Feb. 26, 1935. H. J. BRUNK 1,992,649

AUTOMATIC BAND CONTROL

Filed June 9, 1931 5 Sheets-Sheet 1

Fig. 1.

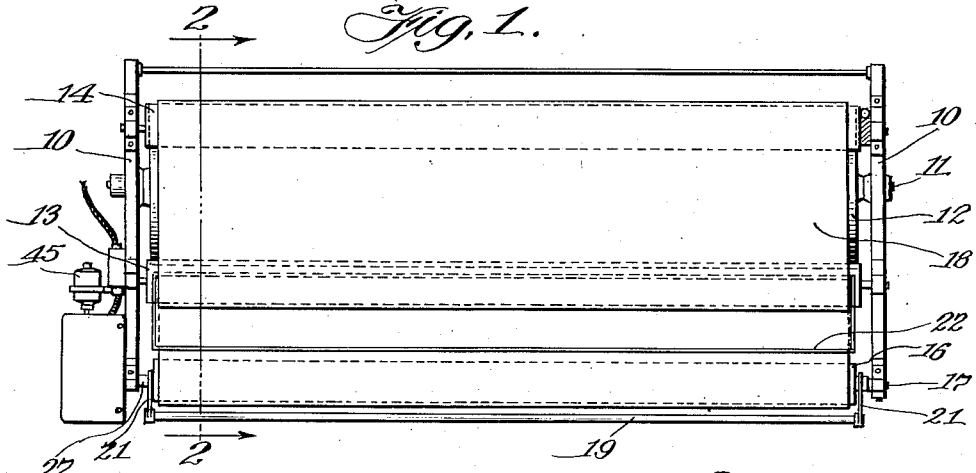


Fig. 2.

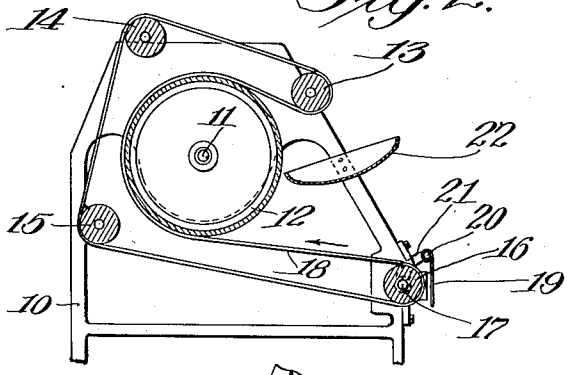


Fig. 12.

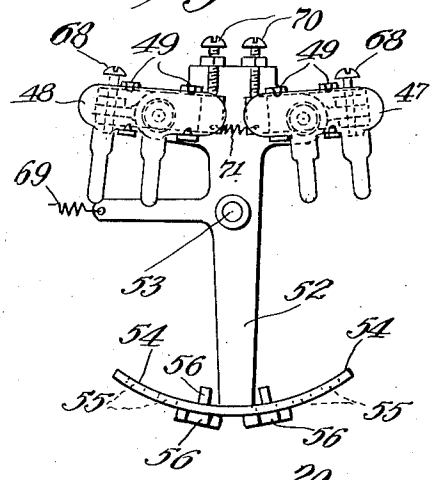


Fig. 3.

