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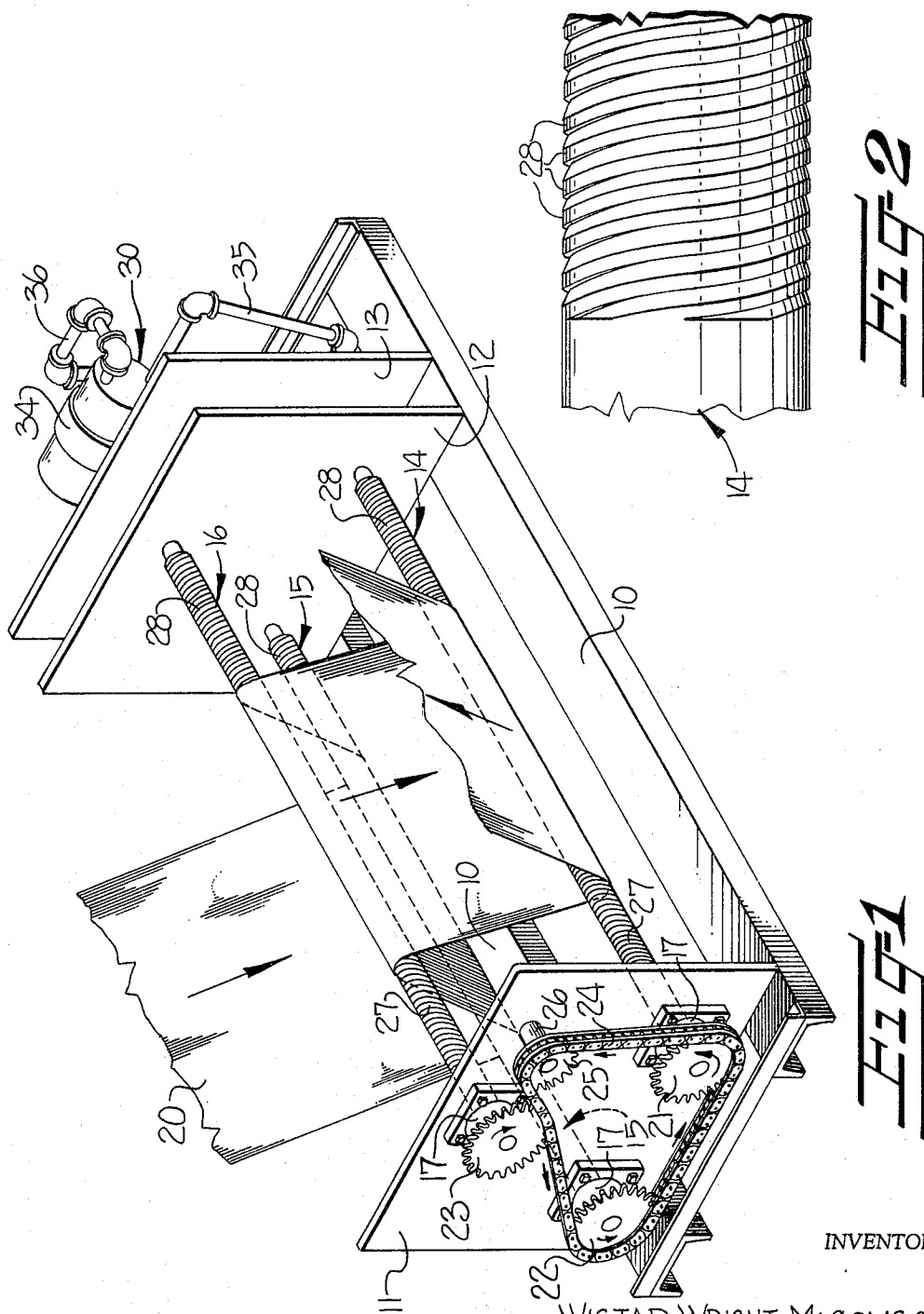
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3,268,142

