April 15, 1958 E. E. BURROUGHS 2,830,506

MANUFACTURE OF SEMI-RIGID CORRUGATED PAPERBOARD CARTONS

Filed April 17, 1953 4 Sheets-Sheet 1

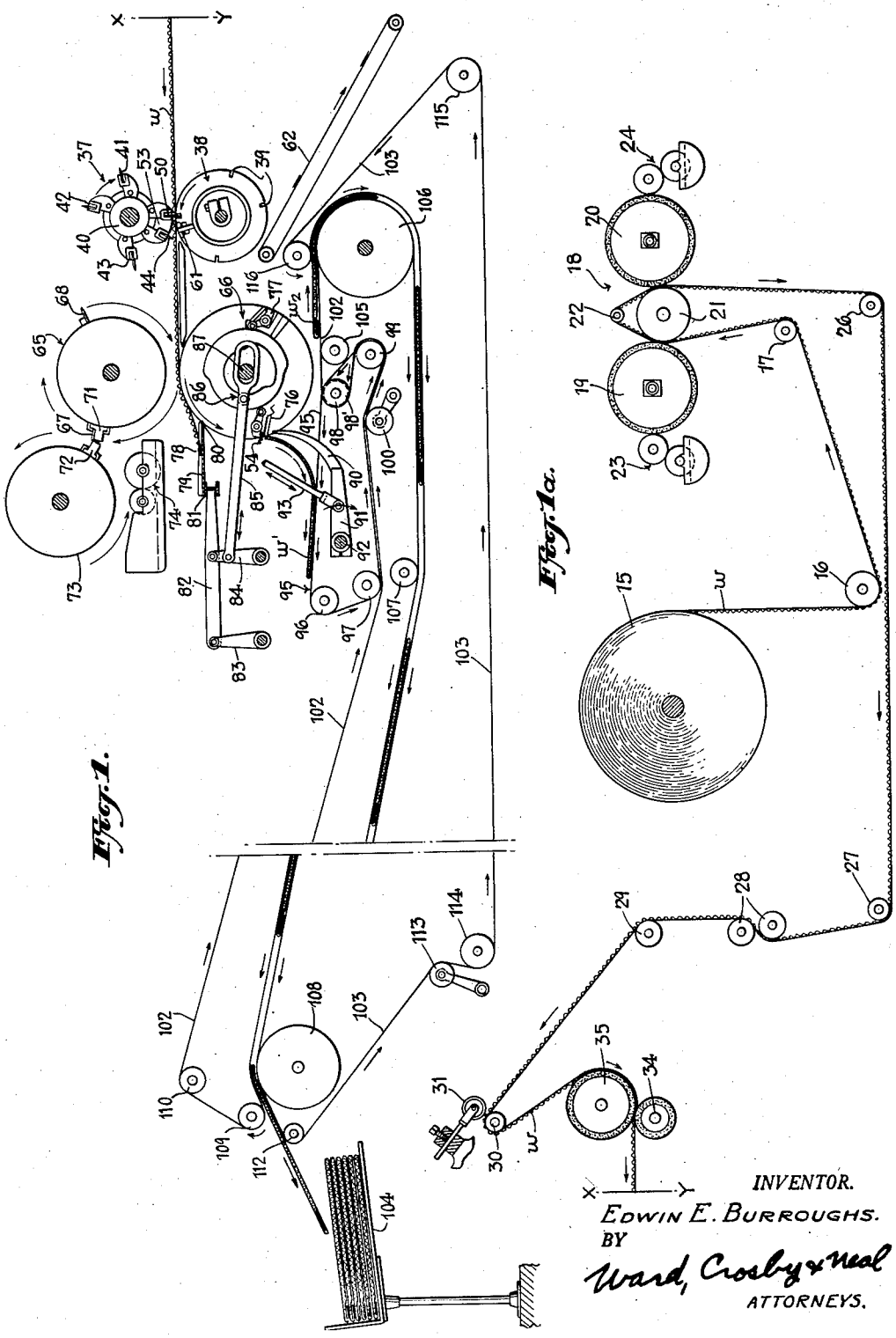


Fig. 1.



Fig. 1a.