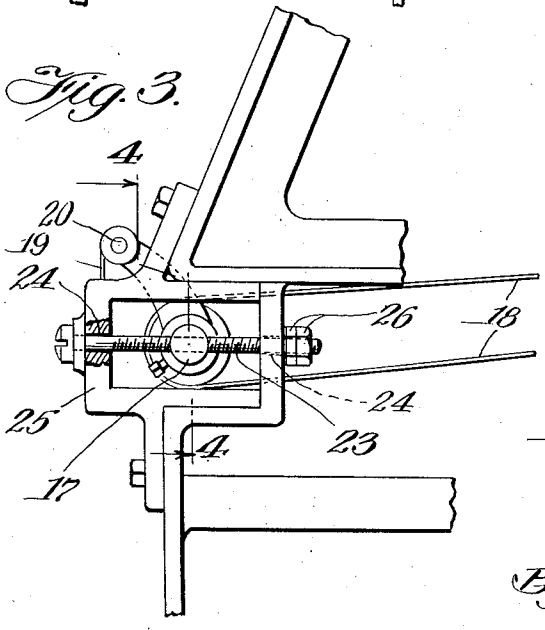
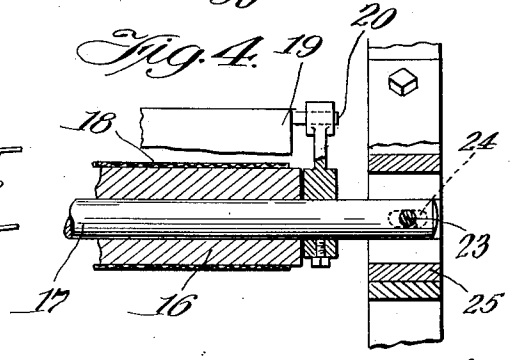


Fig. 4.



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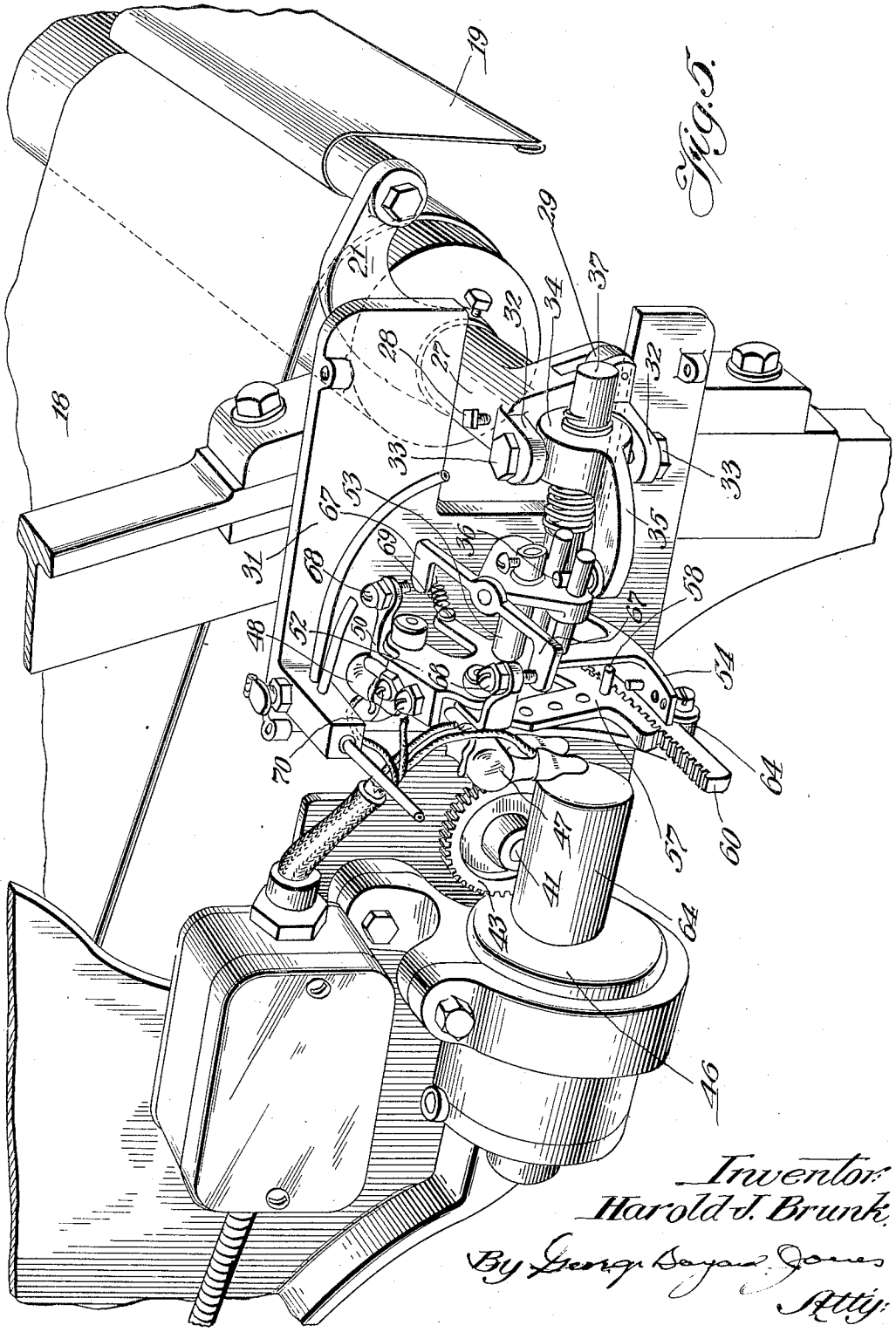


