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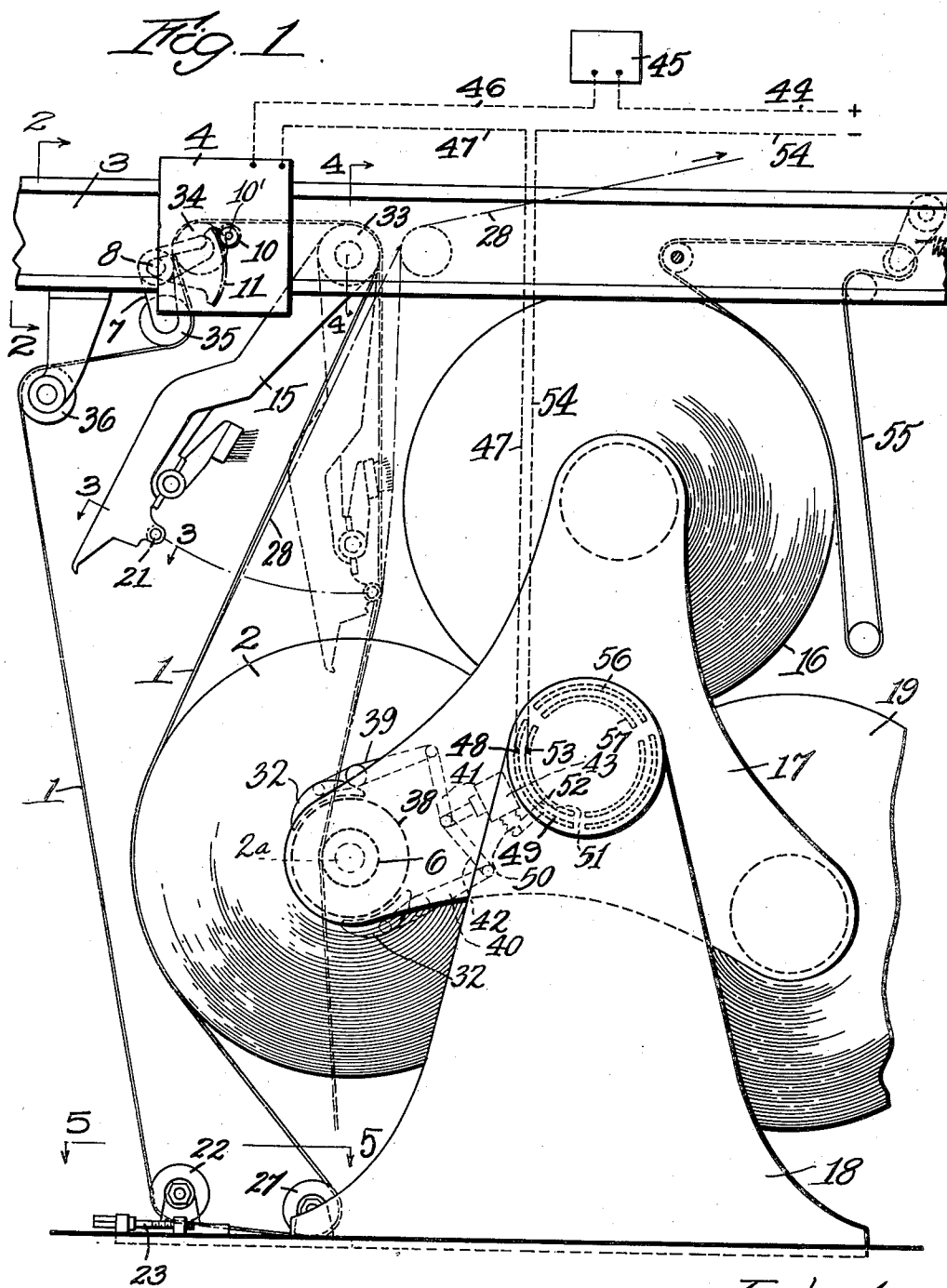
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2,248,014