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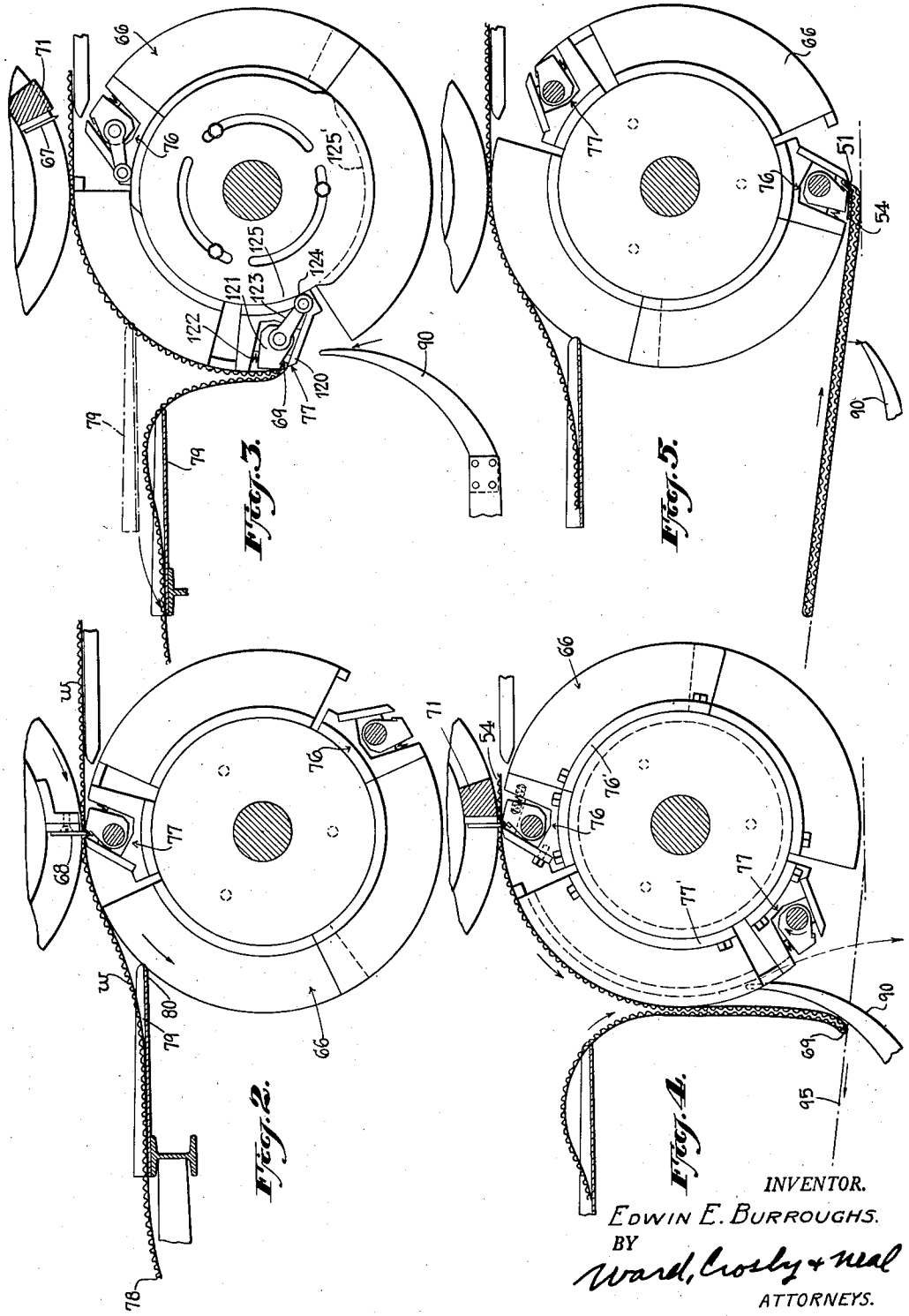



Fig. 3.

Fig. 5.

Fig. 2.

Fig. 4.

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Fig. 6.

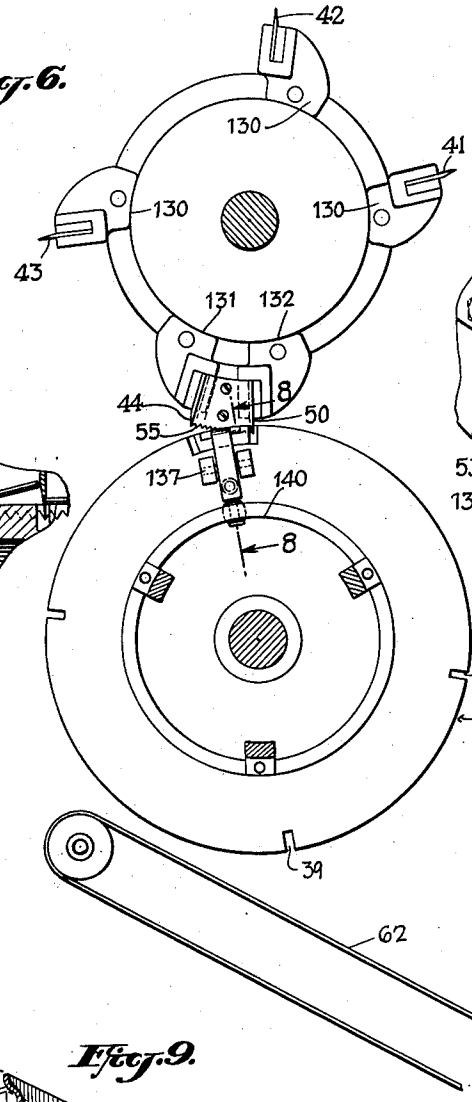



Fig. 7.

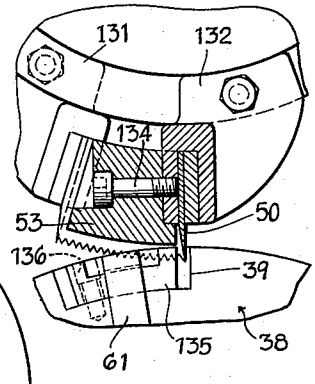
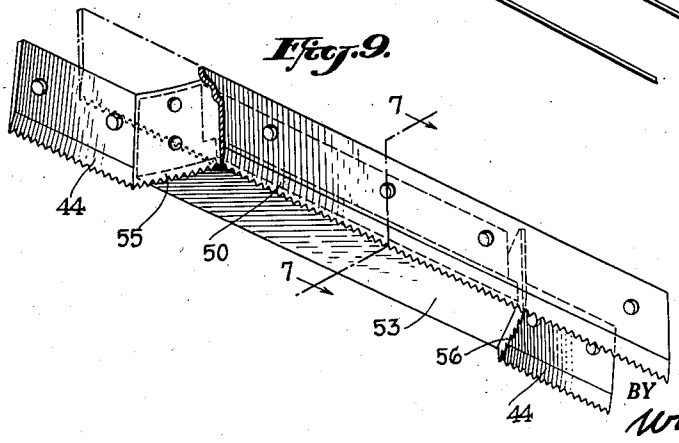



Fig. 8.

Fig. 9.




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Fig. 10.

