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A. J. MENGIS

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METHOD AND APPARATUS FOR APPLYING PATCHES TO A MOVING WEB

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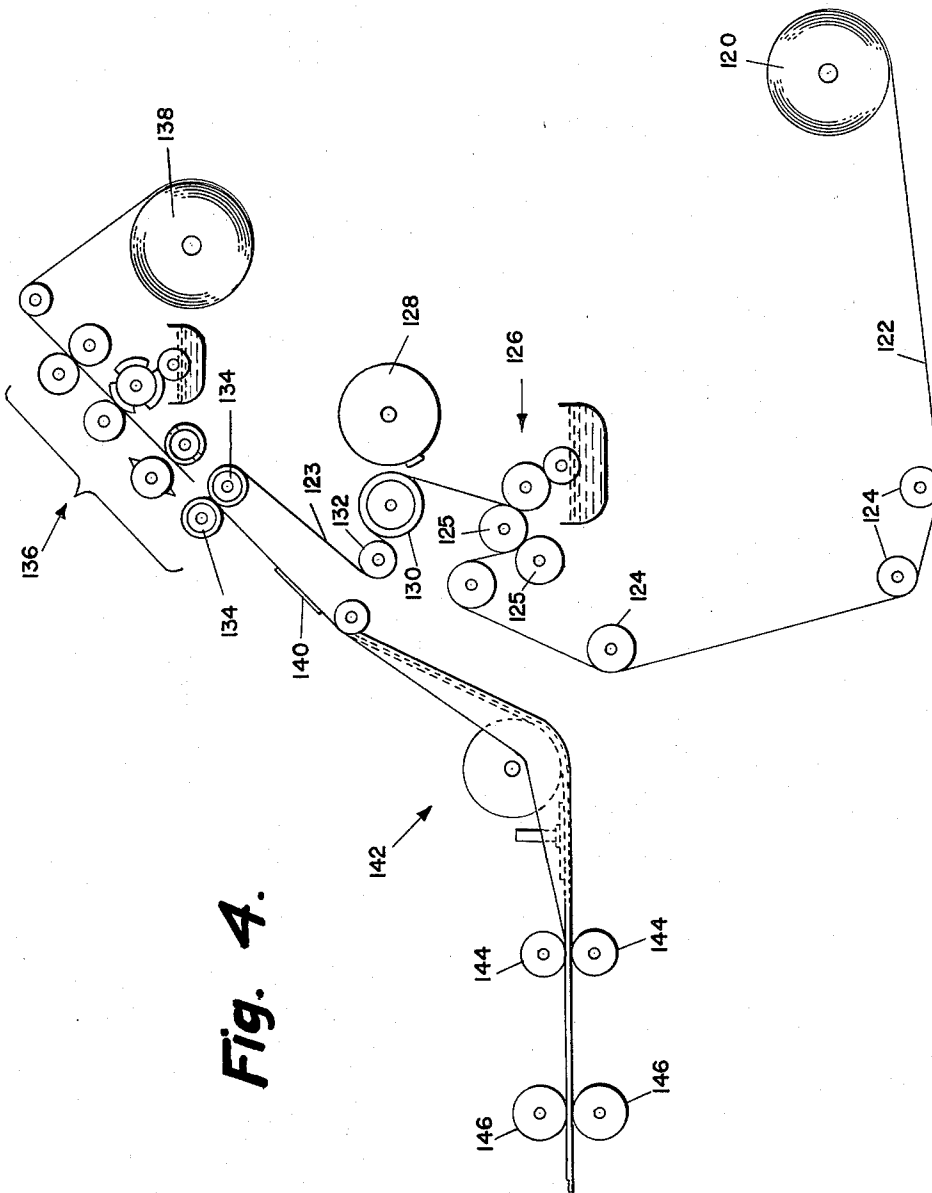


Fig. 4.

INVENTOR.

ALBIN J. MENGIS

BY

Duren, Smith & Harding

ATTORNEYS

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METHOD AND APPARATUS FOR APPLYING PATCHES TO A MOVING WEB

Albin J. Mengis, Philadelphia, Pa., assignor to Wolf Brothers, Inc., Philadelphia, Pa., a corporation of Pennsylvania

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This invention relates to a method and apparatus for applying patches to a moving web and, more particularly, to a method and apparatus for applying finger opening reinforcing patches to a web of material which is to be folded and formed into a succession of bags.

