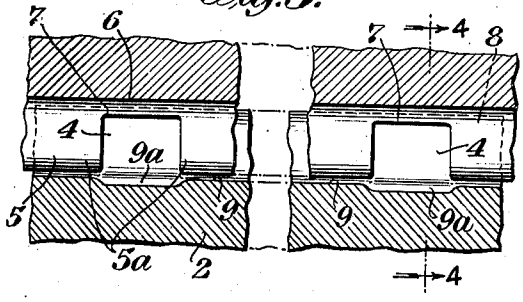


Fig. 4.

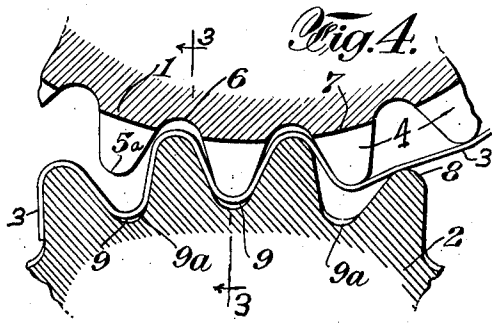


Fig. 5.

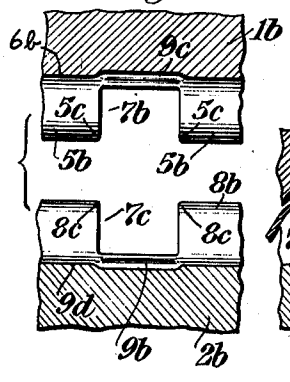


Fig. 6.

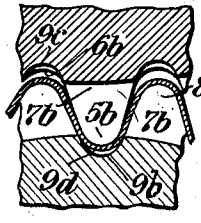


Fig. 7.

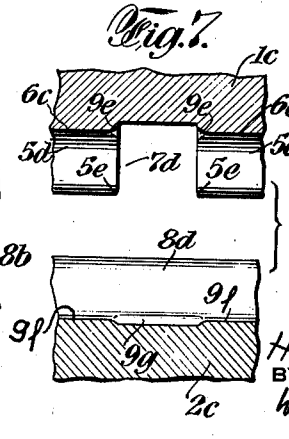
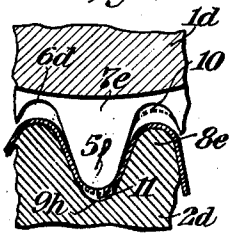


Fig. 8.



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Patented Oct. 7, 1941 2,258,443

UNITED STATES PATENT OFFICE

2,258,443

CORRUGATING ROLLER CONSTRUCTION

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Application March 25, 1939, Serial No. 264,108

6 Claims. (Cl. 154—30)

For many years it has been characteristic of the corrugated paper used in corrugated paper board products, that the corrugated web has carried so-called "finger marks," these marks forming scored lines running along the product which weaken it substantially against crushing strains, in that the finger marks act as creases about which the sheet is prone to bend or buckle and thus give way. These finger marks have been impressed upon the corrugated paper web by the corrugating rolls between which the web passes during the corrugating operation, and the primary object of the present invention is to provide a corrugating roll construction which will produce an otherwise satisfactory corrugated web not having the above mentioned finger marks thereon, the paper board embodying the corrugated web thereby having markedly increased resistance to crushing strains.

Further objects and advantages of the invention will be in part obvious and in part specifically pointed out in the description hereinafter contained which, taken in conjunction with the accompanying drawing, discloses certain corrugating roll constructions suitable for use in carrying out the invention; from the standpoint of the invention in its broader aspects, however, it should be understood that the disclosure is merely illustrative of the principles of the invention. In the drawing—

Fig. 1 shows cooperating portions of a pair of corrugating rolls constructed to operate in accordance with the invention.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1 looking in the direction of the arrows and showing in conjunction with the corrugating rolls, certain stripper fingers and associated parts such as will be used in combination therewith.

Fig. 3 is an enlarged detail section (taken longitudinally of the rolls) and substantially on the broken lines 3—3 of Fig. 4 looking in the direction of the arrows to show adjacent meshing teeth or flutes of the rolls.

Fig. 4 is a section on line 4—4 of Fig. 3 looking in the direction of the arrows.

Fig. 5 is a view similar to Fig. 3 but showing a somewhat modified form of roll construction, the adjacent teeth of the respective rolls being shown in separated relation for clarity.

