United States Patent

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[54] **WEB TENSIONING DEVICE**
1 Claim, 2 Drawing Figs.

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[51] Int. Cl. B65g 15/30
[50] Field of Search 198/208; 74/242.15, 242.14, 242.13, 242.11, 242.9

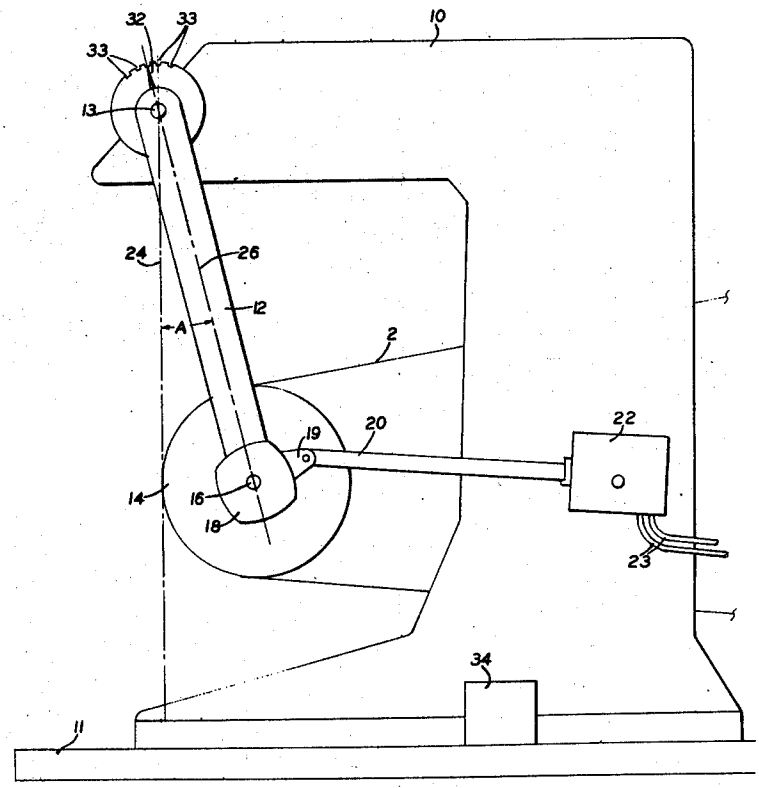
[56] References Cited

UNITED STATES PATENTS

433,133	7/1890	McDonald	74/242.11X
2,280,105	4/1942	Sturgess	74/242.11X
2,781,892	2/1957	Thevenieau	198/208X
2,907,450	10/1959	Reid	198/208X
3,078,983	2/1963	Philips	198/208X

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ABSTRACT: A device for tensioning webs such as felts, wires and other endless loops, particularly those used in the paper making art, comprising a frame, a roll suitable for engaging the web, a pair of pivot support arms suspending the roll from the frame, connector arms mounted on the ends of the roll and attached to power means which are adapted to move the roll in a direction tensioning said web, and cross shaft means connecting the pair of pivot support arms to maintain said arms in a parallel relationship with each other.