In the manufacture of bags, particularly paper bags, it is a well known practice to form a moving web of paper into a succession of bags having one open end and provided adjacent to the open end with openings for the passage of the fingers of a person carrying the bag. Such bags are commonly provided with a patch of reinforcing material surrounding the finger openings in order to prevent tearing of the bag in the region of the finger openings. Bags of this type are well known, one such bag being shown in the patent to Howard A. Wolf 2,281,964.

In the application of patches to the moving web during the manufacture of bags of this type, difficulty is encountered in properly positioning the reinforcing patches. This difficulty arises due to a non-uniformity of indexing or placement of the patches which results in the reinforcing patches either extending beyond the open end of the bag or being spaced too great a distance from the open end of the bag. In view of the fact that successive bags are severed from the moving web with a high degree of accuracy of bag length, it is evident that the difficulty is caused by non-uniformity of patch placement.

I have determined that a substantial portion of this difficulty arises when adhesive is applied to the bag web and the patch is immediately thereafter applied to the adhesive coated area. Under these conditions the adhesive material is soft and fluid at the time the patch is applied to the adhesive coated area of the bag web and thus the layer of adhesive acts in effect as a lubricant making it extremely difficult to hold the patch unmoved from the precise position at which it originally engages the web.

On the other hand, if adhesive material is applied to the ribbon of patch material prior to the cutting of patches therefrom, and prior to the application of the cut patches to the web of bag material sufficient elapsed time may be provided between the application of the adhesive to the patch ribbon and the application of each severed patch to the bag web to provide a substantial setting or drying of the adhesive and thus to avoid the existence of a condition in which, at the time each reinforcing patch is applied to the bag web, the adhesive material is so highly fluid as to form an effective lubricant between the patch and the bag web.

The primary difficulty in carrying out such a method lies in the fact that the patch must be cut from the web and positioned between feed rollers for delivery of the cut patch to the bag web after the adhesive layer has been applied thereto.

Furthermore, I have found that if the patch adhesive is applied in spaced stripes the tendency for the patch to shift its position after application to the web is greatly reduced.

It is an object of this invention to provide improved

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register of reinforcing patches positioned on a bag web by applying an adhesive coating to the patch ribbon at a substantial time interval prior to the severing of individual patches from the ribbon and prior to the application of the successive severed patches to the bag web.

It is a further object of the invention to provide ribbed rollers for applying stripes of adhesive to the patch ribbon and ribbed rollers for feeding adhesive coated patch ribbon and severed patches with the ribs of the rollers being so arranged that adhesive is applied to the bag ribbon in spaced lines and the ribbed feed rollers engage the uncoated areas of the patch ribbon and severed patches. It is an additional object of the invention to apply the patches to the moving web under such conditions that a flat linearly advancing patch is applied to a flat linearly advancing web with the two lines of linear advance being in linear alignment.

When bags of the type disclosed in the above mentioned Wolf patents are manufactured in accordance with the teachings of the Holweg Patent 2,129,842, in which a continuous strip of material is provided with spaced transversely extending lines of perforations providing for separation of the strip into successive bag lengths by means of spaced clamping rollers and acceleration rollers, difficulty arises when patches are positioned in overlapping relation with the portion of the strip which is to receive the transversely extending lines of perforations. The patch effectively prevents proper perforation of the strip and thus serves to interrupt the operation of the machine. Alternatively if the patches are placed at too great a distance from the perforated line there is insufficient patch material provided in the region of the locking tongue which is to be folded through the finger openings to insure proper locking of the closed bag flaps.

It is a further object of this invention to provide an improved sequence of bag manufacture which will insure proper perforation of the bag strip and permit more accurate and closely spaced positioning of the reinforcing patch with the perforated line.

These and other objects of the invention relating particularly to the structure involved will be more clearly understood from the following description when read in conjunction with the accompanying drawing in which:

Figure 1 is a diagrammatic view of bag forming apparatus employing the invention;

Figure 2 is a plan view of the patch ribbons and bag web in the successive stages of bag formation;

Figure 3 is a transverse section through a fragmentary portion of the apparatus shown in Figure 1 taken on the trace 3—3; and

Figure 4 is a diagrammatic view of a portion of bag forming apparatus employing the invention and providing an improved sequence of operation.

