Dec. 8, 1953 F. J. REYNOLDS 2,661,947

FOLDING AND CREASING DEVICE

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Fig. 1.

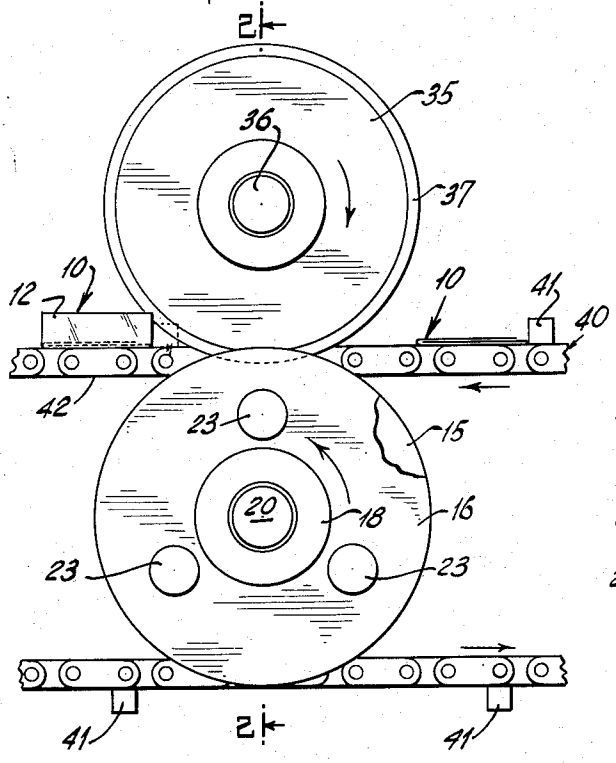


Fig. 2.

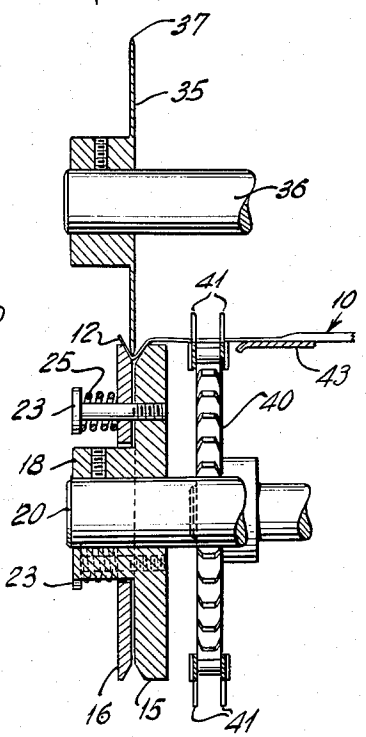


Fig. 3.

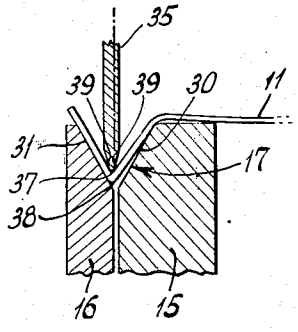
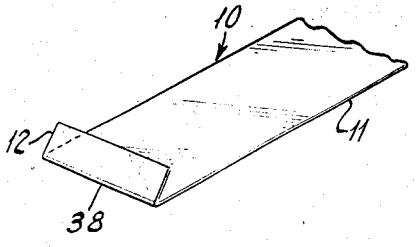


Fig. 4.



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FOLDING AND CREASING DEVICE

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9 Claims. (Cl. 270—86)

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The present invention relates to folding and creasing devices and, although it has a wide range of utility, it is particularly useful in connection with the folding and creasing of the end sections of wrappers for such articles as adhesive bandage units and the like, to form closure flaps therefor.

In the manufacture and packaging of such articles as adhesive bandages, each bandage unit, including a piece of adhesive plaster and a gauze pad thereon, is enclosed in a flat tubular wrapper of plain paper, glassine paper or the like, open at both ends. In an intermediate packaging stage, the end sections of this wrapper tube project beyond the corresponding ends of the adhesive plaster piece therein and are intended to be folded and applied adhesively to the main body of the wrapper tube to close said tube and to seal its contents. The adhesive attachment of the closure flaps may be broken to permit said flaps to be torn off, when access to the contents of the wrapper is desired.

