Oct. 31, 1967 P. E. IRELAND 3,350,031

TRANSMITTING APPARATUS

Filed March 24, 1966

FIG. 1

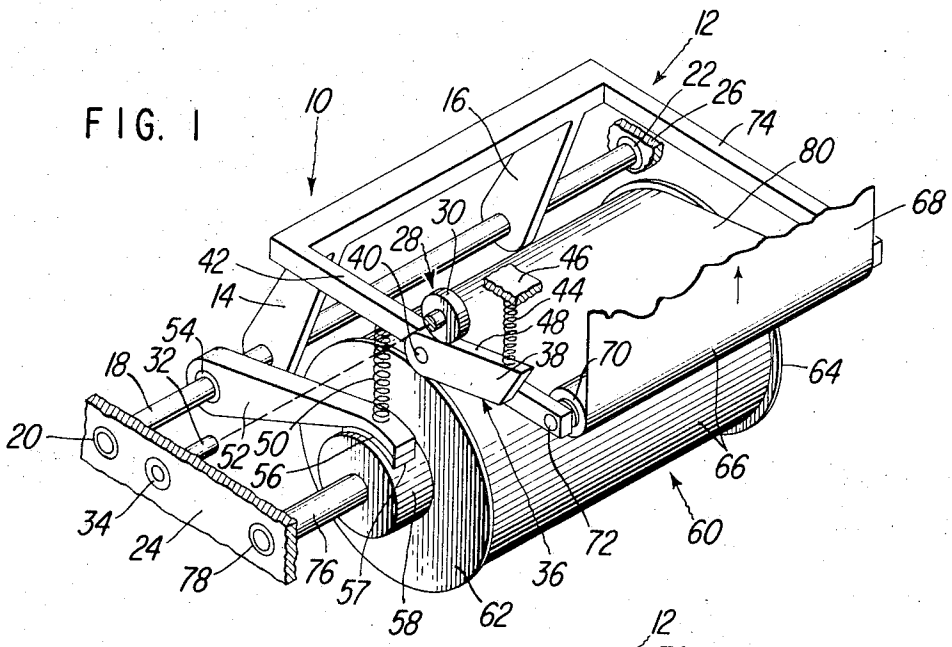
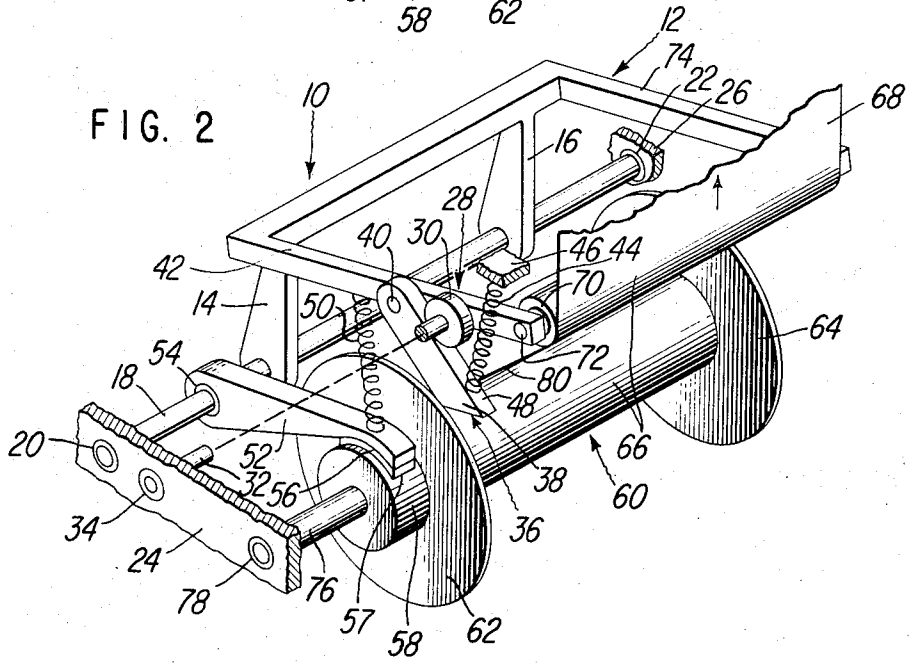


FIG. 2



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TRANSMITTING APPARATUS

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The invention relates to a control apparatus to maintain the tension in a moving strand, web, or any other similar moving flexible medium at a constant value.