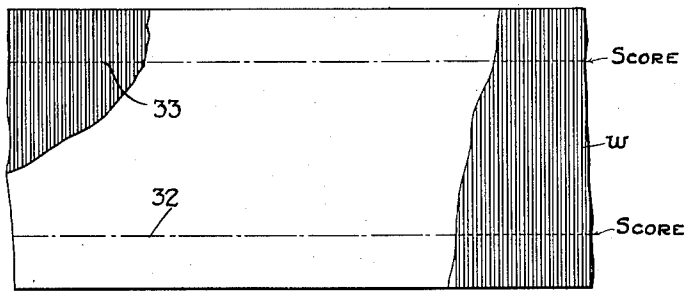



Fig. 11.

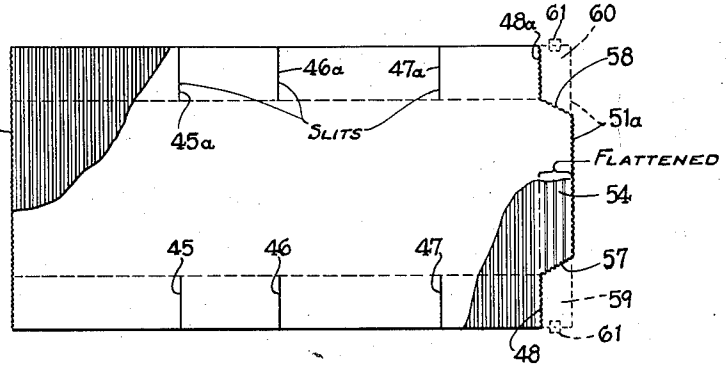



Fig. 12.

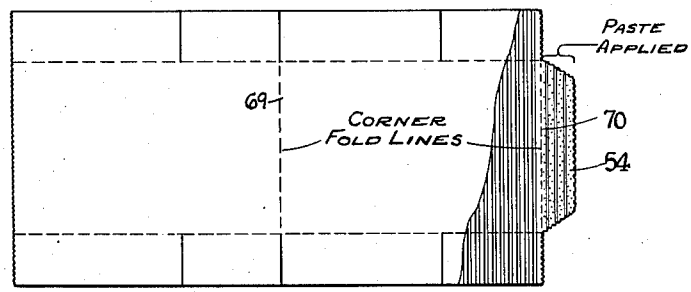



Fig. 13.

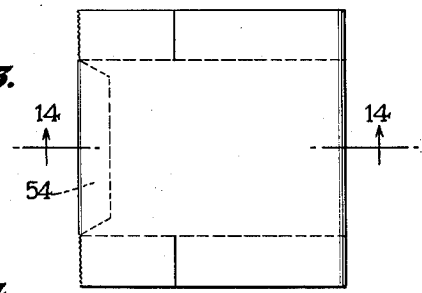
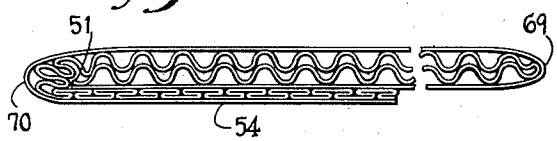



Fig. 14.




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United States Patent Office 2,830,506 Patented Apr. 15, 1958



2,830,506

# MANUFACTURE OF SEMI-RIGID CORRUGATED PAPERBOARD CARTONS

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Application April 17, 1953, Serial No. 349,452

11 Claims. (Cl. 93—45)

This invention relates to methods and apparatus for manufacturing semi-rigid cartons of single-faced corrugated paper or fiber board.

It is common practice to pack small paperboard boxes and the like containing cereals or other commodities within relatively rigid shipping cartons, usually formed of double-faced corrugated board, or else to wrap groups of such boxes in paper or in paper bags during shipment. The present invention relates to the manufacture of semi-rigid cartons suitable for such purposes where it is not necessary to go to the expense of using rigid cartons of double-faced paperboard and yet where it is desired to have the shipping container of a more rigid nature than is afforded by the mere use of wrapping paper or paper bags.

More specifically, this invention relates to the manufacture of semi-rigid carton blanks in completed flattened condition and formed of single-faced corrugated paperboard with the corrugations on the inside and running in a vertical direction in the carton, the top and bottom ends of the flattened carton blank each being suitably slit and scored to provide four closure flaps for both the top and the bottom, such flaps being ready to be folded in when the flattened blank is opened up for use as a box of rectangular cross-section.

In accordance with the invention, an elongated or continuous web of the single-faced corrugated paperboard with corrugations running transversely of the web, is fed through a machine which forms transverse slits in the web along the lines where the top and bottom closure flaps of the carton are to be separated from each other. The machine also acts to cut the web into separate lengths, equal to the perimeter of the desired carton, plus a narrow tab at one end of the severed web length, which tab is ultimately folded over at one corner of the carton blank and pasted to the opposite end of the web length. The separated web lengths pass onto and partly around the periphery of a rotatable assembly on which transverse score lines are made along lines which are to form two of the corners of the carton, and on this rotatable assembly glue is applied to said tab and the web length is so gripped and manipulated as to fold it upon itself (transversely of the web) into a flattened carton blank with the glued tab in adhering contact with said opposite end of the web length, whereupon the completed blank is advanced while held flat, to a point of discharge, while the glue is being allowed to set.

The machine for performing these operations may be similar, with various modifications, to a type of machine heretofore used to some extent for cutting and folding lengths of paper webbing crossways of the web into paper bag tubes, although machines of that nature for making bags have now become generally obsolete because of entirely different and improved types of bag "tubers." So far as is known, it has never, prior to this invention, been appreciated that a machine of that nature, operating as above described, could be used for the manufacture of anything comparable to a corrugated paperboard carton which must involve some degree of rigidity and has corrugations readily subject to flattening under pressure. While because of these factors or others, machines of this class would not naturally have seemed appropriate for making any form of carton, I have, on the contrary, found that such machines, if suitably modified, arranged and adjusted, are surprisingly well suited for rapidly making inexpensive semi-rigid cartons of single-faced corrugated board, wherein the corrugations are to run vertically (that is, transversely of the web entering the machine) so that the web is free to be curved in travelling over rollers etc., while being transversely slit and cut, suitably scored and the carton lengths transversely folded while passing through the machine at high speed.



