March 29, 1960 F. W. BREY 2,930,270

TENSION EQUALIZER FOR SHEET MATERIAL

Filed July 26, 1956 2 Sheets-Sheet 1

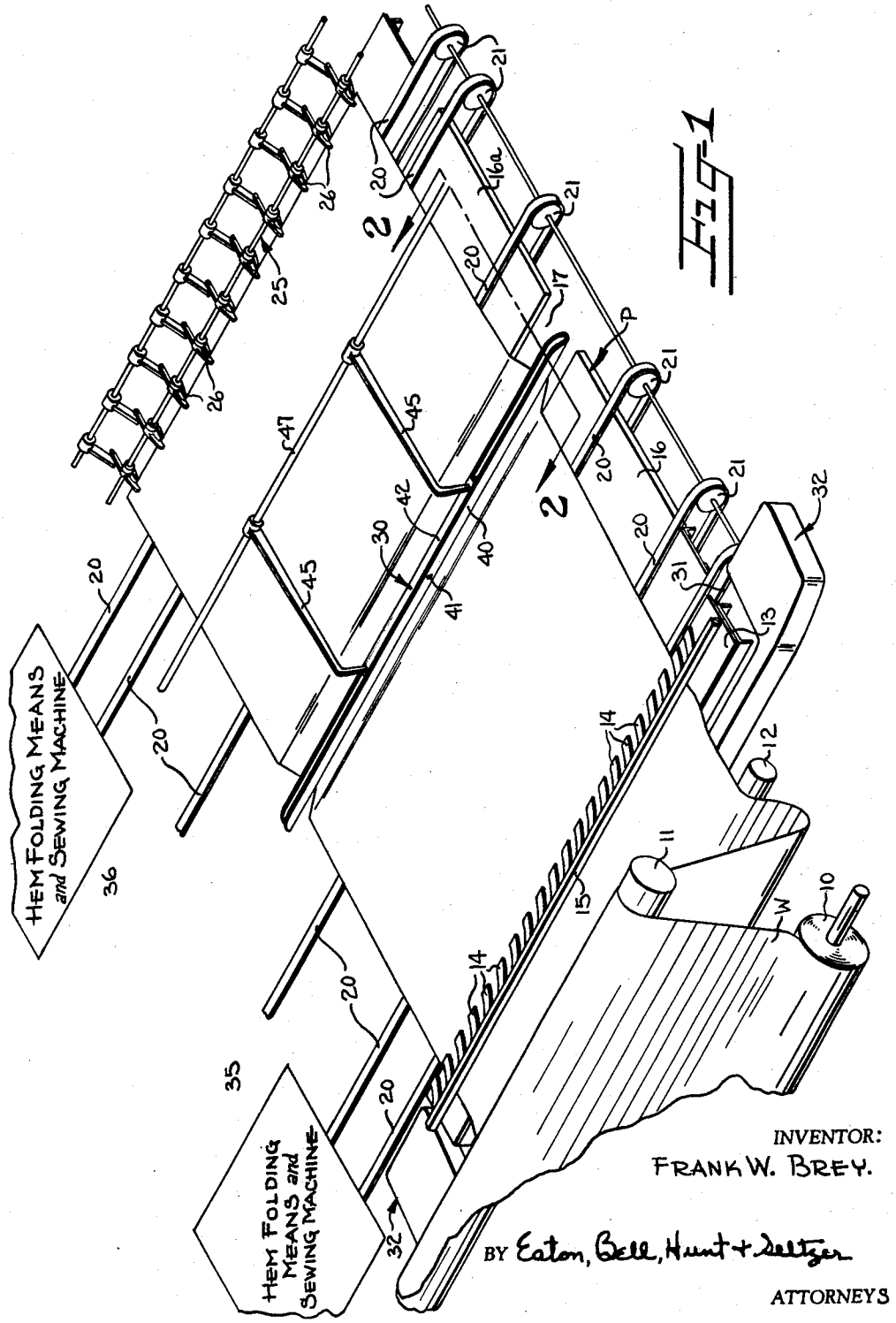


FIG-1

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Filed July 26, 1956 2 Sheets-Sheet 2