More specifically it is an object of the present invention to provide a constant tension brake for a moving sheet of paper or other thin film as it is unrolled from a spool.

A further object of the invention is to provide a constant brake for a moving sheet of paper, such as chart paper, while it is being transferred from a supply spool to a takeup spool.

A better understanding of the present invention may be had from the following detailed description when read in connection with the accomanying drawings in which:

FIGURE 1 is a view showing the position that the parts of the constant tension brake will be in when a substantially full spool of paper is on the supply spool and

FIGURE 2 is a view showing the position the parts of the constant tension brake will be in when nearly all of the paper has been removed from the supply spool.

One of the elements forming the constant tension brake **10** is a yoke **12**. This yoke **12** is comprised of two leg portions **14**, **16** that are fixedly connected at their lower end to a shaft **18**, that in turn is mounted for rotation in bushings **20**, **22** that are supported in stationary wall members **24**, **26**.

Another element that is employed by the brake **10** is a roller pivot member **28**. This roller pivot member **28** is comprised of a roller **30** fixedly mounted on a shaft **32** that in turn is mounted for rotation in a bushing **34** of the stationary wall member **24**.

A third major element that is employed in the brake **10** is a weight shifting member **36**. The member **36** is comprised of a pawl shaped arm **38** that is pivoted to rotate about a stub shaft **40** which in turn is fixedly connected to one leg **42** of an upper U-shaped portion of the yoke **12**.

Another part of the brake **10** is an extension spring **44**. This spring **44** is connected at its upper end to a stationary member **46** and at its lower end to apply an upward force to the top surface of the arm **38**.

A compression spring **50** which is shown extending between the leg **42** of the yoke **12** and an upper portion of the brake arm **52** forms still another portion of the tension brake **10**.

The brake arm **52** contains a bushing **54** at its left end to permit the brake arm **52** to be rotatably moved about the shaft **18**. The right end of the brake arm **52** contains a brake liner **56** in frictional contact with, **57**, the outer cylindrical surface of the disc **58** that forms an integral left end portion of a supply spool **60** which has two flanges **62**, **64**.

FIGURE 1 shows a full roll of paper **66** wrapped about the spool **60** and an outer portion **68** thereof that is in physical contact with a rotatable guide member **70**. This outer portion **68** of the paper **66** is also shown being pulled in the direction of the arrow away from the spool **60** by any paper pulling means such as a motor driven pickup spool, not shown, to which the outer end portion of the paper is attached.

The left end of the guide member **70** has a stub shaft **72** extending therefrom that is supported for rotation in the leg portion **42** of the yoke **12**. The right end of the guide member **70** also has a stub shaft, not shown,

that is supported for rotation in the leg portion **74** of the yoke **12** in the same manner as the left end of the guide member **70**.

The right end of the spool **60** has a stub shaft protruding therefrom for supporting the spool **60** for rotation in a stationary bushing in the same manner as the stub shaft **76** on the left end of the spool **60**.

While the end portion **68** of the paper **66** is being pulled in an upward direction indicated by the arrow from the full supply spool of paper, as shown in FIGURE 1, the portion **80** of the moving paper **66** that extends between the spool **60** and guide member **70** will be in a substantially horizontal position.

While an increasing amount of the paper **66** is pulled from the supply spool **60** and the diameter of the paper **66** on the spool **60** becomes smaller, as shown in FIGURE 2, the portion **80** of the moving paper **66** extending between the spool **60** and the guide member **70** will gradually be moved from its horizontal position as shown in FIGURE 1 to its inclined position as shown in FIGURE 2 and the guide member **70** will be simultaneously moved in a counterclockwise direction.