TENSION REGULATOR

Filed Jan. 21 1939

6 Sheets-Sheet 1



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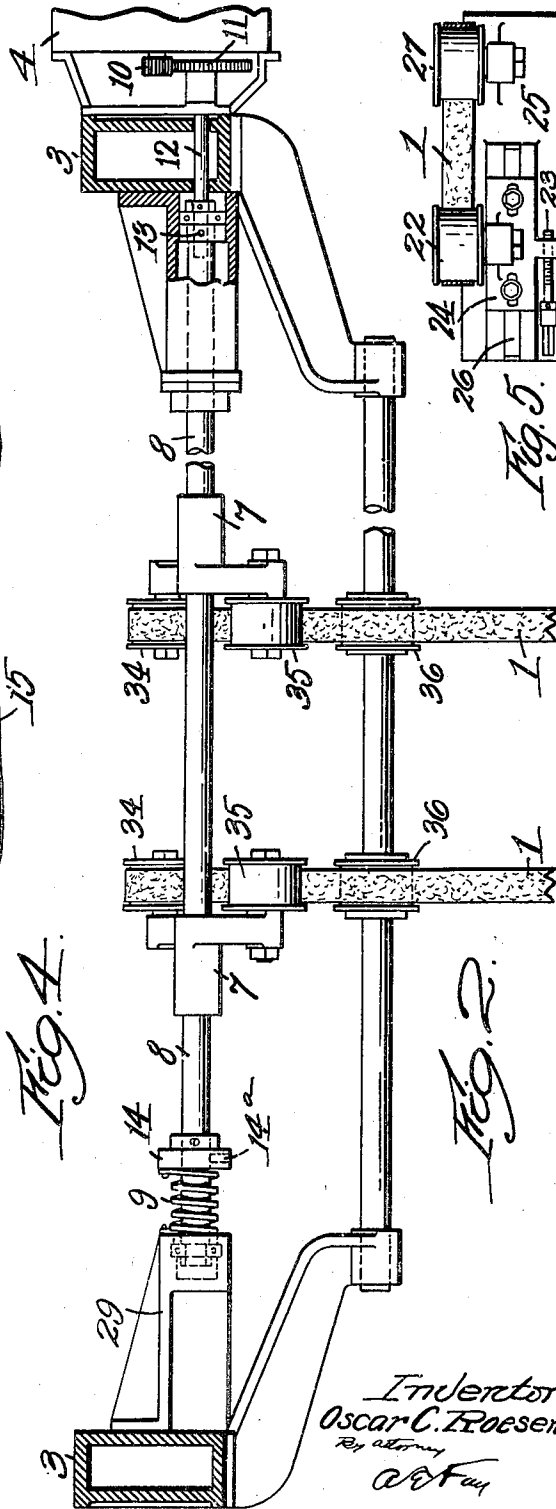
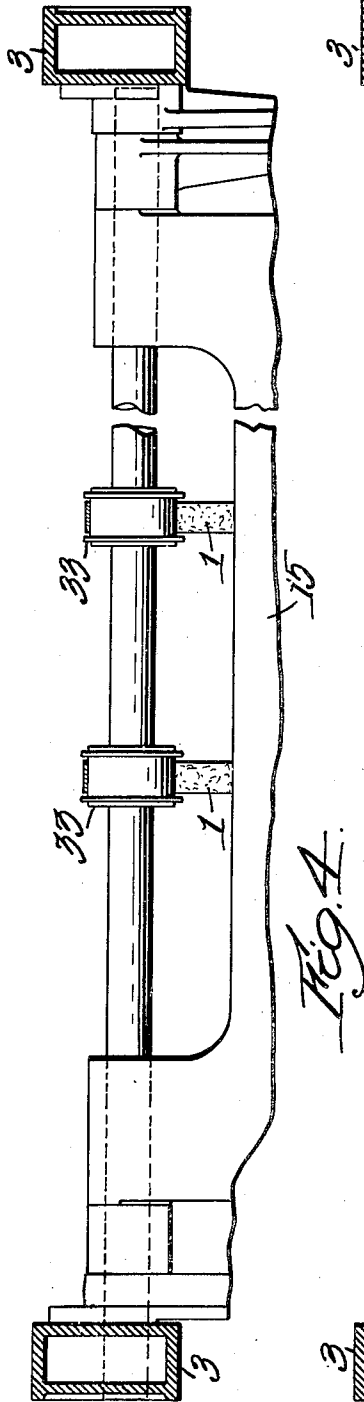
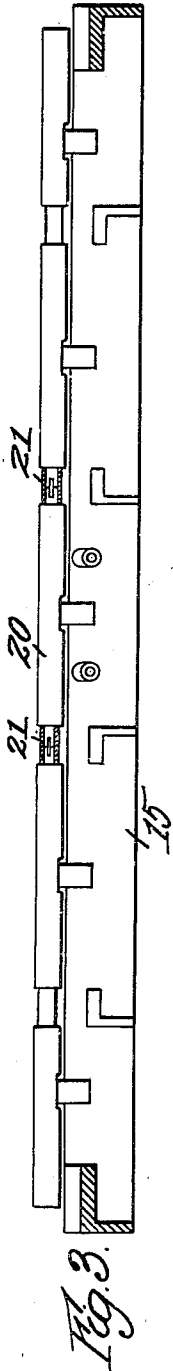
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TENSION REGULATOR

