Aug. 30, 1966 K. W. RAMSEY 3,269,722

PORTABLE WEB CENTERFOLDER

Filed Oct. 14, 1964 3 Sheets-Sheet 1

FIG 1.

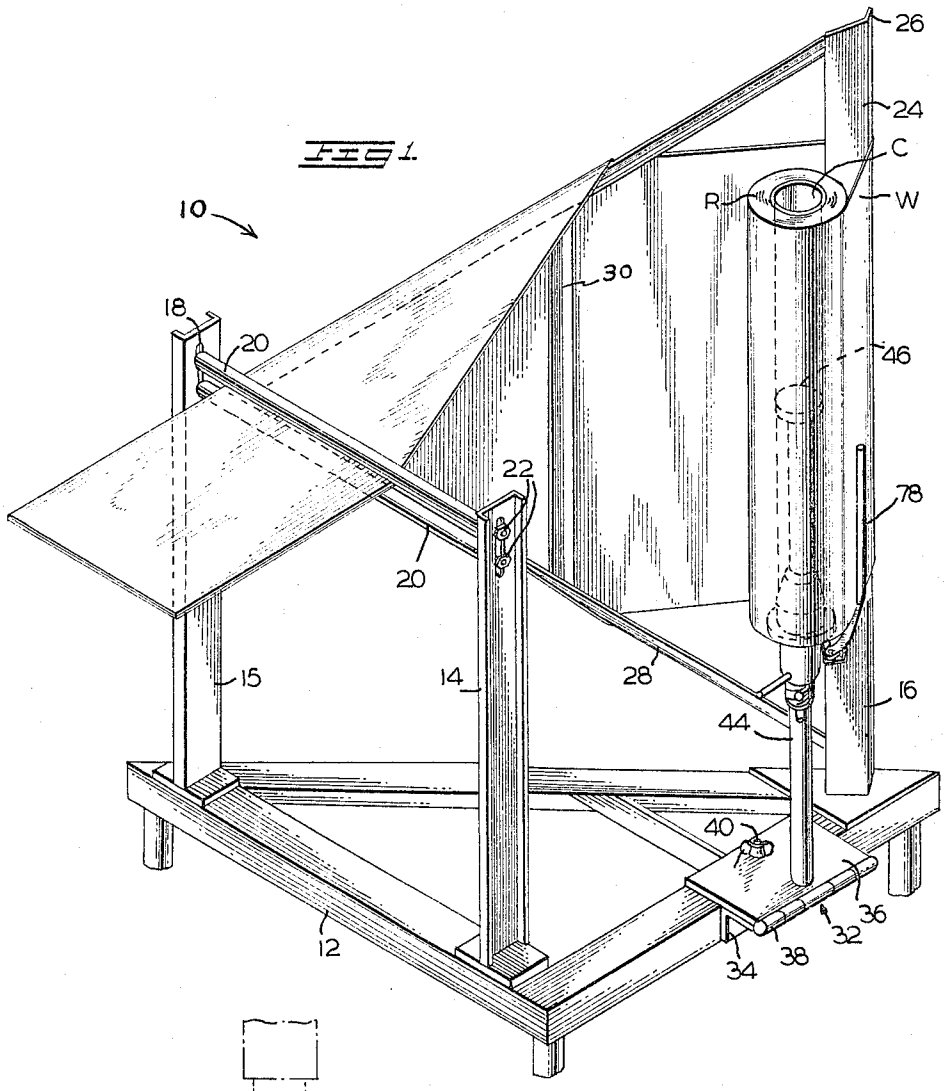
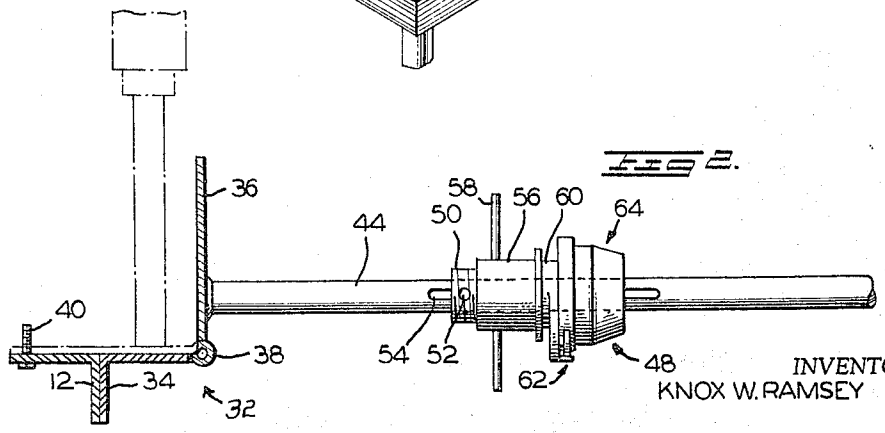


FIG 2.



