Nov. 22, 1960 B. F. HERR 2,961,183

WEB TENSIONING DEVICE

Filed Feb. 24, 1958

Fig. 1

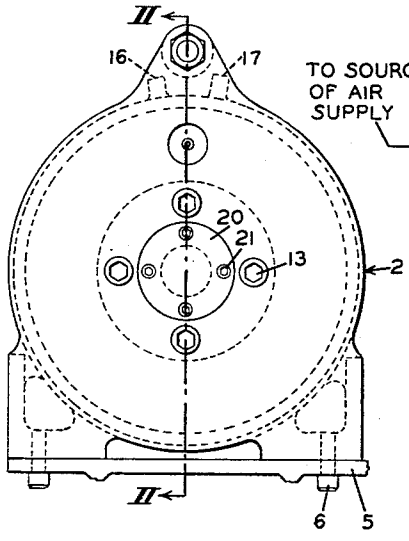


Fig. 2

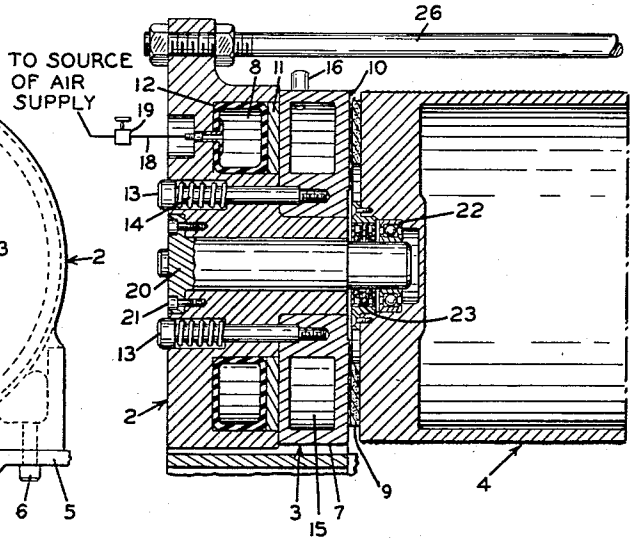


Fig. 3

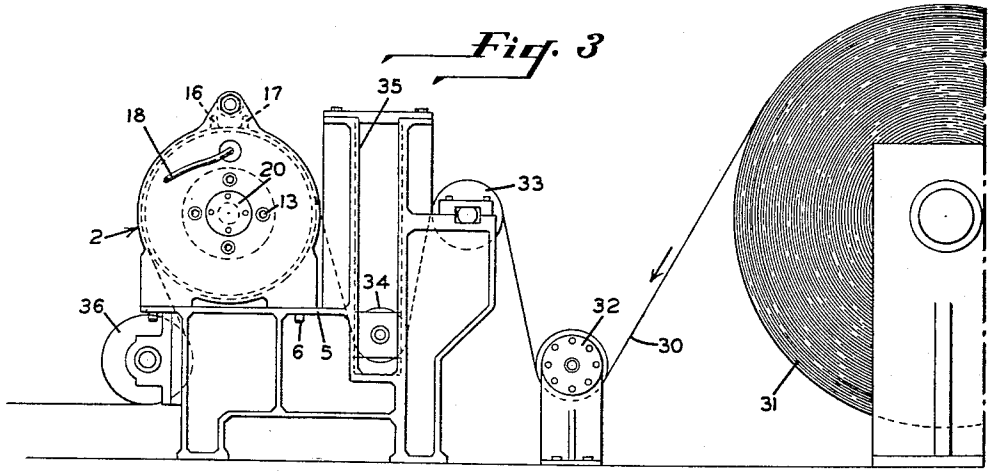
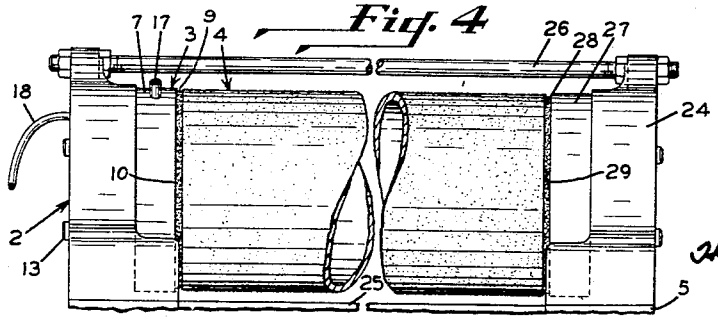