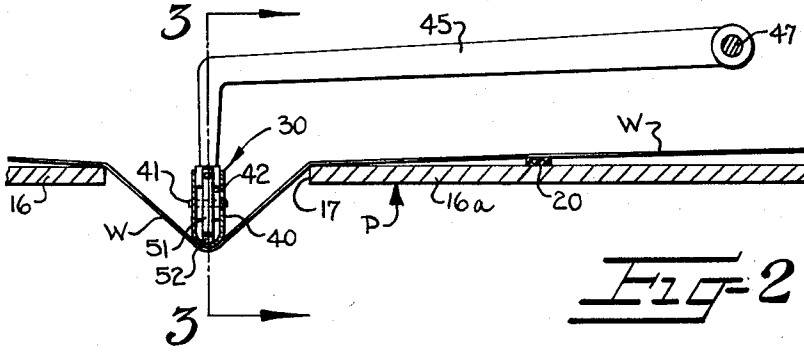


Fig-2

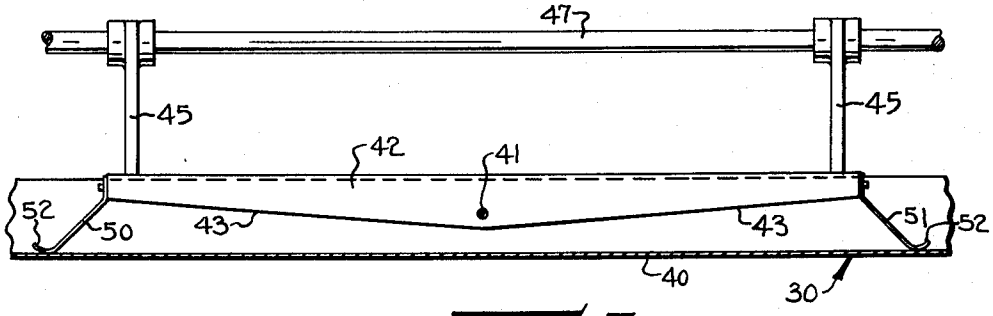


Fig-3

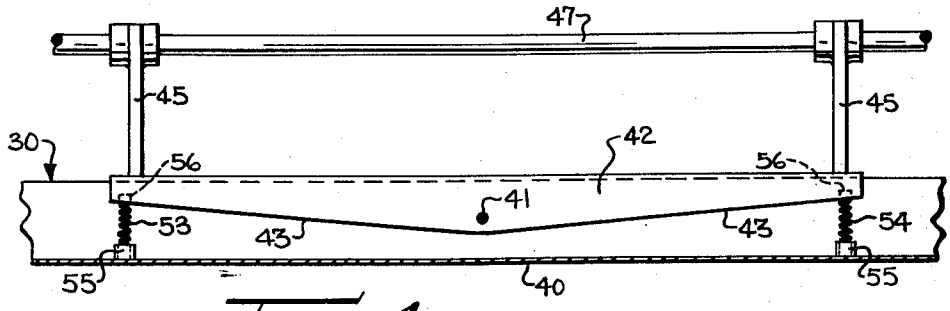


Fig-4

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2,930,270

TENSION EQUALIZER FOR SHEET MATERIAL

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Application July 26, 1956, Serial No. 600,234

11 Claims. (Cl. 83—437)

This invention relates to apparatus utilized in the handling of pliable web material; particularly, apparatus for making bed sheets and the like, such as is disclosed in U.S. Patent No. 2,738,746 dated March 20, 1956, and wherein web material is drawn from a source, past a normally inoperative severing device, across and above a table or platform provided with a transverse slot or opening in its medial portion and wherein the length of the web between the severing device and the point at which the drawing off means comes to rest is determined by a slack bar which moves downwardly, engages and moves a medial portion of the web into the slot for measuring the length of the web prior to actuation of the severing device.