INVENTOR
KNOX W. RAMSEY

BY Rabin & Rabin

ATTORNEY

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PORTABLE WEB CENTERFOLDER

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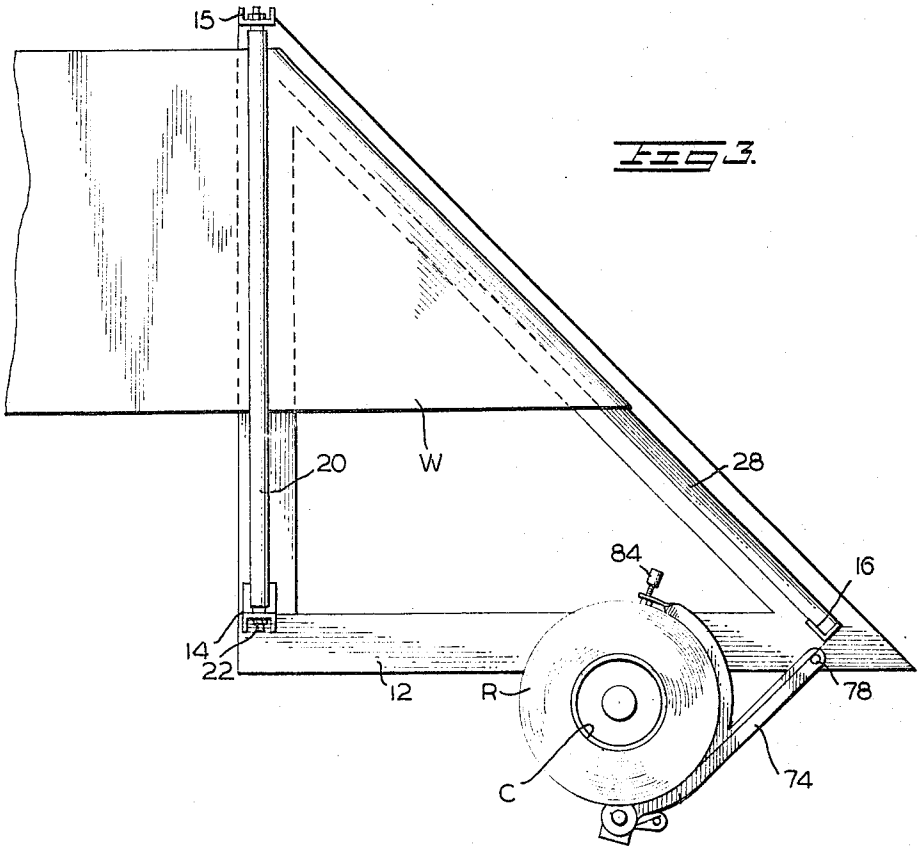
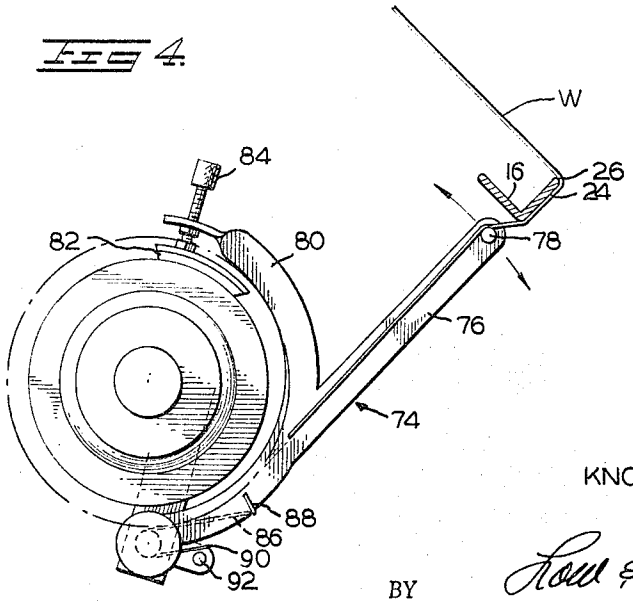


Fig 3.

Fig 4.



INVENTOR
KNOX W. RAMSEY

BY Lowe & Lowe

ATTORNEY

Aug. 30, 1966 K. W. RAMSEY 3,269,722

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Fig 5.