Other objects, features and advantages of the invention will appear from the more detailed description given below, taken in connection with the accompanying drawings which form a part of this specification.

In the drawings:

Figs. 1 and 1A (which are intended to be joined along lines *x*—*y*) are side views of the principal parts of the preferred form of machine on which the method of the invention may be carried out;

Figs. 2, 3, 4 and 5 are end views of a rotatable assembly in the machine by which the folding of the carton blanks is accomplished, these figures respectively showing various stages of the folding operations;

Fig. 6 is an enlarged end view of the mechanism of the machine for forming the slits for separating the flaps of the carton blank and for forming the tab which is to be glued in place;

Fig. 7 is an enlarged sectional view of portions of Fig. 6, the section being taken approximately along line 7—7 of Fig. 9;

Fig. 8 is an enlarged sectional view of portions of Fig. 6, the section being taken along line 8—8 of Fig. 6;

Fig. 9 is a perspective view of the cutter portions for forming and flattening the above-mentioned tab;

Fig. 10 is a view showing a portion of the single-faced corrugated paperboard web as fed into the machine and just after it has been longitudinally scored by the machine along lines which are to comprise the base lines of the closure flaps of the carton;

Fig. 11 is a view showing one of the cut-off lengths of the web and after it has been slit along lines between what are to be the carton flaps and after said tab has been shaped;

Fig. 12 is a view similar to Fig. 11, but showing the same web length after it has been scored along lines which are to be located at two of the diagonally opposite corners of the finished carton;

Fig. 13 is a view showing the same web length after it has been folded over upon itself and the tab adhered in place, to form a finished flattened carton blank; and

Fig. 14 is an enlarged sectional view taken substantially along line 14—14 of Fig. 13, but with the mid-portion broken away.

Referring now to Fig. 1A, the web *w* of single-faced corrugated paperboard may be fed into the machine either directly from a single facing corrugator machine of known type, or from a roll of previously made corrugated paperboard as at 15. The web is drawn over rollers as at 16, 17 and preferably into a printing apparatus as at 18. In Fig. 1A such apparatus, as shown, may be in the form of a two-color printer having a pair of spaced-apart rollers 19, 20, carrying soft rubber-faced printing plates for applying two-color printing to the outer or smooth surface of the web as the latter passes over an intermediate cylinder as at 21. Above this cylin-

der 21 the web may pass over a small idler roll 22. Suitable ink fountains of known type are indicated at 23, 24. Since the corrugations of the paperboard run transversely of the web, it will be noted that in the printer at 18, as well as at other points throughout the machine, the web is free to be bent as it passes over rollers, both large and small, without injury to the corrugations, so long as pressure sufficient to crush the corrugations is avoided. In the printer, the avoidance of crushing of the corrugations is made possible by the use of soft rubber-faced printing plates.

The printed web now passes over rollers as at 26, 27, and thence between a pair of de-curling rolls 28 which are somewhat spaced apart and act to remove any objectionable tendency which the web may have to curl undesirably, because of its passage through the printing apparatus or because of its having been tightly wound in the roll 15. The web then passes over rollers 29 and 30. At the latter roller, the corrugations are brought into engagement with a pair of longitudinal scoring wheels, one of which is shown at 31, and which are held in position respectively to form the two score lines indicated at 32 and 33 (Fig. 10) about which the base lines of the carton flaps are ultimately to be folded. The web *w* then passes between a pair of suitably driven draw rolls 34, 35, one or both of which has a soft rubber covering so as to apply frictionally sufficient tension to the web to advance it at the desired speed into the machine without crushing the corrugations. While such draw rolls should be positioned so that the web in passing through the nip is not subjected to any very substantial pressure, yet it has been found that substantial pressure is not necessary to apply the necessary tension frictionally, in view of the nature of the web and its transverse corrugations.

It is here noted that in Figs. 1 and 1A, in order to avoid obscuring the essential parts and features of the machine, the necessary driving gears which may be of conventional design and construction, for the various moving parts, have been omitted.

Referring now to Fig. 1, the web *w* next passes through slitting and severing mechanism indicated generally at 37. This may comprise a lower roller or the like 38, having slits or gaps as at 39, and on its surface and extending along its length at proper locations to receive cutting or slitting knives hereinafter referred to and which are mounted on an upper rotatable assembly 40. Slitting knives as indicated at 41, 42, 43 and 44 are located at each end of the assembly 40 of proper length and in proper positions to form respectively the carton flap separating slits 45, 46, 47, 48 and 45*a*, 46*a*, 47*a*, 48*a* (see Fig. 11). Also there is provided a severing knife 50 for severing the web clear across as indicated at 51, 51*a* in Fig. 11. And in between the positions of the knives 44 and 50, there is provided a flattener bar means at 53 for flattening out the corrugations on the tab area indicated at 54 in Fig. 11 so that such area may be more readily and firmly glued to the desired area at the end 51 of the blank when the blank is folded over upon itself as hereinafter described. The parts indicated at 44, 50 and 53 in Fig. 1 are illustrated and described in further detail hereinafter in connection with Figs. 6–9, but it should be here mentioned that the knife 50 (Fig. 9) is in effect connected to slitting knives 44 by intervening knife portions 55 and 56, for cutting along the lines 57, 58 at the ends respectively of the tab 54 (see Fig. 11) thereby releasing from the web two small areas indicated at 59 and 60. These areas are gripped by fingers as at 61 and carried counterclockwise on the rotatable member 38 (Fig. 1) around and down to a point where same are released and carried away as by a suitably driven belt conveyor 62.

