

April 19, 1927.

W. M. WHEILDON

1,625,178

EDGE FOLDER

Filed Feb. 4, 1922

2 Sheets-Sheet 1

Fig. 1.

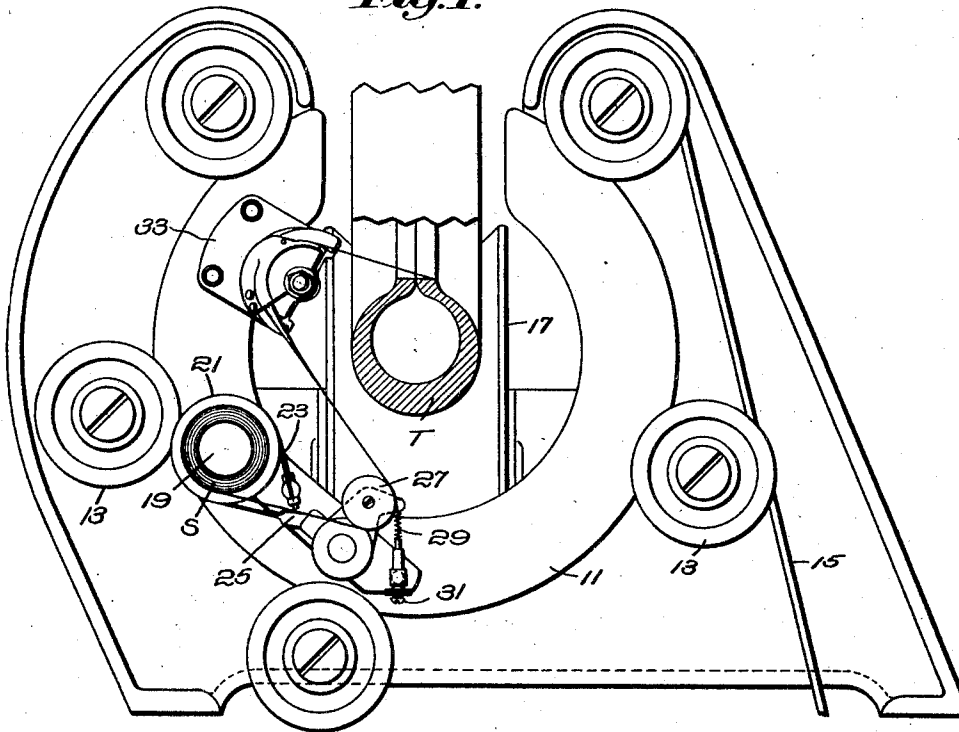


Fig. 2.

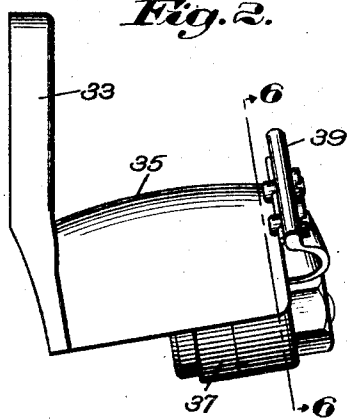
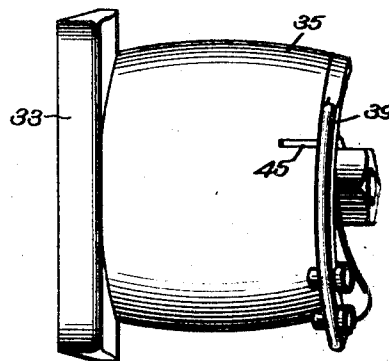


Fig. 3.



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Fig. 4.

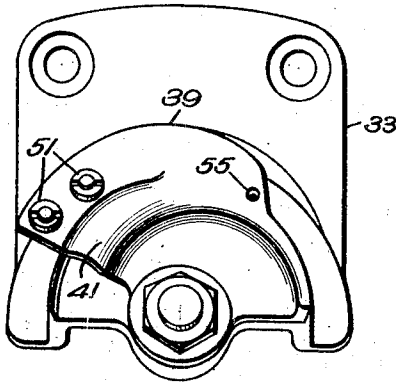


Fig. 5.