Fig. 4



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WEB TENSIONING DEVICE

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This invention relates to a web tensioning device and is concerned more particularly with a device for applying a controlled but substantially constant tension to a moving web, such as a web of burlap which is delivered through a linoleum inlaying machine in the production of inlaid linoleum for floor and wall covering uses.

With constant tension devices of the type under consideration, the web is fed over a tensioning roll and a brake is applied to the roll or to the roll shaft to control the rotation of the roll and to apply the desired tension to the web. Considerable frictional heat is developed in the braking system for these web tensioning devices, particularly in heavy duty installations where wide webs of heavy fabric are placed under substantial tension.

An object of the present invention, therefore, is to provide a web tensioning device with a built-in fluid cooling arrangement for the braking mechanism.

Another problem with heavy duty web tensioning devices is the provide a readily controlled actuating system for the braking mechanism. Where mechanical brakes are used, manual adjustment of the brakes on opposite ends of the tensioning roll is difficult and slow. Control of the tensioning roll must be effected by a dynamic braking action as the web is fed to the operating machine. This complicates the matter of adjustment and necessitates that the adjustment be made quickly on opposite ends of the roll.

Another object of my invention is to provide a web tensioning device which will be simple to operate by a machine operator, or automatically in accordance with the tension on the web being operated upon.

In heavy duty web tensioning systems, there is always present the problem of the application of undesirable torque to the tensioning roll should one end of the roll be braked to a greater degree than the opposite end.

Another object of the invention is to provide a web tensioning device in which braking at the opposite ends of the web tensioning roll will be effected uniformly and automatically.

Other objects of the invention will be clear from the following description of an embodiment of the invention which will be given in conjunction with the attached drawing, in which:

Figure 1 is an end view of a portion of a web tensioning device showing a portion of the framework upon which it is mounted;

Figure 2 is a sectional view of the tensioning device shown in Figure 1 taken along the line II—II of Figure 1;

Figure 3 is a diagrammatic view illustrating the operation of the tensioning device of Figures 1 and 2 in a typical web tensioning service; and

Figure 4 is a side elevational view to a reduced scale of the roll tensioning device shown in Figure 1.

The web tensioning device comprises in general a brake stand 2 in which is mounted a braking mechanism indicated generally by the numeral 3. The braking mechanism serves to apply an adjustable but constant braking action to a tensioning roll indicated generally by

the numeral 4. The brake stand 2, as shown in Figures 1 and 3, is mounted upon a machine frame 5, being secured to it by bolts 6.

The braking mechanism includes a fluid cooled brake ring 7 and a resilient inflatable tube 8 for actuation of the brake ring 7. The actuating tube 8 is expansible by fluid pressure, such as air, supplied thereto from a suitable source as noted by the legend in Figure 2.

A brake shoe 9 is interposed between the brake ring 7 and the tensioning roll 4 and is carried by one of them. In the embodiment shown in Figure 2, it is carried by the roll 4. The other of the roll and brake ring which does not carry the brake shoe has a braking surface which is engageable with the brake shoe. In the embodiment shown in Figure 2, a braking surface 10 is provided on the brake ring 7. Preferably, brake shoe 9 is mechanically or adhesively secured on the tensioning roll 4, but it may be secured to the brake ring 7; in which event, the braking surface 10 for engagement with the brake shoe 9 will be provided on the end of the tensioning roll 4.

A pressure transfer ring 11 is slidably fitted within tube cavity 12 provided in the brake stand 2, and the thrust of the tube 8 upon its inflation is transmitted to the brake ring 7 through the pressure transfer ring 11.

