April 26, 1955 J. B. KOHLER 2,707,083

TENSION DISTRIBUTING ROLLER

Filed April 29, 1950 4 Sheets-Sheet 1

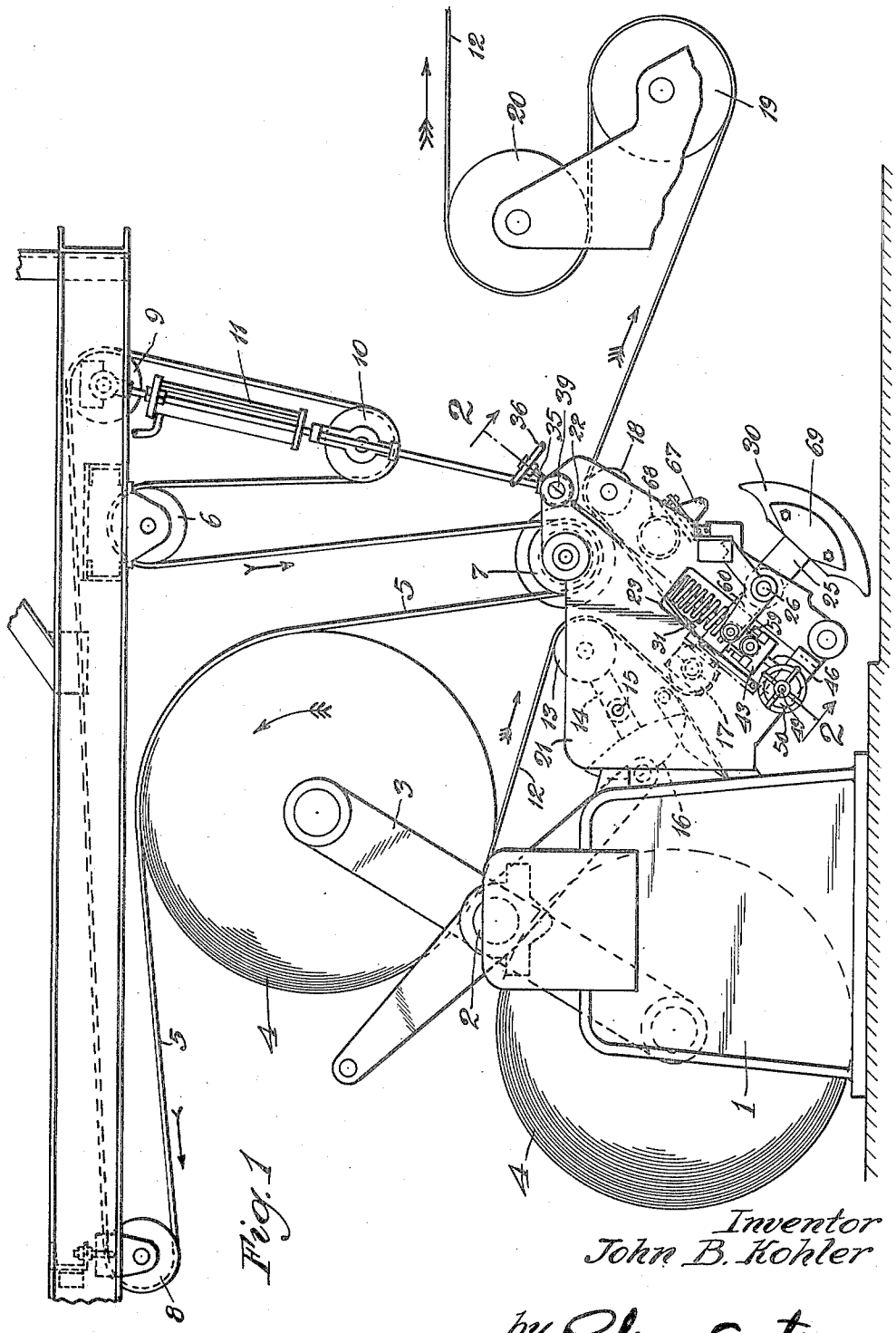

Fig. 1

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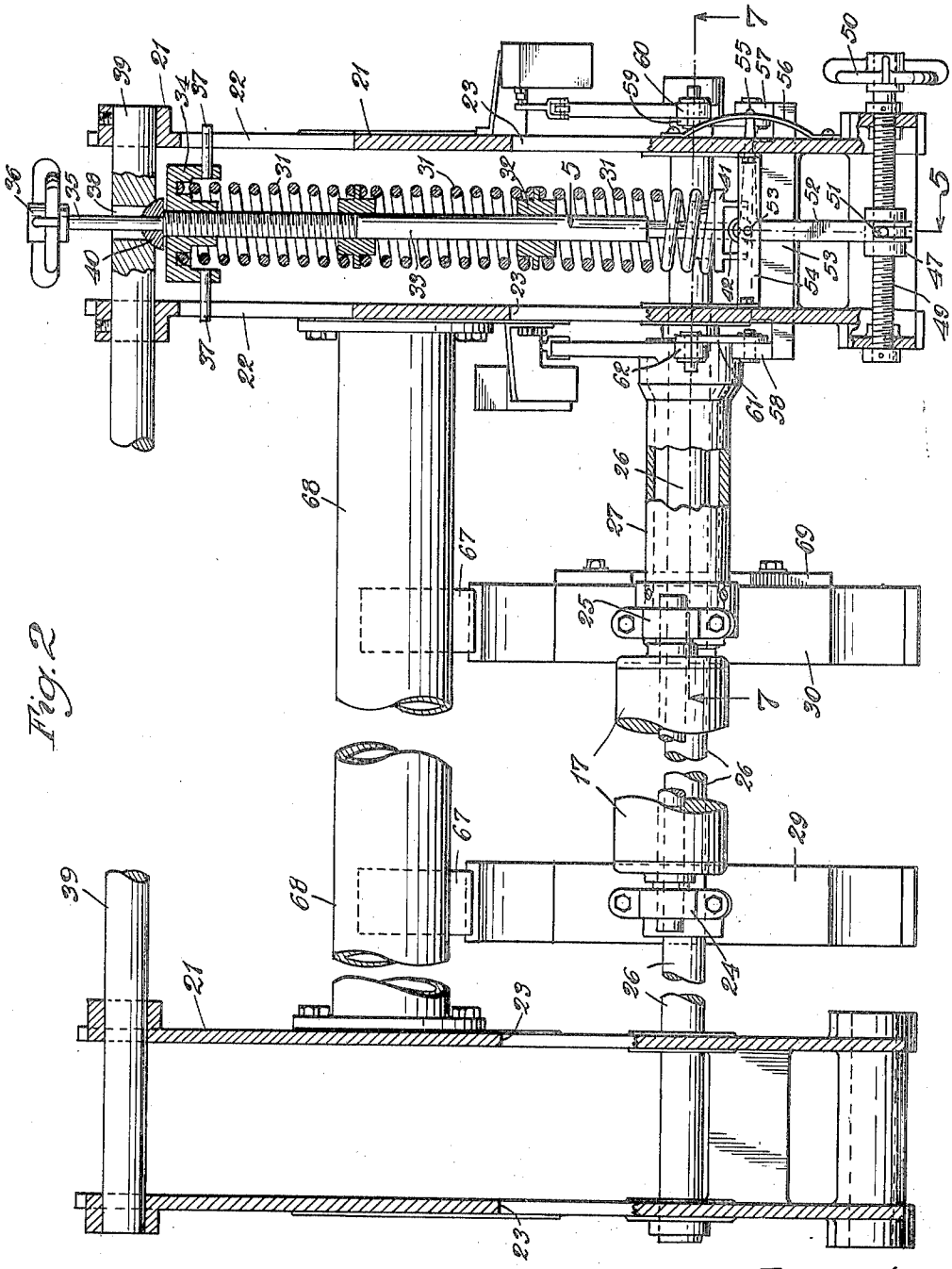