In sheet making machines of the character disclosed in said patent web material is drawn across and above the top runs of a plurality of stationary carrier belts which are disposed on a common substantially horizontal plane and some of which rest upon the platform. After the web material is cut to the desired length, opposite raw edges of the web material are overfolded and the belts are then actuated to advance the blank thus formed to where opposite overfolded ends of the web material pass through folding device which underfold the overfolded portions of the blank to form hems. Thereupon, the hems of the blank are advanced through sewing machines for sewing the hems.

Now, it quite often happens in the forming of rolls of cloth, which rolls usually serve as the source of web material on such machines, that one selvage on some rolls of cloth may be stretched more than the other selvage. With the usual type of rigid slack-forming bar, due to variations in the tension at opposite selvages of the cloth as it is drawn from the roll, there is a tendency for the slack-forming bar to leave one side of the measured blank relatively taut and the other side of the blank relatively loose. As a result, the cloth or web material usually becomes wrinkled adjacent the relatively slack side thereof and at the leading raw edge while, on the other hand, the tight side portion or selvage of the cloth or web material is placed under relatively excessive tension.

Thus, when the cloth or web material is released from the drawing off means, which is usually in the form of grippers, the wrinkle remains in the web material and the relatively taut side portion or selvage of the web material snaps back a relatively small amount. Thus, as the blank thus formed is subsequently advanced past the underfolding devices, it frequently happens that the cloth or web material is not properly alined with the underfolding devices and this causes the material to choke the underfolding devices or effects further wrinkling of the web material so that it is necessary to stop the machine and manually remove the wrinkles from the web material and, of course, it often happens that the wrinkles formed by this defect are not detected by the operator and thus, defective hems are formed.

It is therefore an object of this invention to overcome the above defects by the provision of means which will

insure that the web material is unwrinkled following the measuring operation.

More specifically, it is an object of this invention to provide an improved slack-forming means comprising a bar which is spaced above the slot in the table as the web material is drawn across and above the table and wherein a medial portion of the bar is pivotally connected to a support with resilient means carried by the support and bearing against opposite end portions of the slack-forming bar to maintain the same in a substantially horizontal or neutral position; i.e., in a position substantially parallel to the web material. Thus, as the bar is moved downwardly in engagement with the web material and through the slot, to measure the web material, the bar equalizes the tension in opposite side portions of the web material. For example, in the event of one selvage being tighter than the other, the resilient means permits that end of the slack-forming bar to yield so the bar tilts toward the relatively loose selvage so as to take up a slightly greater amount of material at the loose side or selvage of the web material to equalize the tension in both selvages of the web material.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is a somewhat schematic isometric view of a portion of a web drawing off and measuring apparatus, such as is used on sheet making machines of the character disclosed in said Patent No. 2,738,746, and identifying the hem folding means and sewing machines by legends;

Figure 2 is a fragmentary vertical sectional view taken substantially along line 2—2 in Figure 1;

Figure 3 is a fragmentary vertical sectional view of the central portion of the slack-forming bar taken substantially along line 3—3 in Figure 2;

Figure 4 is a view similar to Figure 3, showing a modified form of means to resiliently urge opposite end portions of the slack-forming bar downwardly or away from the supports.

The improved slack-forming or web measuring apparatus may be used for equalizing tension in opposite side edges of selvages of any of many different types of pliable web materials and it may be used in association with various types of machines. However, in the present instance, the improved slack-forming and equalizing apparatus is particularly devised for use with sheet making machines of the character disclosed in the MacIsaac, Jr. et al. Patent No. 2,738,746 and, since the sheet making machine is fully described in said patent, only a portion of the machine is illustrated in Figure 1 and only so much of the machine will be described as is necessary to a clear understanding of the present invention.