The brake ring 7 is supported by a cylindrical projection formed on the brake stand 2 and is held against rotary motion by four torque pins 13 which are received within bored and counterbored openings in the brake stand 2 and are threaded into the brake ring 7. Compression springs 14 are disposed in the counterbores in the brake stand 2 under the heads of the torque pins 13. The springs serve yieldingly to urge the brake ring to the position shown in Figure 2, its fully retracted position.

The brake ring 7 is arranged for fluid cooling through a chamber 15 which has inlet and outlet connections 16 and 17 for delivery of cooling fluid, such as water, to the chamber 15 and exhaust of the spent cooling water therefrom. Flexible lines may be provided for supplying the fluid to connection 16 and for exhausting the spent fluid through connection 17. If necessary, the temperature of the heat transfer fluid may be controlled to avoid possible changes in braking action which might occur if widely varying temperature conditions were to exist at the braking surfaces.

The actuation tube 8 is connected to the source of air supply through a line 18, and the air supplied for inflation of the actuation tube 8 is controlled by adjustable means for applying a constant fluid pressure to the tube, such as control valve 19. This has been illustrated diagrammatically in Figure 2. The valve 19 may be either manually adjusted or may be automatically adjusted in accordance with the tension on the web being fed through the machine.

The tensioning roll 4 is mounted for rotation on a stud shaft 20 which is received within a counterbored opening in the brake stand 2. The stud shaft is held in place by bolts 21 which pass through a flange on the stud shaft and received in the brake stand 2. The roll 4 is mounted on a bearing 22 which is received over the end of the stud shaft 20 and is slidable to a slight extent along the axis of the stud shaft, as will be more fully hereinafter explained. An oil seal assembly 23 may be provided surrounded the stud shaft 20 and attached to the roll 4, as shown in Figure 2.

Figure 4 shows a tensioning roll which is arranged for braking on both of its ends, with the mechanism of Figures 1 and 2 incorporated into the roll stand on the left side of the unit as shown in Figure 4. The provision of roll brakes on each end of the roll obviates the development of objectionable torque in the tensioning roll unit

which might result if braking were effected at only one end of the roll, particularly where substantial braking force is necessary to apply the desired tension to the web being fed over the tensioning roll. In heavy duty installations, braking is always effected at both ends of the tensioning roll.

The brake stand 2 is shown at the left in Figure 4, and a similar brake stand 24 is shown on the right. The two brake stands are securely connected together at their bases by the frame 5 and floor members 25. A tie bar 26 is disposed at the top of the brake stands and connects them rigidly together at their tops. The braking mechanism in the brake stand 24 may be the same as in the brake stand 2, previously described, but good results are achieved by providing a fixed brake ring 27 and eliminating the inflatable brake ring actuating tube 8. The arrangement will be such, however, that the tensioning roll 4 will be free to move axially a slight distance when pressure is applied by the actuating tube 8 to brake ring 7 to bring the brake shoe 9 and the braking surface 10 into frictional engagement and to move the roll 4 axially along the stud shaft 20 a slight distance, sufficient to bring brake shoe 28 on the opposite end of roll 4 into engagement with braking surface 29 on brake ring 27. After initial engagement of the brake shoes 9 and 28 with their respective braking surfaces 10 and 29, additional force applied by the tube 8, controlled by air valve 19, will result in increased braking force being applied to the roll at each end.

Operation of the device of the invention in a typical installation is shown in Figure 3 where a burlap web 30 from a jumbo roll 31 is to be delivered under tension to an inlaying machine, for example, in the manufacture of linoleum. The web is delivered under a guiding roll 32 and over a guiding roll 33. It then passes under a nerve roll 34 which is mounted for rotation in bearings which are movable vertically in guide ways 35. The nerve roll 34 may control a brake on roll 31 in the conventional manner.

The web is then trained over tensioning roll 4, the surface of which may be roughened, covered with card cloth, or otherwise treated to provide a frictional surface, if that be found to be necessary or desirable. The web passes under a guide roll 36 so positioned that the web engages a substantial portion of the tensioning roll, about 180° of its surface, as shown in Figure 3.