Fig. 6 is a view similar to Fig. 4 but showing the type of roll construction illustrated in Fig. 5.

Fig. 7 is a view similar to Fig. 5 but showing another roll construction within the invention in its broader aspects.

Fig. 8 is a view similar to Fig. 6 but showing still another modified roll construction within the invention in its broader aspects.

The invention is disclosed as applied to a corrugating machine of known type as to many of its features of construction and mode of operation, and since this as well as other corrugating machine constructions suitable for the purpose are well known in the art, only certain parts of the machine will be referred to with which the present invention is more directly concerned. I have shown in Figs. 1 to 4 a pair of meshing corrugating rolls 1 and 2 which may be understood as heated in suitable manner and supported and driven as is customary in the art. The paper sheet 3 (Fig. 2) which is to constitute the liner of the corrugated paper board, after passing partially around the first corrugating roll 1, passes in between rolls 1 and 2 where the corrugating step is performed, and the corrugated web 3 then passes partially around with the roll 2 past an adhesive-applying roll 3a, after which a facing sheet is applied to the sticky peaks of the corrugations and the corrugated paper board otherwise completed in a manner known in the art and not shown or described herein.

To separate the corrugated web 3 from roll 1 and cause it to be carried partially around with roll 2 as above described, it has been customary in the art to provide the roll 1 with a series of peripheral grooves 4 spaced along its length, and in which are received stripper members 5 such as indicated in Fig. 2, these stripper fingers 5 acting to separate the corrugated web 3 from roll 1 after the corrugations have been formed, and cause the corrugated web to follow around with roll 2. These grooves 4 have been the cause of the "finger marks" above referred to, and which it is the primary aim of the present invention to avoid.

In accordance with the embodiment of the invention shown more in detail in Figs. 3 and 4, the peripheral grooves 4 of roll 1 above mentioned, are of a depth shallower than teeth 5 of roll 1, instead of being made deeper than the teeth as has heretofore been the practice. Thus the valley portions 6 of roll 1, which are interposed between the peaks of teeth 5 are located deeper in the roll than the bottom walls 7 of grooves 4. In other words, the valleys 6 between the teeth are continuous throughout the length of the roll 1, and the bottom walls 7 of grooves 4 are discontinuous around the periphery of the roll, instead of the valleys 6 being interrupted by notches at each groove 4 as has been the case according to prior art practice.

In the form of the invention shown in Figs. 3 and 4, the corrugating roll 2 may be regarded as having teeth 8 extending continuously throughout the length of the roll, and thus, assuming the teeth of rolls 1 and 2 to be properly shaped and the rolls adjusted to proper spacing from each other according to the thickness of web 3 being corrugated, in accordance with prior art practice, the peaks of teeth 8 when meshing with the valleys 6, will not press the interposed peaks of the corrugations being formed in the paper web against any sharp corners such as have heretofore produced the finger marks above mentioned, but on the contrary the peaks of the teeth 8 mesh into substantially continuous paper pressing relation with the continuous bottom walls 6, and thus accurately form the corresponding corrugation in the paper web continuously throughout the length of the teeth, without producing any finger marks in such corrugation.

In the form of the invention under discussion, the teeth 5 will have corners 5*a* adjacent the peripheral grooves 4, and to prevent these corners from forming finger marks in the corrugations of the paper web which are formed by the meshing of teeth 5 with the valley portions 9 of roll 2, these valley portions 9 are preferably constructed so as to relieve the pressure on the paper between them and the corners 5*a* above mentioned. This may be done by constructing the valley portions 9 throughout their lengths, so that they are spaced slightly more from the peaks of teeth 5, than are the sides of the teeth 5 and 8 when rolls 1 and 2 are properly spaced as a whole from each other, according to the thickness of the paper web being produced, so that the teeth 5 do not come into full paper pressing relation with the bottom walls 9, but I prefer as shown in Figs. 3 and 4 to construct the bottom walls 9 so that they come into pressure maintaining relation with the teeth 5 except at points alined with the corners 5*a*, and to provide the bottom walls 9 with local pressure relieving depressions 9*a* opposite the corners 5*a*. These depressions 9*a* thus prevent the formation of finger marks by the corners 5*a* and nevertheless the paper pressing relation is maintained between teeth 5 and bottom walls 9 throughout the major part of the length of the corresponding corrugations being formed in the paper web, so as to shape the corrugations with sufficient accuracy. These depressions 9*a* need be only four or five thousandths of an inch in depth to serve the purpose, and as shown in Fig. 3 they preferably are gradually curved at their points of juncture with the walls 9 so as to mesh gradually with the latter and avoid any sharp corners. Although these depressions 9*a* are preferably used in conjunction with the other features of corrugating roll construction above described, they still will be found useful even though the corrugating rolls be in other respects constructed in accordance with the prior art. The corner portions 5*a* of teeth 5 may be similarly relieved from pressure imposing relation with their cooperating valley portions, by slightly rounding off or cutting away their peripheral surfaces at the corners, either in addition to or as a substitute for the depressions 9*a* above mentioned.