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6 Sheets-Sheet 2



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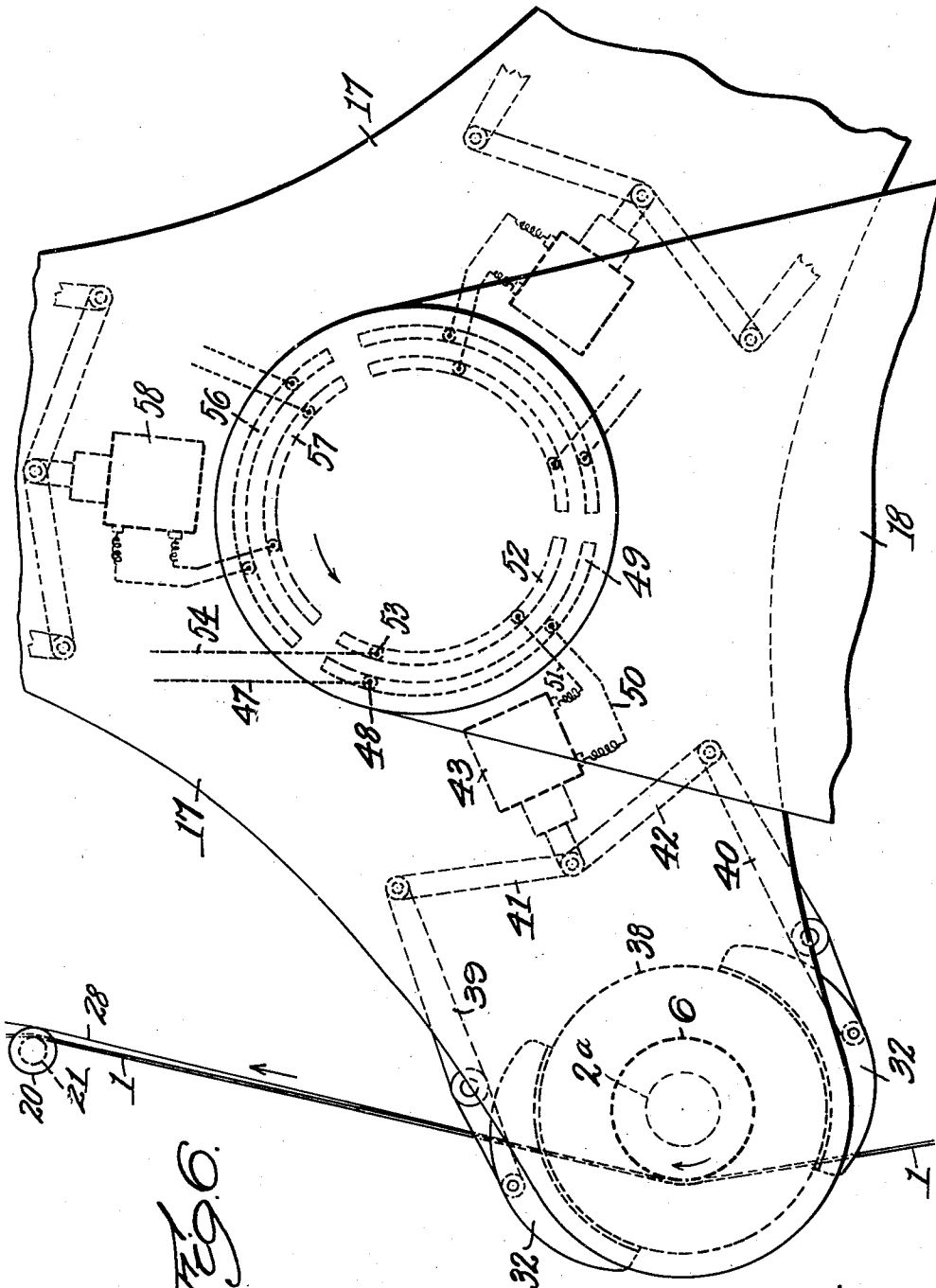
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TENSION REGULATOR