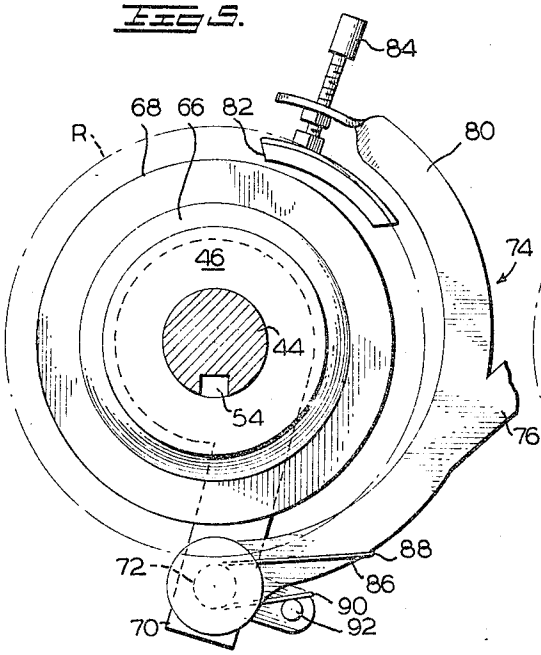
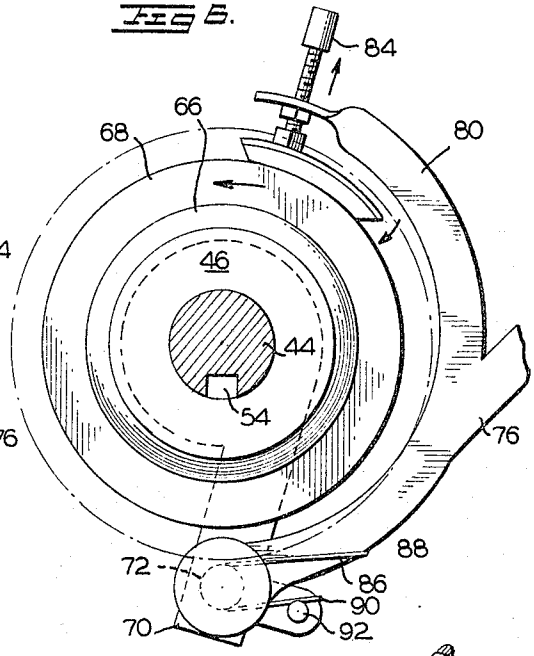


Fig 6.