Fig. 5.

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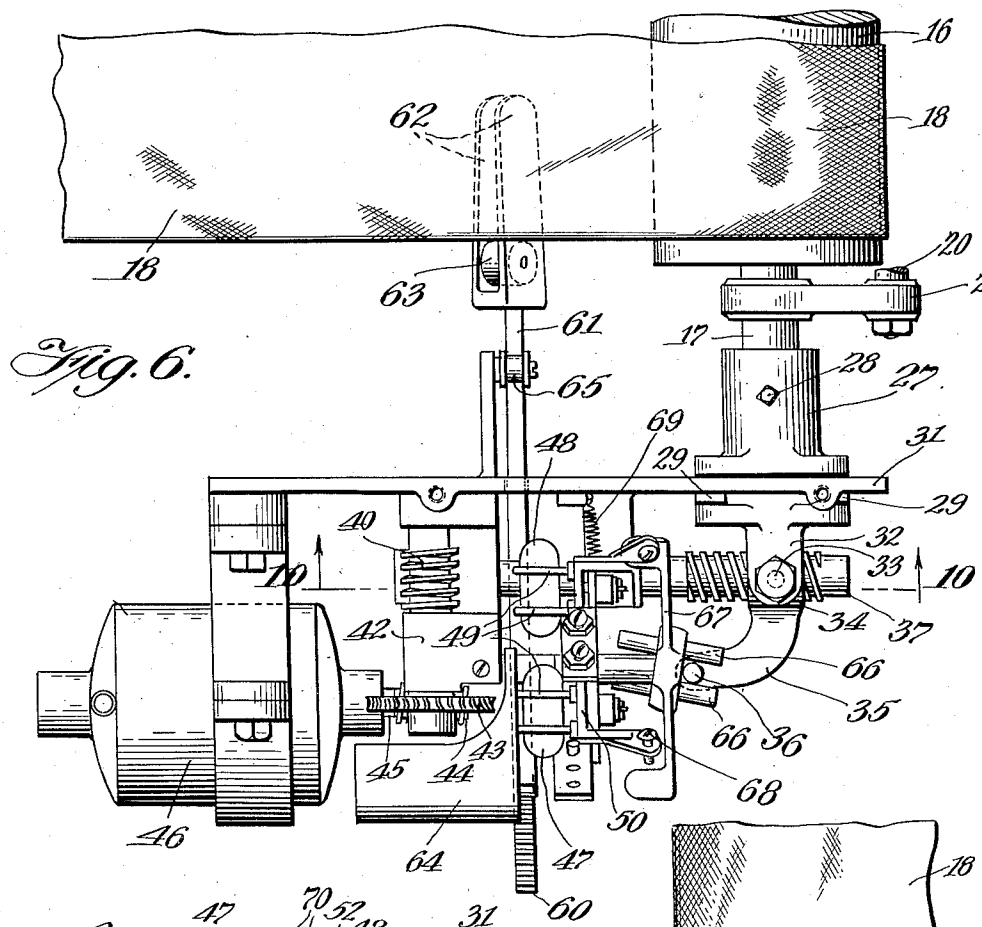


Fig. 6.