In Fig. 1 there is shown at 2 a roll of material from which bags are to be produced. A web 4 is drawn from the roll 2 by drive rollers hereinafter described and passes between rollers 6 and 8. Patches, such as indicated at 10 in Figure 1 and at 10 and 10' in Figure 2, are positioned in spaced side-by-side relation on the web 4 as it passes through the rollers 6 and 8. The patches are prepared and presented to the rollers 6 and 8 by means of apparatus indicated generally at 12. The rollers 6 and 8 are driven with a surface speed equal to the surface speed of the web 4 and are spaced apart sufficiently to engage and feed each patch when a patch and the web are positioned therebetween.

As will be evident from Figure 2, successive spaced side-by-side patches 10 and 10' are applied to the bag web 4 and when the flat web 4 is folded into a tube, as indicated at 14 in Figure 2, the patches 10 and 10' are in superimposed relation. In Figure 1 the patch applying means indicated generally by the numeral 12 is that

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employed in the application of the patch 10. It will be understood that positioned behind the apparatus shown generally at 12 is a substantially identical arrangement which serves to apply the patches 10' to the bag web.

A roll of material is shown at 16 from which a patch ribbon 18 is drawn over a suitable guide roller 20 by means of a pair of driving rollers 22. An adhesive pick-up roller 24 runs in a path of suitable adhesive material 26 and serves to apply a coating of adhesive to the surfaces of spaced circumferential ribs 28 on a roller 30 against which the patch ribbon 18 is urged by a back-up roller 32. The spaced ribs 28 of the roller 30 serve to apply spaced lines on stripes of adhesive material to the patch ribbon. The roller 30 is provided with three grooves 31 extending longitudinally across the ribs 38 on centers spaced circumferentially around the roller by a distance equal to the length of a patch.

The patch ribbon 18 then passes between a roller 34 carrying cut-off knives 36 and a mandrel roller 38. Referring to Figure 3 it will be observed that the mandrel roller 38 has its cylindrical surface formed with a plurality of spaced annular ribs 40. These ribs are similar to the ribs 28 discussed in connection with the roller 30 with the exception that the ribs 28 and the ribs 40 are so positioned with respect to each other that the web 14, as shown in section in Figure 3, carries longitudinally extending lines of adhesive coating as indicated at 42 in positions between the ribs 40 of the roller 38. Thus the surfaces of the web carrying ribs 40 do not become encrusted or otherwise fouled with an accumulation of adhesive material.

The roller 38 is also provided with a pair of mandrel inserts 44 against which the cutting knives 36 of the cutting roller 34 act to sever successive patch lengths from the patch ribbon 18. The cutting knives are so indexed with the grooves 31 that the cut occurs in the center of the non-coated area of the patch ribbon and the width of each of the inserts 44 is less than the width of the grooves 31. Thus the adhesive coating on the patch ribbon does not engage the mandrel inserts 44.

The driven rollers 6 and 8 are positioned exactly one patch length from the cutter roller 34 and as the patch leaves the roller 34 its free end is engaged between the roller 8 and the bag web and is positioned thereby on the bag web 4. It will be evident that if the adhesive coating on the severed patch 10 has by this time become sufficiently dried or stiffened to seize and adhere securely to the bag web 4, this condition in conjunction with the striped application of patch adhesive will result in there being very little possibility of the patch shifting as it is carried through the rollers 6 and 8 or as it is carried along with the bag web 4 after the bag web leaves the rollers 6 and 8.

It should be noted that the bag web 4 is moving at a rate of linear speed relatively high with respect to that of the patch ribbon 18. This will be evident when it is considered that only a relatively short length of patch material is applied to each bag length of the bag web 4. Thus for a given linear distance from the driven rollers 6 and 8 along the length of the patch web, there is involved a substantially greater time interval of ribbon feed than the interval of web feed involved along an equivalent linear distance of the bag web 4. Accordingly, this arrangement serves to conserve a substantial amount of space along the machine while providing the effect sought after, namely, that of allowing sufficient time for the adhesive to partially set or harden prior to the application of a severed patch to the bag web.