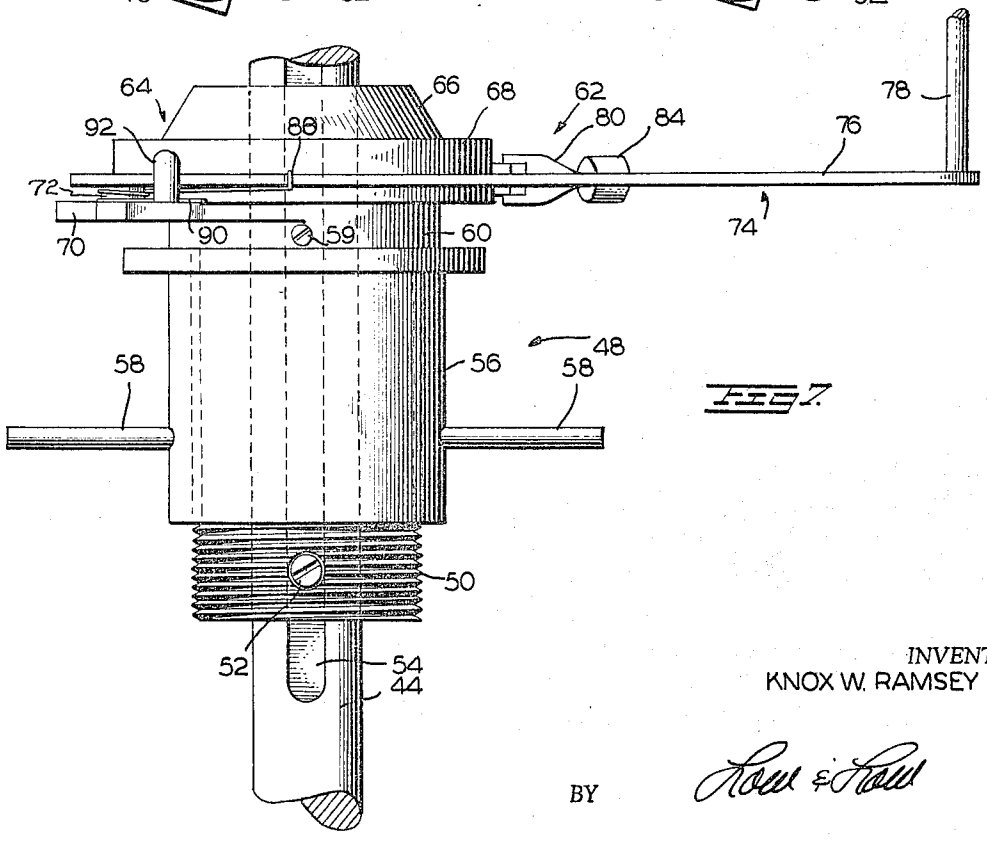


Fig 7.

INVENTOR
KNOX W. RAMSEY

BY Rowe & Rowe

ATTORNEY

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3,269,722

PORTABLE WEB CENTERFOLDER

Knox W. Ramsey, Waynesboro, Va., assignor to McCamsey Machine Company, Incorporated, Waynesboro, Va., a corporation of Virginia

Filed Oct. 14, 1964, Ser. No. 403,785
21 Claims. (Cl. 270—86)

This invention relates to a web folding apparatus and more particularly to a highly efficient and portable device for centerfolding a web of material such as polyethylene or other plastic film for use in conjunction with packaging apparatus.

In many packaging operations employing heat-shrinkable films, such as the overwrap packaging of thin flat articles as jacketed phonograph records, it is economically desirable to employ centerfolded plastic film, i.e. web material which has been U-folded about a line extending longitudinally of the direction of web feed wherein the fold line is disposed substantially midway of the unfolded transverse width of the web. Users of packaging machinery at the present time customarily purchase pre-folded rolls of film for use therewith as it has been economically impractical for packagers to effect centerfolding of an unfolded web just prior to package formation with assurance that the fold will be consistently located at the center of the web or at another desired locale therealong. There have been a number of other operational problems with on-site folding including proper tensioning and braking of the web, ease of height and center adjustments, roll mounting and demounting, and portability of the folding apparatus as desired for various packaging lines. For these reasons, folded-web users heretofore have found it is considerably advantageous to purchase pre-folded rolls of packaging material, despite the substantial additional charge therefor running as high as 25¢ per pound of pre-centerfolded roll film.

It is therefore a principal object of my invention to provide a light-weight and portable centerfolding device which may be associated directly with packaging machinery for centerfolding the packaging film supplied from an unfolded supply roll thereof, whereby the significant additional expense of purchasing pre-folded rolls of film is eliminated. Further, my invention permits the ready use of other types of packaging films which are not normally commercially available in centerfolded roll form, thereby providing the packager with an increased choice of packaging materials.

It is another object of my invention to provide a centerfolder which reliably and consistently folds the web along the centerline or any desired longitudinal line thereof without waste or inaccurate tracking.

It is another object of my invention to provide novel means in a centerfolder apparatus for effecting quick change between a new roll supply and an exhausted core with a minimum of labor and effort.

It is a further object of my invention to provide a centerfolder incorporating a novel brake and web tension means which absolutely prevents inertia-induced overrun of the film during intermittent stoppage of machine operations, yet which does not drag or brake the web feed and folding thereof as the web is drawn from the roll.

Other objects and advantages of my invention will be apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective overall view of my centerfolder showing a web being drawn and folded thereover.

FIG. 2 is a fragmentary side elevation of the roll mounting assembly shown in horizontal position for roll loading and unloading.

FIG. 3 is a top plan view of the apparatus shown in FIG. 1.

FIG. 4 is a top plan view of the brake and tension means on a slightly larger scale.

FIGS. 5 and 6 are enlarged fragmentary views of the brake means shown in engaged and disengaged positions.

FIG. 7 is an enlarged side elevation of the core mount, brake assembly and roll adjustment means.

Referring to the drawings, my centerfolder **10** includes a substantially triangular base **12** to which are secured forward vertical standards **14, 15** and a rear standard **16**. The forward standards **14, 15** are provided with horizontally aligned vertical slots **18** near the upper ends thereof to thereby vertically adjustably receive a pair of freely rotatable rollers **20** between which the folded web is fed and from which it is led to adjunct packaging machinery. Suitable lock nut means **22** permit vertical adjustment of each roller **20** within the slots **18** in conventional fashion.