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6 Sheets-Sheet 3



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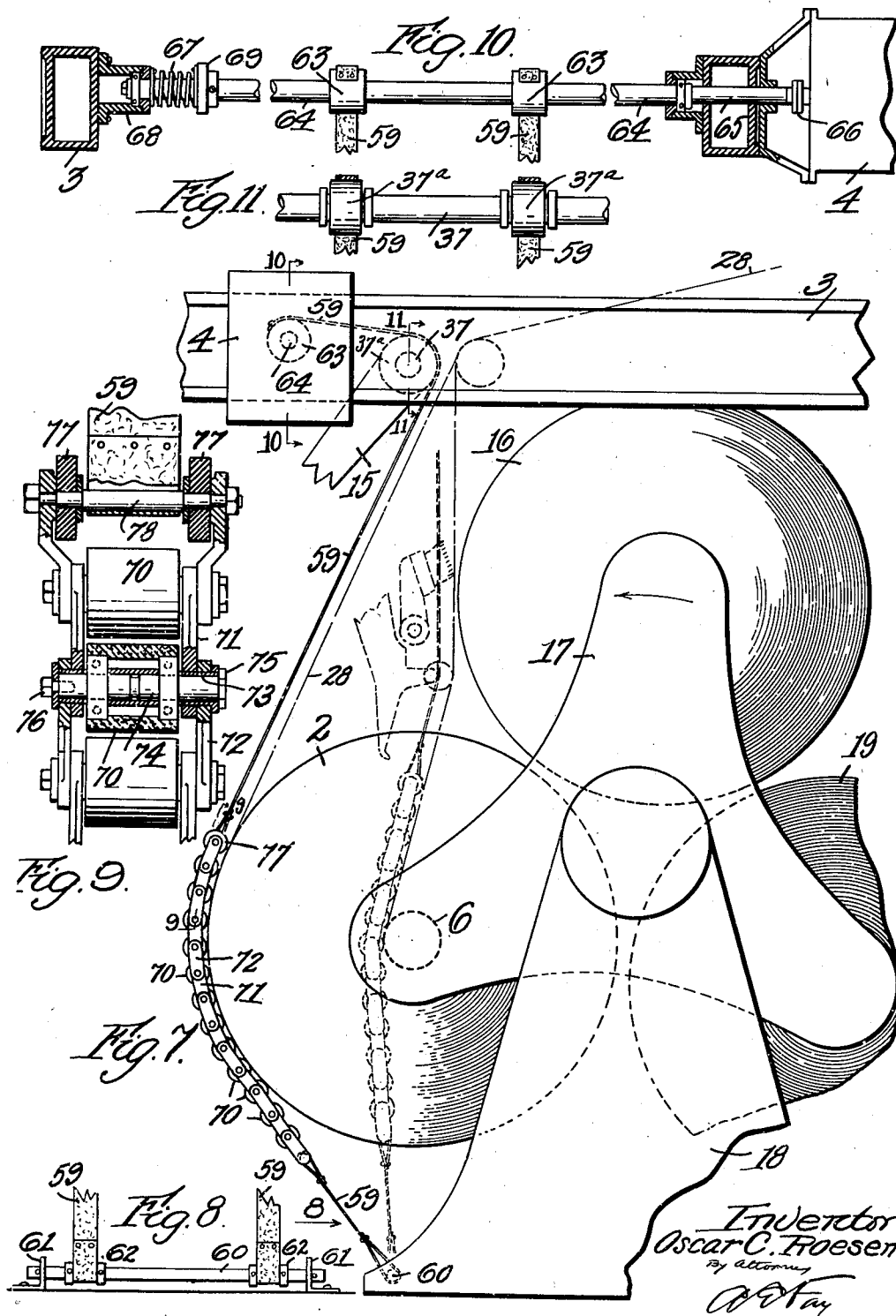
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TENSION REGULATOR