It should also be noted that the patch ribbon 18 extending between the guide roller 20 and the bag web rollers 6 and 8 is in linear alignment with the bag web 4 on the discharge side of the feed rollers 6 and 8. This arrangement provides for the delivery of severed patches to the bag web feeding rollers 6 and 8 which do not have any non-planer set or any tendency to curl as the result of having been fed around a curve or having been de-

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formed while being applied to the bag web. This last result is obtained by the linear alignment of the severed patches prior to their engagement with the bag web and the force of the bag web after patches are applied thereto. This aspect is of particular importance for the reason that deformation of the patch during application thereof to the bag web or deformation of the patch and the bag web immediately after application of the patch to the bag web tends to cause undesirable non-uniform displacements of successive patches during and immediately after positioning thereof on the bag web.

Following the application of patches 10 to the bag web 4, the bag web emerging from the driven rollers 6 and 8 passes through the region indicated generally by the arrow 52 without there being involved any deflection of the web 4 in order to provide additional time for the patch securing adhesive to set and to permit the patch to become firmly bonded to the bag web.

Thereafter the bag web passes over a succession of guide rollers 54 all of which provide for bending of the web only in the direction of the patch, i.e., with the patch on the inside of the bend. This arrangement insures against the patch peeling from the bag web and provides a further time interval for the patch adhesive to become firmly set.

The bag web is then carried over adhesive applying means indicated generally at 56 including a roller 57 for applying a line of adhesive along one edge of the bag web as indicated at 58 in Figure 2. The roller 53 provides a backup for the adhesive applying roller 57 and the rollers 53 and 55 are power driven and are draw rollers drawing the web 4 from the roll 2 and past the rollers heretofore described.

After the applications of the line of adhesive, the bag web passes the roller 64 carrying a blade 62 acting against a mandrel roller 60 to form spaced perforated lines extending transversely of the bag web as indicated at 66 in Figure 2. Immediately thereafter a creasing blade 68 mounted on a roller 70 also acting against the mandrel roller 60 provides a creased line as indicated at 72 in Figure 2.

The successive perforated lines 66 form the lines along which the bag web is ultimately severed and the crease lines 72 form the lines on which the bag closing flaps are folded down over the bag openings.

At 74 in Figure 1 there is indicated generally conventional tube forming means for forming the bag web 4 into a tube as indicated at 14 in Figures 2 and 3. This tube is advanced by means of take-up rollers 76 which serve to draw the bag web 4 through the various operation performing stages just described and following the feed rollers 53 and 55. A pair of clamping rollers 78 and a pair of acceleration rollers 80 serve to sever successive bag lengths 82 from the end of the tube 14. A finger opening cutting roller 84 and a mandrel roller 86 cooperating therewith are positioned between the clamping rollers 78 and the acceleration rollers 80. The cutting roller 84 serves to cut finger openings as shown at 88 in Figure 2 through the superimposed portions of the bag web and the reinforcing patches secured thereto.

Following the severing and perforating operations, the successive bags, which are in tubular form, will then have their lower end folds completed by a pair of rollers 90 and 92. The roller 92 is provided with a member 94 which is adapted to engage a roller 96 supplied with adhesive from a reservoir 98. The adhesive carried by the end of the member 94 is applied to the lowermost portions 100 of the bag lengths which are thereafter pressed into recesses 102 in the roller 90 by a blade 104 carried by the roller 92. Dished recesses 106 are provided to permit clearance for the passage of the member 94 over each bag as the rollers 90 and 92 rotate. This apparatus for severing successive bag lengths from the tube, for cutting the finger openings and for closing the lower ends of the successive bags is fully described in my copending patent application Serial No. 403,791, filed

January 13, 1954, now U.S. Patent No. 2,855,832, issued October 14, 1958.

It should be noted that the major web drawing force is provided by the draw rollers 53 and 55. As previously noted, the rollers 6 and 8 are spaced apart and are effective only to drive a patch in position on the web at the same speed as the speed of the web.