Fig. 2

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Fig. 4

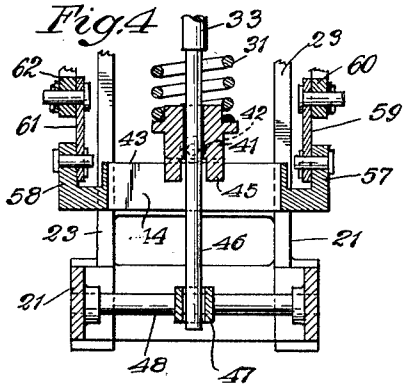

Fig. 3

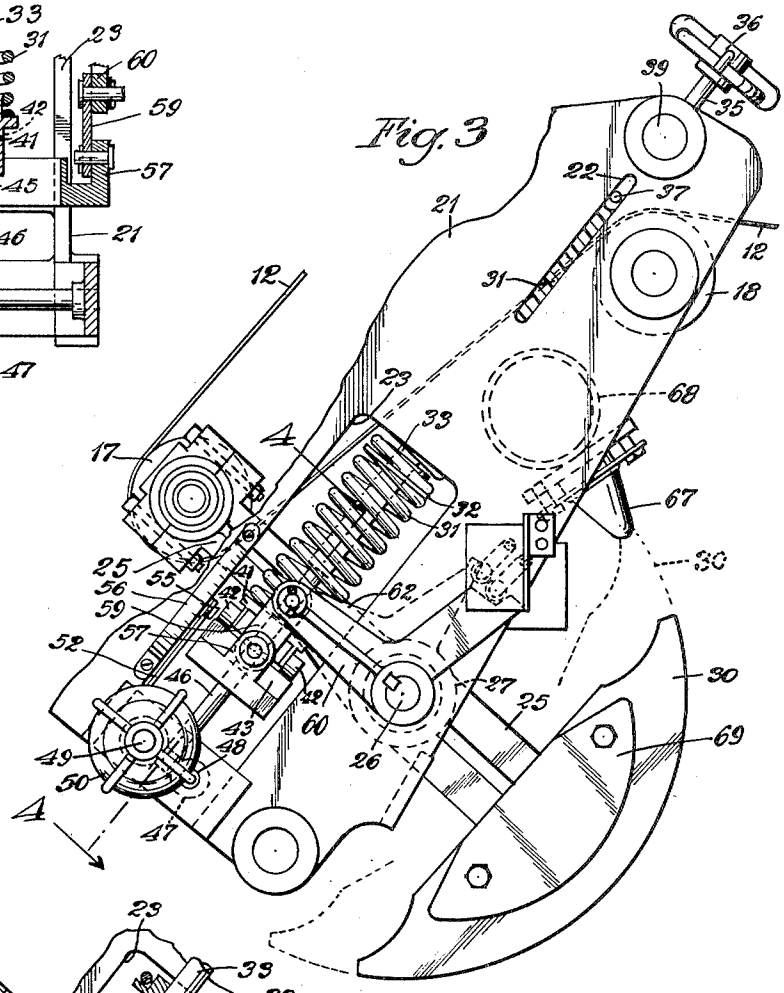

Fig. 5

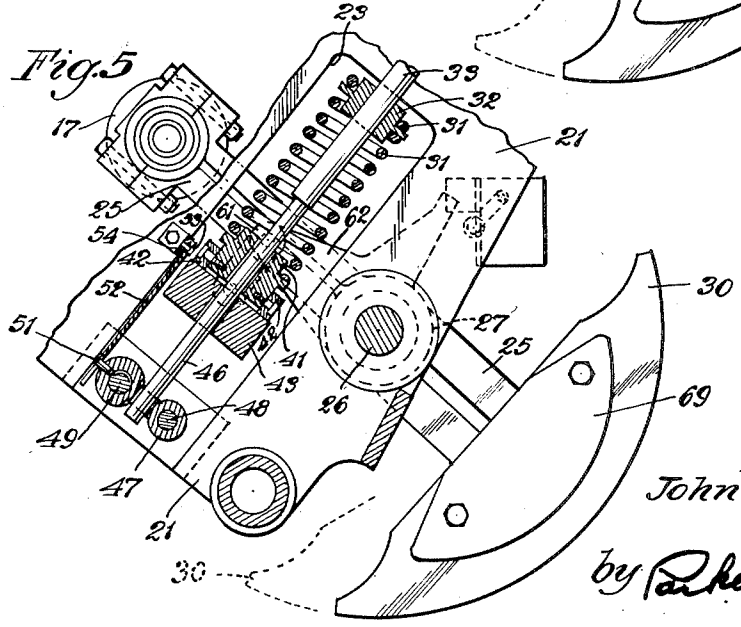

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Fig. 6

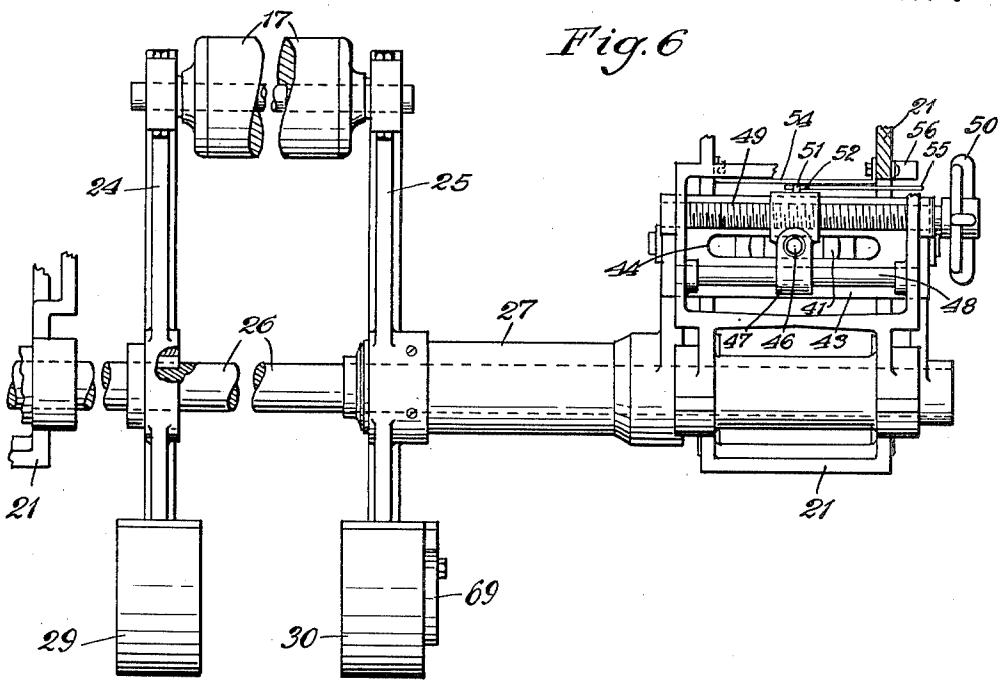
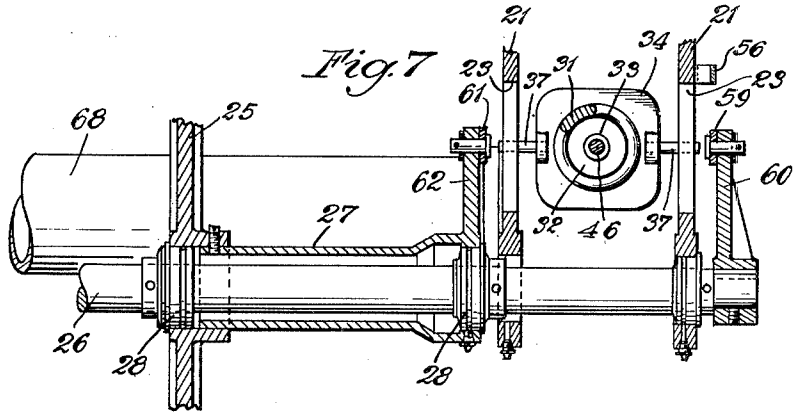


Fig. 7



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2,707,083

TENSION DISTRIBUTING ROLLER

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Application April 29, 1950, Serial No. 159,028

16 Claims. (Cl. 242—75)

This invention relates to a device for controlling the distribution of the tension within a running web of material.

It has for one object to provide means whereby the position of the center of pressure of a roller against a bight in a web under tension may be adjusted to any desired position across the web.

It has for another object to provide a mechanism by means of which the tension of the roller on the web may be varied, if desired, so that one part of the roller may exert tension different from that exerted by another part.

Other objects will appear from time to time throughout the specification and claims.

This invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is an end elevation of a web unwinding mechanism in which the tension distributing device of the present invention is embodied;

Figure 2 is a section taken at line 2—2 of Figure 1 on an enlarged scale, with parts broken away;

Figure 3 is a partial side elevation on an enlarged scale, showing the tension distributing mechanism of Figure 1;

