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C. A. PURDY
TENSION CONTROL APPARATUS FOR THERMAL
VAPORIZING COATING DEVICE
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FIG. 1

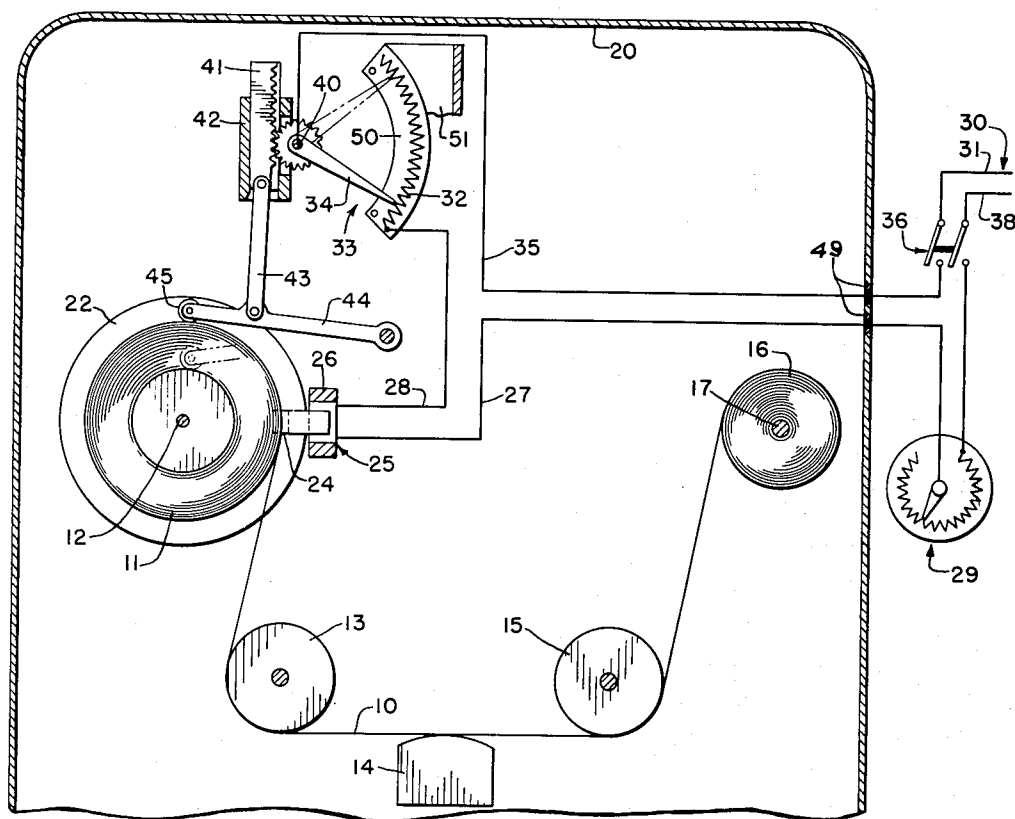
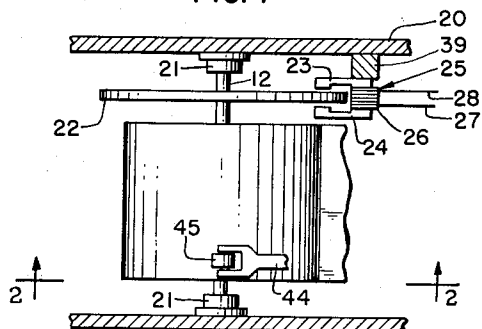


FIG. 2

INVENTOR.

C. A. PURDY

BY

E. F. Kane

ATTORNEY

1

2,750,921

TENSION CONTROL APPARATUS FOR THERMAL VAPORIZING COATING DEVICE

Chester A. Purdy, Hinsdale, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

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4 Claims. (Cl. 118—11)

This invention relates to tension control apparatus, and more particularly to apparatus for braking supply rolls of paper-metallizing machines.

In the manufacture of metallized paper by the vaporizing process, a supply roll of paper is placed in a chamber, which is then evacuated, and metal is vaporized onto the paper, the paper being taken up on a take-up roll. The rotation of the supply roll must be regulated to maintain the paper being taken therefrom under substantially uniform tension, and such regulation has been difficult in the past inasmuch as large and bulky equipment has been required, which necessitates either mounting the equipment outside of the evacuated chamber requiring a mechanical seal or making the chamber sufficiently large to include the braking apparatus which requires heavier equipment to evacuate the larger chamber.