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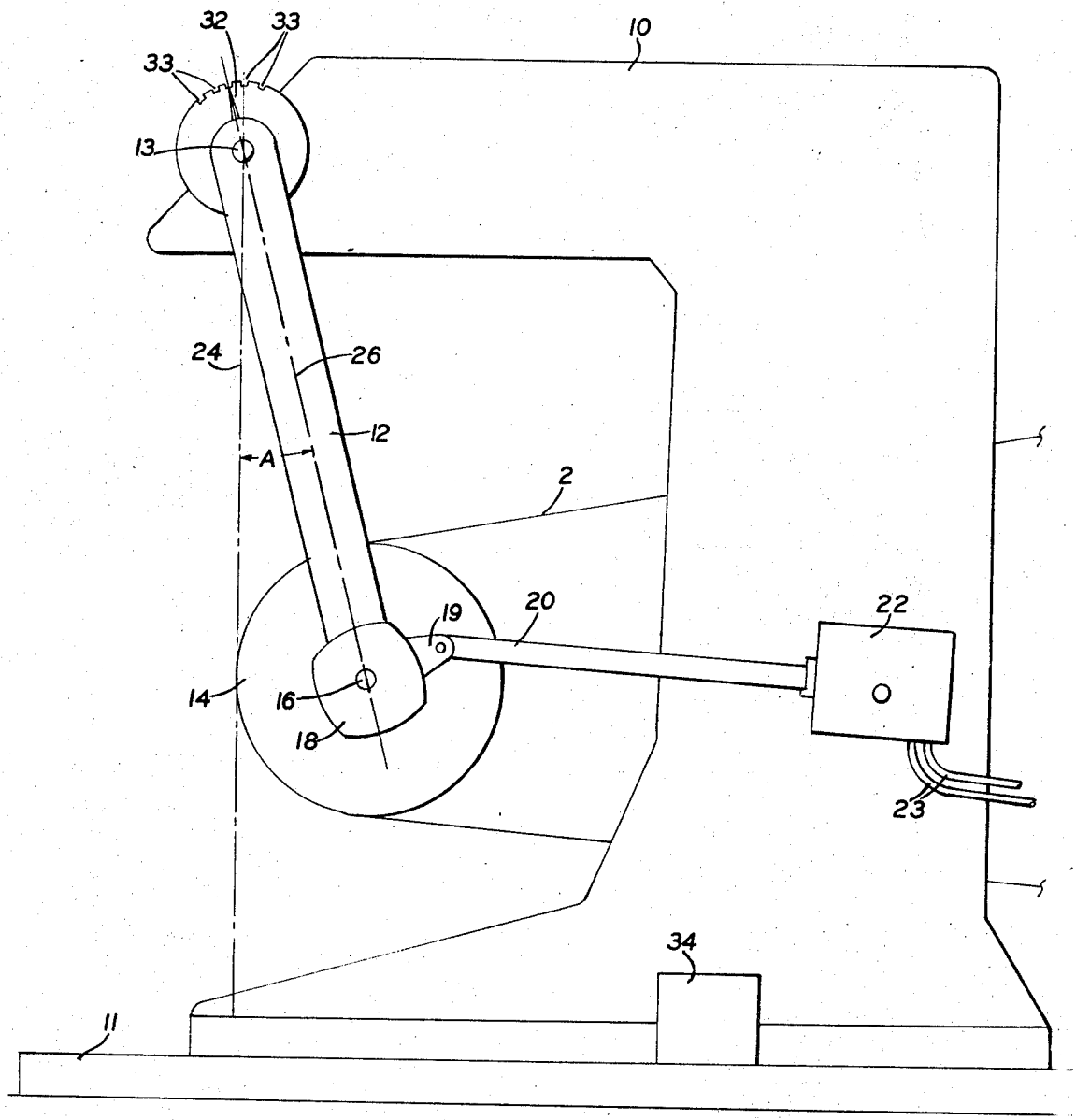


FIG. I.