Figure 4 is a sectional detail taken at line 4—4 of Figure 3;

Figure 5 is a sectional detail on an enlarged scale, taken at line 5—5 of Figure 2;

Figure 6 is a bottom plan view of the tension distributing roll and supporting and adjusting means;

Figure 7 is a sectional detail taken at line 7—7 of Figure 2.

Like parts are indicated by like characters throughout the specification and the drawings.

While the device of this invention might be applied to many winding and unwinding mechanisms and while it might be applied to equalize or distribute the tension on any running web, as shown herewith it is embodied in a mechanism for unwinding paper which is to be fed to a printing press. The invention is, of course, not limited to this particular association.

Only so much of the unwinding mechanism will be described as is necessary for an understanding of the construction and operation of the tension controlling means of the invention.

1 is a standard of which two or more are used to support a shaft 2 on which an arm 3 is supported for rotation. Rolls 4 of paper or other web material are carried in the arms. The means for moving the arms to bring one or another roll into operation are not shown, as they are well-known in the art.

The web is fed from one of the rolls at a time. As shown, this is the uppermost roll 4 and it is rotated by one or more belts 5 which are driven from pulleys 6. These pulleys are driven by any desired means. From the pulleys 6 the belt passes to pulleys 7, thence partially about the roll 4 and to pulleys 8, thence to pulleys 9 and finally about the pulleys 10 and back to the drive pulleys 6.