An object of the invention is to provide new and controlled tension control apparatus.

Another object of the invention is to provide new and improved tension control apparatus for paper-metallizing machines.

A further object of the invention is to provide a small and compact supply roll braking device which may be enclosed within an evacuated chamber without occupying any substantial amount of space therein.

A tension control apparatus illustrating certain features of the invention may include an eddy current brake which may be secured to a supply roll and means responsive to the size of the supply roll for controlling the eddy current.

A tension control apparatus forming a specific embodiment of the invention may include a supply roll on which a copper disc is fixed and an electromagnet having pole pieces bracketing the copper disc to form an eddy current brake therewith. A feeler engaging the supply roll actuates a cam engaging a rheostat in series with the electromagnet and a source of power to increase the resistance of the rheostat as the supply roll diminishes.

A complete understanding of the invention may be obtained from the following detailed description of an apparatus forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which

Fig. 1 is a fragmentary, horizontal section of a portion of the tension control apparatus forming a specific embodiment of the invention, and

Fig. 2 is a vertical section taken along line 2—2 of Fig. 1.

Referring now in detail to the drawings, there is shown therein a machine for applying metal to one surface of a paper web 10 as the web is advanced from a supply roll 11 keyed to an arbor 12. The web travels from the roll 11 under a guide roll 13, over a metal-vaporizing chamber 14 and under a guide roll 15 to a takeup roll 16 being rotated by a shaft 17. As the web 10 is advanced by the takeup roll 16, the metal-vaporizing chamber 14 applies vaporized metal to the undersurface of the web. These elements are enclosed within a hermetically sealed chamber 20, which is evacuated down to a residual pressure of few microns of mercury.

2

The shaft 12 is mounted in bearings 21 supported on walls of the chamber 20 and a copper disc 22 is keyed to the shaft 12 in a position such that it extends between pole pieces 23 and 24 of an electromagnet 25 having a coil 26 and leads 27 and 28. The lead 27 is connected to a rheostat 29, and the lead 28 is connected to a conductor 31 of an A. C. powerline 30 through a resistor 32 of a rheostat 33, a variable contactor 34 and a conductor 35 connecting the contactor 34 to the conductor 31 through a manually operable switch 36. The rheostat 29 connects the conductor 27 to a conductor 38 of the powerline 30.

A bracket 39 mounted on one of the walls of the chamber 20 supports the electromagnet 25 rigidly on the wall. Seals 49 seal the openings in the chamber 20 through which the conductors 27 and 35 extend. The contactor 34 is keyed to a pinion 40 meshing with a rack 41 slidably mounted in a guide 42 fixed to the chamber 20 and supporting the pinion. A link 43 connects the rack to a feeler arm 44 on which a roller 45 is mounted.

Current flowing through the coil 26 of the electromagnet 25 generates a field between the pole pieces 23 and 24 which induces eddy currents in the electroconductive copper disc 22 when the disc 22 is rotated by the shaft 12 as the roll 11 is unwound. The eddy currents generated exert a braking force on the supply roll 11. As the supply roll 11 diminishes in diameter, it must be braked with a lesser force on the shaft 12 to maintain the same tension on the web 10 than when the diameter of the roll is greater. Consequently, as the roll 11 diminishes, the feeler arm 44 is turned in a counterclockwise direction, as viewed in Fig. 2, by gravity, to move the rack 41 downwardly and turn the pinion 40 and the contactor 34 in a counterclockwise direction to place more of the resistor 32 in series with the electromagnet winding 26 thereby decreasing the strength of the field between the pole pieces 23 and 24 to decrease the braking force exerted on the shaft 12 just sufficiently to keep the tension on the web the same.

The resistor 32 is mounted on a plate 50 screwed to a bracket 51 mounted on the container. Thus, the resistor may be replaced with a different resistor when it is desired to increase or decrease the braking effect on the supply roll 11. The tension control elements described hereinabove may be quickly and inexpensively installed in existing metallizing apparatus as well as in other types of filament-handling apparatus.