The take-up rollers 76 are preferably adjusted to run at a surface speed slightly greater than web speed with sufficiently low roller pressure to permit the web to slip with respect to the rollers. Thus, the take-up rollers apply sufficient tension to the web to insure its advance through the gumming means, the perforating and creasing means and the tube forming means without causing failure of the web along the weakened perforated lines.

While my novel patch applying arrangement has been disclosed herein in combination with a particular bag forming means, it should be noted that the invention is not limited to any particular bag forming means and may be employed in connection with the application of spaced patches to any moving web of material regardless of the treatment subsequently given the web of material. Furthermore, the word "adhesive" as employed throughout the description and claims should be construed as including any glue, paste, adhesive, cohesive or other similar material which may be employed to provide a bond between the web of material and the patch.

By way of illustration it may be noted that in a typical bag the patch 10 will be approximately $4\frac{1}{2}$ inches wide and $3\frac{3}{4}$ inches long and have twelve stripes of adhesive thereon approximately $\frac{1}{8}$ inch wide and spaced apart approximately $\frac{1}{16}$ of an inch. The transversely extending interruptions provided in the stripes of adhesive by the slots 31 of the roller 30 are approximately $\frac{1}{4}$ inch wide thus providing a $\frac{1}{8}$ inch clearance between the ends of the adhesive stripes and the edge of each patch.

When the bag is manufactured by means of the sequence shown in Figures 1 and 2 a reasonable tolerance must be provided between the edges of the successive reinforcing patches 10 and the portion of the web which is to receive the perforated line 66 in order to insure an adequate clearance between the perforating blade 62 and the reinforcing patch 10. While the patch application arrangement which has been disclosed greatly improves the accuracy of patch application the extended length of bag web between the patch application station indicated generally at 12 in Figure 1 and the perforation line cutting station at the roller 64 in Figure 1 makes it difficult to accurately index the perforation cutting location on the bag web.

An improved sequence of operation is shown in Figure 4 in which a roll of bag web material 120 has drawn therefrom a web 122 which passes over guide rollers 124, between drive rollers 125, and through an edge gum applying arrangement indicated at 126. This gum applying arrangement is identical to that described in connection with Figure 1 and indicated generally at 56 therein.

The web leaving the gum applying station passes over a mandrel roller 130 against which a perforating blade carrying roller 128 acts to produce a perforated line in the bag web identical with that indicated at 66 in Figure 2. The perforated web is then carried over a guide roller 132 and between rollers 134.

At 136 there is indicated generally patch cutting and feeding apparatus identical to that indicated generally at 12 in Figure 1. The apparatus serves to draw the web of patch material from a roll thereof 138 and to sever the successive patches and deliver successive severed patches between the driven rollers 134 which serve to successively hold the patches on the web and advance the patches and the web at web speed. The rollers 134 are

spaced apart and have substantially no effect on the web 122 passing therethrough in the absence of a patch.

The web leaving the rollers 134 and carrying spaced patches as indicated at 140 passes through tube forming means indicated generally at 142 which is identical to that indicated generally at 74 in Figure 1. The formed tube passes through guide rolls 144 and clamping rolls 146 to accelerating rolls, handle cut-out die carrying rolls and the remaining bag forming apparatus which has been described in connection with Figure 1.

As previously noted, the arrangement shown in Figure 1 involves, in connection with the consideration of accuracy of location of the reinforcing patches and of the transverse perforating lines, both the inaccuracies involved in patch application and the inaccuracies involved in locating the perforated lines on the bag web a substantial linear distance following the application of the patches. In the arrangement shown in Figure 4, the patches are applied immediately after perforation and thus extreme accuracy of register is provided. Furthermore, by means of the improved patch applying arrangement an improved uniformity of patch application is provided. Thus, by the arrangement shown in Figure 4, bags are produced in which the patches are located much more closely spaced to the transverse perforated line than as heretofore possible and the result is a bag in which the patches are positioned neatly and closely adjacent to the upper edges thereof thus improving not only the appearance of the bag but improving the handle locking action.

What is claimed is:

1. Apparatus comprising means for applying spaced lines of adhesive to one side of an advancing ribbon of material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including cutting means, a mandrel against which said cutting means acts and a roller mounting said mandrel and having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing said patches for engagement of their adhesive coated sides with an advancing web of material.