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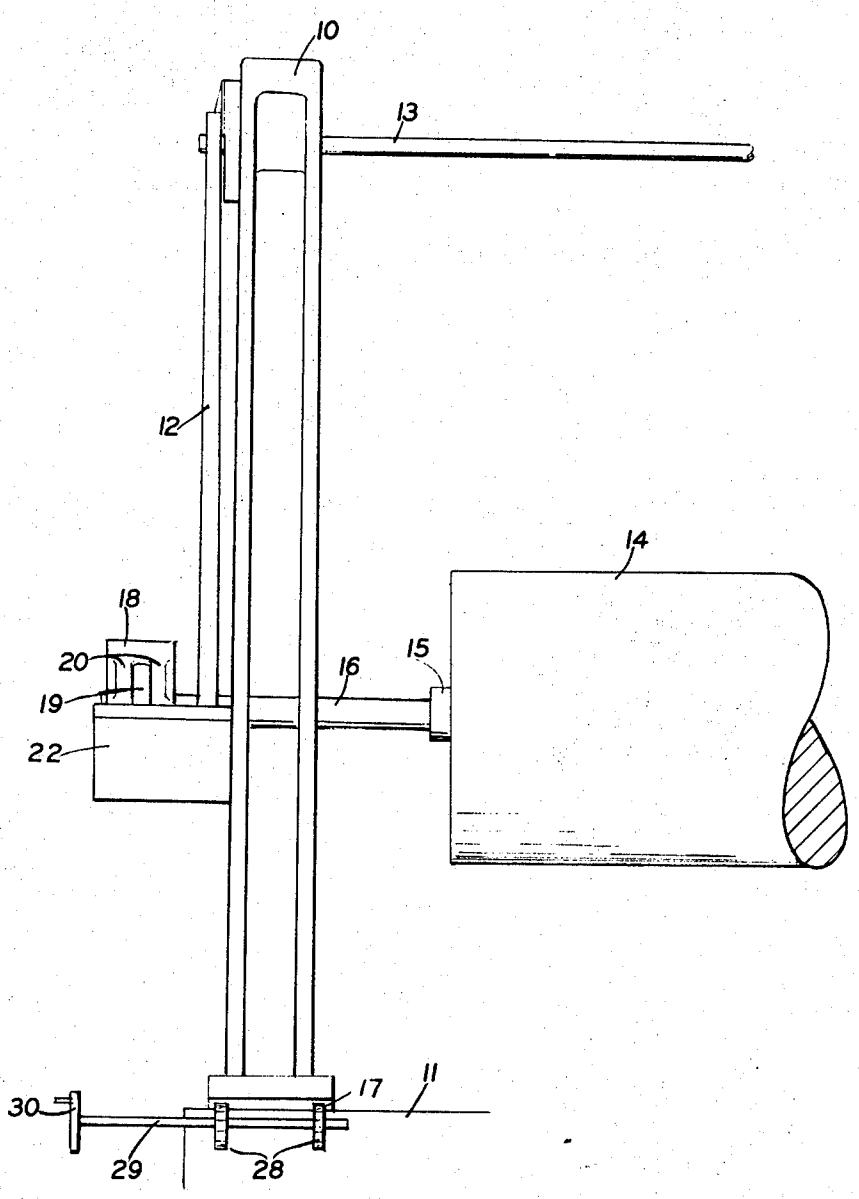


FIG. II.

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WEB TENSIONING DEVICE

THE INVENTION

In a wide variety of industries, endless belts or webs are employed in the production of sheeted materials. Typical of these industries is the paper industry, wherein felt, wire, or synthetic materials are formed into endless belts or webs which are trained about a series of rolls. The function of these webs is to convey materials which are normally in the form of a sheet such as paper or paperboard from one point to another. Many times, these webs have additional functions, such as the removal of moisture from the product being conveyed. Due to the nature of their construction, these webs have a tendency to undergo changes in their overall length, whether due to stretching or shrinking caused by their contact with moisture, heat, etc., or due to other factors such as sudden or gradual buildup of material on a roll within a loop of the web.

Oftentimes, the webs are periodically replaced when they become worn or no longer serve the intended purpose. Due to the many varied uses of these webs, oftentimes it is not possible to obtain a sufficient quantity of replacement webs which are exactly the same length. For these, and other reasons, it has been the practice in many industries including the paper industry to employ tensioning devices which are designed to take up the slack and/or maintain a desired amount of tension in the looped belt or web.

Due to the many problems found in operating processes wherein endless webs or belts are employed, the art has long searched for a simple, effective means for tensioning a web, which device is sufficiently adaptable to allow for sudden or gradual changes in overall web length.

