Feb. 17, 1959 J. G. MITCHELL 2,873,965

FOLDING DEVICE FOR STRIP MATERIAL

Filed June 9, 1955

Fig. 1.

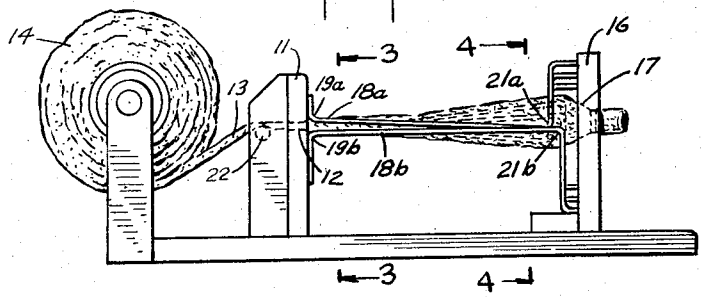
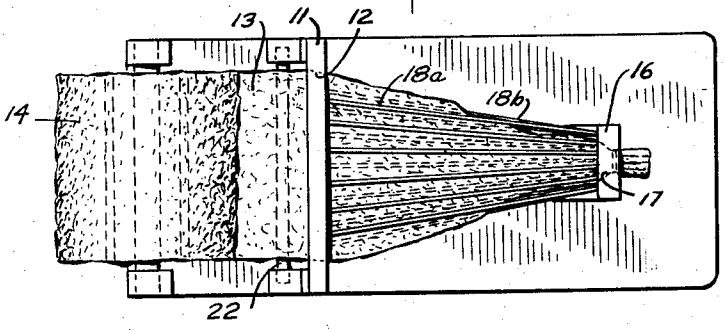


Fig. 2.



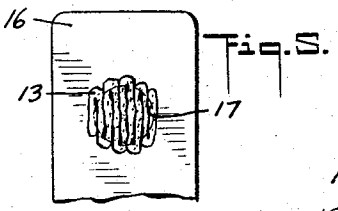


Fig. 5.

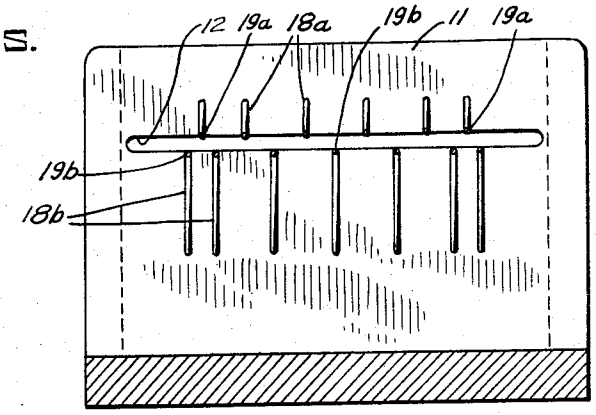


Fig. 3.

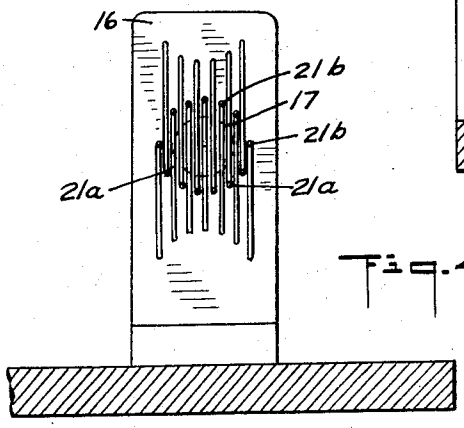


Fig. 4.

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FOLDING DEVICE FOR STRIP MATERIAL

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Application June 9, 1955, Serial No. 514,309

10 Claims. (Cl. 270—40)

This invention relates to the folding of sheet material and relates more particularly to a method and means for the continuous folding of sheet material.

It is an object of this invention to provide a novel process for the continuous folding of sheet material.

Another object of this invention is the provision of a new and efficient apparatus for the continuous folding of a strip of fibrous batting into a cylindrical form suitable for use as a cigarette filter tip.