11 indicates generally a piston and cylinder take up assembly which is operated by fluid pressure and designed to control and effect the tension on the belt 5. The details of this mechanism form no essential part of the present invention, and they need not be described further.

The web 12 of paper or other material leaves the roll 4, as shown in Figure 1, and passes about a roller 13 carried on arms 14 pivoted at 15. The arms are counterweighted, as at 16. From the roller 13 the web 12 passes to a spring pressed roll 17 which will be described in detail below. From the roller 17 it passes about one or more idler

rollers such as 18, 19 and 20, and thence it passes to a printing press, to a point of storage, treatment or winding.

The rollers 13, 17 and 18 are carried in support or frame members 21. These members are shaped generally alike. As shown in Figure 2 they are provided adjacent their upper ends with relatively narrow slots 22, 22 and adjacent their lower ends with wider slots 23, 23.

The roller 17 is carried, as shown generally in Figure 1 and in detail in the other figures, at the ends of arms 24 and 25. The arm 24 is keyed to a shaft 26. The arm 25 is fixed to a sleeve 27 which is positioned concentrically about the shaft 26. It is supported, as shown in Figure 7, by bearings 28 upon the shaft 26. The shaft 26 itself is supported in bearings in the members 21. Counterweights 29 and 30 are mounted on the ends of the arms 24 and 25 opposite to the roller 17.

As shown in Figures 2, 6 and 7, the right hand support or frame member 21 has postioned within it one or more compression springs. In the particular form shown there are three such springs 31. They are positioned about spring seats 32 which are slidable on a shaft 33. The upper end of the uppermost spring is engaged in an adjustable seat member 34 which is in threaded engagement with the upper end of the rod 33. A reduced extension 35 of the rod 33 is provided with a handle 36 by means of which it may be rotated. Pins 37 hold the seat against rotation with respect to the support 21 and slide in the slot 22. The reduced portion 35 passes through a perforation 38 in a rod 39 which is fixed to both frame members 21 adjacent their upper margin. If desired, the perforation 38 may be given a partially spherical face to receive a rounded or hemispherical member 40 which is positioned about the reduced extension 35. At its lower end the lowermost spring 31 bears upon a seat 41. The seat 41 is provided on each side adjacent its bottom surface with oppositely positioned rollers 42 which rest upon the upper surface of a stirrup 43. The stirrup is slotted, as at 44, and ears 45 formed on the spring seat 41 extend into this slot to prevent rotation of the spring seat with respect to the stirrup. As shown in Figure 4 the reduced extension 46 of the shaft 33 extends through the spring seat 41 and through the slot 44 and into an aperture in the carriage 47. The carriage 47 is supported on a shaft 48 which is itself mounted in the frame member 21. The carriage is also supported and threadedly engaged with a screw 49 which is provided with an operating handle 50 by means of which it may be turned to move the carriage.

The carriage 47 is provided with an outwardly extending pin 51 engaged in a slot or otherwise in an indicating arm 52 which is pivoted, as at 53, on a transverse supporting member 54 which is itself secured between or upon the sides of the member 21. The member 52 has fixed to it a pointer 55 which moves along a scale 56. By this indicating device the position of the carriage 47 may be accurately determined at a glance.

The stirrup 43 is provided with lateral extensions 57 and 58. Pivoted to the extension 57 is a link 59. The link 59 is pivoted to a projecting arm or projection 60 on the shaft 26. Pivoted to the extension 58 is a link 61 which is pivoted to a projecting arm or projection 62 fixed on the sleeve 27. One or more bumpers 67 may be provided and, as shown, these are carried on a frame member 68 which is secured to the supports 21 and ties them together.

The use and operation of this invention are as follows:

In the particular form here shown when the mechanism is associated with an unwinding device and the web 12 is being unwound, the various parts are adjusted manually or automatically to drive the roll 4 at the desired speed and initially, at least, to maintain the desired tension on the web. It frequently happens, however, that the roll 4 is unsymmetrical or ununiform or becomes so during unwinding. In such condition, it is customary to provide a spring roller or floating roller which acts as a shock absorber, permitting the roll to unwind regardless of its irregularity without setting up localized strains which would snap the web. Normally such rollers are positioned by springs at either end with individual adjustments. To meet operating conditions, it is frequently necessary to vary the relative pressure between the two ends of the

springs acting on the roller. This is particularly true of rolls of paper which have been slit from a wider web made on a paper machine, where the side rolls will frequently be found to be actually shorter on one side than the other, so that if unrolled on a level floor, the web will describe an arc rather than a straight line. In such cases, it is desirable to stretch the shorter side by applying more tension thereto than to the other side so that the web will run true in succeeding operations.