One object of the present invention is to provide a new and improved device which will expeditiously produce in one continuous operation a sharp neat fold and crease in a section of a flexible strip, sheet or similar article, while this article is continuously advancing, which is automatically adjustable, so that its parts will assume proper folding and creasing relationship and will apply proper creasing pressure under all conditions of use, and which is simple in construction, especially in connection with the shaft mounting of the parts and in the drive therefor.

Another object of the present invention is to provide a device of the improved character described particularly adaptable to fold and crease the end sections of flat tubular wrappers, such as those for adhesive bandages, in the operation of closing these wrappers.

As a feature of the present invention, the device is operable to fold and crease sharply a flexible strip, sheet or other web-like article, while said article is being continuously advanced past the field of action of said device, and comprises a pair of opposed folding members defining therebetween a generally V-shaped folding slot. These members, in the more specific aspects of the invention, conjointly form a roll and are in the form of rotary discs coaxially mounted for rotation in unison. The confronting end faces of these discs are circumferentially bevelled or otherwise shaped near their outer peripheries to define the generally V-shaped folding slot therebetween. Extending into the

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folding slot between the discs, is a creasing blade presenting a creasing edge around which the fold is adapted to be formed. This blade is advantageously in the form of a rotatable disc and is mounted axially off-center with respect to the vertex of said slot to bear with creasing pressure against the part of the flexible article supported against the bevelled surface of one of the folding discs. This latter folding disc is spring-pressed axially against the operating edge of the creasing blade, to serve effectively as a yieldable platen member for said creasing blade.

Three rotatable elements, namely the two coaxial folding discs and the creasing blade enter into the folding and creasing operation. As a feature of the present invention, at least one of these elements is arranged to yield axially and resiliently. As an added feature, two of the elements are axially and resiliently yieldable. For example, both of the coaxially mounted folding discs may be mounted for axial elastic movement or one of these folding discs may be axially and resiliently yieldable, while the creasing blade may be rendered axially yieldable, either by resiliently mounting it on its shaft or by making it thin enough to flex resiliently. With this arrangement, the rotatable elements can automatically adjust themselves to accommodate sheet-like articles of varying thickness without digging or tearing into the articles, without unduly crushing these articles and without jamming the device.

Conveyor means are provided for advancing the articles to be folded and creased successively and continuously into the field of action of the device. As an article reaches the folding slot, the creasing blade operating in said slot progressively bends the advancing article therein and forms a sharp crease thereon.

Various other objects, features and advantages of the invention are apparent from the following particular description and from an inspection of the accompanying drawings, in which:

Fig. 1 is a side elevation of a folding and creasing device embodying the present invention;

Fig. 2 is a section of the folding and creasing device taken approximately along the lines 2—2 of Fig. 1;

Fig. 3 is an enlarged detail section of part of the device shown in the process of folding and creasing an article; and

Fig. 4 is a perspective of the article folded and creased by the device of the present invention.

Referring to the drawings, the creasing device of the present invention is adapted to crease and

fold any pliable strip, sheet or other web-like article, but is particularly useful for the creasing and folding of the end wrapper sections of such strip-like articles as adhesive bandage units 10 to form closure flaps therefor. An adhesive bandage unit ordinarily comprises a long narrow adhesive plaster piece carrying a small gauze pad and enclosed in a flat wrapper tube 11 of glassine paper or other suitable flexible material. In one of its intermediate packaging stages, the wrapper tube 11, open at both ends, has end sections 12 projecting beyond the corresponding ends of the adhesive plaster piece therein. To complete the packaging of the individual unit, the wrapper tube 11 is creased and folded transversely at one end or at both ends at regions outwardly beyond the adhesive plaster piece, and the resulting end wrapper sections, in the form of closure flaps 12, are then secured, as for example by adhesive, to the main body of the wrapper tube to complete the package. These closure flaps may be lifted out of adhesive attachment to the main body of the wrapper tube and may be easily torn off to permit access to the contents of the wrapper tube.