WEB TENSIONER AND SPREADER

Filed March 12, 1964

3 Sheets-Sheet 1



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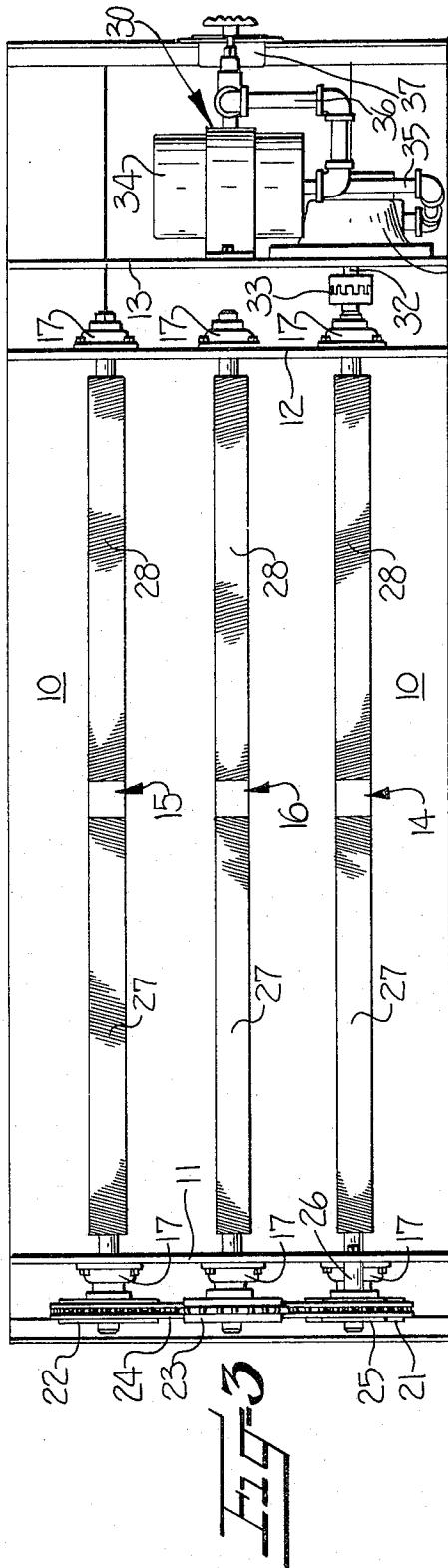
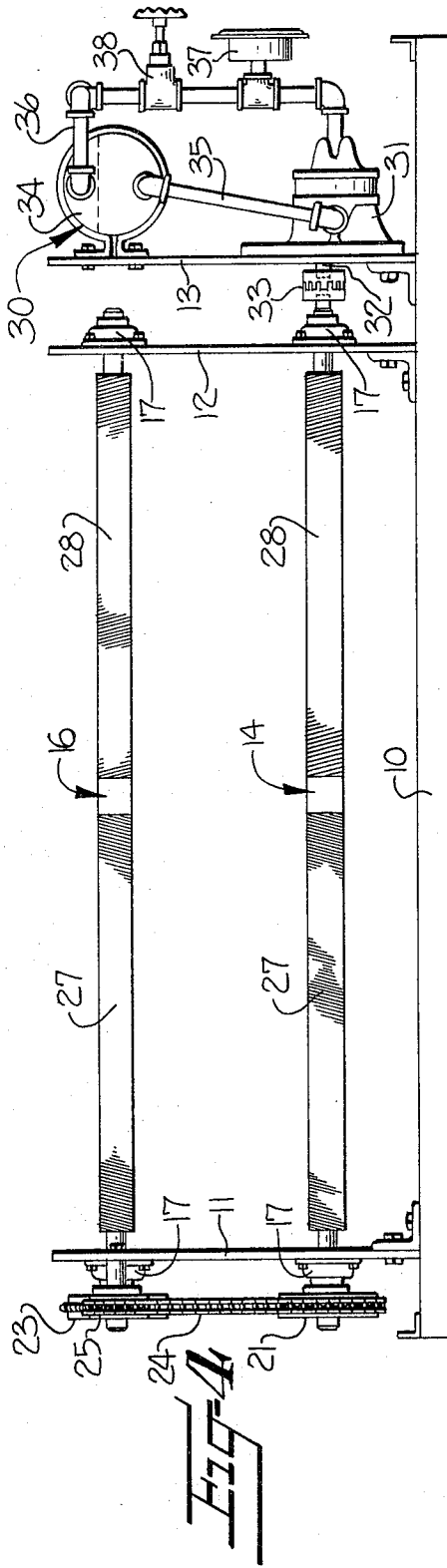
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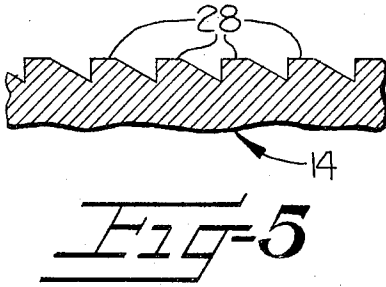
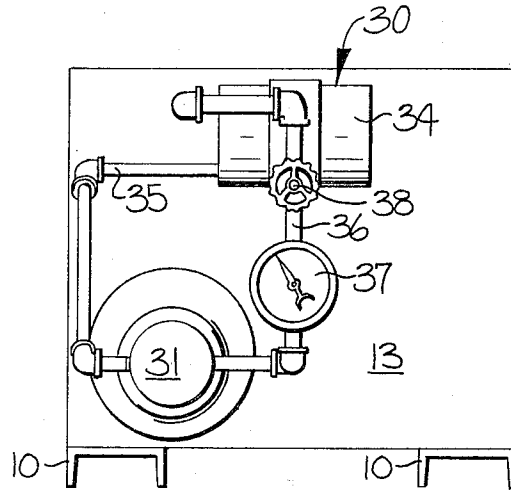
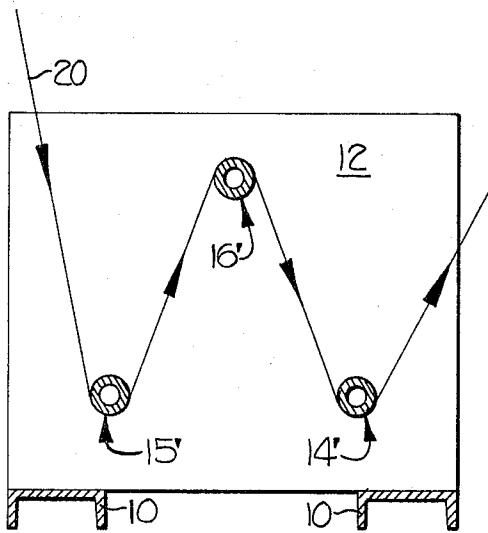
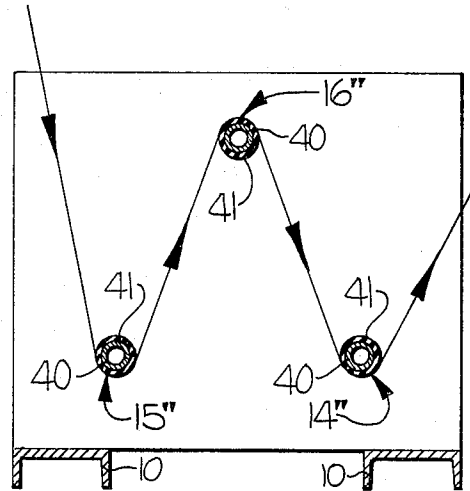
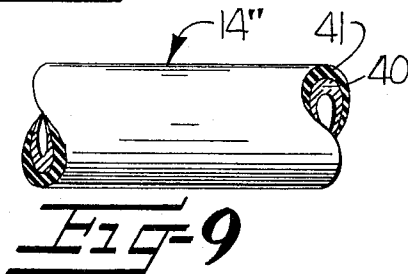
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WEB TENSIONER AND SPREADER