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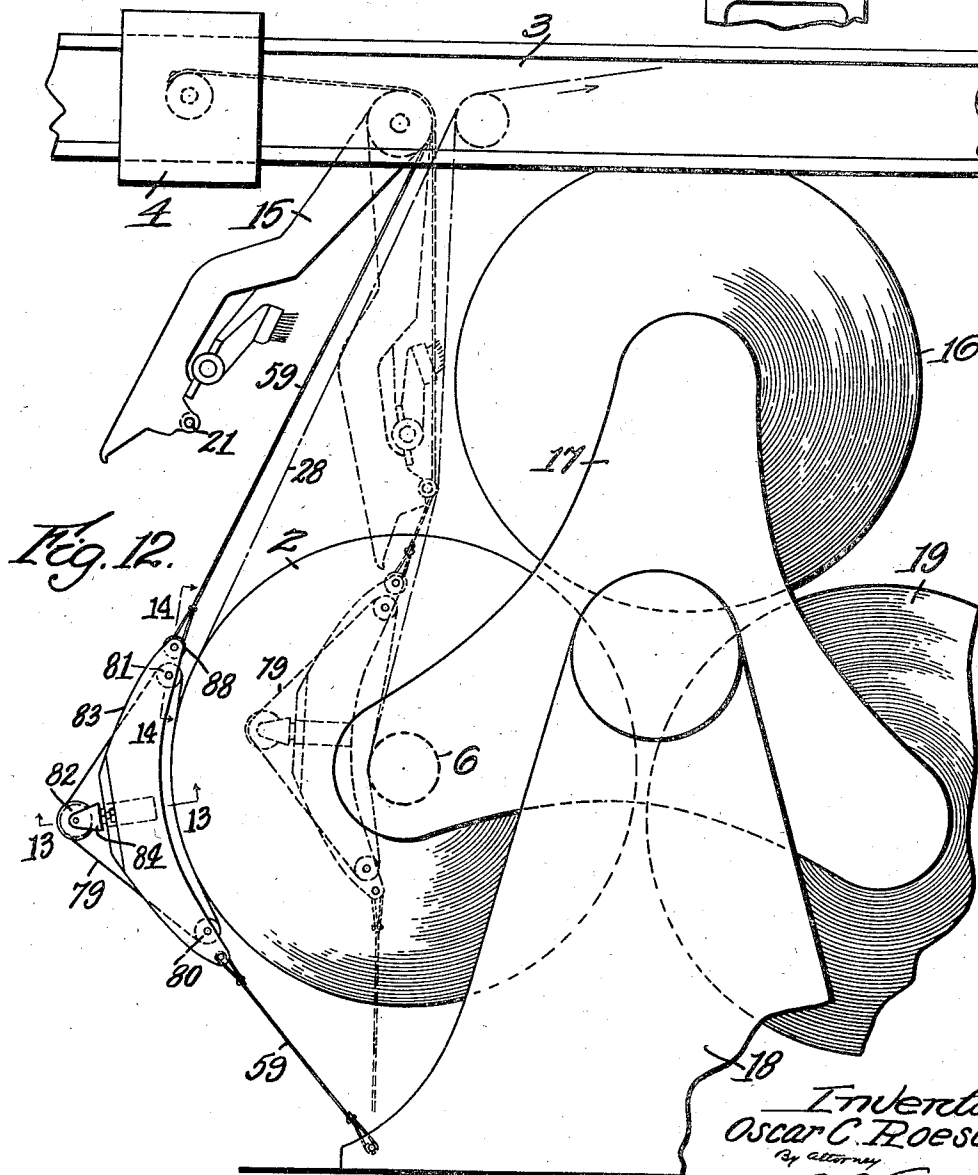
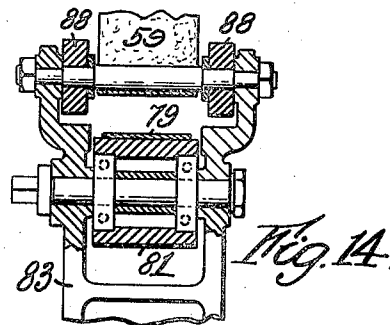
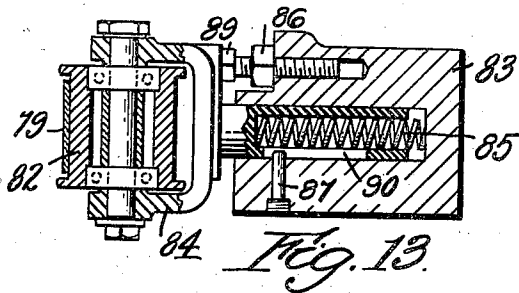
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TENSION REGULATOR

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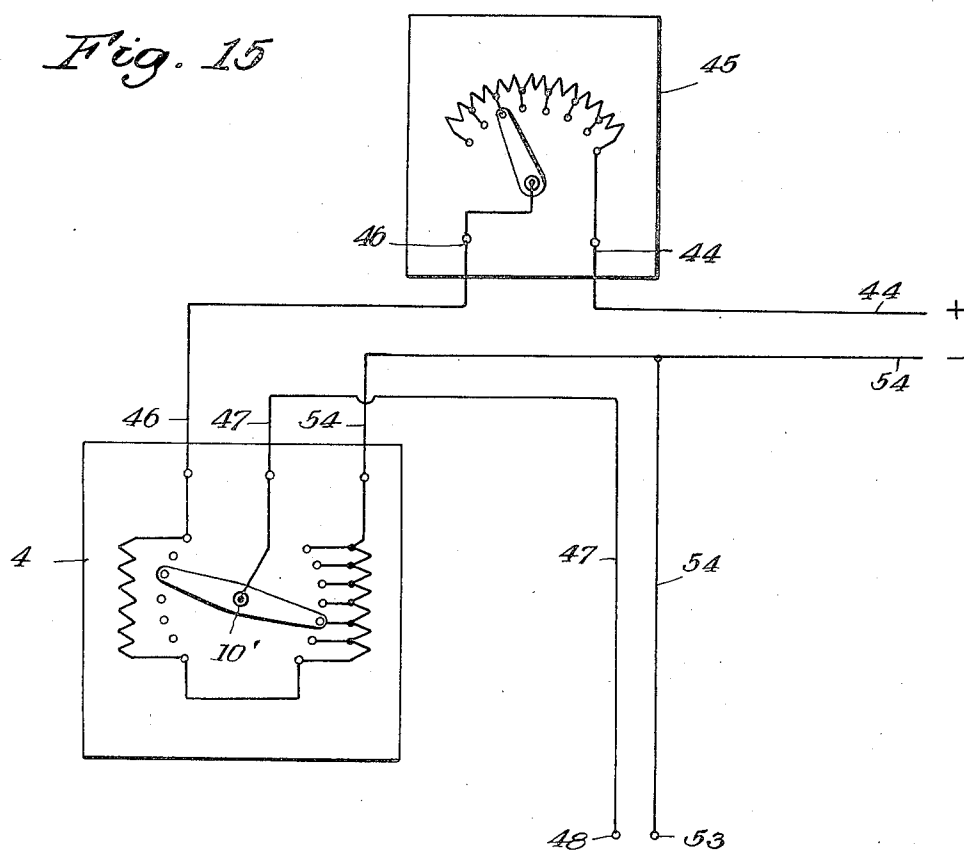
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TENSION REGULATOR