From the slitting and cutting apparatus 37 the web passes on between two rotatable assemblies 65, 66. Assembly 65 has mounted thereon two folding bars 67, 68, in the form of dull knife-like blades which do not cut, but act to crease the two corner fold lines 69, 70 (see Fig. 12). The bar 67 is accompanied by a glue applicator 71 which upon each rotation (clockwise) of the assembly 65, receives glue from a pad 72 mounted on a rotating member 73, the pad 72 in turn receiving glue from a fountain or the like indicated at 74 and which may be of a suitable well known construction for the purpose. The glue applicator 71 is thus positioned and arranged to apply glue to the tab portion 54 on each carton length of the web just as the creaser bar 67 forms the fold or crease line 70.

The rotatable assembly 66 has extending lengthwise thereof at suitably spaced positions, two clamping assemblies 76, 77 which are more clearly shown and hereinafter described with reference to Figs. 2 to 5. These clamping means act to receive the folding bars 67, 68, respectively, when the latter contact with the web, causing the web to be simultaneously creased and to be pushed down (along the lines 69, 70) into the clamping means, which then act to crimp and grip a narrow folded-over strip of the web while the web length is being folded as hereinafter described, during its travel down around to the underside of the rotatable assembly 66. The width of the transverse strip of the web which is gripped by these clamping means is about equal to the width of one corrugation plus the spaces at either side of such corrugation, so that the next adjacent corrugations at either side do not tend to be crushed. While these clamping means, in order to grip the web with sufficient pressure to hold it firmly in place during the folding operations, thus ordinarily act to crush somewhat one of the corrugations, this is not objectionable because such corrugation will occur along a line which is to be within one vertical corner of the carton, and in fact the crushing of a single corrugation in such corner will enable the finished flat carton blank to lie flatter without bulging up at the fold.

It will be noted that while, of course, the finished carton will have four vertical corners, only two of these (at lines 69 and 70, Fig. 12) will be creased by the machine. If the other two were creased, the proper manipulation of the blank during the folding operations hereinafter described would be more difficult. Furthermore, it has been found that if a single-faced corrugated paperboard carton of the type here involved has two diagonally opposite corners creased (at lines 69, 70), it may be very readily manipulated and quickly opened up in ultimately shaping the carton, and creases at the other two corners will automatically form in alignment with the corresponding flap separating slits. The presence of corrugations at or closely adjacent and parallel to the lines of such slits, will facilitate this effect. The absence of creases at two of the corners will also insure that the finished carton blank as of Figs. 13 and 14 will lie more flat for easy stacking or storage.

In order to strip from the assembly 66 the advancing cut off edge of the web as at 78, one or more stripper bars as at 79 are arranged so that the end or ends thereof as at 80 temporarily come in under the edge 78 and cause the web length to travel out along the upper surface of such bars. A moment later, however, the bars 79 are retracted away from the rotatable assembly 66. That is, the bars 79 may all be mounted upon a cross-piece 81 which is connected to a rod or lever 82 mounted upon pivotally supported links as at 83, 84. The links 83 and 84 may be oscillated back and forth to advance or retract the stripper bars by any suitable mechanism properly timed. For example, a link 85 may connect the link 84 to cam and follower means as at 86 mounted on one end of the shaft 87 about which the assembly 66 rotates.

At a lower point adjacent the left-hand side of the rotatable assembly 66, one or more additional stripper elements 90, of sickle-like shape, are provided. These may be mounted upon suitable frame means 91 pivoted

at 92 and arranged to be oscillated up and down at the proper times by a connection rod 93, connected to be operated by cam and follower means (not shown) located at any desired one of the rotated shafts of the machine.

Beneath the rotatable assembly 66, conveyor ribbons or belts at 95 are positioned and mounted to be driven over rollers 96, 97, 98, 99 and take-up roller 100, the drive being in a direction to move the upper stretches of such ribbons or belts toward the left as viewed in Fig. 1 for briefly moving each web length as at *w'* during the folding thereof toward the left. Another conveyor means having two sets of ribbons or belts 102, 103 are provided beneath the rotatable assembly 66 to take each carton blank after it is folded, and carry it away to the left to a catch box or the like 104. That is, the ribbons or belts 102 pass under roller 97, over take-up roller 100, then around rollers 99 and 98', over a roller 105, around roller 106, thence under roller 107, over a roller 108, then around rollers 109, 110 back to roller 97. It will be understood that the belts 102 are so positioned that when they pass over certain of the same rollers as the belts 95, belts 102 will travel along lines intervening between the belts 95 in accordance with common practice where two sets of conveyor belts or ribbons are to pass over the same rollers without interference. Belts 103 pass around or over in succession rollers 106, 107, 108, 112, take-up roller 113, and rollers 114, 115 and 116. It will be apparent that when each of the folded carton blanks, for example, the blank $w^2$, arrives between the rollers 106 and 116, it will become gripped between the ribbons or belts 102 and 103 and remain gripped therebetween under some pressure until discharge to the catch box. These belts may be provided with relatively long stretches between the main part of the machine and the discharge point, so that the carton blanks will be thus held under pressure for a substantial time sufficient for the glue on the tabs 54 to become fairly well set before the blanks are discharged. To secure more firm adhesion of the tabs, the finished folded carton blanks may, of course, be piled and stored for a time under pressure if necessary.

It will be understood that the rotatable assemblies 37, 38, 65, 66, 73 and the draw rollers 34, 35, as well as certain of the conveyor rollers, are to be positively driven by suitable conventional gearing not shown, and in directions such as to advance the corrugated paper board web and carton blanks in the directions indicated by the arrows in Figs. 1, 1A. The parts following the slitter assembly at 37 should be driven to move the cut-off web lengths at a speed sufficiently faster than the movement of the web up to and through the slitter assembly so that the carton blanks before folding, as well as after, will be spaced apart somewhat. This will allow leeway to permit the clamping, scoring and gluing means on the assemblies 65 and 66 to be circumferentially adjusted as described below, to properly space same for forming cartons of various sizes. In the forming of cartons, for example, having a total perimeter of four or five feet, the machine may be operated at a speed such as to deliver 50 or more carton blanks per minute.