Referring to Figure 1, in particular, web material W is drawn from a suitable source 10, shown in the form of a roll, and passes over rollers 11, 12 from whence it passes over a clamp plate 13 and beneath resilient or leaf spring clamping members 14 carried by a fixed frame member 15. The resilient clamping members 14 normally maintain the web material in pressure engagement with the plate 13. The cloth or web material W is then drawn over a composite platform or table P including spaced transversely extending platform sections 16, 16a forming a transverse slot 17 therebetween.

The web material W is also drawn across and above a plurality of top runs of carrier belts 20 which are stationary at the time that the web material W is drawn across and above the same, but which are caused to move by automatic means, clearly shown in said patent, upon each successive blank being severed or cut from the web material W. The carrier belts 20 are portions of conveyors and are mounted upon rolls 21 and, also,

the top belt runs rest against the upper surface of the composite platform P.

The web material is drawn from its source **10** by means of a reciprocably traversing web feeding mechanism broadly designated at **25** which is shown in the form of a row of grippers **26** which are automatically opened, by means not shown in the present drawings but clearly shown in said patent, at the end of each active and each inactive stroke of the web feeding mechanism **25** so that, when the web feeding mechanism **25** occupies a position adjacent resilient or leaf spring clamping members **14**, the relatively movable jaws of the grippers **26** are open and then close to grip the leading raw edge of the web material W between adjacent said jaws. Thereupon, the web feeding mechanism **25** moves across and above the top belt runs and the composite platform P to deposit a portion of the web material W upon the said top belt runs and said platform. After a predetermined interval, the grippers **26** are open to release the leading raw edge of the web material.

During said last-mentioned interval, the improved slack-forming mechanism, broadly designated at **30**, moves downwardly from a normally raised position above the level of the web material W to engage and impart downward movement to a medial portion of the portion of web material overlying the belts **20** to force a medial portion of the web material overlying said belts into the slot **17** between the platform sections **16**, **16***a*. In so doing, a relatively small amount of additional web material is drawn past the clamping members **14** to determine the length of that amount of the web material disposed between the grippers **26** and the clamping members **14**. The improved slack-forming mechanism **30** will be later described in detail.

Also, during said last-mentioned interval, an endless cutting blade **31**, of a cutting or severing mechanism broadly designated at **32**, moves upwardly from a normally lowered position below the level of the web material and immediately adjacent the free end of the clamping members **14** to sever the web material and thereby form a blank. The slack-forming mechanism **30** then moves upwardly out of engagement with the web material W and the leading raw edge of the web material is then released from the grippers **26**.

In the particular type of machine disclosed in said patent, conventional means move inwardly to overfold opposite end portions or opposite raw edges of the web material or blank, whereupon movement of the carrier belts **20** is effected to advance the overfolded raw edges of the blank to and through corresponding hem folding means and sewing machines which are respectively designated at **35** and **36** and are defined by legends in Figure 1. Since the overfolding means, the hem folding means and sewing machines do not necessarily constitute parts of the present invention and are fully disclosed in said patent, a detailed description and illustration thereof are deemed unnecessary.

In order that the opposite side edges or selvages of the web material are drawn off from the source **10** in substantially parallel relationship and in order to insure that the opposite side edges or selvages of the web material are of substantially the same tension, it is generally necessary that the source be in the form of a roll. Notwithstanding this fact, the source **10** is generally in the form of a roll, because cloth is taken up in the form of a roll during the usual finishing operations. During the said finishing operations, cloth and other pliable materials are wound under tension and one of the selvages or edges of the web material, in some rolls of web material, is stretched more than the other of the selvages or edges, even though every possible effort is made during the finishing of cloth and similar web materials to maintain the tension in the web material uniform throughout the width of the web material.