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Fig. 15



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2,248,014

TENSION REGULATOR

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Application January 21, 1939, Serial No. 252,093

8 Claims. (Cl. 242—75)

This invention deals particularly with a device to be used for controlling the tension on a web roll which is being fed into a machine, such as a printing press.

The chief objects of this invention are to provide substantially frictionless means bearing against the surface of unwinding rolls supported in a rotatable reel adapted to carry a plurality of rolls, with means for regulating the tension in the web from the running roll, said means being applied to the spindle of the running roll; to provide means for applying brakes to the spindles of the rolls with automatic means for connecting them with, and disconnecting them from, a source of power according to the angular location of the reel; to provide means for speeding up a fresh roll and splicing it to the running web; and to provide certain improvements in the mechanism shown in United States Patent No. 1,353,401.

This is particularly useful in the printing of magazines where highly calendared webs or webs carrying a very sensitive surface are used.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 shows an end view of this arrangement including a speeding up and pasting device for splicing web rolls at full speed of the press;

Fig. 2 is a section of the frictional non-rubbing regulator mechanism, taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view of a part of the brush arm, on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view showing the pulleys mounted on the brush arm shaft, on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view of the pulley tightening arrangement on the line 5—5 of Fig. 1;

Fig. 6 is a view similar to Fig. 1 on enlarged scale, but showing the brake-operating arrangement;

Fig. 7 shows an end view of a modified arrangement where small rollers are mounted directly in the controlling strap;

Fig. 8 is a detailed view showing how the straps are attached to the floor, looking in the direction of the arrow 8 in Fig. 7;

Fig. 9 is an enlarged sectional view of the rollers, on the line 9—9 of Fig. 7;

Fig. 10 is a sectional view on the line 10—10 of Fig. 7 showing the attachment of the straps to the automatic regulator shaft;

Fig. 11 is a sectional view on the line 11—11

of Fig. 7, showing the straps passing over the brush arm shaft;

Fig. 12 is an end view showing still another modification where a bracket having a small moving belt is carried in a stationary strap;

Fig. 13 is a sectional view of the tightener in the small strap, on the line 13—13 of Fig. 12,

Fig. 14 is a sectional view, showing the idler serving this small strap and the rollers for bringing it into service against the paper roll, on the line 14—14 of Fig. 12; and

Fig. 15 is a view illustrating diagrammatically the control of the regulator.

Referring now to Fig. 1, the paper feed and pasting mechanism is set up adjacent to a press frame 3 carrying a conventional form of automatic regulator 4. The conventional type of pedestal 18, carrying fresh roll 16 and spare roll 19, is used for supporting a shaft carrying spiders 17 in which are rotatably mounted a plurality of web rolls. In the particular view shown, a roll 2 is the active one in use, the web being led to the press or similar machine. Bearing against the roll 2 is a friction tape or belt 1, which is trained over a series of idlers, including pulleys 33, 34, 35, 36, 22 and 21. This friction device preferably is in the form of two belts capable of running with the rotation of the roll 2. As shown particularly in Fig. 2, pulleys 34 and 35 are mounted on a take-up bell crank 7, which, in turn, is secured to an oscillatable shaft 8. The shaft 8 is carried in suitable ball bearings and is connected to a stub shaft 12 by a pin 13. Mounted on the stub shaft 12 is an oscillatable sector 11, meshing with and driving a pinion 10, carried on the shaft 10' of the automatic regulator 4. Thus, it is evident that any turning motion of the shaft 8, caused by the belt 1, will cause a corresponding stepped-up, or stepped-down, movement of the automatic regulator shaft. This automatic regulator is constructed in a similar manner to that shown in Patent No. 1,353,401. The press pulls the web 28, rotating the roll 2 and carrying with it by friction the belt 1. The belt, through the pulleys 34 and 35, will cause the shaft 8 to turn forward or back, with, or in opposition to, the spring 9.