2. Apparatus comprising means for applying spaced lines of adhesive to one side of an advancing ribbon of material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including cutting means, a mandrel against which said cutting means acts and a roller mounting said mandrel and having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing said patches for engagement of their adhesive coated sides with an advancing web of material, said directing means comprising a pair of feed rollers for said patches, the roller adjacent to the adhesive coated sides of said patches being formed with ribs positioned to engage said patches in the spaces between said spaced lines of adhesive thereon.

3. Apparatus comprising means for advancing a web of material, means for applying spaced lines of adhesive to one side of an advancing ribbon of material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including cutting means, a mandrel against which said cutting means acts and a roller mounting said mandrel and having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing said patches for engagement of their adhesive coated sides with one side of said advancing web of material, said directing means comprising a pair of feed rollers for said patches and a pair of feed rollers for said web, said pairs of feed rollers being spaced apart

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by a distance approximately equal to the length of a patch, the patch feed roller adjacent to the adhesive coated sides of said patches being formed with ribs positioned to engage said patches in the spaces between said spaced lines of adhesive thereon.

4. Apparatus comprising means for advancing a ribbon of material along a substantially linear path, means for advancing a web of material along a substantially linear path, said two linear paths being in substantially linear alignment, means for applying spaced lines of adhesive to one side of said advancing ribbon of material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including cutting means, a mandrel against which said cutting means acts and a roller mounting said mandrel and having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing said patches along said substantially linear path for engagement of their adhesive coated sides with said web advancing along said substantially linear path.

5. Apparatus comprising means for advancing a ribbon of material along a substantially linear path, means for advancing a web of material along a substantially linear path, said two linear paths being in substantially linear alignment, means for applying spaced lines of adhesive to one side of said advancing ribbon of material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including cutting means, a mandrel against which said cutting means acts and a roller mounting said mandrel and having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing said patches along said substantially linear path for engagement of their adhesive coated sides with said web advancing along said substantially linear path, said directing means comprising a pair of feed rollers of said patches, the roller adjacent to the adhesive coated sides of said patches being formed with ribs positioned to engage said patches in the spaces between said spaced lines of adhesive thereon.

6. Apparatus comprising means for advancing a ribbon of material along a substantially linear path, means for advancing a web of material along a substantially linear path, said two linear paths being in substantially linear alignment, means for applying spaced lines of adhesive to one side of said advancing ribbon of material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including cutting means, a mandrel against which said cutting means acts and a roller mounting said mandrel and having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing said patches along said substantially linear path for engagement of their adhesive coated sides

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with said web advancing along said substantially linear path, said directing means comprising a pair of feed rollers for said patches and a pair of feed rollers for said web, said pairs of feed rollers being spaced apart by a distance approximately equal to the length of a patch, the patch feed roller adjacent to the adhesive coated sides of said patches being formed with ribs positioned to engage said patches in the spaces between said spaced lines of adhesive thereon.

7. Apparatus for applying a succession of spaced patches to an advancing web of material comprising means for advancing a web of material, means for advancing a ribbon of patch material, means for applying spaced lines of an adhesive material to one side of said ribbon of patch material, means for severing successive lengths of said adhesive coated ribbon to form thereof successive adhesive coated patches, said severing means including a cutter blade and a mandrel roller against which said blade acts, said mandrel roller having its surface formed with ribs positioned to engage said adhesive coated ribbon in the spaces between said spaced lines of adhesive thereon, and means for directing successive patches for engagement of their adhesive coated sides with said advancing web.

8. Apparatus for applying a succession of spaced patches to an advancing web of material comprising means for advancing a web of material, means for advancing a ribbon of patch material, means for applying spaced lines of an adhesive material to one side of said ribbon of patch material, said adhesive applying means providing transversely extending interruptions in the lines of adhesive material, means for severing successive lengths of said adhesive coated ribbon at said spaced transversely extending adhesive interruptions to form successive patches, said severing means including a cutter blade and a mandrel roller against which said blade acts, said mandrel roller having its surface formed with ribs positioned to engage said ribbon in the spaces between said spaced lines of adhesive thereon and said mandrel being of lesser width than said spaced transversely extending adhesive interruptions, and means for directing successive patches for engagement of their adhesive coated sides with said advancing web.

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