Various ordinary frame parts and supporting structure for the machine have, of course, been omitted in the drawings for clearness.

The manner in which the severed carton blanks are folded on the rotatable assembly 66 will now be described with reference to Figs. 2 to 5. As shown in Fig. 2, when the web *w* passes over the rotatable assembly 66, its severed end 78 will be stripped away so that it will travel over the stripper bars 79 to the left as shown. Meanwhile, when the creaser bar 68 arrives at its lowermost position, it will engage the upper and corrugated surface of the web and cause a narrow transverse strip thereof to be squeezed and crimped down into the clamping means 77. This clamping means as better shown in Figs. 3 and 4, may comprise a fixed jaw member 120 and a pivoted jaw member 121, normally urged by springs as at 122 toward the fixed jaw member, but the pivoted jaw member has fixed thereon an arm 123 carrying a cam follower 124 adapted to be engaged by a fixed cam 125 such as to hold the clamping means with the jaws open during a greater part of each rotation of the assembly 66. But just as the web is creased downwardly into the clamping means 77 at the position shown in Fig. 2, the jaws are allowed to close with a moderate degree of pressure, thus affixing in position on the assembly 66 the corner crease portion which is identified by numeral 69 in Fig. 12.

As shown in Fig. 3, at a short time later the stripper bars 79 are retracted far enough to leave ample clearance permitting the clamping means 77 to carry the creased over corner portion of the blank down to the position shown in this figure. At about this time or shortly thereafter and just before the clamping means 77 releases, the creaser bar 67 will engage the corrugations of the web and then in the next moment will crease a narrow portion thereof down into the clamping means 76 (this clamping means operated by cam 125', may be of the same construction as the clamping means 77). That is, this will result in forming a corner crease such as shown at 70 in Fig. 12, and the glue pad 71 will apply glue to the tab area 54. And as the clamping means 76 comes into gripping operation, clamping means 77 releases. At this moment the stripper means 90 becomes elevated to substantially the position indicated in Fig. 3, causing the released creased-over portion 69 to be deflected down toward and onto the conveyor belts 95 as shown in Fig. 4. Then the carton blank which is by now folded over upon itself about the crease 69, will travel to the left to the position shown at *w'* in Fig. 1. Meanwhile the stripper means 90 will start to move down, and finally out of the way as shown in Fig. 5.

After the stripper means 90 is down out of the way, clamping means 76 will start to pull the folded-over blank toward the right as indicated in Fig. 5 and into a position whereby the clamping means presses the glue-bearing tab area 54 down against and in adhering relation to the carton edge portion 51 so that the blank is frictionally engaged by the belts 102, clamping means 76 is released and the blank is carried around to the point of discharge as above explained.

As best shown in Fig. 4, the rotatable assembly may comprise a central cylindrical core means, about which retaining means 76', 77' may be circumferentially adjusted in position and suitably clamped in the desired position by bolts, as indicated. By thus adjusting the positions of these clamping means, one may provide for various different spacings of corner fold lines 69, 70 as necessary for cartons of different dimensions.

Referring to Figs. 6, 7 and 9, the slitting and severing knives 41—44, 50, 55, 56 may be in the form of blades with serrated or saw-toothed edges for insuring easy cutting of the corrugated web through its thickness, and these blades may be removably mounted in brackets as at 130, 131, 132. Just in advance of the blade 50, the flattening means or pad 53 (for flattening tab 54) may be removably secured in place as by bolts such as shown at 134. As shown in Fig. 7, the gaps at 39 in rotatable member 38 may be made of adjustable width as by use of a slotted filler piece 135 secured by bolts as at 136.

As shown in Fig. 8, the fingers 61 for gripping the cut-out tab areas 59, 60 may be pivotally mounted as at 137 on the ends of the rotating assembly 38 and urged by springs as at 138 down into positions for pressing against the tab areas. But each of the pivoted finger members is provided with a cam follower 139 adapted to be engaged by a fixed cam 140 so shaped as to cause the fingers to move to open position except when the cut-out tab areas are about to be severed, whereupon the fingers are moved by the cam to clamping position to carry the cut-out areas around down to a position

above the conveyor 62, where the cam moves the fingers to open position to release the cut-out areas.

Although a particular embodiment of the invention is herein disclosed for purposes of explanation, various modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains. Reference should accordingly be had to the appended claims in determining the scope of the invention.

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

1. Method for making flat blanks adapted to be opened out to form semi-rigid cartons, rectangular in cross-section, of single-faced corrugated paperboard with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the four side walls of the carton when finished, which method comprises: advancing a web of single-faced corrugated paperboard with the corrugations extending transversely of the web; slitting the side portions of such web transversely thereof to provide the lines of separation between said flaps; severing said web transversely to form a succession of carton lengths, each of which has at one end a tab area adapted when the length is folded over on itself, to be glued to the other end of the length along adjacent a line which is to be at one vertical corner of the carton; then gripping and creasing a narrow strip transverse to the mid-portion of each such length, along what is to comprise another and diagonally opposite vertical corner of the carton; deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease to form a folded length with the corrugations within the fold; then gripping and creasing said length along adjacent said tab area and at a line which is to form said first-named corner of the carton; releasing said first-creased strip while advancing the other gripped crease; so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; and pressing said tab area in folded-over relation onto said other end of the length, the two corner creases being made in alignment with corresponding flap separating slits which are to occur at diagonally opposite corners of the carton, the other two diagonally opposite corners remaining uncreased.