In Figs. 5 and 6 I have shown a somewhat modified form of roll construction wherein the roll 1*b* is provided with peripheral grooves 7*b* and teeth 5*b*, similar respectively to the parts 7 and 5 previously described, but in this instance the roll 2*b* is provided with teeth 8*b* which also have in them peripheral grooves 7*c* which are alined with the grooves 7*b*. The roll 2*b* has depressions 9*b* similar to the parts 9*a* above described, and cooperating in like manner with the corners 5*c* of teeth 5*b*, and the roll 1*b* also has similar pressure relieving depressions 9*c* cooperating in like manner with the corners 8*c* of teeth 8*b*. The peripheral corner portions 5*c* may be relieved as above described in respect to members 5*a*. Thus in this form of the invention the rolls 1*b* and 2*b* may be made identical in respect to their tooth, valley and peripheral groove features of construction, the bottom walls of the valley portions 6*b* of roll 1*b*, and 9*d* of roll 2*b*, meshing into pressure maintaining relation on the peaks of the corrugations being formed in the paper web, throughout the major portions of the lengths of the corrugations, so as to form the corrugations with sufficient accuracy, pressure on the paper web being nevertheless relieved sufficiently at points alined with the corners 5*c* and 8*c* to avoid the formation of finger marks in the corrugations.

In Fig. 7 I have shown another modification of roll construction according to which only the pressure relieving feature of the invention is employed, that is to say the roll 1*c* may be regarded as having peripheral grooves 7*d* therein which are deeper than the teeth 5*d*, and the meshing roll 2*c* is provided with continuous teeth 8*d* which come into pressure imposing relation with the valley portions 6*c* of roll 1*c*, except at the corners thereof which are formed by the grooves 7*d*. These corners are provided with pressure relieving depressions 9*e* similar to the parts 9*a*, etc., above described, in such manner as to avoid the production of finger marks in the paper web between these corners and the peaks of teeth 8*d*. The valleys 9*f* between teeth 8*d* are also provided with pressure relieving depressions 9*g* similar to the parts 9*a*, etc., in character, in order to avoid the formation of finger marks by the corners 5*e* of teeth 5*d*. The peripheral surfaces of corners 5*e* may be relieved as above described in respect to members 5*a*. Thus both the teeth 5*d* and 8*d* come into pressure imposing relation with the valleys 9*f* and 6*c* respectively throughout the major portion of the length of the corrugations being made in the paper web, avoiding the production of finger marks at points in alinement with the peripheral grooves 7*d*.

In Fig. 8 I have shown another construction embodying the pressure relieving feature of the invention, the roll 1*d* of Fig. 8 being provided with peripheral grooves 7*e* which are deeper than the teeth 5*f*, and the valleys 6*d* which are interposed between the teeth 5*f* being uniformly depressed along their entire length so that the peaks of the teeth 8*e* on roll 2*d* do not come into pressure imposing relation with the valleys 6*d* in respect to the paper web being corrugated. In other words, when the rolls 1*d* and 2*d* are spaced in proper relation to the thickness of the paper web being corrugated, so that the sides of the teeth 5*f* and 8*e* press the paper web between them to shape the corrugations, the bottoms 6*d* of the valleys between the teeth 5*f* will be a greater distance from the peaks of teeth 8*e*, thus avoiding the finger marks above referred to. In Fig. 8 the valleys 9*h* between the teeth 8*e* of roll 2*d* are likewise depressed throughout their length so as to be out of pressure imposing relation to the peaks of teeth 5*f*. The depth of the depressions

6d and 9h, as indicated respectively by the dotted lines 10 and 11 of Fig. 8, need only be of the order of a few thousandths of an inch below conformity to the desired configuration of the corrugations in the paper web, as above mentioned in respect to the depressions 9a, etc. In the embodiment of Fig. 8 the depressions 9h avoid the finger marks which the teeth 5f otherwise would produce in the corresponding corrugations of the paper web.