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3 Sheets-Sheet 3



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WEB TENSIONER AND SPREADER
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This invention relates to a web tensioner and spreader device and more particularly to means for controlling the amount of tension and the amount of spreading force applied to a web of material.

In the manufacturing of textile webs and in the finishing processes therefor, it is often necessary to have a device for applying a longitudinal tension to the traveling web of material and also to transversely spread or open up the web to its full width.

Various devices have been available for accomplishing these purposes; however, these devices have not been fully satisfactory. These prior devices have means for regulating to some extent the spreading forces applied to a traveling web of material, i.e. by varying the angle of roll means relative to the web or by varying the amount of the circumference of roll means transversed by the web. However, the amount of regulation of the spreading force in these prior devices is severely limited and therefore, these prior devices are incapable of the sensitive adjustment required by the various types of web material to be processed thereon. Also, the mechanisms for adjusting the roll means relative to the web material are rather complicated and require many separate adjustments which require considerable time and effort. Another deficiency of these prior devices resides in the fact that these prior devices do not have any means for controlling the tension in the traveling web.

Therefore, it is an object of this invention to provide a web tensioner and spreader device which has control means for regulating the amount of tension in and the spreading force applied to a traveling web of material.

Another object of this invention is to provide a novel web tensioner which may be regulated to provide a wide range of constant tensioning to a web of material as it passes therethrough.