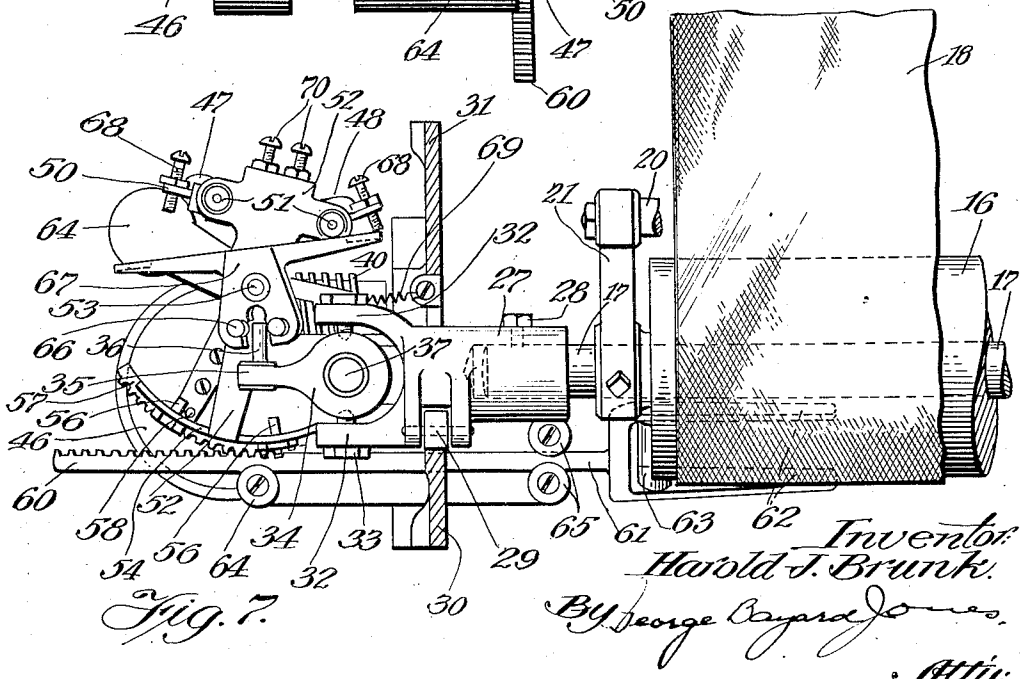


Fig. 7.

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AUTOMATIC BAND CONTROL

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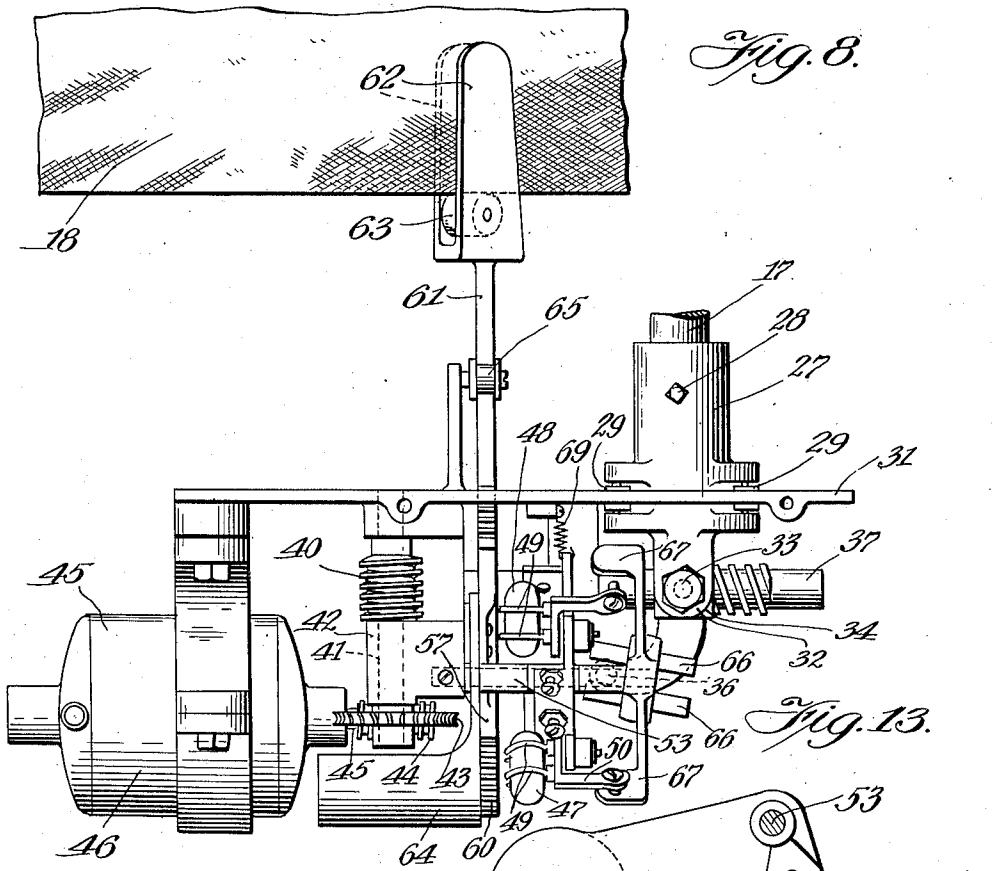