Again, in unwinding paper into printing presses, it is frequently desired to run a narrow roll of paper on one side of the machine, rather than in the center. In such cases it is necessary that the spring farthest from the center line of the web have a lesser presure than the other, so that the movement of each spring about the center of the web will be approximately equal. With separate springs it is only possible to adjust the springs to balance for one degree of compression of the two springs, since the two springs change pressure according to the linear measure of compression rather than proportionally. Therefore, if the roller changes position due to a change in web tension, or due to the irregularities of the unwinding roll, the balance is destroyed, unequal strains are set up in the web, and "snap-offs" or web breaks occur.

In the device herein disclosed, the roller is free to float both in its total position and also about the central axis of the web. It should be noted that at all times the roller is actually positioned by the bight of web wrapped about it.

The roller **17** must, therefore, be adjusted to compensate for unevenness or other conditions in the roll which is being unwound. Frequently the tension in the web will vary from side to side. In the initial position of adjustment the spring or springs **31** may be positioned centrally, as shown in Figure 2 in particular. When they are in that position the rotative effect exerted upon each of the arms **60** and **62** is balanced and equal and, therefore, the spring does not, of itself, tend to rotate the shaft **26** with respect to the sleeve **27**. However, the roll itself is free to follow the irregularities of the running web, caused by a rough running unwinding roll or otherwise, without destroying such balance.

The spring pressure itself acts to rotate the entire assembly which includes the roller **17**, the shaft which carries it, the arms **24** and **25** and the counterweights **29** and **30**. So long as the spring **31** is centrally positioned, it neither causes nor prevents relative movement of the members **24** and **25**. Should unequal tension develop across the width of the web for any reason, it will be noticed by the operator of the mechanism because flapping will occur or wrinkles will develop, or some other visual indication will be given. When that occurs the operator will rotate the handle **50** to carry the carriage **47** either to the right or to the left, depending upon the location of the unsatisfactory condition, and as the carriage moves, the reduced extension **46** of the shaft **33** moves and the spring seat **41** and the springs **31** are similarly carried to the right or the left, so that they bear against a new position on the stirrup **43**. The stirrup **43** constitutes a floating lever arm pulling against the arms **60** and **62**, by means of the links **59** and **61**, but free to float about the rollers **42** as a fulcrum. Thus, as the seat **41** is moved along the stirrup **43**, it is caused to bear more heavily against the nearer of the arms **60** and **62** and less heavily against the farther arm and the center of push of the roller **17** against the bight of the web **12** is moved to a proportionate position. Thus, the spring effect upon the extensions **57** and **58**, and correspondingly upon the links **59** and **61** and the arms **60** and **62** to which they are secured, respectively, is varied. When this occurs the force of the spring **31** is unequally exerted upon the arms **24** and **25** and tends to cause a relative movement of those members.

When the unsatisfactory or unequal tension condition in the web has been remedied, readjustment of the carriage **47** and associated parts to the original position may be necessary. The movement of the carriage **47** thus results in changing the point of application of the spring effect and causes a tendency toward relative movement of the supports **24** and **25** for the roller **17**. The main spring adjustment and compression, irrespective of the point of application of the spring effect, is accomplished by rotation of the handle **36** to produce greater or less total pressure.

If desired, the counterweights may be arranged for adjustment. One method of accomplishing this is to apply one or more added members to a counterweight. As shown in Figures 5 and 6, the counterweight **30** is provided with an added member **69**. The purpose of the counterweights is solely to balance the roller **17** so that no part of the spring force is exerted in lifting the weight of the roller.

I claim:

1. In combination in a tension distributing device, a roller adapted to contact a running web, adjustable supports for said roller comprising arms on which said roller is mounted for rotation, a shaft to which one of said arms is fixed, a sleeve positioned concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a thrust upon said projections, and means for controlling the application of said thrust to distribute it between said projections selectively in any desired ratio whereby said projections are given a controlled tendency to relative movement.

2. In combination in a tension distributing device, a roller adapted to contact a running web, adjustable supports for said roller comprising arms on which said roller is mounted for rotation, a shaft to which one of said arms is fixed, a sleeve fixed concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a thrust upon said projections, and means for controlling the application of said thrust to equalize it between said projections and, selectively, to cause a differential thrust whereby said projections are given relative movement, said thrust means including a spring, a seat member for one end of said spring, connections between said seat member and said projections, and means for moving said seat member to vary the point of application of the thrust of said spring and to cause a differential thrust upon said projections.