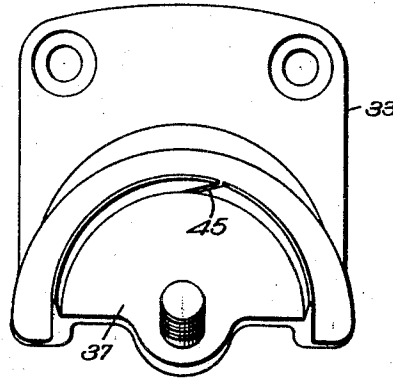


Fig. 6.

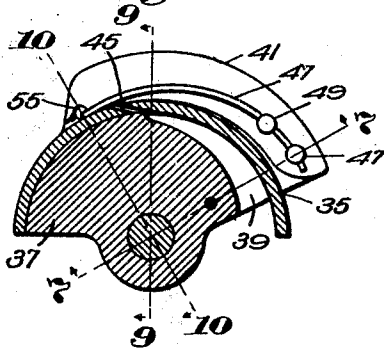


Fig. 7.

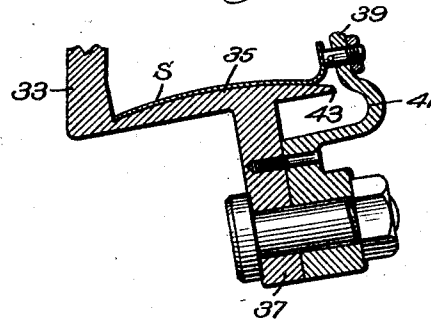


Fig. 8.

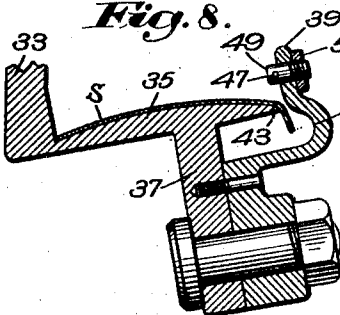


Fig. 9.

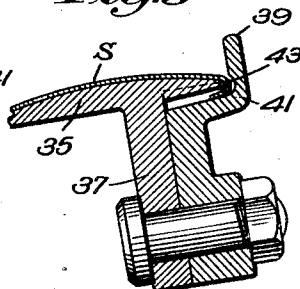
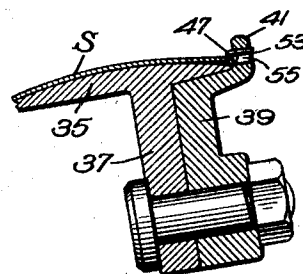


Fig. 10.



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UNITED STATES PATENT OFFICE.

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EDGE FOLDER.

Application filed February 4, 1922. Serial No. 534,126.

This invention relates to folding devices and in its more specific aspect to a device adapted to fold over the edge of a strip of material. Such a device finds a useful application in a machine for wrapping tires, wire coils and like annular articles with a strip of paper helically applied. As disclosed in the patent to Dixon 351,584, October 26, 1886, it is sometimes desirable to fold the edge of the wrapping strip so that the exposed edge will be folded over. As a specific example of my invention I have therefore herein disclosed a device designed for and used in connection with a tire wrapping machine.

My invention will best be understood by reference to the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is an elevation of a portion of a tire wrapping machine of known type having an embodiment of my invention incorporated therewith;

Fig. 2 is a side elevation of the folding element proper on a larger scale;

Fig. 3 is a plan view thereof;

Fig. 4 is an end elevation of the same;

Fig. 5 is a view similar to Fig. 4 with a portion removed;

Fig. 6 is a section on the line 6—6 of Fig. 2;

Fig. 7 is a section on the line 7—7 of Fig. 6 showing the paper in position;

Fig. 8 is a view similar to Fig. 7 showing the paper after tension has been applied thereto; and

Figs. 9 and 10 are sections on the lines 9—9 and 10—10 of Fig. 6, respectively.