Fig. 8.

Fig. 13.

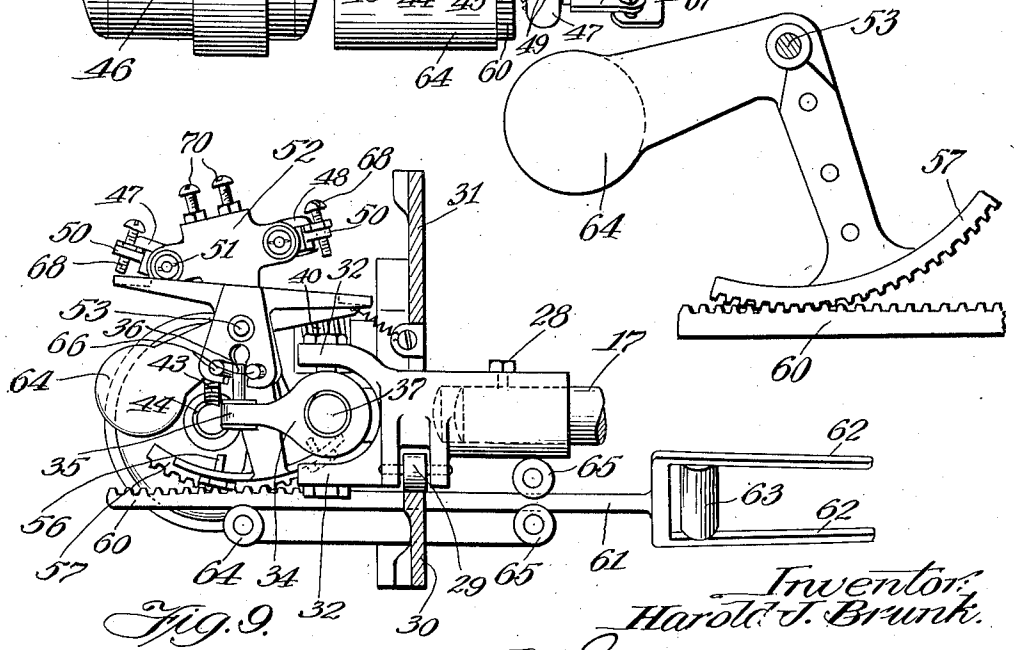


Fig. 9.