2. Method for making flat blanks adapted to be opened out to form semi-rigid cartons, rectangular in cross-section, of single-faced corrugated paper or other fiber board with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the four side walls of the carton when finished, which method comprises: advancing a web of the single-faced corrugated board with the corrugations extending transversely of the web; slitting transversely the side portions of such web to provide the lines of separation between said flaps; severing said web transversely to form a succession of carton lengths, each of which has at one end a tab area adapted when the length is folded over on itself, to be adhered to the other end of the length along adjacent a line which is to be at one vertical corner of the carton; then creasing each such length inwardly and transversely of the mid-portion of the length, along what is to comprise another and diagonally opposite vertical corner of the carton; gripping the crease while deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease with the corrugations within the fold; then applying adhesive to said tab area and similarly creasing and gripping said length along adjacent said tab area and at a line which is to form said first-named corner of the carton; releasing the first-formed crease while advancing the other gripped crease; so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; and pressing said tab area in folded-over relation onto said other end of the length, the two creases being made in alignment with corresponding flap separating slits which are to occur at diagonally opposite corners of the carton.

3. Method for making flat blanks adapted to be opened out to form semi-rigid cartons, rectangular in cross-section, of single-faced corrugated board with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the four side walls of the carton when finished, which method comprises: advancing a web of single-faced corrugated board with the corrugations extending transversely of the web while slitting transversely the side portions of such web to provide the lines of separation between said flaps and severing said web transversely to form a succession of carton lengths, each of which has at one end a tab area adapted when the length is folded over on itself, to be adhered to the other end of the length along adjacent a line which is to be at one vertical corner of the carton; flattening the corrugations of such tab areas; creasing each such length inwardly of said structure transversely of the mid-portion of the length, along what is to comprise another and diagonally opposite vertical corner of the carton; gripping the crease while deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease with the corrugations within the fold; then applying adhesive to said tab area and similarly creasing and gripping said length along adjacent said tab area and at a line which is to form said first-named corner of the carton; then releasing the first crease while advancing the other gripped crease and so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; and pressing said tab area in folded-over relation onto said other end of the length.

4. Method for making flat blanks adapted to be opened out to form semi-rigid cartons of single-faced corrugated board with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the side walls of the carton when finished, which method comprises: advancing a web of single-faced corrugated board with the corrugations extending transversely of the web while slitting transversely the side portions of such web to provide the lines of separation between said flaps and severing said web transversely to form a succession of carton lengths, each of which has at one end an area adapted when the length is folded over on itself, to be adhered to the other end of the length; creasing and gripping a narrow transverse strip of each such length, along what is to comprise a vertical corner of the carton; deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease with the corrugations within the fold; then gripping and creasing said length along another line which is to form another corner of the carton; releasing said first-creased strip while advancing the other gripped crease and so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; and pressing said area onto said other end of the length, the two corner creases being made in alignment with corresponding flap separating slits which are to occur at diagonally opposite corners of the carton.

5. In apparatus for making flat blanks adapted to be opened out to form semi-rigid cartons of single-faced corrugated board with the corrugations running vertically on the interior and with top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the side walls of the carton when finished, the combination comprising: means for continuously feeding a web of such single-faced corrugated board with the

corrugations extending transversely of the web; a rotary structure having, at predetermined spaced positions around its periphery, knife means in positions to engage the corrugated surface of the web and form the slits therethrough extending substantially parallel to said corrugations to separate said closure flaps as the web moves forward, one of said knife means being shaped and positioned to cut the web into carton lengths with one end of each length having a tab area extending part way across the web and adapted when the length is folded over on itself, to be adhered to the other end of the length, said latter knife means being shaped to cut out a waste area at an end of said tab area; means on said structure for substantially flattening the corrugations on said tab area; another rotary structure adapted to support the web during such slitting, cutting and flattening, said other structure having thereon gripping finger means for gripping the cut-out waste area; and means for actuating said finger means to cause same to grip said waste area when cut out and to release same at a point spaced from the web; rotatable means having means for gripping and creasing a narrow transverse strip of each said length along what is to comprise a vertical corner of the carton and for carrying said length partially around said rotatable means and then releasing said length, said rotatable means also having means for gripping and creasing said length along another line which is to form another corner of the carton and which is adjacent said tab area and for carrying said length partially around said rotatable means and then releasing said length; means for deflecting the forward portion of said length back onto the rear portion thereof as said length is carried around said rotatable means; and stripping means adjacent said rotatable means for stripping a released length from said rotatable means.

6. In apparatus for making flat blanks adapted to be opened out to form semi-rigid cartons of single-faced corrugated board with the corrugations running vertically on the interior and with portions slitted to provide separate closure flaps which respectively are to form folded-over continuations of the side walls of the carton when finished, the combination comprising: means for continuously feeding a web of such single-faced corrugated board with the corrugations extending transversely of the web; a rotary structure having, at predetermined spaced positions around its periphery, knife means in positions to engage the web and form the slits therethrough extending substantially parallel to said corrugations to separate said closure flaps as the web moves forward, one of said knife means being shaped and positioned to cut the web into carton lengths with one end of each length having a tab area adapted when the length is folded over on itself, to be adhered to the other end of the length; and rotatable means having means for gripping and creasing a narrow transverse strip of each said length along what is to comprise a vertical corner of the carton and for carrying said length partially around said rotatable means and then releasing said length, said rotatable means also having means for gripping and creasing said length along another line which is to form another corner of the carton and which is adjacent said tab area and for carrying said length partially around said rotatable means and then releasing said length; and means for deflecting the forward portion of said length back onto the rear portion thereof as said length is carried around said rotatable means by said first-mentioned gripping and creasing means.