The device for folding and creasing an end projecting section of the wrapper tube 11 comprises a pair of opposed folding members 15 and 16 defining therebetween a generally V-shaped folding slot 17. These folding members 15 and 16, shaped as discs, are mounted for rotation in unison about a common axis to form conjointly a roll and at least one of these members is axially spring-pressed towards the other, for the purpose to be made apparent. In the specific form shown, the inner disc 15 is fixed against axial movement and for that purpose is integral or otherwise rigid with a cylindrical hub 18, secured to shaft 20 driven in any suitable manner, and is in the form of a flange extending around and radially outwardly from the hub. The other disc 16 is axially yieldable and is in the form of a flat ring embracing the hub 18 on one side of the disc 15 with an axial slide fit. A series of studs 23, three being shown spaced 120° apart, are threaded into the fixed disc 15 and pass with slide fits through the yieldable disc 16. A compression spring 25 encircles each of these studs 23 and bears at one end against the disc 16 and at the other end against the head of the corresponding stud.

The discs 15 and 16 are provided at their confronting end faces near their outer peripheries with similar bevelled or chamfered surfaces 30 and 31 inclined at an acute angle with respect to each other, and desirably at an angle of about 30° with respect to the vertical, to define therebetween the folding slot 17 at a total angle of 60°.

Cooperating with the folding slot 17 is a creasing blade 35 desirably in the form of a rotary circular disc or plate secured to a shaft 36 extending parallel to the shaft 20 of the discs 15 and 16 and driven by any suitable means. This blade has a double-bevelled or chamfered periphery terminating in a creasing edge 37 which is sharp enough to form a fine well-defined crease and fold line 38 in the end section of the strip unit 10. The bevelled surfaces 39 of this creasing blade 35, flanking the creasing edge 37 are desirably parallel to the bevelled slot surfaces 30 and 31 at their lines of tangency and, in the specific construction illustrated, are at an angle of 60° to each other.

The creasing blade 35 extends into the folding slot 17, but not to the base of said slot, and is mounted axially outwardly off-center with respect to the vertex of said slot, to cause its creasing edge 37 to press the strip unit 10 against the bevelled surface 31 of the yieldable spring-pressed disc 16 and against the action of the springs 25 and to form thereby a crease in said unit. The folding disc 16 by that means serves as a platen member for the creasing blade 35.

Since the folding disc 15 is fixed against axial movement, it is desirable that the creasing blade 35 be rendered axially yieldable. For that purpose, the creasing blade 35 is thin enough and resilient enough to yield axially to a limited extent at the section of its periphery extending into the V-slot 17.

For continuously advancing the strip units 10 to be creased successively into the field of action of the folding and creasing device, there is provided a suitable conveying or feeding system shown in the form of a conveyor chain 40 of well-known articulated link construction passing over suitable drive and supporting sprockets (not shown) and carrying a series of pushers 41. This conveyor chain 40 has a substantially horizontal top run 42 approximately at the level of the folding slot 17. Pushers 41, when on this top run 42, are adapted to engage the longitudinal edges of the strip units 10 on one side thereof and to advance them sidewise and edgewise towards the field of action of the folding and creasing device. A supporting table or bed 43, at the top level of the folding disc 15, is provided on the side of the conveyor chain 40 opposite the folding discs 15 and 16.

In the drawings, only one folding and creasing device and one conveyor chain 40 with associated pushers 41 are shown on one side of the supporting table 43. However, it is to be understood that where the strip unit 10 is to be folded and creased at both ends, as in the case of an adhesive bandage unit, another folding and creasing device and a conveyor chain 40 with pushers 41 similar to those shown and described are disposed on the opposite side of the supporting table 43 to operate simultaneously with the corresponding device and chain shown in the drawings.

Where the fold and crease is to be produced only at one end of the unit 10, the means for pushing the unit through the field of action of the folding and creasing device could be more positive than the pushers 41 shown, to prevent displacement of said unit during the folding and creasing operation.