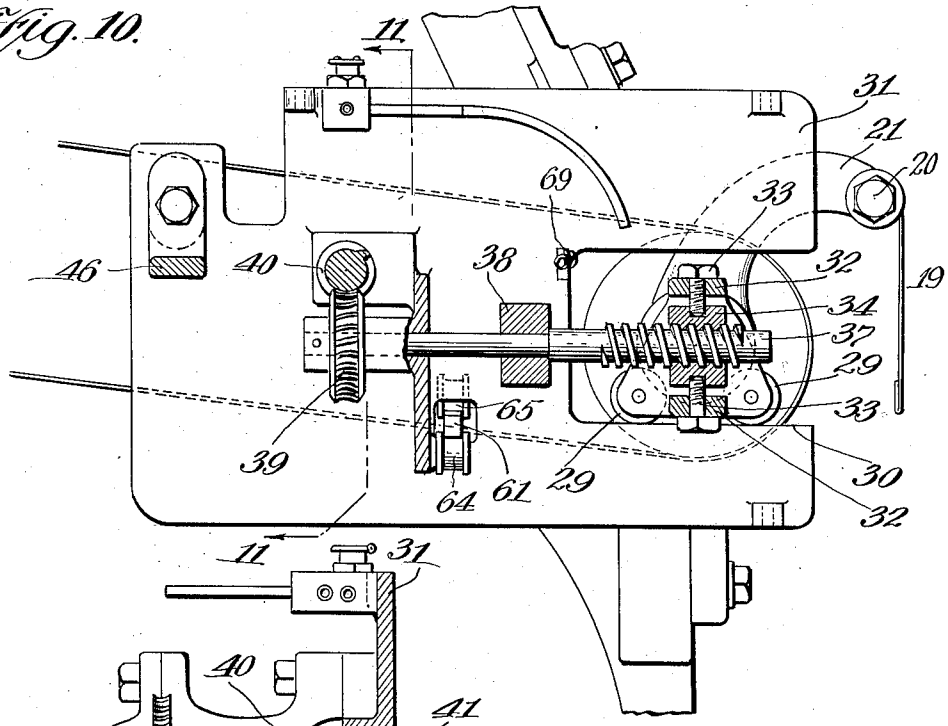
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AUTOMATIC BAND CONTROL

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Fig. 10.



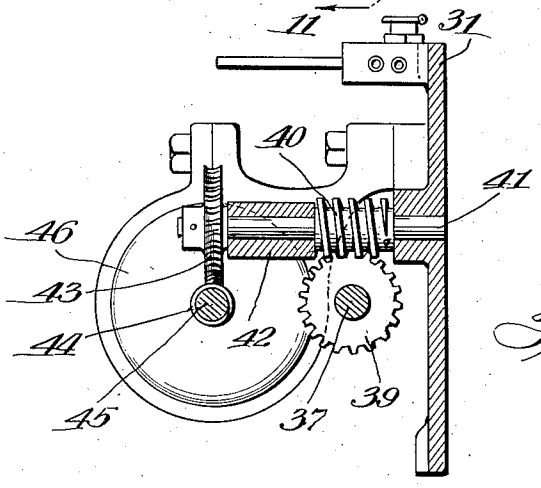
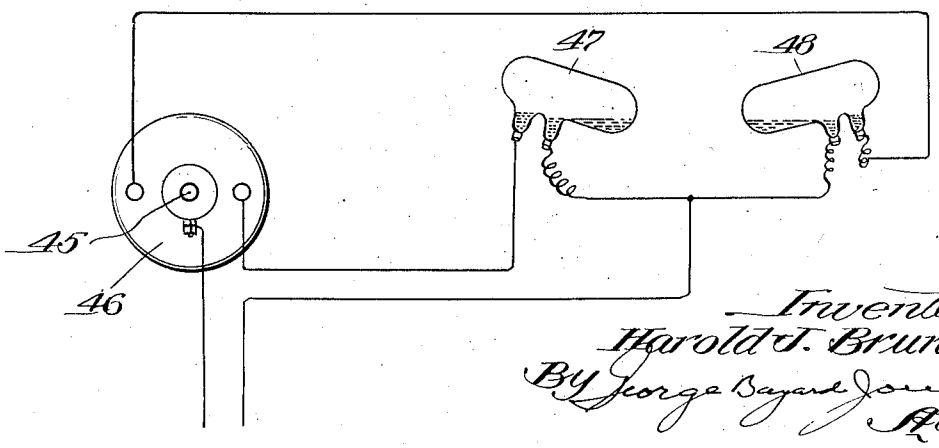


Fig. 11.