A more specific object of this invention is to provide a web tensioner and spreader device which includes a plurality of rolls having opposite hand convolutions thereon which join in the middle to spread the web transversely and apply tension thereto. The threaded rolls are interconnected for synchronized movement through gears, chains, or the like and are associated with an adjustable control device which regulates the amount of force required to rotate the rolls and thereby regulates the amount of constant tension in and constant spreading force applied to a traveling web of 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 perspective view of the device of this invention showing a portion of a traveling web of material passing therethrough;

FIGURE 2 is an enlarged fragmentary plan view of one of the threaded rolls used in the device illustrated in FIGURE 1;

FIGURE 3 is a top plan view of the device illustrated in FIGURE 1;

FIGURE 4 is a front elevational view of the device illustrated in FIGURE 1;

FIGURE 5 is an enlarged fragmentary sectional view of one of the threaded rolls used in the device illustrated in FIGURE 1;

FIGURE 6 is a right side elevational view of the device illustrated in FIGURE 1;

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FIGURE 7 is a transverse vertical section of a modified form of the device of this invention;

FIGURE 8 is a view similar to FIGURE 7 of another modified form of the device of this invention; and

5 FIGURE 9 is an enlarged fragmentary plan view of one of the rolls shown in FIGURE 8.

Referring now to the drawings, one embodiment of the web tensioner and spreader device of this invention is shown in FIGURE 1 and includes a stationary frame 10.

10 The stationary frame 10 has a base portion and three upstanding plates 11, 12 and 13 secured to the base portion.

The device further includes three cylindrical rolls 14, 15 and 16. The ends of these rolls are disposed between and pass through apertures in the upstanding plates 11 and 12 and are rotatably carried in bearings 17 secured to the outside of plates 11 and 12, as shown in FIGURES 1, 3 and 5. These rolls are so disposed, as shown in FIGURE 1, that a traveling web of material 20 will pass under rolls 14 and 15 and over roll 16, thus rotating these rolls as the traveling web is pulled forwardly by any suitable means (not shown).

The rolls 14, 15 and 16 are interconnected on the outside of plate 11, as shown in FIGURES 1, 3 and 4, by sprockets 21, 22 and 23, which are secured to one end of the rolls 14, 15 and 16 respectively, and by a chain 24. The chain 24 is positioned partially around sprockets 21 and 22 and under sprocket 23 to ensure that the rolls 14, 15 and 16 will rotate with the direction of travel of the web 20 according to whether the web passes under or over a particular roll. To support the chain 24 in engagement with the underside of sprocket 23, the chain passes around an idler sprocket 25 which is rotatably carried on the end of a stub shaft 26. The stub shaft 26 is secured to the upstanding plate 11. This interconnection of the rolls 14, 15 and 16 ensures synchronized rotation of the rolls for reasons to be presently described.

To provide a transverse spreading or width-wise opening of the traveling web 20, each of the rolls 14, 15 and 16 have opposite hand spiral convolutions or threads 27 and 28 on each end portion thereof diverging from the center, as shown in FIGURES 1, 3 and 4. Threads or convolutions 27 and 28 are more particularly shown in FIGURES 2 and 5 and preferably are square, quadruple threads, but any suitable threads may be used. As the rolls 14, 15 and 16 are rotated in unison by the traveling web 20, the spiral convolutions 27 and 28 exert transverse forces on the web 20 in opposite directions from the center which will open up or transversely spread the web 20 as it travels over and under the rolls. Each of the rolls 14, 15 and 16 will exert equal spreading forces on the web 20 due to their interconnections and synchronized rotation. These spreading forces will uncurl opposite longitudinal side edges of the web to render the same substantially flat across its width.

To regulate the amount of constant tension and the amount of constant spreading forces applied to the web 20, the above described device is provided with a control means generally indicated by the reference numeral 30. This control means 30 comprises a positive displacement hydraulic pump 31 secured to upstanding plate 13 and having an output shaft 32. The output shaft 32 is connected to one end of roll 14 between upstanding plates 12 and 13 by a coupling 33. The control means 30 further includes a hydraulic reservoir 34 which is secured to upstanding plate 12. The reservoir 34 is connected to the pump 31 by a supply pipe 35 and a return pipe 36. The return pipe 36 has a pressure indicator 37 and an adjustable flow valve 38 disposed therein. As is apparent, the control means is a closed positive displacement hydraulic pump system with the pump being driven by roll 14. The

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pressure in this system and hence the load on pump 31 may be regulated by opening or closing the flow valve 38 and this pressure is indicated on pressure indicator 37. This regulated pressure in the control system 30 regulates and makes constant for a given pressure setting the amount of force required to rotate rolls 14, 15 and 16 due to the interconnection of these rolls to the control system 30 through coupling 33 and the interconnections between the rolls themselves.

