Aug. 30, 1960 J. E. DAIN ET AL 2,950,875

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Filed May 6, 1957 2 Sheets-Sheet 1

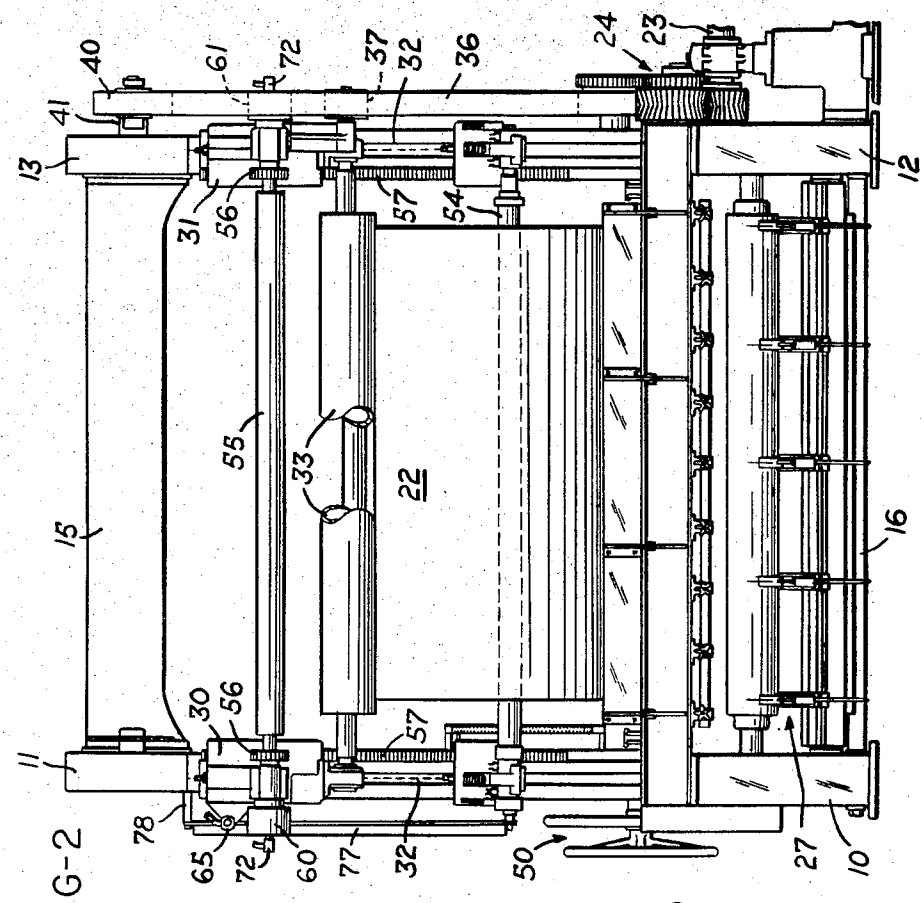


FIG-2

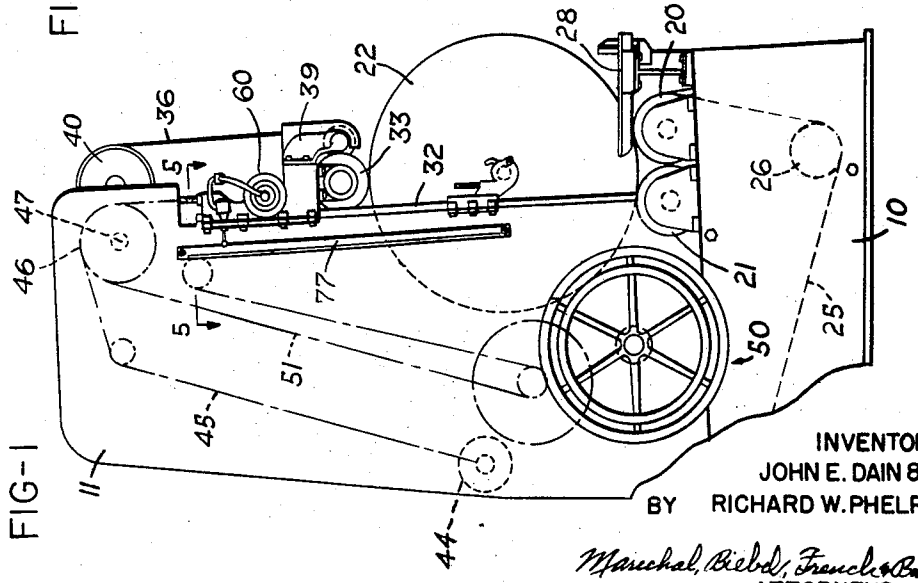


FIG-1

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FIG-3

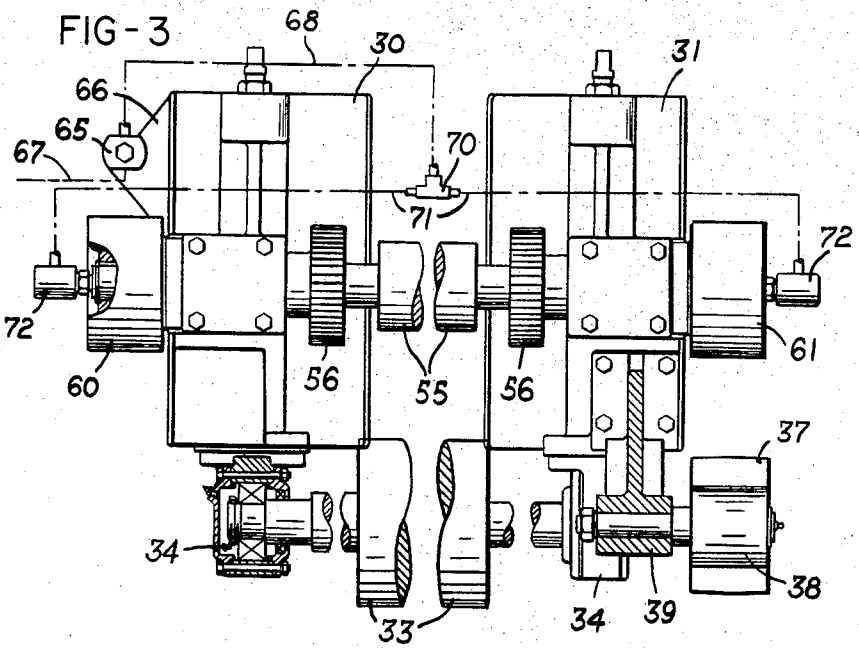


FIG-4

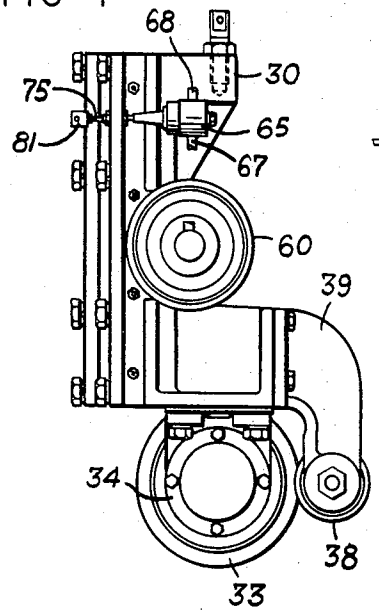
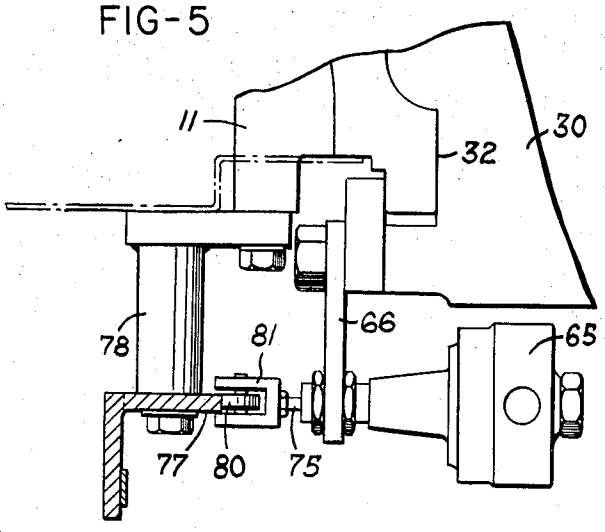


FIG-5



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4 Claims. (Cl. 242—66)

This invention relates to winding apparatus for web materials.

The invention has particular relation to winders of the drum type employing a rider roll which is in constant engagement with an upper portion of the roll during winding and which therefore travels upwardly as the web material accumulates on the new roll with resulting increase in its diameter. This rider roll is commonly driven at a surface speed slightly in excess of that of the winding roll, and it is also commonly caused to press against the winding roll to assure maintained tightness of the winding thereof. However, since this pressure of the rider roll is transmitted through the winding roll to the drum or drums which support and drive the winding roll, it is added to the constantly increasing weight of the winding roll on this drum or drums.

It is a primary object of the present invention to provide a simple and effective rider roll assembly for a winder of the above general type in which the pressure load of the rider roll on the winding roll is constantly decreased in proportion to the increase in diameter of the winding roll by means of a control responsive to the extent of upward movement of the rider roll by the accumulated web material on the winding roll.