Rear standard **16** comprises in its simplest form an upstanding member, having a polished rear face **24** and a smoothly curved edge flange **26** over which the unfolded plastic web W is drawn. In another form, standard **16** may comprise a polished tubular member. Extending in converging relation from the upper and lower extremities of standard **16** are a pair of wedge-like folder rails **28** which terminate in an apex adjacent standard **15** at and to one side of the gap between rollers **20**. A suitable reenforcing brace **30** is secured between the converging arms **28** substantially midway thereof to rigidify the folder wedge assembly.

If desired, or as may be necessary with particular web materials, the portions of standard **16** and arms **28** over which the webs pass may be coated or faced with a friction-reducing material such as "Teflon" (polytetrafluoroethylene).

The chief structural elements of the apparatus including the base, standards, and folder wedge are preferably of cast or extruded aluminum, thereby providing a frame which is of relatively light weight and thus easily shifted as required within a plant, while yet having the necessary structural rigidity. Base **12** may be provided with adjustable legs or feet of conventional form to attain proper levelling and overall height of the centerfolding device.

Affixed to one of the bottom frame members **12** somewhat forwardly of standard **16** is a web supply roll support assembly **32** which includes a lower angle plate **34** whose vertical face is secured as by bolting or welding to the base frame **12**, while a plate member **36** is disposed in overlying relation to plate **34** and is hinged thereto along a horizontal axis in conventional fashion at **38** for swinging movement. The hinge plate **36** is normally detachably secured in horizontal relation to base **12** as by means of a bolt **40** which extends through the base **12** and a corresponding aperture in hinge plate **36** receives locking means such as a wing nut **42**. A plurality of bolts **40** or like securing devices may be of course provided as necessary to insure rigidity of hinge plate **36** in its horizontally clamped position. Fixedly secured to and upstanding from hinge plate **36** is a roll support standard or unwind mandrel **44**. A core support cap **46** may be removably and rotatably carried by conventional ball bearing races at the upper end of standard **44**, it being understood that a plurality of caps of varying diameters may be provided for utilization with rolls of film having varying internal core diameters. Standard **44** also carries a roll mounting assembly **48** which permits desired vertical adjustment of the roll rotatably supported thereby, depending upon the width of the web or the desired locale of the fold to be imparted to the web. Core support assembly **48** includes an externally threaded sleeve **50** slidably journaled upon mandrel **44**, the sleeve **50** having set screw means **52** which

cooperate with an elongated groove 54 in mandrel 44, whereby a rough vertical positioning of the core support assembly 48 may be obtained, screws 52 also preventing rotation of sleeve 50 relative to the mandrel. An external sleeve 56 is threaded about sleeve 50 and is provided with hand grip means 58 to facilitate rotation of sleeve 56 with respect to sleeve 50 to thereby axially shift sleeve 56 to achieve fine adjustment and accurate vertical positioning of the mounting means 48. The sleeve 56 supports thereabove an annulus 60 which is slidable upon rod 44 and prevented from rotation thereon as by a set screw means 59. Annulus 60 mounts a tension and brake assembly 62 hereinafter described. Freely rotatably journaled upon rod 44 above sleeve 60 is the roll support member 64 which includes a frustoconical core centering portion 66 and a disk portion 68 integrally formed therewith. Ball bearing races are provided in conventional fashion to permit free rotation of support 64 upon which the roll of film is vertically mounted.

Accordingly, a roll R of web material W having tubular core C therein as indicated, is received over the upper terminal end of mandrel 44 and rests upon flange 68 of the rotatable support member 64, being centered thereon by means of the frustoconical portion 66 thereof. Cap element 46 serves to maintain the supply roll in non-wobbling vertical alignment with the vertical axis of mandrel 44.

Thus, as seen in FIG. 1, the web material W is led rearwardly about rear face 24 and rounded terminal edge 26 of standard 16 and thence forwardly over the converging folder rails 28, whereby the web is centerfolded thereby, and the thus longitudinally folded web is led between the rollers 20. The rollers 20 may be spaced apart as desired to obtain the desired degree of sharpness of fold in the web as well as to hold the web in folded alignment during delivery to associated packaging machinery.