Referring to Fig. 1 of the drawings, I have there shown a portion of a wrapping machine of known type wherein a partly annular shuttle 11 suspended on the supporting rolls 13 is adapted to be revolved by means of the belt 15 through the eye or central opening of a tire T which is itself supported and revolved by rolls 17, one of which is shown. A supply of wrapping strip is carried by the shuttle and as a result of the revolution of the shuttle and the rotation of the tire is drawn off from the former and applied to the tire as a helical wrapping in a manner well understood. My invention in the form disclosed provides means for fold-

ing one edge of the wrapping strip as it is drawn from the supply and before it is applied to the tire.

A suitable supply roll of wrapping strip *s* is mounted on the shuttle 11 and suitable tension means are provided so that the wrapping will be drawn off under tension and applied to the tire. As the unwinding torque on the roll decreases as the size of the roll decreases, the tension is preferably made variable to compensate for the variation in the size of the roll. In Fig. 1 the roll *s* is non-rotatably mounted in any suitable manner upon a spindle 19 to which is secured a brake wheel 21 with which cooperates a band brake 23. One end of the band brake is fixed to the shuttle and the other end is connected to the arm 25 of a bell crank lever, the other arm of which carries a guide roll 27 over which the strip *s* is led on its way to the tire. A suitable spring 29, which may be adjusted by means of the screw 31, acts on the bell crank and normally positions the same. The strip *s* is looped about the roll 27. The strip can unwind from the spindle 19 only when the band brake is relaxed and this is effected by the pull of the strip on the roll 27. A very slight motion of the lever which carries that roll, however, serves to release the spindle 19 and so the tension of the paper will at all times be determined by the pull necessary to force the spring 29 slightly to yield. As the size of the supply roll decreases, the length of strip between the supply roll and roll 27 moves more nearly parallel to the portion beyond the roll and the resistance to unwinding acts more effectually on the bell crank. If the unwinding pull on the end of the strip were constant in pounds, a greater force would be exerted tending to rock the bell crank. Therefore, a lesser pull in pounds is sufficient to overcome the resistance of spring 29 and to relax the band brake when the size of the roll diminishes.

The strip *s* on its way between the guide roll 27 and the tire T passes over the folding device which is more particularly the subject matter of the present application and is shown in detail in Figs. 2 to 10.

Referring first to Figs. 2 and 3, the folding device may be organized on a base plate adapted to be secured to the face of the

shuttle and this base plate serves as one flange of a strip-receiving trough hereinafter referred to. From the base plate projects a convex supporting surface 35 in substantially the form of a cylindrical segment, but preferably crowned in the manner of a pulley as clearly seen from Fig. 2. The face of this supporting surface 35 is preferably tipped upwardly at an angle from the base plate 33 and therefore to the plane of the shuttle 11 to which the latter is secured. Since the spindle 19 which carries the supply roll of paper is mounted perpendicular to the shuttle, this means that the convex supporting surface 35 is oblique to the plane of the paper strip as it is delivered to the folding device. This not only provides for certain advantages hereinafter referred to but also guides the paper to the tire T more effectually, conforming to the pitch at which the wrapping is applied. Conveniently formed as a separate piece and secured to a web 37 of the surface 35 is a member 39 which forms a flange of a trough opposing the flange formed by the supporting plate 33, but preferably as seen in Figs. 2 and 4 this flange does not extend completely to the receiving side of the surface 35, that is, the left hand side in Fig. 4.

Referring to Fig. 7, I have there shown the paper as is first applied to the folding device on starting the operation of the machine and it will be seen therefrom that the trough defined by the parts 33 and 39 is preferably narrower than the unfolded strip *s*. It will also appear that it is perfectly unobstructed from above so that the unfolded strip may be seized by the operator and the body portion thereof between the ends freely placed into the trough from above and the edge will be folded over in the manner more readily understood as the description proceeds. As distinguished from folding devices hitherto known, there is no necessity for threading the strip through a more or less closed eye or loop or for preliminarily folding over of the edge by hand to initiate the folding operation.