As the roll 2 decreases in diameter, it reaches the size shown as roll 6 in Fig. 1, in which case the take-up arm 7 and shaft 8 slowly turn in a counter-clockwise direction as shown in Fig. 1. This rotation is assisted by the spring 9 and adjustable collar 14, which is secured to the shaft 8 by a screw 14^a, the other end of the spring being supported in a bracket 29 attached to the frame

of the machine. It employs that type of tension where the retarding force is applied through the center of the roll by an electro-magnetic brake, the actual braking force being controlled through an automatic speed regulator compensating for changes in diameter.

On the spindle 2^a of the roll 2, which eventually becomes roll 6, a brake wheel 38 is fixed and receives pressure from brake shoes 32 through levers 39 and 40, links 41 and 42, from a solenoid 43, see Fig. 6. It will be understood that the operation of the automatic regulator 4 controls the electro magnetism in the solenoid 43 so that, as the roll decreases in diameter, the amount of friction exerted by the brake shoes 32 on the brake wheel 38 is reduced proportionately.

Referring particularly to Figs. 1 and 6, a line 44 runs from one side of the power to a manual tension regulator 45 and a line 46 runs from it. The other end of the line 46 runs to the automatic regulator 4 where it passes through controlling resistances (not shown) and emerges as a line 47, running then to a stationary brush 48. The brush 48 contacts with a segment ring 49, carried in fixed position on the spider 17. A line 50 running from the segment ring 49, see Fig. 6, connects to one side of the solenoid 43. The other side of the solenoid 43 is connected by a line 51 to a segment ring 52 which contacts with a brush 53, the latter being connected by a line 54 to the other side of the power. Thus, it is apparent that by placing power on lines 44 and 54, the solenoid 43 may be energized to regulate the tension in the running web.

One of the problems in using a reel with a device of this kind is to control properly the automatic tension regulator so that there is no rubbing action on the running web or web roll. This is accomplished by making the belt 1 a freely moving member, passing over the idlers as described above. It will be noted in Fig. 5 that the pulley 22 is rotatably mounted on an adjustable bracket 24 which may be moved on a stationary bracket 25 by an adjusting screw 23. It is guided in this motion by a key 26, and when properly adjusted may be clamped in place by suitable bolts.

Referring again to Fig. 1, when the butt 6 is about exhausted, a brush arm 15 is lowered to the dotted line position. A press driven belt 55 is lowered in contact with a fresh roll 16 by the same motion which lowers the brush arm, and this fresh roll is rotated to a speed equal to that of the running web, the fresh roll having previously been prepared for splicing in a well known manner. This type of splicing mechanism is well known in the trade and it is thus not considered necessary to give a detailed description. After the splice has been made and the brush arm 15 moved to its full line position, the newly spliced roll 16 will then be moved against and run the belt 1, and the rotation of the reel will place the brushes 48 and 53 in contact with segment rings 56 and 57 respectively, transferring the control to another solenoid 58 on another arm of the spider, which has a series of connections to a brake wheel and tension block arrangement similar to that described above.

Referring to Fig. 3, a small roller 21 is shown mounted on a bar 20 on the brush arm 15. This reduces the friction on the belt 1 when the brush arm 15 is in its dotted line position.

When half width rolls are used, it is planned to remove the belt 1 from the left hand pulleys

35, 36 and put it on the right hand pulleys, or vice versa, as needed. See Fig. 2.

Referring to Fig. 7 an arrangement of roll supporting device is revealed similar to that shown in Fig. 1. In this case, however, the automatic tension regulator 4 is operated from straps 59 whose lower ends are secured to a rod 60 carried by brackets 61 secured to the floor. Collars 62 prevent side motion of the straps 59.

Referring particularly to Fig. 10 the upper ends of the straps 59 are attached to collars 63 secured to a shaft 64. This shaft 64 is mounted in suitable ball bearings and connected with a stub shaft 65 which in turn is connected to the automatic tension regulator 4 by a coupling 66. A spring 67, secured one end to a stationary bracket 68 and the other to an adjustable collar 69, mounted on the shaft 64, tends to keep the straps 59 wound up.

The straps 59 carry a series of rollers 70, preferably made of hard rubber, which contact with the paper roll 2. The rollers 70 are mounted on ball bearings and connected together by side plates 71 and 72, said side plates being free to swivel on a bushing 73. Each individual assembly is held together by a short shaft 74 carrying a nut 75 and a bolt 76 for holding it together. Fig. 7 shows a series of these rollers 70 bearing against the roll 2.

Referring again to Fig. 9, rollers 77 are mounted free to rotate on special bolts 78, as the web roll 2 is brought into contact with the straps 59. These rollers 77 will prevent any tearing of the paper. As shown particularly in Figs. 7 and 11, the brush arm shaft 37 has rollers 37^a rotatably mounted thereon to decrease friction on the straps 59.