An additional object of the invention is to provide such a rider roll assembly in which control of the rider roll pressure is effected by a mechanism located in part on the winder frame and in part on the rider roll assembly for continuous coaction as the rider roll is raised by the accumulated web material on the new roll.

Another object of the invention is to provide a rider roll assembly as outlined above in which the pressure load of the rider roll on the winding roll is established by controlled resistance to the upward movement of the rider roll assembly on the winder frame, and more particularly by a control which varies the resistance to upward movement of the rider roll in accordance with its position in its path of upward travel.

It is also an object of the invention to provide a rider roll assembly as outlined above in which the upward movement of the rider roll on the winder frame is opposed by a friction brake connected between the rider roll assembly and the winder frame, and in which the friction of the brake is varied in accordance with the position of the rider roll in its path of upward travel on the winder frame.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a view in side elevation showing a winder incorporating a rider roll assembly in accordance with the invention;

Fig. 2 is a fragmentary front elevational view looking from right to left in Fig. 1;

Fig. 3 is an enlarged fragmentary view partly in elevation and partly broken away in vertical section showing the rider roll assembly of Figs. 1 and 2 and looking in the same direction as Fig. 2;

Fig. 4 is a side elevational view looking from left to right in Fig. 3; and

Fig. 5 is an enlarged fragmentary section taken on the line 5—5 of Fig. 1.

Referring to the drawings, which illustrate a preferred embodiment of the invention, the winder in Figs. 1 and 2 includes a main framework formed by top and bottom wide frames 10—11 and 12—13 interconnected by suitable cross beams and tie rods 15 and 16. The drums 20 and 21 on which the new roll 22 is supported and driven are mounted on the bottom frames 10 and 12 and driven by the drive shaft 23 and gearing 24 in Fig. 2. The web 25 is indicated in Fig. 1 as guided to the front winder drum 20 by an idler roll 26 and Fig. 2 shows a slitter assembly 27 at the front of lower part of the winder frame. The roll out table for the finished roll is indicated at 28.

The rider roll assembly includes a pair of carriages 30 and 31 mounted for up and down sliding movement along ways 32 on the front of each of the upper side frames 11 and 13, and the rider roll 33 is journaled in bearings 34 depending from the carriages 30 and 31. Rider roll 33 is shown as driven from the drive 23—24 by means of a belt 36, a pulley 37 on one end of the rider roll shaft, an idler 38 mounted at 39 on carriage 31, and a pulley 40 mounted at the top of the upper side frame 13 by means of a spring loaded take-up arm 41. The rider roll assembly is also shown as provided with a counterweighting system comprising a counterweight 44 supported for guided movement in the upper side frames and connected to the carriages 30 and 31 by chains 45 running over sprockets 46 on a cross shaft 47 in the top of the side frames. The carriage assembly can also be raised manually by the hand wheel 50 and chain drive indicated generally at 51 to an additional sprocket on the cross shaft 47.

The movements of carriages 30 and 31 are coordinated to maintain the rider roll 33 in accurate parallelism with the mandrel 54 for the new roll 22. Referring particularly to Fig. 3, a torque shaft 55 extends across the full width of the winder and is journaled at opposte ends in the two carriages 30 and 31. This shaft 55 has secured thereon a pair of pinions 56 each of which engages a rack 57 mounted on the adjacent upper side frame 11 or 13. The pinions 56 will therefore track at the same rotational speed along the racks 57 and thus force the two carriages 30 and 31 to travel at the same rate, but in the absence of additional mechanism, this movement of the rider roll assembly will be opposed only by gravity, to the extent that the assembly is not completely balanced by counterweight 44.

In accordance with this invention, controlled resistance is provided to the upward movement of the rider roll caused by increase in the diameter of roll 22 by means of a friction brake assembly 60 and 61 connected between each of carriages 30 and 31 respectively and the adjacent end of shaft 55. This result is accomplished by changing the braking action of the brakes 60 and 61 in accordance with the vertical position of the carriage assembly, and specifically the invention provides for maximum braking action when the assembly is in its lowest position, which is the position during the start of a new roll when the rider roll 33 is helping to start the web on a new core on a new mandrel 54, and for steadily decreasing braking action as the rider roll carriages move upwardly.

This result is obtained in accordance with the invention by employing brakes 60 and 61 which are fluid pressure operated, and preferably pneumatically operated, and

by continuously varying the pressure supply thereto as the rider roll assembly travels along the ways 32. Referring particularly to Figs. 4 and 5, an air regulator 65, such as an adjustable reducing valve, is mounted on the carriage 30, as by means of the bracket 66 shown in Fig. 5, and is connected to the air supply line 67 for the brakes 60 and 61. Line 68 leads from the outlet side of air regulator 65 to a fitting 70 from which branch lines 71 lead to connection 72 to the two brakes 60 and 61, and the air regulator 65 includes a reciprocable plunger 75 which provides high pressure for maximum braking when it is at its innermost position and reduced pressure for decreasing braking as it moves outwardly.