As clearly appears from Fig. 7 a portion of the flange 39 adjacent the intake end of the folding device is bowed at 41 around the margin of the supporting surface 35 to provide a free edge 43 on the latter, which as seen in Fig. 2 extends beyond the flange on the intake side of the device. Now when the strip is tensioned by initiating the operation of the machine the free edge of the strip, which in Fig. 7 is shown folded upwardly through the action of placing it into the trough, is drawn downwardly and overlaps the edge 43 and is unsupported. The tension then causes it to assume the position shown in Fig. 8 bent downwardly over this edge. At the beginning of the surface 35 before the end of the flange is reached nothing

opposes this bending of the strip and as the strip is drawn forward the bent over edge passes in between the edge 43 and the flange 41 in the position shown in Fig. 8. This action is particularly marked if the wrapping strip *s* is of expansible material such as is used, for example, in making the package described in the patent to Edward H. Angier, No. 1,282,167, October 22, 1918. The folding device, however, serves also to fold plain inextensible paper.

While I do not wish to be understood as binding myself to any particular mechanical theory of operation, I believe that, in the preferred form of the invention herein disclosed, a number of factors cooperate to effect the turning over of the edge of the paper in the manner illustrated in Fig. 8. The strip is tensioned around the cylindrical surface 35 in a convex path and the tension tends to draw the unsupported part of the strip taut and thus pulls it down over the edge 43. Also, when the supporting surface 35 is set at an angle the outer edge of the strip passes through a longer path than the inner edge and the tendency under tension then is for the unsupported edge to seek the shorter path. The crowning of the surface 35 tends to cup the strip across its width and where unsupported it follows with a sharper curvature this initial cupping. I may point out here, however, that I believe the crowning of the surface 35 serves the further function of centralizing the strip on the surface in the same manner as a belt is centralized on a pulley so as to prevent it from being drawn sidewise and crowded off the edge 43. The angular position of the surface 35 also neutralizes any tendency in this direction.

The portion 41 of the flange element 39 where it opposes the edge 43 is formed as a guide surface which acts in the manner of the mold board of a plough, being preferably gradually tapered in and towards the edge 43 as will be clearly understood by a comparison of Figs. 8 and 9. As the strip is drawn along, the bent over edge thereof shown in Fig. 8 is turned and guided by the element 41 and folded over the edge 43 of the supporting surface 35. The surface may be so formed as to start the folding of the edge of the strip which when once started will follow the curvature given it or, as in the example shown, the surface may be designed to follow and support the strip substantially throughout until it reaches the folded position of Fig. 9.

I prefer to arrange the guiding surfaces to contact with the paper adjacent the angle of fold and not to extend to the edge thereof. It is well known that the edge of paper has considerable wearing and cutting capacity and the edge of a strip of paper running at high speed against a strip of metal

will soon destroy the latter. In the embodiment of the invention shown the edge of the strip is to be folded inwardly and by tensioning it in the manner described about the surface 35 with the edge unsupported, the edge is bent down in the manner shown in Fig. 8. The guiding surfaces 41 instead of acting on the direct edge of the paper in its unfolded position and supported stiffly like a knife thereagainst crowds laterally against the bent over paper and guides it from the bent position of Fig. 8 to the folded position of Fig. 9 with an avoidance of undue wear.

While for certain purposes the flange 39 of the strip receiving trough may be utilized to fold over by itself the edge of the strip I preferably arrange as herein for first bending the edge of the strip approximately at right angles to the body thereof by other means.

Since in the form of the invention shown the edge of the paper is folded underneath it embraces the edge 43 of the surface 35 and the surface is therefore provided with a slot 45 (see Figs. 3 and 6) to permit the underturned fold to pass from underneath the edge and with the main body of the paper to overlie the continuation of the surface 35 that forms the further portion of the trough. If desired suitable means may be provided for pressing down and creasing the fold made in the edge of the paper and I have herein shown a presser formed from a piece of piano wire 47 or other light durable material, the end of which passes through the studs 49 in the upper portion of the flange 39 and is clamped against the inner face of that flange by the nuts 51 of said studs. The wire, as best shown in Fig. 6, slopes downwardly toward the bottom of the trough and has a laterally bent end 53 (Fig. 10) closely overlying the bottom at a point beyond the slot 45 so as to press down the folded edge of the paper after it issues from that slot. Preferably the end of the wire 53 passes loosely through a suitable opening 55 at the end of the flange 39. The wire may thus spring to one side, being laterally yieldable, and thus offers no substantial resistance to the insertion of the strip from the open side of the trough at the beginning or to the initial bending of the same in the manner illustrated in Fig. 8.