3. In combination in a tension distributing device, a roller adapted to contact a running web, adjustable supports for said roller comprising arms on which said roller is mounted for rotation, a shaft to which one of said arms is fixed, a sleeve fixed concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a thrust upon said projections, and means for controlling the application of said thrust to equalize it between said projections and, selectively, to cause a differential thrust whereby said projections are given relative movement, and said arms are correspondingly moved relative to each other.

4. In combination in a tension distributing device, a roller adapted to contact a running web, adjustable supports for said roller comprising arms on which said roller is mounted for rotation, a shaft to which one of said arms is fixed, a sleeve fixed concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a thrust upon said projections, and means for controlling the application of said thrust to equalize it between said projections and, selectively, to cause a differential thrust whereby said projections are given relative movement, said thrust means including a compression spring, and means for varying the degree of compression of said spring, a seat member for one end of said spring, connections between said seat member and said projections, and means for moving said seat member to vary the point of application of the thrust of said spring and to cause a differential thrust upon said projections.

5. In combination in a tension distributing device, a roller adapted to contact a running web, adjustable supports for said roller comprising arms on which said roller is mounted for rotation, said arms being counterweighted, a shaft to which one of said arms is fixed, a sleeve fixed concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a thrust upon said projections, and means for controlling the application of said thrust to equalize it between said projections and, selectively, to cause a differential thrust whereby said projections are given relative movement.

6. In combination in a tension distributing device, a roller adapted to contact a running web over an extended area, adjustable supports for said roller com-

prising a pair of arms on which said roller is mounted for rotation, said arms being counterweighted, a shaft to which one of said arms is fixed, a sleeve fixed concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a variable thrust upon said projections, and means for controlling the application of said thrust to equalize it between said projections and, selectively, to cause a differential thrust whereby said projections are given relative movement, and said arms are correspondingly moved relative to each other.

7. In combination in a tension distributing device, a roller adapted to contact a running web over an extended area, adjustable supports for said roller comprising a pair of arms on which said roller is mounted for rotation, said arms being counterweighted, a shaft to which one of said arms is fixed, a sleeve fixed concentrically about said shaft to which another of said arms is fixed, projections from said shaft and from said sleeve, and means for exerting a variable thrust upon said projections, and means for controlling the application of said thrust to equalize it between said projections and, selectively, to cause a differential thrust whereby said projections are given relative movement, and said arms are correspondingly moved relative to each other, said thrust means including a compression spring, and means for varying the degree of compression of said spring, a seat member for one end of said spring, connections between said seat member and said projections, and means for moving said seat member to vary the point of application of the thrust of said spring and to cause a differential thrust upon said projections.

8. In combination in a tension distributing device, a roller positioned to contact a running web of material, and means for canting said roller with respect to said web, said means including a pair of counterweighted arms, said roller supported for rotation by said arms, and a shaft upon which one of said arms is fixed, a sleeve concentrically positioned about said shaft, the other of said arms being fixed thereupon, projections from said sleeve and from said shaft, and a single spring means for exerting an adjustable thrust upon each of said projections.

9. In combination in a tension distributing device, a roller positioned to contact a running web of material, and means for canting said roller with respect to said web, said means including a pair of counterweighted arms, said roller supported for rotation by said arms, and a shaft upon which one of said arms is fixed, a sleeve concentrically positioned about said shaft, the other of said arms being fixed thereupon, projections from said sleeve and from said shaft, and a single spring means for exerting an adjustable thrust upon each of said projections, said spring means including a spring, a support therefor, means for adjusting the degree of effect exerted by said spring, a movable seat member for one end of said spring, a stirrup upon which said seat member is movably supported, connections from said stirrup to each of said projections, said spring, when centrally positioned, exerting an equal thrust upon each of said projections, and means for moving said seat member laterally in said stirrup to cause said spring to exert a differential thrust upon said projections.

10. In combination in a tension distributing device, a roller positioned to contact a running web of material, and means for canting said roller with respect to said web, said means including a pair of counterweighted arms, said roller supported for rotation by said arms, and a shaft upon which one of said arms is fixed, a sleeve concentrically positioned about said shaft, the other of said arms being fixed thereupon, projections from said sleeve and from said shaft, and a single spring means for exerting an adjustable thrust upon each of said projections, said spring means including a spring, a support therefor, means for adjusting the degree of effect exerted by said spring, a movable seat member for one end of said spring, a stirrup upon which said seat member is movably supported, connections from said stirrup to each of said projections, said spring, when centrally positioned, exerting an equal thrust upon each of said projections through said stirrup, and means for moving said seat member laterally in said stirrup to cause said spring to exert a differential thrust upon said projections.