While the invention has been disclosed as carried out by certain specific corrugating roll constructions, it should be understood that many changes may be made therein without departing from the invention in its broader aspects, within the scope of the appended claims.

I claim:

1. In combination, a corrugating roll of the class described having alternating teeth and valley portions extending along the roll, and also having a series of peripheral grooves therein extending around the roll and intersecting said teeth, the depth of said valley portions being greater than the depth of said grooves thereby to provide bottom walls for said valley portions which extend across the grooved portion of the roll, and a second corrugating roll meshing with the roll above mentioned, said second roll having teeth provided with peaks constructed and arranged to mesh into substantially continuous paper pressing relation with the aforesaid bottom walls.

2. In combination, a corrugating roll of the class described having alternating teeth and valley portions extending along the roll, and also having a series of peripheral grooves therein extending around the roll and intersecting said teeth to form corner portions on the teeth adjacent such grooves, the depth of said valley portions being greater than the depth of said grooves thereby to provide bottom walls for said valley portions which extend across the grooved portion of the roll, and a second corrugating roll meshing with the roll above mentioned, said second roll having teeth provided with peaks constructed and arranged to mesh into substantially continuous paper pressing relation with the aforesaid bottom walls, said second roll having valley portions alternating with its teeth, but said teeth and valley portions including means constructed and arranged to afford relief from pressure imposing relation between the corner portions of the teeth of the first mentioned roll and the valley portions of the second roll which mesh with such corner portions.

3. In combination, a corrugating roll of the class described having alternating teeth and valley portions extending along the roll, and also having a series of peripheral grooves therein extending around the roll and intersecting said teeth to form corners on the teeth adjacent such grooves, the depth of said valley portions being greater than the depth of said grooves thereby to provide bottom walls for said valley portions which extend across the grooved portion of the roll, and a second corrugating roll meshing with the roll above mentioned, said second roll having teeth provided with peaks constructed and arranged to mesh into substantially continuous paper pressing relation with the aforesaid bottom walls, but said second mentioned roll having valley portions including means constructed and arranged to relieve pressure on the paper being corrugated at points in line with the corners of the teeth of the first mentioned roll which are formed by said peripheral grooves.

4. In combination, a corrugating roll of the class described having alternating teeth and valley portions extending along the roll, and also having a series of peripheral grooves therein extending around the roll and intersecting said teeth to form corners on said teeth, a second corrugating roll having alternating teeth and valley portions meshing with those of the first mentioned roll, the aforesaid teeth and valley portions of said rolls being constructed and arranged to assume substantially continuous paper pressing relation along the lengths of said meshing portions, but the above mentioned corners of the teeth and the valley portions of the second mentioned roll which are alined therewith being provided with means constructed and arranged to relieve pressure on the paper being corrugated, at points in line with the aforesaid corners of the teeth.

5. In combination, a corrugating roll of the class described having alternating teeth and valley portions extending along the roll, and also having a series of peripheral grooves therein extending around the roll and intersecting said teeth to form corners on said teeth, a second corrugating roll having alternating teeth and valley portions meshing with those of the first mentioned roll, the aforesaid teeth and valley portions of said rolls being constructed and arranged to assume substantially continuous paper pressing relation along the lengths of said meshing portions, but the valley portions of the second mentioned roll being provided with pressure relieving depressions alined with the aforesaid corners on the teeth of the first mentioned roll.

6. In combination, a corrugating roll of the class described having alternating teeth and valley portions extending along the roll, and also having a series of peripheral grooves therein extending around the roll and intersecting said teeth to form corners on said teeth, a second corrugating roll having alternating teeth and valley portions meshing with those of the first mentioned roll, the aforesaid teeth and valley portions of said rolls including means constructed and arranged to assume substantially continuous paper pressing relation along the lengths of said meshing portions, but peak portions of the teeth of said second mentioned corrugating roll being relieved to provide a greater spacing thereof from the above mentioned corners of the teeth of the first mentioned corrugating roll and thereby relieve said corners from pressure imposing relation to the paper web being corrugated.

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