Accordingly, it is an object of this invention to provide a simple, efficient and practical device for tensioning endless belts or webs.

It has now been discovered that such a device may be provided by the present invention. Basically, the invention comprises the use of a roll suitable for engaging the web and attached to a frame by a pair of pivot support arms. The frame is mounted on the surface of the plant employing such a device. Also connected to the roll, and preferably connected at the two ends of the roll, are connector arms which are in turn connected to a power means such as a piston, air cylinder, hydraulic cylinder, mechanical spring or other thrust creating device. The power means is adapted to move the roll in a direction suitable for tensioning the web. As a further part of the present device, cross shaft means connecting the pair of pivot support arms are employed to maintain the pivot support arms in a parallel relationship with each other, thereby obviating the difficulty of uneven wear and stress on the web.

In a preferred embodiment, the pivot arms are positioned to form an angle with the vertical such that the weight of the roll tensions the web by itself. This feature is desirable for it allows some tensioning of the web under circumstances wherein the power means may fail, due to a sudden loss of pneumatic pressure for example. Ordinarily, the angle which the pivot arms make with the vertical will range from 10° to 40°, although a smaller or greater angle would also be possible.

In another embodiment, the invention includes the use of a means for moving the frame along the surface or floor of the plant. This means for moving the frame along the floor surface permits the device to tension the web after large changes in web length, such as, for example, where a felt will stretch substantially after several days of operation. It is further possible to include means for responding to the position of the pivot support arms, wherein these means for responding to the arms indicates a change in web length and actuates the means for moving the frame along the floor surface. These means may be adapted to operate intermittently, such as by the actuation of limit switches which are activated by the position of the pivot support arms. If, for example, the position of the pivot support arm indicates that the web has increased in size, such as through stretching, the frame and therefore the entire device would move away from the inside of the web and in the direction causing tension in the web. Likewise, should there be a sudden or gradual buildup of material on one of the rolls which supports the web, the position of the pivot support arm would indicate a shortening of the web, thereby causing the frame and the entire device to move in the opposite direction.

For a more complete understanding of the present invention, and the various embodiments, reference is hereby made to the drawings, in which:

FIG. 1 represents a side schematic view of the preferred embodiment of this invention; and

FIG. 2 represents a partial front view of the device of this invention.

As can be seen in FIG. 1, a web 2 is being tensioned by the device of the present invention. This device comprises a frame 10 which is mounted on a surface 11 which may be the floor of the plant employing the device, or it may be some form of track or guide means. Positioned below the top of the frame and being wrapped by the web 2 is a roll 14. The roll 14 is suspended from the frame 10 by pivot support arms 12 which are connected to the roll 14 at each end thereof.

As shown in Fig. 2, the pivot arm 12 is mounted to the frame 10 by a cross connecting shaft 13. These mountings are provided with bearings or other suitable friction relieving means when suitable. Although only one end of the roll 14 and the cross connecting shaft 13 are shown in FIG. 2, it is to be understood that a like mounting arrangement is shown at the other end of the roll 14 and shaft 13. The roll 14 is mounted on a shaft 16 through journal 15 and is connected to bearing means 18, thereby permitting the roll 14 to move along with the web 2. The pivot support arm 12 is fixedly mounted to the bearing means 18.

Also attached to the ends of the roll 14 is a pair of connector arms 20, mounted to the bearing means 18 through pivot mounting 19. These connecting arms 20 are attached to a power means 22, which as shown in FIG. 1 may be an air cylinder or other device which is capable of moving the connecting arm 20 in a direction suitable for tensioning the web 2. Air lines 23 are shown as a source of power for the power means 22.