Other objects of this invention will be apparent from the following detailed description and claims.

In accordance with one aspect of this invention, the strip material is forwarded continuously into contact with a plurality of guide members extending along the path of the moving strip material. The guide members are arranged in sets, said sets being spaced apart at one end to provide an entrance for receiving said strip material, and the guide members of one set intermesh with the guide members of another set along the path of movement of said strip material to effect lengthwise folding of said material. Advantageously the guide members are in the form of wires converging from the outer edges of the strip toward the center thereof, with the wires adjacent the outer edges of the strip intermeshing to a lesser degree than the wires adjacent to the center of said strip, the degree of convergence and of intermeshing of the wires being such that the strip material is folded into substantially cylindrical form as it moves along the wires.

The wires may be mounted between two vertical plates, one plate being slotted to receive the strip material before it engages the wires and the second plate having a circular opening with converging walls for receiving the cylindrically folded material and for compressing said folded material uniformly.

The apparatus of this invention is particularly suitable for the production of cigarette filter tips from a batting of randomly arranged fibers. A preferred type of batting is one made of staple fibers of cellulose acetate in which the fibers are coalesced or bound one to the other at many of their points of contact, the bonding being at a maximum at the outer surfaces of the batting and decreasing gradually toward the interior thereof. For example, there may be employed the batting described in the copending application of Pratt et al., Serial No. 454,116, filed September 3, 1954.

In the drawing, which shows one preferred form of apparatus for carrying out this invention,

Fig. 1 is a side elevational view of the apparatus,

Fig. 2 is a plan view of the apparatus,

Fig. 3 is a view along the line 3—3 of Fig. 1,

Fig. 4 is a view along the line 4—4 of Fig. 1, and

Fig. 5 is a view in cross-section showing the circular folded material as it enters the circular opening in the second plate and after it has been disengaged from the guide wires.

Like reference characters designate like parts throughout the several views of the drawing.

Referring now to the drawing, reference numeral 11

designates a vertical plate having a substantially straight, horizontal slot 12 (Fig. 3) for the passage of a continuous strip or sheet of batting material 13, which is supplied from a rotatably mounted roll 14. Reference numeral 16 designates a second vertical plate which is provided with a funnel-shaped circular guide hole 17 aligned with the center of the slot 12. Means (not shown) are provided for drawing the batting successively and continuously through the slot 12 and the guide hole 17. This means for drawing the batting is preferably situated at a point in the path of the travel of the batting beyond the guide hole and may comprise a device which wraps the folded batting emerging from said guide hole and thereby forms a cigarette filter tip therefrom.

Positioned between the two plates 11 and 16 are a plurality of wires 18*a*, 18*b*, arranged in two intermeshing sets, each wire having its ends supported on said plates. The wires 18*a* of the upper set extend downwardly along the plate 11 to the upper edge of the slot 12, then, after a substantially right angle bend 19*a*, extend with a gradual downward slope and in converging relation (see Fig. 2) towards the guide hole 17, then make another right angle bend 21*a* adjacent to the guide hole and extend straight up before making another bend to the plate 16. The wires 18*b* of the lower set are substantially identical with those of the upper set 18*a* but are mounted in mirror image fashion with respect to said upper set. That is, the wires 18*b* extend upwardly along the plate 11 to the upper edge of the slot 12, then after a substantially right angle bend 19*b*, extend with a gradual upward slope and in converging relation towards the second plate 16 and between adjacent upper wires 18*a*, then make another right angle bend 21*b* adjacent to the guide hole 17 and then extend straight down before making another bend to the plate 16. The bends 21*a*, 21*b* are arranged substantially along the circumference of a circle whose diameter is about the same as the diameter of the entrance to the funnel-shaped guide hole 17, the bends 21*b* of the lower wires 18*b* being above the bends 21*a* of the upper wires 18*a*. The wires 18*a*, 18*b* may be round as shown in the drawing, or of any other suitable cross-section.