Provision is made for continuously changing the position of the plunger 75 as the carriage 30 travels along upper side frame 11. Referring particularly to Fig. 1, a cam 77 is mounted on the side frame 11 by brackets 78 for engagement by a follower roller 80 mounted on the outer end of the plunger 75 by means of a yoke 81, and the forward edge of the cam 77 is contoured with respect to the adjacent way 32 to cause continuously controlled outward movement of plunger 75 as the carriage 30 moves from its lowest to its highest position. Since the weight of the new roll 22 increases at an accelerating rate with each layer of web material thereon, if the resistance of the carriage assembly to upward movement is to decrease in accurate proportion to the weight of the new roll, then cam 77 would diverge upwardly from the adjacent way 32 along an appropriately calculated curving path, but satisfactory results for practical purposes have been obtained by constructing cam 77 as a straight bar inclined to diverge upwardly from the adjacent way 32 at a small angle of the order of 1°.

With this construction, when the rider roll assembly is at its lowest position and the rider roll 33 is helping to cause the end of the web to start winding on a new core, the brakes 60 and 61 are applied with maximum force to obtain maximum pressure by the rider roll and the new mandrel. Then as the winding continues and the diameter of the new roll increases, the rider roll assembly is pushed upwardly against the frictional resistance of the brakes 60 and 61, but this resistance is continuously decreased by the modification of the air pressure supply to the brakes caused by the continuous slow outward movement of plunger 75. Since this result is independent of roll size, the invention is equally applicable to rolls of any desired maximum diameter and axial length, and for all such cases, it offers similar advantages of simplicity of construction, ease of applicability to existing winders, and assured reliability and economy of operation.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a winding machine for web material including side frames and a rider roll adapted to engage an upper portion of the new roll being wound and to be moved upwardly by the accumulated web material on said new roll, the combination of carriage means for said rider roll, means supporting said carriage means for upward movement on said side frames along a predetermined path, adjustable friction brake means effective between said carriage means and one of said side frames for resisting said upward movement of said carriage means, and means responsive to the position of said carriage means on said path for adjusting said brake means to provide maximum resistance to the upward movement of said carriage means when said carriage means is at its lowermost position on said path and minimum such resistance when said carriage means reaches a predetermined raised position on said path.

2. In a winding machine for web material including side frames and a rider roll adapted to engage an upper portion of the new roll being wound and to be moved upwardly by the accumulated web material on said new roll, the combination of carriage means for said rider roll, means supporting said carriage means for upward movement on said side frames along a predetermined path, adjustable friction brake means effective between said carriage means and one of said side frames for resisting said upward movement of said carriage means, means including a movable plunger member on said carriage means for adjusting said brake means, and a cam on one of said side frames for continuous engagement by said movable member during upward movement of said carriage means and cooperating therewith to provide maximum resistance to the upward movement of said carriage means when said carriage means is at its lowermost position on said path and minimum such resistance when said carriage means reaches a predetermined raised position on said path.

3. In a winding machine for web material including side frames and a rider roll adapted to engage an upper portion of the new roll being wound and to be moved upwardly by the accumulated web material on said new roll, the combination of carriage means for said rider roll including a pair of carriages supported for upward movement on said side frames along a predetermined path, a pair of racks on said side frames, a shaft journaled in said carriages, a pair of pinions secured to said shaft for engagement with said racks during said upward movement of said carriages, an adjustable friction brake on said shaft, and means on said side frames responsive to the position of said carriages on said path for adjusting said brake to provide maximum resistance to the upward movement of said carriages when said carriages are at their lowermost positions on said path and minimum such resistance when said carriages reach a predetermined raised position on said path.

4. In a winding machine for web material including side frames and a rider roll adapted to engage an upper portion of the new roll being wound and to be moved upwardly by the accumulated web material on said new roll, the combination of carriage means for said rider roll including a pair of carriages supported for upward movement on said side frames along a predetermined path, a pair of racks on said side frames, a shaft journaled in said carriages, a pair of pinions secured to said shaft for engagement with said racks during said upward movement of said carriages, an adjustable friction brake connected between each of said carriages and the adjacent end of said shaft, fluid pressure control means on one of said carriages for adjusting both of said brakes, a movable control member for said fluid pressure control means, and a cam on the adjacent said side frame for continuous engagement by said control member during upward movement of said carriages and cooperating therewith to adjust said brakes to provide maximum resistance to the upward movement of said carriages when said carriages are at their lowermost position on said path and minimum such resistance when said carriages reach a predetermined raised position on said path.

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