In the operation of the folding and creasing device shown, the strip units 10 resting side by side on the supporting table 43, with their end sections overlapping the opposite edges of said table and extending beyond the two folding and creasing devices, are advanced continuously sidewise and edgewise by the pushers 41 on the two conveyor chains 40 on the opposite sides of said table. As the end sections of these strip units 10 are successively moved over the V-slots 17, the creasing blades 35 come into play to tuck the end sections into the slots and to thereby progressively fold them. As each end section of a strip unit approaches the creasing station, the part of said section passing over the disc 15 is gradually bent downwardly into the V-slot 17, without creasing it, while the outer end part 12 of said section is folded upwardly abruptly about the peripheral edge 37 of the creasing blade 35 by the bevelled surface 31 of the yieldable disc 16. When the end section of the strip unit reaches the lowermost region of the V-slot 17, said section will be pressed against the bevelled surface 31 of the yieldable disc 16 by the creasing

blade 35 and said disc will be displaced axially by said creasing blade sufficiently to stress the springs 25. Since the folding and creasing of the section 12 of the strip unit is effected under spring pressure, and the bevelled face 39 of the creasing blade 35 presses said section against the inclined surface 31 of the yieldable disc 16, the creasing and folding action is effected neatly and sharply without cutting into any of the layers of the strip unit and without in any way injuring them.

The resilient yieldable mounting of the disc 16 serves not only to maintain the creasing pressure under safe spring-controlled limits, but also serves to accommodate said disc automatically to any irregularity in the axial position of the creasing blade 35, to any obliquity in the position of said creasing blade with respect to its supporting shaft 36, and to any irregularities in the thicknesses of the strip unit 10 presented to the action of the folding and creasing device.

A thick strip unit 10 requires more clearance on both sides of the creasing blade 35 adjacent to its bevelled surfaces 39 than a thin one. Assuming that the disc 16 alone is axially yieldable and that the clearance between the disc 15 and the creasing blade 35 is axially fixed, the blade would tend to dig in and tear the paper, if the section of the strip unit on the side adjacent to the disc 15 should be unusually thick. In the construction shown, since the creasing blade 35 is thin and resilient, it will yield axially to accommodate for any increase in the thickness of the strip unit 10 on the side thereof adjacent to the axially fixed disc 15 and will transmit its movement to the yieldable disc 16. This disc 16 can yield sufficiently to accommodate both for the yield in the creasing blade 35 and for any increase in clearance necessary between said blade and said disc, as a result of an increase in the thickness of the strip unit 10 between said disc and said blade.

The same result could be accomplished with a rigid creasing blade 35 by permitting it to yield resiliently along its axis or by permitting the disc 15 to yield resiliently along its axis independently of the disc 16.

Since the folding and creasing operations are carried out simultaneously at both ends of the strip unit 10, any tendency of either folding and creasing device to displace the unit during these operations is counterbalanced by the corresponding displacing tendency of the other folding and creasing device, thereby maintaining the unit in its true course.

During the folding and creasing operations described, the section of the strip unit 10 inwardly of the fold line 38 is bent bluntly over the bevelled surface 30 of the disc 15 without creasing. After the end section 12 of the strip unit 10 has been folded as shown in Fig. 3 to define the closure flap, the part of the strip unit 10 which has been bent over the bevelled surface 30 of the disc 15 is straightened out in line with the main body of the strip unit as a result of the inherent resiliency of the material from which the strip unit is made, causing the end folded closure flap 12 to assume an acute angle with respect to the main body of the strip unit. This makes it easy for the flap to be pressed down by a subsequent operation and to be attached to the main body of the strip unit desirably by adhesive.

Only a single fold has been shown at one end of the strip unit 10. However, it may be desirable to first make a narrow fold at the end of each

wrapper tube to seal said tube and then a wider fold to form the tearable flaps by which access to the contents of the tube may be gained. Both folds at each end of the wrapper tube may be formed in successive steps by the same creasing device or by successive creasing devices of the general character described.

What is claimed is:

1. A device for folding and creasing pliable articles, comprising a pair of coaxial rotary folding members, one of which is mounted for yieldable movement axially with respect to the other, said members presenting at the outer peripheries of their confronting faces chamfered surfaces respectively defining therebetween a circumferential generally V-shaped folding slot, and a rotary creasing blade supported on an axis parallel to the axis of said folding members and having a peripheral creasing edge extending into said slot to tuck the articles successively into said slot, said creasing edge being in a plane axially offset from the vertex plane of said slot, to cause said edge to bear against the chamfered surface of the yieldable folding member, and spring means urging said latter folding member axially toward the other folding member.