With the unique construction above described, it will be seen that the removal of an exhausted core C and replacement of a new roll R upon standard 44 is readily effected by virtue of the hinge mounting of plate 36. Hitherto one of the chief difficulties in the practical operation of film-folding at the time of packaging as compared with the purchase of pre-folded rolls has been the time-consuming inconvenience of mounting a fresh and therefore relatively heavy roll of unfolded film onto a vertical core support. This problem is solved with the portable centerfolder of my invention, wherein it is but a simple matter to loosen one or more wing nuts 42 to pivot the hinge plate 36 and thereby core standard 44 to a substantially horizontal position as seen in FIG. 2, whereupon the exhausted core may be easily slid therefrom and a new roll readily axially inserted onto the core in horizontal position, either manually or by a dolly without the awkward difficulty of first lifting a new heavy roll to an elevated position, and turning the same upright and thence lowering the roll onto a vertical standard, with the attendant likelihood of marring or otherwise damaging the film.

As the folded film is drawn through rollers 20 in response to demand of the packaging machine, which may be either substantially continuous or intermittent in nature depending upon the particular packaging machinery to be associated therewith, it is important that the web W be maintained under sufficient tension to draw smooth and tautly across the wedge folder arms 28 into the nip of rollers 20 without developing slack which would cause the web to drop or become misaligned with respect to the folding rails 28, whereby proper and accurate centerfolding cannot be achieved and the web may wrinkle, tear or jam in the device. While the web thus must be under reasonable slack-preventing tension, it is likewise imperative that there be no undue drag or braking on the supply roll which would interfere with the free unwinding thereof about mandrel 44.

Similarly, it will be appreciated that with large rolls there is a natural tendency for the roll which has been slowly revolving during the unwinding operation, to continue to unwind by inertia even when positive draw upon the web ceases at a given interval due to intermittent operation of the associated machinery or to temporary shutdown of the same. Such overrunning of the roll would likewise cause the web to fall slack about the centerfolding arms with the resultant difficulties above noted. Further, when the packaging films employed are highly surface-clinging in nature, or achieve relatively great static build-up, continued roll unwind will cause reverse winding of the film, with resultant obvious difficulties when web feedout resumes.

These difficulties are uniquely obviated by the tension and brake assembly 62, which has proved exceedingly reliable in actual packaging operations. To this end, the brake and tension assembly 62 as best seen in FIGS. 4 and 7, includes a short arm 70 projecting outwardly from annulus 60, the arm having upstanding therefrom at its outer extremity a stud 72 to which a tension and brake arm 74 is pivotally secured. Arm 74 incudes a rearwardly extending portion 76 having an upstanding rod 78 affixed thereto adjacent its outer extremity, which rod 78 is disposed on the outside face of the web W as the same is unrolled as seen in FIGS. 1, 3, and 4. Arm 74 further includes an arcuately curved portion 80 lying in the plane of core support flange 68 but is sufficiently spaced therefrom to be free of contact therewith. At the terminal end of curved leg 80 there is mounted thereon an arcuate brake shoe 82 which may be radially adjusted by means of threaded rod 84, whereby the relative proximity of the brake shoe 82 to the disc 68 may be varied as necessary to obtain proper clearance during operation, in accordance with brake shoe wear, permissible slack desired, etc. Arm 74 is normally urged in a counterclockwise braking direction as seen in FIGS. 3, 4 and 5 for example, by means of torsion spring 86 which is wrapped around post 72 and has one terminal end 88 engaging arm 74 and its other terminal end 90 bearing against an upstanding stud 92 on fixed arm 70.

Thus it will be seen that brake and tension arm 74 tends to pivot in a counterclockwise direction and thus inwardly of standard 16 by virtue of spring 86, thereby tending to bring brake shoe 82 into contact with the peripheral surface of supply roll mounting flange 68. However, it will be appreciated that as the web W is drawn through the device, the web will become relatively taut between the supply roll and standard 16, thereby urging upstanding rod 78 and its associated arm 74 in a clockwise direction to overcome spring 86 and thereby holding brake shoe 82 free from contact with the peripheral face of flange 68. The relatively great length of arm 76 serves to promptly lever brake shoe 82 from flange contact immediately upon the development of draw tension in the web.