Now, whenever the tension varies in opposite side edges of the web material, and the web material is grasped by the grippers **26** and drawn across and above the top belt runs of belts **20** and the composite platform P, with the usual type of slack-forming bar there is a tendency for this slack-forming bar to leave one side of the measured piece of cloth taut and the other side of the cloth relatively loose. The reason for this is that the usual slack bar of the type shown in said patent comprises a rigid horizontal bar which, when forcing a medial portion of the web down as in slot **17**, forces each selvage down the same amount irrespective of the fact that one selvage might be loose and the other taut. In such instances, a wrinkle usually develops adjacent the leading raw edge of the web material at the slack side portion thereof while the other side portion of the web material is placed under excessive tension. Thus, when the grippers **26** release the web material, the wrinkle remains in the web material and the web material usually snaps back a small amount at the taut side portion thereof so that, when the opposite raw edges of the web material are overfolded, the folds are not evenly formed and will choke the corresponding end overfolding means and the hem folding means **35** and/or **36**.

In order to avoid the occurrence of wrinkles in the web material and to insure that opposite side portions or selvages of the web material are at uniform tension as the web material is measured or, in other words, as the measuring portion is formed in the slot **17**, the improved slack-forming mechanism **30** is provided which will now be described in detail.

The improved slack-forming mechanism comprises an elongated slack-forming element or bar **40** which is of substantially the same length as or of slightly greater length than the width of the web material W and a medial portion of which is pivotally connected, as at **41**, to a rigid but vertically reciprocable support **42** and wherein means are provided to apply yieldable pressure against opposite end portions of the slack-forming bar **40** toward the web material; i.e., downwardly. In the first form of the improved slack-forming mechanism shown in Figures 1, 2 and 3, the slack-forming bar **40** is shown as being substantially channel or U-shaped in cross-section so that it has a smoothly rounded web-engaging surface thereon and, of course, a channel-shaped or U-shaped slack-forming bar is of relatively light weight as compared to a solid bar.

Medial portions of the flanges of the U-shaped slack-forming bar **40** are pivotally connected, as at **41**, to a medial portion of the support **42** which support is shown in the form of an elongated bar in Figure 3 which is preferably of substantially lesser length than that of the slack-forming bar **40** and is preferably of greater thickness at its central portion than it is at its outer portions to form angularly extending surfaces **43** thereon. These surfaces permit the slack-forming bar **40** to tilt about the pivot pin **41** relative to the supoprt **42**. The slack-forming bar support **42** is attached to or integral with arms or levers **45** which are substantially L-shaped and whose upper portions extend substantially parallel with and above the platform section **16***a* and are fixed to an oscillatable shaft **47** which is oscillated in timed relation to the operation of the drawing off mechanism **25** by means not shown in the present drawings but being clearly shown in said Patent No. 2,738,746. The cycle of operation of the slack-forming mechanism **30** has already been described.

In Figures 3 and 4, two forms of means are illustrated for yieldably maintaining the slack-forming bar in neutral position substantially parallel to the platform sections **16**, **16***a* and the portion of web material W overlying the same. In Figures 2 and 3 said yieldable means is shown in the form of a pair of leaf spring or band-type spring members **50**, **51** fixed to opposite ends of the support bar **42** and which extend downwardly in diverging relationship and have curved lower portions **52** which

bear against the upper surface of the rounded web portion of the slack-forming bar 40.

In the form of the invention shown in Figure 4, the opposite end portions of the slack-forming bar 40 are normally urged downwardly by means of compression springs 53, 54 whose upper ends engage opposite end portions of the support bar 42 and whose lower ends engage the upper surface of the web portion of the corresponding slack-forming bar 40. If so desired, suitable cup-like guides or sleeves 55 may be suitably secured to or formed integral with the web portion of the corresponding slack-forming bar 40 for accommodating the lower ends of the springs 53, 54 and suitable cavities 56 may be formed in the lower surface of the support bar 42 adjacent opposite ends thereof for receiving the upper ends of the compression springs 53, 54.

If so desired, a solid or relatively heavy bar could be substituted for the slack-forming bar 40 in each instance and the yieldable means could be omitted. However, the yieldable means, as exemplified by the leaf spring members 50, 51 in Figure 3 and by the compression springs 53, 54 in Figure 4, are desirable to maintain the slack-forming bar at a level or neutral altitude or in a position substantially parallel to the platform sections 15, 16 when the slack-forming bar is not in engagement with the web material.