Fig. 14.



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UNITED STATES PATENT OFFICE

1,992,649

AUTOMATIC BAND CONTROL

Harold J. Brunk, Chicago, Ill., assignor to The C. F. Pease Company, a corporation of Delaware

Application June 9, 1931, Serial No. 543,156

15 Claims. (Cl. 74—241)

This invention relates to improvements in automatic band controls.

Where a continuous band or belt of fabric or the like is mounted on rollers as in machines for making blue prints, machines for drying the same and other machines, including paper making machines where a wire screening is used, the band gradually travels toward one side or the other while passing around the supporting rollers. Various devices have been proposed heretofore to shift the axis of rotation of one of the rollers automatically to cause the band to restore itself to normal position, including the means disclosed in my earlier application No. 170,560, filed February 24, 1927, and issued August 11th, 1931, as Patent 1,818,685.

In my earlier device and in certain other prior art devices the roller carries yieldable members at each end which are depressed radially inward by one side or margin of the belt or the other, thereby effecting a mechanical locking of certain parts which are thereafter driven by said roller to shift the axis of the latter. The radial depression of said members requires that the edges of the belt be under considerable tension and the source of power utilized to shift the roller axis is the same as that employed to cause the belt to travel.

The present invention is an improvement in devices of the general character wherein the axis of rotation of one of the rollers is shifted and involves the use of a reversible electric motor to swing one end of said roller in a small arc one way or the other about the other end as a pivot, for the purpose of causing the belt to travel back toward mid-position after it has deviated therefrom, the rotation of the motor armature in one direction or the other being controlled by a pair of circuit closing devices which are actuated to make and break the necessary circuits by means yieldingly held against one edge of the band or belt and hence moved back and forth as said band or belt creeps back and forth during its forward travel.

The objects of the invention are:

To provide controlling means which responds quickly to deviations of the band from its normal position;

To provide means of this character which is not dependent on the tension of the margins or edges of the belt;

To provide means of this character in which the amount of side travel of said band or belt may be regulated and may be adjusted as the band stretches and in which the speed of the return movement may be regulated.

Other objects and advantages will be apparent from the description hereinafter given of one embodiment of the invention.

Fig. 1 is a plan view of a blue print dryer equipped with the automatic band control;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged side elevation of part of the frame on the opposite side;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the automatic belt control;

Fig. 6 is a top plan view thereof;

Fig. 7 is an elevation thereof partly in section;

Fig. 8 is a view similar to Fig. 6 but with the parts in a different position;

Fig. 9 is an elevation thereof partly in section;

Fig. 10 is an enlarged elevation of the side of the machine opposite Fig. 3;

Fig. 11 is a section on the line 11—11 of Fig. 10;

Fig. 12 is a rear view of the mercury switch supporting member;

Fig. 13 is an elevation of a detail; and

Fig. 14 is a circuit diagram.

The apparatus selected to illustrate the invention is a machine for drying blueprints, negative prints, photostats and the like, and is provided with suitable side frames, 10, (Figs. 1 and 2), supporting a shaft 11 on which a drying drum 12 is mounted, and with additional smaller cylinders or rollers, 13, 14, 15, and 16. The latter is rotatably mounted on a non-rotatable shaft 17. An endless band or belt 18, made preferably of canvas or of similar fabric, passes over the four rollers mentioned and also around the drying drum 12, moving in the direction shown by the arrow as in Fig. 2. A shield or water deflector 19 is suspended from a cross rod 20, carried on arms 21, which latter are fixed to the non-rotatable shaft 17.

The prints or other sheets of material to be dried are fed into the machine by being placed on the slightly inclined span of the belt 18, whereby they are fed around the heating drum and delivered at the same side or front of the machine into a pan 22. See Fig. 2.