Thus it will be seen that there is no contact or frictional drag whatever being exerted upon supply roll support plate 64, whereby the roll supported thereon may unwind freely with only a light pulling force on the web. When, however, demand from the associated packaging or other apparatus momentarily ceases, any further inertial or momentum induced unwinding of roll R while the withdrawn portion remains stationary will immediately cause a modicum of slack between the roll and post 16, thereby permitting web-contacting rod 78 to pivot inwardly under the influence of spring 86 thereby bringing brake shoe 82 into immediate braking contact with the roll support collar 68 to immediately stop roll unwinding. Pivoting motion of arm 80 and brake shoe 82 into contact with flange 68 thus effects the immediate stopping of roll rotation. In this connection it is important to note, as seen in FIGS. 5 and 6, that only a minor brake shoe portion, namely the remote end of shoe 82 initially contacts the face of flange 68 and the first immediate drag and binding action thereon as the roll

and the flange **68** attempt to continue to rotate in a counter-clockwise direction, cause the arm **80** to slightly flex to bring the entire brake shoe surface into contact with the face of the flange **68** as indicated by the several arrows in FIG. 6, thereby insuring the positive immediate stoppage of rotation. Once the roll is stopped, the sightly stressed arm **80** flexes back to its normal position somewhat similar to FIG. 5, thereby effecting a self-releasing action or a major portion of the brake shoe, the remote minor portion thereof only remaining in light contact with the flange **68** under the force of spring **86**, until web feedout is resumed. It is to be noted also that inasmuch as brake shoe **82** does not engage the web material directly, no marring or wrinkling of the rolled plastic will occur during the braking action.

Accordingly, it will be seen that my centerfolder apparatus is exceedingly simple in construction and mode of operation, yet is highly effective for the purposes contemplated and has proven its value in actual use. The capability of ready adjustment thereof to achieve any desired fold with a minimum of effort is apparent, wherein it is only required to effect the threaded adjustment of sleeve **56** to raise or lower the core support **64**, or where necessary to effect a major axial shift thereof by virtue of the externally threaded sleeve **50** and lock means **52**. Thus the web can be folded precisely medially thereof, or with no difficulty can be adjusted to provide a slightly offset fold to any extent desired as required by the operator.

It will further be seen that with all major structural elements of my centerfolder being formed from lightweight materials such as aluminum, including the triangular base support and the several standards, the entire centerfolder may be moved or re-located as desired within a plant to whatever machinery with which it is desired to employ the same, and wherein in addition to the ease of transporting thereof, new or different rolls of unfolded web material may be readily supplied by virtue of the pivoted mounting of the roll support mandrel.

What I claim is:

1. A device for longitudinally folding a web of flexible material comprising

a base,

a mandrel upstanding from said base and having means thereon for vertically rotatably mounting a supply roll of said web material,

a web guide standard upstanding from said base and disposed rearwardly of said mandrel and having vertical surfaces thereon about which said web material is trained,

a pair of folder arms respectively secured to and extending forwardly in converging relation from vertically spaced points on said guide standard and being connected at their apex over which said web is trained to be folded longitudinally thereby,

and a pair of vertically spaced rollers rotatably carried by said base forwardly of said apex and extending transversely thereof in a horizontal plane between which said folded web is fed to thereby draw opposing margins of said web into horizontal parallelism as said web passes toward said folder arms apex.

2. The web folding device of claim **1** further including means permitting vertical adjustment of said rollers to vary the gap therebetween in accordance with the thickness of the folded web material and the crease desired to be imparted thereto.

3. The device of claim **1** wherein said guide standard and said converging arms are provided with smooth surfaces thereon in contact with said web trained thereabout.

4. The device of claim **1** wherein said guide standard and said converging arms are coated with a material having a low coefficient of friction.

5. The device of claim **1** wherein said material is polytetrafluoroethylene.

6. The device of claim **1** wherein said base includes a pair of horizontally spaced vertical standards between which said rollers are mounted, said standards being disposed respectively on opposite sides of said folder arm apex forwardly thereof.

7. The device of claim **1** wherein said mandrel is pivotally secured to said base for swinging movement about a horizontal axis through substantially 90° to facilitate supply roll mounting thereon and demounting therefrom, and means for detachably retaining said mandrel in vertical position.

8. The device of claim **1** wherein said roll mounting means is vertically adjustable along said mandrel to thereby compensate for different supply roll web widths as well as to vary the desired longitudinal fold line of the web fed through the device.

9. The device of claim **8** wherein said roll mounting means includes a first sleeve mounted on said mandrel for vertical adjustment thereon, and a second sleeve carried by said first sleeve for vertical adjustment with respect thereto, said second sleeve rotatably carrying thereon a roll support sleeve in surrounding relation to said mandrel.

10. The device of claim **9** wherein said first sleeve and mandrel have cooperating key and slot means for linearly axially adjusting said first sleeve thereon, and said first sleeve and said second sleeve are threaded for rotative axial adjustment of said second sleeve thereon.

11. The device of claim **1** wherein said roll mounting means is provided with a brake for preventing web unwinding rotation thereof when the web material is slack between the supply roll and said guide standard.