It is thus seen that, assuming that a portion of the web material W has been drawn across and above the platform sections 16, 16*a* and the top runs of the endless belts 20, as the improved slack-forming mechanism 30 is actuated, the slack-forming bar 40 moves downwardly into the slot 17 against the upper surface of the web material and, since the slack-forming bar is pivotally connected at its central portion to the support 42, the slack-forming bar can tilt about its pivot point in accordance with the condition of the selvages or opopsite edges of the web material. In other words, if one selvage or side portion of the web material is relatively taut and the other selvage or side portion is relatively loose, the end of the slack-forming bar 40 engaging the relatively taut selvage or side portion of the web material will be raised slightly relative to the support bar 42 while the other end thereof will be lowered slightly relative to the slack-forming bar support 42. However, once the improved slack-forming bar 40 has reached its lowermost position at the pivot point 41, the tension in the web material is substantially constant throughout the width of the web material thus eliminating the tendency for any portion of the web material to snap back greater than the remainder of the web material at its leading edge when the web material is released from the grippers 26.

In the processing of bed sheets and the like, the finished sheet may be of slightly greater length at that side portion thereof which was originally under lesser tension than the other side portion thereof as the cloth was drawn across and above the platform sections 15, 16 by the drawing off means 25. However, it has been found that such differences in the length of opposite side portions of the web material are well within quality control standards. In utilizing the overfolding mechanisms disclosed in said patent for folding the opposite raw edges of the web material after the length of the blank has been measured by the improved slack-forming mechanism 30, it has been found that the amount of the leading raw edge which is folded over to form the hems is consistent throughout its length because of the improved slack-forming bar equalizing the tension of the cloth throughout the length of the leading raw edge thereof. It should be noted that the median length of the web material between the clamping members 14 and the grippers 26 is determined by the central portion of the slack-forming bar 40 immediately beneath the pivot 41, the amount or length of said material at each side thereof varying according to the prevailing tension therein.

In the drawings and specification there has been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. In a machine of the character described having a platform provided with a transverse slot therein and having means for drawing off a portion of web material from a source across and above said platform, means resiliently clamping the web material adjacent the source and means for severing the web material adjacent the clamping means to form a blank; an improved slack-forming device for forming a slack portion in the web material at said slot while determining the length of the web material between the drawing off means and the clamping means comprising a slack-forming bar normally positioned in spaced relation above the platform in substantial alinement with said slot and being movable downwardly in engagement with said web material to force a portion of the web material into said slot prior to the web material being severed, a support for the slack-forming bar, and means pivotally connecting a medial portion of said bar to said support whereby, upon variation in tension in opposite sides of the web material, said bar will move upwardly at the relatively tight side of the web material and will move downwardly at the relatively loose side of the web material relative to the support to thereby move a greater amount of web material into said slot at the relatively loose side thereof than at the relatively tight side thereof to equalize the tension in the web material while determining the length of the portion of the web material between the clamping means and the drawing off means.

2. A structure according to claim 1 wherein said support is provided with resilient means thereon yieldably urging opposite end portions of the slack-forming bar to neutral position relative to the support.

3. A structure according to claim 2 wherein said resilient means comprises a spring means adjacent each end of said support, said support being of lesser length than the length of the slack-forming bar and said spring means yieldably urging the corresponding portions of the slack-forming bar downwardly.

4. A structure according to claim 2 wherein said resilient means comprises a leaf spring member for each end portion of the slack-forming bar, each leaf spring member being fixed to the corresponding end of the support and extending downwardly and outwardly therefrom in engagement with the slack-forming bar.

5. A structure according to claim 2 wherein said resilient means comprises a compression spring for each end portion of the slack-forming bar, each spring having one end engaging the corresponding end portion of the support and having its other end engaging the upper surface of the corresponding end portion of the slack-forming bar.