While the counterclockwise movement of the guide member **70** takes place the arm **42** of the yoke **12** that supports the guide member **70** will likewise be moved in a counterclockwise direction from the positon shown in FIGURE 1 to the position shown in FIGURE 2. While this counterclockwise movement of the arm **42** occurs this action will cause the weight shifting member **36** to be simultaneously moved in a clockwise direction about shaft **40** on which it is pivoted due to the sliding contact that takes place between the member **36** and the rotatable roller fulcrum **30** as shown in FIGURE 2.

While this clockwise movement of the weight shifting member **36** occurs the extension spring will be expanded so as to add a progressively increasing force to the weight shifting member **36** and the force per se that the compression spring **50** is permitted to apply to brake arm **52** is progressively decreased.

It can be seen that this change in force acting on pin **40** is brought about because the distance, or moment arm, between the rotatable roller fulcrum **30** and the spring **44** is decreased, and the force of spring **50** on brake arm **52** is decreased during a withdrawal of paper from the supply roll **60**. The net result of these spring forces acting on the stub shaft **40** when this counterclockwise rotation of yoke **12** takes place is that a progressively decreasing force will be applied to the stub shaft **40** and a decreasing force will, therefore, be applied to the brake **52** as increasing amounts of paper are removed from the supply spool **60**.

The aforementioned linkage **10** thus introduces a unique negative spring rate or a force in the form of friction on the spool **60** that progressively decreases to compensate for the decrease in force due to the moment arm distance between the center of spool **60** and the outer portion **80** of the paper **68** decreasing while the paper **68** is removed from the spool **60**.

From the aforementioned description of the linkage **10** it can, therefore, be seen that this linkage provides a means for maintaining constant tension in a piece of paper or other thin film or moving medium as it is being pulled off a spool of paper and the diameter of the roll thereon is being progressively decreased.

What is claimed is:

1. An apparatus to maintain a constant tension in a moving flexible medium being unspooled from a rotatable spool, comprising a roller in contact with a portion of the flexible medium that has been unspooled, a link operably connected to support the roller for arcuate movement about a stationary pivot means as the unspooling

of the flexible medium takes place, an arm pivotedly connected to the link, a stationary stub shaft, a rotatable fulcrum mounted for rotation on the stub shaft, a first spring extending between a stationary member and the arm to retain the arm in slidable contact with the rotatable fulcrum as the arcuate movement of the link takes place, a brake arm to apply friction to the spool, and a second spring extending between the link and the brake arm to alter the amount of the friction that the brake arm applies to the end of the spool as the arcuate movement of the link takes place.

2. The apparatus defined in claim 1 wherein the first spring is an extension spring and the second spring is a compression spring.

3. The apparatus defined in claim 1 wherein the brake arm is mounted for arcuate movement about the pivot means on which the link is mounted.

4. The apparatus as defined in claim 1 wherein the arm is of such a characteristically shaped configuration that the portion of the first spring connected to the arm will be moved by the arm toward the rotatable fulcrum member when the arcuate movement of the roller occurs during the unspooling of the flexible medium from the rotatable spool.

5. The apparatus defined in claim 1 wherein the arm is of such a characteristically shaped configuration that the portion of the first spring connected to the arm will be moved by the arm toward the rotatable fulcrum member and the second spring is positioned on the link for movement therewith to reduce the amount of friction being applied by the second spring to the brake arm when arcuate movement of the roller occurs during unspooling of the flexible medium from the rotatable spool.

6. The apparatus defined in claim 1 wherein the first spring is an extension spring and the second spring is a compression spring, and wherein the arm is of such a characteristically shaped configuration that the portion of the extension spring connected to the arm will be moved by the arm toward the rotatable fulcrum member and the compression spring is positioned on the link for movement therewith to reduce the amount of friction being applied by the compression spring to the brake arm when arcuate movement of the roller occurs during unspooling of the flexible medium from the rotatable spool.

References Cited

UNITED STATES PATENTS

1,671,976	6/1928	Avery	242—156.2
2,215,651	9/1940	Pierce	242—156.2 X
2,419,808	4/1947	Wirth	242—156.2
3,111,742	1/1964	Trombetta	242—156.2

FOREIGN PATENTS

793,404	11/1935	France.

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