7. In apparatus for making flat blanks adapted to be opened out to form semi-rigid cartons of single-faced corrugated board with the corrugations running vertically on the interior and with portions slitted to provide separate closure flaps which respectively are to form folded-over continuations of the side walls of the carton when finished, the combination comprising: means for continuously feeding a web of such single-faced corrugated board with the corrugations extending transversely of the web; a rotary structure having, at predetermined spaced positions around its periphery, knife means in positions to engage the web and form the slits therethrough extending substantially parallel to said corrugations to separate said closure flaps as the web moves forward, one of said knife means being shaped and positioned to cut the web into carton lengths with one end of each length having a tab area extending part way across the web and adapted when the length is folded over on itself, to be adhered to the other end of the length, said latter knife means being shaped to cut out a waste area at an end of said tab area; another rotary structure adapted to support the web during such slitting and cutting, said other structure having thereon gripping finger means for gripping the cut-out waste area; cam-operated means for actuating said finger means to cause same to grip said waste area when cut out and to release same at a point spaced from the web; rotatable means having means for gripping and creasing a narrow transverse strip of each said length along what is to comprise a vertical corner of the carton and for carrying said length partially around said rotatable means and having means for gripping and creasing said length along another line which is to form another corner of the carton and which is adjacent said tab area and for carrying said length partially around said rotatable means; means for deflecting the forward portion of said length back onto the rear portion thereof as said length is carried around said rotatable means; means for operating said gripping and creasing means and for thereby causing gripping and creasing of said length as aforesaid in predetermined positions of said rotatable means and release of said length in different predetermined positions of said rotatable means; and stripping means adjacent said rotatable means for stripping a released length from said rotatable means.

8. In apparatus for making flat blanks adapted to be opened out to form semi-rigid cartons of single-faced corrugated board with the corrugations running vertically on the interior and with portions slitted to provide separate closure flaps which respectively are to form folded-over continuations of the side walls of the carton when finished, the combination comprising: means for continuously feeding a web of such single-faced corrugated board with the corrugations extending transversely of the web; rotary creasing means for engaging the advancing web to crease same along lines which are to become base fold lines of the closure flaps; a rotary structure having, at predetermined spaced positions around its periphery, knife means in positions to engage the web and form the slits therethrough extending substantially parallel to said corrugations to separate said closure flaps as the web moves forward, one of said knife means being shaped and positioned to cut the web into carton lengths with one end of each length having a tab area adapted when the length is folded over on itself, to be adhered to the other end of the length; and rotatable means having means for gripping and creasing a narrow transverse strip of each said length along what is to comprise a vertical corner of the carton and for carrying said length partially around said rotatable means and then releasing said length, said rotatable means also having means for gripping and creasing said length along another line which is to form another corner of the carton and which is adjacent said tab area and for carrying said length partially around said rotatable means and then releasing said length; and means for deflecting the forward portion of said length back onto the rear portion thereof as said length is carried around said rotatable means by said first-mentioned gripping and creasing means.

9. Method for making flat blanks adapted to be opened out to form semi-rigid cartons, rectangular in cross-section, of single-faced corrugated paperboard with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate

closure flaps which respectively are to form folded-over top and bottom continuations of the four side walls of the carton when finished, which method comprises: advancing a web of single-faced corrugated paperboard with the corrugations extending transversely of the web; creasing the advancing web along lines which are to become base fold lines of the closure flaps; slitting the side portions of such web transversely to provide the lines of separation between said flaps; severing said web transversely to form a succession of carton lengths, each of which has at one end a tab area adapted when the length is folded over on itself, to be glued to the other end of the length along adjacent a line which is to be at one vertical corner of the carton; gripping and creasing a narrow strip transverse to the mid-portion of each such length, along what is to comprise another and diagonally opposite vertical corner of the carton; deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease with the corrugations within the fold; then gripping and creasing said length along adjacent said tab area and at a line which is to form said first-named corner of the carton; releasing said first-creased strip while advancing the other gripped crease; so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; and pressing said tab area in folded-over relation onto said other end of the length.

10. Method for making flat blanks adapted to be opened out to form semi-rigid cartons, rectangular in cross-section, of single-faced corrugated paperboard with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the four side walls of the carton when finished, which method comprises the following steps in the order given: advancing a web of single-faced corrugated paperboard with the corrugations extending transversely of the web; slitting the side portions of such web transversely to provide the lines of separation between said flaps; severing said web transversely to form a succession of carton lengths, each of which has at one end an area adapted when the length is folded over on itself, to be glued to the other end of the length; gripping and creasing a narrow strip transversely of each such length, along what is to comprise a vertical corner of the carton; deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease; gripping and creasing said length at a line which is spaced from said strip and which is to form a further corner of the carton; releasing said first-creased strip while advancing the other gripped crease; so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; pressing said area onto said other end of the length; and finally releasing and discharging the folded-over blank.

11. Method for making flat blanks adapted to be opened out to form semi-rigid cartons, rectangular in cross-section, of single-faced corrugated paperboard with the corrugations running vertically on the interior and with the top and bottom portions slitted to provide separate closure flaps which respectively are to form folded-over top and bottom continuations of the four side walls of the carton when finished, which method comprises the following steps in the order given: advancing a web of single-faced corrugated paperboard with the corrugations extending transversely of the web; slitting the side portions of such web transversely to provide the lines of separation between said flaps; severing said web transversely to form a succession of carton lengths, each of which has at one end an area adapted when the length is folded over on itself, to be glued to the other end of the length; gripping and creasing a narrow strip transversely along what is to comprise a vertical corner of the carton; deflecting the forward portion of the length so as to fold same at least partially back upon itself about the crease; gripping and creasing said length at a line which is intermediate said one end and said strip to form a further corner of the carton; releasing said first-creased strip while advancing the other gripped crease; so directing said forward portion as to complete the folding thereof onto the rear portion of the carton length; pressing said area onto said other end of the length, the two corner creases being made in alignment with corresponding flap separating slits which are to occur at diagonally opposite corners of the carton; and finally releasing and discharging the folded-over blank.

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