After the web has been threaded through the tensioning unit and the inlaying machine, the tension of the web is adjusted by control of the air supplied through valve 19 to inflate tube 8. Upon inflation of the tube 8, the brake shoes 9 and 28 are brought into engagement with their respective braking surfaces 10 and 29, and the tensioning roll 4 is restrained against rotation in accordance with the inflating pressure applied through tube 8. This may be controlled from time to time as may be required by adjustment of valve 19. As the inflating pressure on tube 8 is lessened in any such adjustment, springs 14 on the torque pins 13 will move the brake ring 7 axially toward the position shown in Figure 2.

Since the brake shoes 9 and 28 are continuously in frictional engagement with their respective braking surfaces 10 and 29 and may be exerting a substantial restraining force against rotation of the tensioning roll 4, water or other cooling fluid is continuously inletted and exhausted through the brake rings 7 and 27 to absorb heat from the brake shoes and from the braking surfaces. The temperature of the coolant may be controlled if that is found to be necessary or desirable.

Where the tensioning force permits, braking may be effected, of course, on one end only of the tensioning roll, in which event the opposite end may be journaled in conventional bearings for rotation, without the need for a braking unit on that end of the roll.

With the present invention, it is possible to apply a controlled, continuous tensioning force to the tensioning roll and also to apply a substantially uniform braking force to each of the ends of the roll so as to minimize the development of any objectionable turning torques within the tensioning unit. The device is simple in construction and may be conveniently adjusted by mere manipulation of a single valve. The unit is rugged and positive in action and is ideally suited for controlling the tension on wide webs such as the burlap and saturated felt paper backings used in surface covering manufacture.

I claim:

1. A web tensioning device comprising a rotatable tensioning roll, bearings in which said roll is journaled for rotary motion and for limited axial movement, stands disposed at opposite ends of said tensioning roll to support the same, braking means including brake shoes and braking surfaces disposed at opposite ends of said roll to restrict the rotary movement of said roll upon interengagement of said brake shoes and braking surfaces, and brake actuating means comprising a brake ring mounted on one of said stands for axial movement, inflatable means mounted in said one of said brake stands for moving said brake ring axially to bring said brake shoe and braking surface disposed at the end of said roll adjacent to said brake ring into braking relationship and to move said roll axially to bring said second brake shoe and braking surface at the opposite end of said roll into braking relationship.

2. A web tensioning device in accordance with claim 1 in which means are provided for securing said brake stands together at their tops and bottoms against displacement axially with respect to said roll during braking.

3. A web tensioning device comprising a rotatable tensioning roll, a pair of supporting brake stands disposed at opposite ends of said tensioning roll, means tying said brake stands together at their bases, a stud shaft received within each of said brake stands and to which said tensioning roll is journaled for rotation and is mounted for limited axial movement between said brake stands, a brake ring mounted on one of said brake stands, torque pins securing said brake ring to said one of said brake stands for limited axial movement between said one of said brake stands and said tensioning roll, a braking surface on one of said roll or said brake ring, a brake shoe carried by the other of said roll or said brake ring, a second braking surface and brake shoe on the other end of said roll and the other of said brake stands, and brake actuating means carried by said one of said brake stands for engaging said brake shoes with their respective braking surfaces comprising an inflatable resilient tube confined within a chamber in said one of said brake stands for applying an axial force to said brake ring to move the same axially, and adjustable means for applying a constant fluid pressure to said tube.

4. In a web tensioning device, a rotatable tensioning roll over which the web to be tensioned passes, a fixed support, a shaft secured to said support and upon which said roll is mounted for rotation, a hollow brake ring mounted on said support and encircling said shaft and slidable axially with respect to said shaft from a retracted inoperative position to an extended operative position, torque pins received in said fixed support and attached to said brake ring holding the same against rotation, yielding means disposed between said pins and said support for normally holding said brake ring in said retracted, inoperative position, fluid pressure actuatable, expansible means received within a chamber in said fixed support, a pressure transfer ring interposed between said expansible means and said brake ring for transmitting force from said expansible means to said brake ring to move the same axially of said shaft to said extended operative position against the action of said yielding means, a braking surface on one of said roll or said brake ring, and a brake shoe affixed to the other of said roll or said brake ring for interengagement with said braking surface

for braking action when said brake ring is moved to said extended operative position.

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