In operation, the batting 13 is drawn from the roll 14, over a guide roll 22 which aligns the batting with the slot, and then through the slot 12. The width and thickness of the batting 13 is sligthly less than the width and height of the slot 12, so that the batting passes easily therethrough. The batting then passes along the wires 18*a*, 18*b* which deflect it alternately up and down across its width to form continuous longitudinal folds in the batting. In the embodiment shown in the drawing and described above these folds are not of equal depth but are rather of such dimensions that the batting takes a generally circular cylindrical form. The folded batting then passes through the guide hole 17, where it is compressed by engagement with the converging walls thereof. After emerging from the guide hole 17 the folded batting may be introduced into the wrapping section of a cigarette-making machine to serve as a cigarette filter tip.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Apparatus for the continuous lengthwise folding of strip material, which comprises means for feeding said strip material, a plurality of guide members extending along the path of said strip material and adapted to engage said strip material, said guide members being arranged in sets, said sets being spaced apart at one end to provide an entrance for receiving said strip material, and the guide members of one set intermeshing with the guide

members of another set along the path of movement of said strip material with the guide members adjacent the outer edges of said strip material intermeshing to a lesser degree than the guide members adjacent to the center of said strip material, said guide members being disposed so as to effect gradual lengthwise folding and simultaneous gradual transverse gathering of said material into a plurality of longitudinal pleats with the pleats in the central portion of the strip material larger than the pleats at the lateral portions thereof.

2. Apparatus as set forth in claim 1 in which said entrance is adapted to receive a substantially flat strip without substantial deformation of said strip at said entrance and the degree of intermeshing of said guide members is such that said strip material is folded into a shape of substantially circular outline.

3. Apparatus as set forth in claim 2 in which said guide members are wires.

4. Apparatus as set forth in claim 2 in which there is a member having a slot disposed adjacent said entrance for the passage of said strip material through said slot before said strip material engages said entrance.

5. Apparatus as set forth in claim 2 in which there is provided a guide adapted to engage said folded strip material around the entire periphery thereof as said material leaves said guide members.

6. Apparatus as set forth in claim 5 in which said guide has converging walls for compressing the folded strip material passing therethrough.

7. Apparatus as set forth in claim 1 in which said guide members are wires.

8. Apparatus as set forth in claim 1 in which there is a member having a slot disposed adjacent said entrance for the passage of said strip material through said slot before said strip material engages said entrance and there is provided a guide adapted to engage said folded strip material around the entire periphery thereof as said material leaves said guide members.

9. Apparatus as set forth in claim 1 in which said entrance is adapted to receive a substantially flat strip without substantial deformation of said strip at said entrance.

10. Apparatus for the continuous lengthwise folding of a batting of randomly arranged fibers, comprising means for mounting a roll of said batting in strip or sheet form, a member having a straight slot for the passage of said batting therethrough in flat condition, a guide roller for directing said batting from said roll to said slot, a second member carrying a funnel-shaped guide aligned with the center of said slot for receiving said batting in folded condition and for compressing said folded batting into a shape of substantially circular outline as it passes therethrough, a plurality of guide wires extending between said two members and mounted thereon, said guide wires being adapted to engage said batting as it passes from said slot to said funnel-shaped guide, said guide wires being arranged in two sets, said sets being spaced apart at one end to provide an entrance for receiving the substantially flat batting from said slot without substantial deformation of said strip at said entrance, the guide wires of one set intermeshing with the guide wires of the other set along the path of movement of said strip material to effect lengthwise folding and transverse gathering of said material into a plurality of longitudinal pleats, the guide wires of each set converging from the outer edges of said batting toward the center thereof, the guide wires adjacent the outer edges of said batting intermeshing to a lesser degree, and defining smaller pleats, than the guide wires adjacent to the center of said batting, the degree of intermeshing of said guide wires being such that said batting is folded into a shape of substantially circular outline, the guide wires of each set extending from the edge of said slot in a substantially straight line into said converging intermeshed relationship and then diverging sharply, out of intermeshed relation, from the guide wires of the other set.

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