The above-described tension control apparatus exerts varying braking forces on the supply roll in such relation to the diameters of the roll that the tension on the web is kept uniform regardless of variation in diameter of the roll. The elements of the eddy current brake and the control device therefor may be small physically and occupy very little space so they may be enclosed in the chamber 20 without extra space being required therefor over what is necessary for the supply roll 11 and the other elements of the metallizing machine. Also, this tension control apparatus requires no seals for moving parts, such as shafts or the like as is normally required by conventional tension control apparatus. In the use of the term "filament" in the appended claims, it is intended to include threads and strands as well as tapes, webs and the like inasmuch as the tension control device described hereinabove is equally effective with narrow elements as with the broader webs.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

3

What is claimed is:

1. In a metallizing machine, a vacuum chamber, takeup means mounted in the chamber for advancing a web through the chamber and a metal applicator mounted in the chamber for applying vaporized metal to the web, a shaft holding a supply roll of the web against rotation relative thereto, bearings mounted on the walls of the chamber supporting the shaft rotatably, an electroconductive disc keyed to the shaft, an electromagnet provided with a coil and pole pieces so spaced as to closely bracket the disc, a support mounted on a wall of the chamber for mounting the electromagnet in a position in which the pole pieces bracket the disc, a variable resistance including a resistor and a contactor mounted in the chamber, a guide mounted in the chamber, a pinion mounted on the guide and fixed to the contactor, a rack meshing with the pinion and slidable in the guide, a pivotally mounted feeler urged into engagement with the roll, a link connecting the rack to the feeler, and means for supplying power to the electromagnet through the variable resistance.

2. In a metallizing machine, a vacuum chamber, takeup means mounted in the chamber for advancing a web through the chamber and a metal applicator mounted in the chamber for applying vaporized metal to the web, a shaft holding a supply roll of the web against rotation relative thereto, bearings mounted on the walls of the chamber supporting the shaft rotatably, a copper disc keyed to the shaft, an electromagnet provided with a coil and pole pieces so spaced as to closely bracket the disc, a support mounted on a wall of the chamber for mounting the electromagnet in a position in which the pole pieces bracket the disc, an arcuate resistor, means supporting the resistor from a wall of the chamber, a contactor for engaging the resistor, a pinion for turning the contactor, a rack engaging the pinion, a guideway guiding the rack, a feeler urged into engagement with the roll, a link connecting the feeler and the rack, and means for supplying power to the electromagnet through the contactor and the resistor.

3. A tension control apparatus for a web including a vacuum chamber, which comprises a shaft holding a supply roll of the web against rotation relative thereto, bearings mounted on the walls of the chamber supporting the

4

shaft rotatably, an electroconductive disc keyed to the shaft, an electromagnet provided with a coil and pole pieces so spaced as to closely bracket the disc, a support mounted on a wall of the chamber for mounting the electromagnet in a position in which the pole pieces bracket the disc, a variable resistance including a resistor and a contactor mounted in the chamber, a guide mounted in the chamber, a pinion mounted on the guide and fixed to the contactor, a rack meshing with the pinion and slidable in the guide, a pivotally mounted feeler urged into engagement with the roll, a link connecting the rack to the feeler, and means for supplying power to the electromagnet through the variable resistance.

4. A tension control apparatus for a web including a vacuum chamber, which comprises a shaft holding a supply roll of the web against rotation relative thereto, bearings mounted on the walls of the chamber supporting the shaft rotatably, a copper disc keyed to the shaft, an electromagnet provided with a coil and pole pieces so spaced as to closely bracket the disc, a support mounted on a wall of the chamber for mounting the electromagnet in a position in which the pole pieces bracket the disc, an arcuate resistor, means supporting the resistor from a wall of the chamber, a contactor for engaging the resistor, a pinion for turning the contactor, a rack engaging the pinion, a guideway guiding the rack, a feeler urged into engagement with the roll, a link connecting the feeler and the rack, and mean for supplying power to the electromagnet through the contactor and the resistor.

References Cited in the file of this patent

UNITED STATES PATENTS

1,353,401	James	Sept. 21, 1920
2,179,334	Keyes	Nov. 7, 1939
2,317,290	McIlvried	Apr. 20, 1943
2,364,808	Nelson	Dec. 12, 1944
2,382,432	McManus et al.	Aug. 14, 1945
2,402,269	Alexander et al.	June 18, 1946
2,545,576	Godley	Mar. 20, 1951

FOREIGN PATENTS

189,905	Great Britain	Dec. 14, 1922
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