I have described in detail the particular form of my invention shown in the drawing in order that the construction and operation of that particular device might be well understood and not because all the features described are essential to my invention in its broader aspects.

What I do claim as new and desire to secure by Letters Patent I shall express in the following claims:

1. A folding device for a strip comprising

a trough adapted freely to receive from above an unfolded portion of the strip between the ends thereof, an edge turning surface on a flange of said trough and a laterally yieldable presser beyond the said surface.

2. A folding device for a strip comprising a trough adapted freely to receive from above an unfolded portion of the strip between the ends thereof, the bottom of said trough presenting an edge portion under which the margin of the strip is adapted to be folded, a turning surface on the flange of said trough adjacent said edge and a laterally yieldable presser beyond said surface.

3. A folding device for a strip comprising a trough narrower than the unfolded strip and adapted freely to receive from above an unfolded portion of the strip between the ends thereof, the interior of said trough being shaped to fold over the surplus width of the strip as it is drawn therethrough.

4. A folding device for a strip comprising a convex element having a crowned face and disposed obliquely to the plane from which the strip is delivered and having an edge over which the strip may bend and a guide adjacent said edge for infolding the strip thereover.

5. A folding device for a strip comprising a convex element disposed obliquely to the plane from which the strip is delivered and having an edge over which the strip may bend and a guide adjacent said edge for infolding the strip thereover.

6. A folding device for a strip comprising a convex element having a crowned face and having an edge over which the strip may bend and a guide adjacent said edge for infolding the strip thereover.

7. A folding device for a strip comprising an element over which an unfolded portion of a strip between the ends thereof may be freely laid, said element having a free edge over which the edge of the strip may be folded, an edge turning guide adjacent said free edge, said element having a slot to permit the release of the folded over portion of the strip from said edge.

8. A folding device for a strip comprising an element over which an unfolded portion of a strip between the ends thereof may be freely laid, said element having a free edge over which the edge of the strip may be folded, an edge turning guide adjacent said free edge, said element having a slot to permit the release of the folded over portion of the strip from said edge and a presser opposing said element beyond said slot.

9. A folding device having an open side in which a portion of unfolded paper strip between the ends thereof is adapted to be placed by a movement transverse to the body of the strip and formed to fold the

edge of such strip as it is drawn through the device.

10. A folding device having an open side in which a portion of unfolded paper strip
5 between the ends thereof is adapted to be placed by a movement transverse to the body of the strip and formed to fold under the edge of such strip as it is drawn through the device.

11. A folding device comprising a trough in which a portion of strip between the ends thereof may be placed by a movement of approach substantially perpendicular to the plane of the strip to be received between
15 the sides or flanges of the trough to be drawn therethrough, said trough having a portion of the bottom cut away to leave an edge of the strip unsupported and a turning surface adjacent said cut-away portion.

12. A folding device comprising a trough through which a strip may be drawn having a portion of the bottom cut away to leave an edge of the strip unsupported, a turning surface adjacent said cut-away portion and a slot through the bottom beyond
25 the cut-away portion.

13. A folding device comprising a trough through which a strip may be drawn having a portion of the bottom cut away to leave an edge of the strip unsupported, a turning surface adjacent said cut-away portion, a slot through the bottom beyond the cut-away portion and a presser beyond the slot.

14. A folding device comprising a support for the strip which provides means for bending a strip transversely by the reaction from tensioning the strip thereover and cooperating guide means for folding over the bent portion.

15. A device for folding the edge of a paper strip comprising a trough in which an unfolded portion of the strip between the ends thereof may be freely placed by a movement transverse to the body of the strip, a flange of the trough being shaped in the manner of a mold board to turn the edge of such strip.

16. A device for folding the edge of a paper strip comprising a trough in which an unfolded portion of the strip between the ends thereof may be freely placed by a movement transverse to the body of the strip, a flange of the trough being shaped in the manner of a mold board to turn the edge of such strip, and a presser opposing the bottom of the trough beyond the molding surface.