2. A device for folding and creasing pliable articles as defined in claim 1, the creasing blade being axially and resiliently yieldable.

3. A device for folding and creasing pliable articles as defined in claim 1, the creasing blade being thin enough and resilient enough to yield.

4. A device for folding and creasing pliable articles comprising a pair of opposed coaxial rotary folding members defining therebetween a circumferential folding slot across which the articles to be folded and creased are adapted to be advanced, one of said folding members being axially yieldable with respect to the other, spring means urging the yieldable folding member axially towards the other member, and a rotary creasing blade mounted on an axis parallel to the axis of the folding member and extending into the folding slot for tucking the articles into said slot as they are advanced thereacross, said rotary creasing blade being axially and resiliently yieldable in the same direction as the axially yieldable folding member.

5. A device for folding and creasing pliable articles as defined in claim 4, the creasing blade being thin enough and resilient enough to yield axially.

6. A device for folding and creasing pliable articles comprising a rotatable device provided circumferentially with a substantially V-shaped folding slot defining opposing surfaces converging towards a vertex, the articles to be folded and creased being adapted to be advanced over said slot, and a rotary creasing blade supported an an axis parallel to the axis of said rotatable device and having a peripheral creasing edge extending into said slot to tuck the articles successively into said slot, said creasing edge being in a plane offset from the vertex plane of said slot, to cause said edge to bear against one of said slot surfaces at a localized region spaced from both said vertex and the mouth of the V-slot, and spring means urging said creasing blade and said last-mentioned surface relatively and yieldably towards each other.

7. A device for folding and creasing pliable articles comprising a pair of coaxial rotary discs mounted for rotation in unison about a common axis and provided at their confronting end faces near their outer peripheries with bevelled sur-

faces defining therebetween a circumferential folding slot across which the articles to be folded and creased are adapted to be advanced, one of said discs constituting a platen member, a rotary creasing blade member presenting a peripheral creasing edge extending into said slot and positioned to bear said creasing edge against the bevel surface of said platen member at a localized region intermediate the inner and outer peripheries of the last-mentioned bevel surface, and spring means yieldably pressing one of said members axially against the other member to spring-press said last-mentioned bevel surface and said creasing edge together.

8. A device for folding and creasing pliable articles comprising a pair of coaxial rotary disc members mounted for rotation in unison about a common axis and provided at their confronting end faces near their outer peripheries with bevelled surfaces defining therebetween a circumferential folding V-slot across which the articles to be folded and creased are adapted to be advanced, one of said disc members serving as a platen member, a rotary creasing blade member presenting a peripheral creasing edge extending into said slot and positioned to bear said creasing edge against the bevel surface of said platen member at a localized region intermediate the inner and outer peripheries of the last mentioned bevel surface, two of said members being arranged to yield axially, and spring means pressing said yieldable members axially in directions to urge one disc member axially towards the other disc member and to press said platen member and said creasing blade member relatively axially towards each other, to spring-press the bevel surface on said platen member and said creasing edge together.

9. A device for folding and creasing a flat pliable strip-like article having inherent resiliency comprising a rotatable device presenting around its circumference a substantially V-shaped folding slot, a creasing member having a creasing edge extending into said slot for tucking the article into said slot as it is advanced across said slot, said creasing member having bevelled surfaces which define its creasing edge and which in a radial direction are much narrower than the bevelled surfaces of the V-shaped folding slot, means for supporting the article in flat position and for simultaneously advancing said article sidewise and edgewise substantially in the plane of said article with its end section passing over said slot between said rotatable device and said creasing member, to cause said end section to bend from its main body into said slot and to form thereby a V-shaped offset, while said main body remains supported in flat position, the inherent resiliency of said article causing said offset to straighten out where it was bent into said V-slot, as said article leaves the field of action of said rotatable device to cause the inner section of said offset to return substantially to the plane of said main body and to cause the outer end section of said offset to assume an acute angle in the form of a flap with respect to the main body of said article.

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