As mentioned above, in a preferred embodiment of the present invention, the pivot arms 12 form an angle with the vertical such that the weight of the roll 14 tensions the web 2. As shown in FIG. 1, the pivot support arm 12 forms an angle A between the imaginary vertical line 24 and the center axis 26 of the pivot support arm 12. It can be seen that the angle A may vary during operation of the device. Of course, the larger that angle A becomes, the more effect the weight of the roll has on the web 2. Normally, the angle A will range from about 10° to about 40°. Of course, if the angle A were to be less than 0°, that is if the pivot arms were to be swung out past the vertical line, the weight of the roll would operate in the direction opposite to the direction necessary for tensioning the web. Similarly, as angle A increases substantially, a limit will be reached when the pivot arm 12 is fully extended in the web and can no longer pivot.

Thus it can be seen that the roll 14 is adapted to move in response to minor variations in the tension of the web 2. Normally, during the operation of the present device, a very gradual change in the overall length of the web will occur. In addition, oftentimes minor quantities of material are momentarily introduced on the other rolls which support the web, thereby causing a slight shortening of the web. During these changes, the action of pivot arms 12 supporting the roll 14 allows for these minor changes while maintaining a constant tension on the web 2. The tension caused by the web is completely balanced by the tension in the opposite direction caused by the weight of the roll and the thrust of the power means. Minor changes in the length of the web will result in almost immediate changes in the position of the roll, but the tension on the roll will be maintained at the desirable level.

To accommodate large changes in the length of the endless belt or web, several features of the present invention are suitable. It is possible to mount a series of contact points 33 at the

point where the frame and the pivot support arm are connected. By attaching an indicator point 32 to the pivot arm, variations in the position of the pivot arm 12 will cause the indicator 32 to contact the various contact points 33. If, for example, the endless belt were to break, the roll 14 would swing to the left in FIG. 1. As the indicator 32 reached a suitable contact point 33, a signal could be transferred automatically to the power means 22 to shut off the power means 22 and prevent the operation of the device in an uncontrolled manner. Similarly, should a large quantity of material become wedged in between one of the rolls supporting the web and the web, thereby materially shortening the length of the web, a swing of the roll towards the right in FIG. 1 would cause the indicator 32 to contact a different contact point 33. This contact point could cause a signal to operate the power means to cause a reduction in the tension thrust due to the shortening of the web, or it could in fact shut off the drive means rotating the web, thereby saving a possible loss of the web itself through excessive tension.

Further use of these contact points to automatically control the operation of the present invention is also possible. As has been mentioned above, oftentimes large but not dangerous changes in the length of the web will occur. If the device is operated manually, the entire frame 10 can be moved along the surface 11, such as by the means provided in FIG. 2. Gears 28 may be mounted in the base 11 along a track (not shown) and attached to a shaft 29 which in turn connects to wheel 30. A rack 17 in frame 10 then moves the frame 10 when gears 28 are turned. By observation of the position of the pivot support arms 12, and other factors, the operator may rotate the wheel 30 causing movement towards or away from the tensioning direction to accommodate changes in web length. Also, the above mentioned contact points 33 can be arranged to signal an automatic motor 34 for moving the frame along the surface. Thus if a large increase in web length were effected, the indicator point 32 would necessarily be swung in the direction to operate a contact point which cause the entire device to move away from the web, thereby accommodating the increase in length. Decreases in length could likewise be accommodated.

Thus it can be seen that a simple and effective device for tensioning webs has been provided by the present invention.

We claim:

1. A device for tensioning a web comprising: a frame mounted on a surface; a roll suitable for engaging said web; a pair of pivot support arms, one being mounted on each end of said roll and attached to said frame; power means fixedly mounted; a pair of connector arms, mounted on each end of said roll and further attached to said power means, whereby said power means is adapted to move said roll in a direction tensioning said web; cross shaft means connecting said pair of pivot support arms to thereby maintain said arms in a parallel relationship with each other; means for moving said frame along said surface, whereby said device operates to tension said web after large changes in web length, and said means for moving said frame along said surface, including means for responding to the position of said pivot support arms, whereby movement of said pivot support arms indicating change in length of said web actuates said means for moving said frame along said surface to maintain tension in said web.