A simple speeding up device is contemplated with this arrangement as described above so that the fresh roll 16 may be spliced to the running web and brought, after splicing, to the running position occupied by the web roll 2 in Fig. 7. A spare roll 19 is shown, which, after roll 16 is about exhausted, may be spliced to the running web and brought, after splicing, to the running position theretofore occupied by web rolls 2 and 16.

Fig. 12 shows still another arrangement where the straps 59 are used in a similar manner to that shown in Fig. 7. Instead of a series of rollers for bearing against the web roll a small traveling belt or tape 79 is provided. This belt is trained around idler rolls 80, 81 and 82 and bears against the running web roll 2. A bracket 83 rotatably supports the idler rolls 80 and 81 and is secured by the straps 59. The bracket 83 also mounts the tightener arrangement including the pulley 82, as best shown in Fig. 13. A sliding bracket 84 is normally pressed outwardly by a spring 85 to keep the belt 79 taut. A bolt 89 serves as a limiting stop for the bracket 84 and is held in adjusted position by a nut 86. A screw 87, carried in the bracket 83 and operating in a slot 90 of the bracket 84, serves to limit the motion of that bracket.

Fig. 14 shows a detailed view of the upper end of the bracket 83, illustrating in detail the mounting of the rollers 81 as well as the rollers 88 which serve the same purpose as the rollers 77 previously described.

The idler belt 79 causes no rubbing action on the web and, as the roll decreases in diameter, the whole assembly moves toward the center of the roll, allowing a spring similar to the spring 67 to operate the automatic tension regulator 4

to automatically control the tension of the running web to keep it constant regardless of roll diameter.

Thus it is apparent that a mechanism is provided for splicing web rolls at the full speed of the web, said web rolls being mounted in a rotatable magazine reel, with means for regulating a tension device carried by the spindle of the roll without producing friction on the surface of the web.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. In a tension mechanism for a web roll, the combination with a reel for supporting the running web roll and other web rolls and an automatic tension regulator, of a free running belt for engaging the surface of the running roll to control tension thereto, idlers over which the belt travels, a bell crank pivoted on said mechanism, two of said idler rolls being carried by said bell crank, a segment coaxially pivoted with the bell crank and relatively fixed thereto, and a pinion meshing with the segment for rotating said regulator.

2. In a tension mechanism for a web roll, the combination with a reel for supporting the running web roll and other web rolls and an automatic tension regulator, of a free running belt for engaging the surface of the running roll to regulate tension thereto, idlers over which the belt travels, a bell crank pivoted on said mechanism, two of said idler rolls being carried by said bell crank, a segment coaxially pivoted with the bell crank and relatively fixed thereto, a pinion meshing with the segment for rotating said regulator, and a spring for returning the segment toward zero position.

3. In a tension mechanism for a web supply device, the combination with a movable support for a web supply roll and an automatic tension regulator, of means controlled by the position of said support for connecting the regulator with a source of power and disconnecting it therefrom, said web roll support being in the form of a reel having means for simultaneously supporting a plurality of rolls, a set of brakes for each roll adapted to grasp a brake wheel carried on the spindle of each web roll, a solenoid connected to operate each pair of brakes, and segments on the reel for connecting the solenoid with a source of power according to the position of the reel.

4. In a tension device, the combination of a tension regulating strap and a freely movable endless belt carried thereby for engaging a web roll and keeping the strap away from the roll, a frame having a roller adjacent each end and a third roller extending from the frame between said rollers for carrying the belt, and means adjacent the ends of said frame for connecting it with said strap.

5. In a tension mechanism for a web roll, the combination with a reel for supporting the running web roll and other web rolls and an automatic tension regulator, of a strap for engaging the web roll to regulate tension, the strap being fixed in stationary position at one end and connected with said tension regulator at the other, rollers carried by the strap and engaging the web roll to avoid injury to the web, a brake wheel carried on the spindle of the roll, a brake for the roll adapted to grasp the brake wheel, a solenoid connected to operate said brake, and segments on the reel for connecting the solenoid with a source of power according to the position of the reel.

6. In a tension device, the combination of a tension regulating strap anchored at one end and wound up on the other end, in accordance with the changing diameter of the web roll which it controls, with a running belt inserted in the strap and kept in contact with the running web roll, said running belt being set in motion by the web roll.

7. In a tension device, the combination of a tension regulating strap for a web roll anchored at one end below the roll and wound up on the other end above the roll, in accordance with the changing diameter of the web roll which it controls, with a running belt inserted in the strap and kept in contact with the running web roll, said running belt being set in motion by the web roll.

8. In a tension device, the combination of a tension regulating strap for a web roll anchored at one end, and means at the other end for taking up the slack in the strap which occurs with the change in diameter of the web roll which it controls, with a running belt inserted in the strap and kept in contact with the running web roll, said running belt being set in motion by the web roll.

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