6. In a machine for making bed sheets and the like from a source of web material, said machine having means for drawing off a portion of the web material to form a blank, means to sever the blank from the web material and a shaft driven to oscillate in timed relation to the drawing off means and extending substantially parallel to and spaced above the blank as it is being formed; an improved slack-forming and blank-measuring mechanism comprising at least one arm fixed to said oscillatable shaft and extending outwardly therefrom in generally parallel relation to the longitudinal side edges of the web material, a support fixed to said arm, a substantially channel-shaped slack-forming bar having flanges thereon, means pivotally connecting said flanges to the support at a medial portion of the slack-forming bar, and so that the bar extends substantially transverse to said web material, resilient means disposed adjacent opposite sides of the point at which the flanges are pivotally

connected to said support for normally maintaining the slack-forming bar in a neutral position extending substantially parallel to the general path of the web material as it is drawn from said source, and said shaft being oscillatable in timed relation to the drawing off means such as to impart downward movement to the support and the slack-forming bar at the completion of each operation of the drawing off means to thereby engage the web material and form a slack portion in, and measure the length of, the portion of the web material between the drawing off means and the severing means and whereby, upon either side portion of the web material being under lesser tension than the other, the tighter side portion of the web material will cause the corresponding end portion of the slack-forming bar to move upwardly relative to the support as the other end portion thereof is moved downwardly relative to the support to equalize the tension in opposite side portions of the web material.

7. A structure according to claim 6 wherein said support is in the form of a bar extending in substantially parallel relation to said slack-forming bar and disposed between the flanges of the slack-forming bar, and said resilient means are disposed between the slack-forming bar and the support bar for normally maintaining the slack-forming bar in neutral position relative to the support bar.

8. A structure according to claim 7 wherein said resilient means comprises a leaf spring member fixed to each end of the support bar and extending downwardly and outwardly therefrom in engagement with the slack-forming bar.

9. A structure according to claim 7 wherein said resilient means comprises a compression spring adjacent each end of the support bar and having one end engaging a corresponding end portion of the support bar and having its other end engaging the upper surface of the corresponding end portion of the slack-forming bar.

10. In a machine having a substantially horizontal platform provided with a transverse slot therein, means to draw off a portion of a web from a source above and across said platform, and means yieldably restraining said web adjacent the source whereby said web is tensioned as it is drawn across said platform; an improved slack-forming and web-length-determining mechanism comprising a substantially vertically reciprocable support movable in timed relation to said drawing off means and a slack-forming bar of substantially the same length as the width of the web having a medial portion pivotally connected to said support and depending therefrom, said slack-forming bar extending transversely of the web and movable into engagement therewith to move a portion of said web into said slot, said support being provided with resilient means thereon yieldably urging opposite end portions of said slack-forming bar to neutral position relative to said support and cooperating with said support to automatically vary the movement of said slack-forming bar at least adjacent opposite side edges of the web to compensatively move a greater amount of said web into said slot at one side of said web than at the other side of said web upon there being a lesser amount of tension in said one side of the web than in the other side of the web.

11. In a machine for making bed sheets and the like from web material comprising a platform having a transverse slot therein, means for drawing off a portion of said material from a source above and across said platform, and means for tensioning said material as it is drawn from the source; an improved slack-forming bar movable into engagement with said material to move a portion thereof into said slot, said slack-forming bar having oppositely disposed flanges connected together at one end thereof to define a substantially channel-shaped cross-section, and means yieldably supporting said slack-forming bar to permit the slack-forming bar to move a greater distance into said slot at a relatively loose side edge of said material than at the opposite relatively taut side edge of the material upon the occurrence of such variations in the material as it is drawn from said source, said yieldable supporting means for the slack-forming bar comprising a vertically reciprocable support bar extending in substantially parallel relation to said slack-forming bar and disposed between the flanges of the slack-forming bar, means pivotally connecting medial portions of the flanges to a medial portion of the support bar, and resilient means disposed between the slack-forming bar and the support bar for normally maintaining the slack-forming bar in neutral position relative to the support bar.

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