11. In combination in a tension distributing device, a roller positioned to contact a running web of material, and means for canting said roller with respect to said web, said means including a pair of counterweighted arms, said roller supported for rotation by said arms, and a shaft upon which one of said arms is fixed, a sleeve concentrically positioned about said shaft, the other of said arms being fixed thereupon, projections from said sleeve and from said shaft, and a single spring means for exerting an adjustable thrust upon each of said projections, said spring means including a spring, a support therefor, means for adjusting the degree of effect exerted by said spring, a movable seat member for one end of said spring, a slidable stirrup upon which said seat member is movably supported, connections from said stirrup to each of said projections, said spring, when centrally positioned, exerting an equal thrust upon each of said projections through said stirrup, and means for moving said seat member laterally in said stirrup to cause said spring to exert a differential thrust upon said projections.

12. In combination in a tension distributing device, a roller positioned to contact a running web of material, and means for canting said roller with respect to said web, said means including a pair of counterweighted arms, said roller supported for rotation by said arms, and a shaft upon which one of said arms is fixed, a sleeve concentrically positioned about said shaft, the other of said arms being fixed thereupon, projections from said sleeve and from said shaft, and a single spring means for exerting an adjustable thrust upon each of said projections, said spring means including a compression spring, a support therefor, means for adjusting the degree of compression effect exerted by said spring, a movable seat member for one end of said spring, a slidable stirrup upon which said seat member is movably supported, connections from said stirrup to each of said projections, said spring, when centrally positioned, exerting an equal thrust upon each of said projections through said stirrup, and means for moving said seat member laterally in said stirrup to cause said spring to exert a differential thrust upon said projections.

13. In combination, a roller adapted to contact a running web, a shaft upon which said roller is mounted for rotation, members for supporting said shaft, said members comprising counterweighted arms, and a second shaft, one of said members fixed thereto, a sleeve positioned concentrically about said shaft, the other of said members fixed to said sleeve, a projection fixed on said sleeve and on said second shaft, and a spring, means for varying the effect of said spring, a stirrup, a seat member movably mounted on said stirrup, one end of said spring bearing against said seat member, and means for moving said seat member to move said end of said spring, and connections from said stirrup to each of said projections, said spring effective when centrally positioned to exert equal compression on each of said projections and effective, when moved out of central position, to exert unequal compression on said projections and to cause relative rotation of said sleeve and said second shaft.

14. In combination, a roller adapted to contact a running web, a shaft upon which said roller is mounted for rotation, members for supporting said shaft, said members comprising counterweighted arms, and a second shaft, one of said members fixed thereto, a sleeve positioned concentrically about said shaft, the other of said members fixed to said sleeve, a projection fixed on said sleeve and on said second shaft, and a spring, means for varying the effect of said spring, a stirrup slidably supported, a seat member movably mounted on said stirrup, one end of said spring bearing against said seat member, and means for moving said seat member to move said end of said spring, and connections from said stirrup to each of said projections, said spring effective when centrally positioned to exert equal compression on each of said projections and effective, when moved out of central position, to exert unequal compression on said projections and to cause relative rotation of said sleeve and said second shaft.

15. In combination, a roller adapted to contact a running web, a shaft upon which said roller is mounted for rotation, members for supporting said shaft, said members comprising counterweighted arms, and a second shaft, one of said members fixed thereto, a sleeve positioned concentrically about said shaft, the other of said members fixed to said sleeve, a projection fixed on said

sleeve and on said second shaft, and a compression spring, means for varying the compression effect of said spring, a stirrup slidably supported, a seat member movably mounted on said stirrup, one end of said spring bearing against said seat member, and means for moving said seat member to move said end of said spring laterally, and separate connections from said stirrup to each of said projections, said spring effective when centrally positioned to exert equal compression on each of said projections and effective, when moved out of central position, to exert unequal compression on said projections and to cause relative rotation of said sleeve and said second shaft.

16. In combination in a tension distributing device, a roller adapted to contact a running web of substantial width, a shaft upon which said roller is mounted for rotation, two members for supporting said shaft, said members comprising counterweighted arms, and a second shaft, one of said members fixed thereto, a sleeve positioned concentrically about said shaft, the other of said members fixed to said sleeve, projections fixed on said sleeve and on said second shaft, and a compression

spring, means for varying the compression effect of said spring, a stirrup slidably supported, a seat member movably mounted on said stirrup, one end of said spring bearing against said seat member, and means for moving said seat member to move said end of said spring laterally, and separate connections from said stirrup to each of said projections, said spring effective when centrally positioned to exert equal compression on each of said projections and effective, when moved out of central position, to exert unequal compression on said projections and to cause relative rotation of said sleeve and said second shaft.

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