12. The device of claim **11** wherein said brake includes an arm pivotally mounted for swinging movement about a vertical axis, said arm being bifurcated to define a first portion having a brake shoe disposed adjacent said roll mounting means and a second portion extending rearwardly therefrom for engaging said web, and spring means urging said arm to pivot about its axis to bring said brake shoe into contact with said roll mounting means, said spring yielding to opposite pivotal movement effected by said web under tension in engagement with said arm second portion.

13. The device of claim **12** wherein said roll mounting means comprises a disk rotatably mounted on said mandrel for supporting a supply roll thereon.

14. The device of claim **13** wherein said brake shoe swings into engagement with said disk when said web is slack to prevent further rotation thereof and the supply roll carried thereby.

15. The device of claim **14** wherein the terminal portion of said brake shoe initially engages said disk, and wherein said arm first portion flexes under disk rotative force to thereby bring the entire braking portion of said brake shoe into engagement with said disk, and said arm flexes to unstressed condition to thereby release said entire braking portion upon stoppage of said disk.

16. The device of claim **1** wherein said guide standard comprises a member having angularly related flanges, one of said flanges having an outwardly directed smooth surface over which said web passes, said flange having a smoothly curved rear terminal over which said web passes in being redirected forwardly over said folded arms.

17. The device of claim **1** wherein said folder wedge arms define with said guide standard a vertically oriented isosceles triangle.

18. The device of claim **1** wherein a core support cap is rotatably carried by the upper terminal end of said mandrel, said cap having a diameter corresponding substantially to the internal core diameter of the supply roll mounted on said mandrel.

19. Braking means for web unwinding apparatus hav-

ing means rotatably mounting a roll of web material comprising

a brake shoe carried by a support mounted for movement toward and away from said roll mounting means,

resilient means normally urging said support and said brake shoe carried thereby toward said roll mounting means,

means operative during normal web draw-unwinding from said roll to maintain said brake shoe out of contact with said roll mounting means against the force of said resilient means,

said brake shoe having a minor portion thereof urged by said resilient means into initial contact with said roll mounting means upon termination of web draw-unwinding to initially retard momentum-induced roll unwinding rotation,

said support cooperating with said brake shoe minor portion and said roll mounting means for bringing the entirety of said brake shoe into contact with said roll mounting means while inertial forces are present to thereby exert a maximum stopping force on said roll mounting means, and said support further cooperating with said brake shoe and said roll mounting means upon stoppage of said roll mounting means for removing a major portion of said brake shoe therefrom to leave only said minor brake shoe portion in engagement with said roll mounting means.

20. In a web unwinding device having a rotatable mounting means for a roll of web material,

a brake assembly for stopping momentum-induced roll-unwinding rotation of said roll mounting means,

said brake assembly including an arm mounted for pivotal movement toward and away from said roll mounting means,

a brake shoe carried by said arm having an arcuately curved braking surface corresponding substantially to the curvature of said roll mounting means,

said braking surface having a leading minor portion and a trailing major portion,

spring means urging said arm toward said roll mounting means to bring said leading minor brake portion into contact with said roll mounting means to exert an initial drag thereon,

said arm having a portion capable of limited flexure whereby drag between said minor brake portion and said roller mounting means serves portion and flex said arm to bring said trailing major brake surface portion into contact with said roll mounting means to stop rotation thereof,

said arm portion upon stoppage of said roll mounting means flexing back to an unstressed position to thereby unseat said trailing major brake surface portion from said roll mounting means and leave said leading minor brake surface portion in contact therewith under the force of said spring means.

21. A device for longitudinally folding a web of flexible material comprising

a base,

vertically disposed rotatable supply roll support means on said base,

a vertical web guide standard on said base disposed rearwardly of said roll support means,

a pair of web folder arms disposed in a vertical plane secured to and extending forwardly from said guide standard in converging relation and terminating in an apex,

a pair of horizontally disposed rollers rotatably mounted transversely and forwardly of said apex,

and brake means for said roll support means,

said brake means having an inoperative position, a minimum braking position, and a maximum braking position relative to said roll support means,

said roll support means and said brake means cooperating to locate said brake in said inoperative position during normal roll unwinding draw forces; in said minimum braking position upon the initial occurrence of a predetermined amount of slack; in said maximum braking position during roll momentum induced unwinding; and in said minimum braking position upon full stoppage of said roll rotation.

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EUGENE R. CAPOZIO, *Primary Examiner.*

N. M. ELLISON, *Assistant Examiner.*