17. A device for folding the edge of a paper strip comprising a trough in which an unfolded portion of the strip between the ends thereof may be freely placed, a flange of the trough being shaped in the manner of a mold board to turn the edge of such strip, and a presser mounted on the flange

above the molding surface and inclining beyond the same into cooperating relation with the bottom of the trough.

18. A folding device for a strip positioned to provide in itself a guide receiving the unfolded strip and which deflects the strip out of a straight path and having a shoulder over which an edge portion of the strip may be bent by a tensioned pull thereon to initiate the folding.

19. A folding device for a strip positioned to provide in itself a guide receiving the unfolded strip and which deflects the strip out of a straight path and presenting a supporting surface narrower than the strip over which the edge of the strip may collapse to initiate the folding.

20. In a machine of the class described in combination with a shuttle having means for supporting a supply of wrapping strip, a guide over which the strip is led from the supply and comprising instrumentalities for folding the edge of the strip organized substantially about a cylindrical segment.

21. In machine of the class described in combination with a shuttle having means for supporting a supply of wrapping strip, a guide over which the strip is led from the supply and comprising instrumentalities for folding the edge of the strip organized substantially about a cylindrical segment disposed obliquely to the plane in which the strip is delivered from the supply.

22. A method of folding paper strip characterized by tensioning the strip in a convex path in which the major portion of the width of the strip is supported while leaving an edge thereof unsupported whereby to cause collapse of said edge.

23. A method of folding paper strip characterized by tensioning the strip in a transversely arched form in which the major portion of the width of the strip is maintained while leaving an edge thereof unsupported whereby to cause collapse of said edge.

24. A method of folding paper strip characterized by tensioning the strip in transversely arched form in a convex path in which the major portion of the width of the strip is supported while leaving an edge thereof unsupported whereby to cause collapse of said edge.

25. A method of folding paper strip characterized by tensioning the unfolded strip over an oblique underriding support which upholds the major portion of the width of the strip while leaving the higher edge thereof unsupported to permit the edge of the strip to collapse over the edge of the support to initiate the folding.

26. A folding device for a strip comprising a trough narrower than the unfolded strip and adapted freely to receive from above an unfolded portion of the strip be-

tween the ends thereof, the interior of said trough presenting to the strip for contact therewith between its edges a guide surface to cause the surplus width of the strip to fold over as it is drawn through the trough.

27. A folding device for a strip comprising a convex support having flanges defining a trough narrower than the unfolded strip and adapted freely to receive from above an unfolded portion of the strip between the ends thereof, the interior of said trough presenting to the strip for contact therewith between its edges a guide surface to cause the surplus width of the strip to fold over as it is drawn over the support.

28. A folding device for a strip comprising a convex support narrower than the strip whereby a portion of the same may bend under tension over an edge of such support and a folding guide surface opposing such edge and designed to co-operate with the bent over portion of such strip between the edges thereof and to have clearance from the edge of the strip.

29. A device as defined in claim 28 wherein said guide surface is located inwardly from the end of the support thereby providing an unobstructed space through which the side portion of the strip may freely bend under tension.

30. A folding device comprising a supporting surface for the strip narrower than the strip having a free edge over which the edge of the strip is folded, an element shaped in the manner of a mold board ad-

jacent said free edge, the other edge of the surface having a substantially upright flange whereby a portion of the strip between the ends thereof may be inserted in the folder without substantial distortion of the edge thereof which is to lie adjacent the flange.

31. A folding device comprising a supporting surface having a free edge over which the edge of the strip is folded, a member shaped in the manner of a mold board adjacent said edge, and means for mounting the device in canted position whereby tension on the strip passing therethrough tends to direct it laterally to said member.

32. In a machine of the class described, in combination with a shuttle having means for supporting a supply of wrapping strip, folding mechanism projecting in overhung position from said shuttle and comprising a cylindric supporting surface over which the strip may be looped, said surface being unobstructed from above freely to receive a portion of the unfolded strip between the ends thereof and having a free edge, over which an edge portion of said strip may collapse, and a further trough-like portion having a turning surface shaped in the manner of a mold board to turn over the collapsed edge portion, which trough-like portion is likewise open from above similarly to receive the unfolded strip.

In testimony whereof, I have signed my name to this specification.

WILLIAM M. WHEILDON.