Thus, it may be seen that a web tensioner and spreader is provided which has rolls driven by the web for exerting tension and spreading forces on the web. These tensioning and spreading forces are equalized between the rolls by interconnecting the rolls for synchronized rotation and are controlled or regulated and held constant by connecting the rolls to a closed positive displacement pump mechanism in which the pressure may be regulated through a very wide range and with a single adjustment to regulate the amount of force required to rotate the rolls for increasing or decreasing the amount of tensioning and spreading forces applied to the web.

FIGURES 7, 8 and 9 illustrate two modified forms of this invention wherein the device is used for tensioning only. These forms include all of the above described mechanisms with only different kinds of rolls being used.

In FIGURE 7, there is shown rolls 14', 15' and 16' formed entirely of steel and having a smooth surface thereon.

FIGURES 8 and 9 show a tensioning mechanism having rubber covered rolls 14'', 15'' and 16''. The rolls comprise a base of 40 of any suitable material and a covering 41 of rubber, which provides rolls having surfaces with high coefficients of friction for greater tensioning action.

In the drawings and specification there have 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 in limitation, the scope of the invention being defined in the claims.

I claim:

1. A web tensioner and spreader mechanism for applying longitudinal tension and transverse spreading to a traveling web of material comprising a stationary frame a plurality of roll means rotatably mounted on said frame and adapted to apply longitudinal tension and transverse spreading to the traveling web of material as it travels over and under said roll means, means interconnecting each of said roll means for synchronizing the rotation of said roll means to equalize the tension and spreading forces between said roll means, and an adjustable hydraulic control means coupled to said roll means for maintaining constant the amount of force necessary to rotate the rolls, thereby regulating and maintaining constant the amount of tension and spreading forces applied to the traveling web of material.

2. A web tensioner and spreader mechanism, as set forth in claim 1, in which each of said roll means comprises a longitudinally extending cylindrical roll having opposite hand spiral convolutions on each end thereof diverging from the center of said roll.

3. A web tensioner and spreader mechanism, as set forth in claim 1, in which said means interconnecting each of said roll means comprises sprockets secured to each of said roll means and an endless chain interconnecting each of said sprockets for synchronized rotation of said sprockets and said roll means.

4. A web tensioner and spreader mechanism, as set forth in claim 1, in which said control means comprises a closed hydraulic system including a positive displacement pump having an output shaft coupled to said roll

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means, a hydraulic reservoir, a supply pipe connected between said reservoir and said pump, a return pipe connected between said reservoir and said pump, a pressure indicator disposed in said return pipe for indicating the pressure in said system, and an adjustable flow valve disposed in said return pipe for regulating and maintaining constant the pressure in said return pipe and hence the load on said pump to thereby regulate and maintain constant the tension and spreading force applied to the traveling web of material by said roll means.

5. A web tensioner mechanism as set forth in claim 1, in which each of said rolls is provided with a surface having a high coefficient of friction.

6. A web tensioner and spreader mechanism for applying longitudinal tension and transverse spreading to a traveling web of material comprising a stationary frame, a plurality of longitudinally extending cylindrical rolls each having opposite hand spiral convolutions thereon diverging from the center of said roll and being rotatably mounted on said frame for applying longitudinal tension and transverse spreading to the traveling web of material as it travels over and under said rolls, means interconnecting each of said rolls for synchronizing the rotation of said rolls to equalize the tension and spreading forces between said rolls, and control means comprising a closed hydraulic system including a positive displacement pump having an output shaft coupled to said roll means, a hydraulic reservoir, a supply pipe connected between said reservoir and said pump, a return pipe connected between said reservoir and said pump, a pressure indicator disposed in said return pipe for indicating the pressure in said system, and an adjustable flow valve disposed in said return pipe for regulating the pressure in said return pipe and hence the load on said pump to thereby regulate the tension and spreading force applied to the traveling web of material by said roll means.

7. A web tensioner mechanism for applying longitudinal tension to a traveling web of material comprising a stationary frame, a plurality of longitudinally extending cylindrical rolls rotatably mounted on said frame for applying longitudinal tension to the traveling web of material as it travels over and under said rolls, means interconnecting each of said rolls for synchronizing the rotation of said rolls to equalize the tension and spreading forces between said rolls, and control means comprising a closed hydraulic system including a positive displacement pump having an output shaft coupled to said roll means, a hydraulic reservoir, a supply pipe connected between said reservoir and said pump, a return pipe connected between said reservoir and said pump, a pressure indicator disposed in said return pipe for indicating the pressure in said system, and an adjustable flow valve disposed in said return pipe for regulating and maintaining constant the pressure in said return pipe and hence the load on said pump to thereby regulate and maintain constant the tension and spreading force applied to the traveling web of material by said roll means.

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