One end of the shaft 17, the right-hand end, as viewed from the front in Fig. 4, has a screw threaded opening in it to receive a screw-threaded bolt 23, (Figs. 3 and 4), whereby rotation of the latter will move the end of said shaft toward or away from the operator to tighten or loosen the corresponding side of the belt 18. After this adjustment has been made, it is not necessary to

change it for long intervals of time. Said bolt passes through horizontal slots 24 (see Figs. 3 and 4) in a rectangular frame 25, whereby said shaft 17 may be swung in a horizontal plane about a vertical axis intersecting said bolt, said bolt being free to swing back and forth in said slots. The nuts 26 on the end of said bolt do not clamp the latter tightly to the frame 25 but permit the oscillating movement described and also permit the adjustment of the end of the shaft previously described, whereby that end of the shaft is in effect pivotally supported and its opposite end may move toward or away from the operator in a horizontal plane. Said opposite end, or left-hand end, if moved toward the operator will cause the belt to move gradually toward the right-hand side of the machine or if moved away from the operator beyond its normal position, will cause said belt to move gradually toward the left-hand side of the machine.

The means for automatically moving the left-hand end of said shaft and of the roll carried thereby, toward or away from the operator to maintain the bolt within a small limit of travel sideways, will now be described.

The left-hand end of said shaft (see Figs. 7 and 9), is received within an opening in a substantially circular housing 27 and held by a set screw 28, said housing having a pair of rollers 29 thereon, which permit said housing to travel toward or away from the operator a short distance along a track 30, constituting one side wall of an opening in a side plate 31.

Said housing 27 has a bifurcated end extension in the form of a pair of arms 32 through which pass studs 33, about the inner ends of which is pivoted a nut 34. Said nut has a curved arm 35 extending therefrom with a pin 36 thereon, the purpose of which is hereinafter explained. Said screw-threaded nut receives a screw threaded shaft 37, the latter passing through a lug 38 on the side plate 31, and having a worm gear 39 on its end, which is rotated by a horizontal worm 40 on a shaft 41, said shaft passing through a supporting bracket 42, having a worm gear 43 on its end rotated by a horizontal worm 44 on the shaft 45 of the motor 46. Said motor is known to the trade as a "Universal 3-wire reversing series type", and by rotation of the armature shaft in one direction or another, it is apparent that the housing 27 may be moved forwardly or rearwardly, i. e., to the right or the left, in the position shown in Fig. 10. During such movement the nut 34 travels back and forth in a straight line, whereas said housing 27 has a slight angular movement about the right end of the shaft 17, as a pivot.

As shown in the circuit diagram, Fig. 14, the circuit to the motor may be closed by either of the mercury switches 47, 48, each of which are secured by spring clips 49 (Figs. 6, 7, 8, 9) to an L shaped bracket 50 pivoted at 51 to a T shaped plate 52 so that said brackets and mercury switches carried thereby may be tilted independently about a horizontal axis in a manner which is well understood. In said diagram the circuit of both switches is open but either circuit may be closed by tilting said plate and hence inclining one of said switches in the opposite direction.

Said plate 52 is mounted to rock back and forth about the stud 53, mounted, at one end, in the casting or bracket 42, (Fig. 8). The rocking of said plate tilts the mercury switches, its lower end having a pair of arc-shaped brackets 54 with openings 55 therein, in which two studs 56 may be inserted equidistant from the center, whereby when one or the other of said studs is engaged as hereinafter described, said T-shaped member will be rocked back and forth to close the circuit of one switch or the other.

To cause this back and forth tilting movement, a toothed segment 57 is pivotally mounted on the shaft 53 and carries a pin 58, which projects between the two studs 56 previously mentioned, said segment being oscillated by a rack 60 (Figs. 5, 7, 9, 13) which rack has an extension 61 (Fig. 9) with a fork 62 at the end, embracing the upper and lower side of the belt at one edge thereof and provided with a roller 63 to reduce the friction as the belt travels between the extensions 62, 62. A counter weight 64 (Fig. 13) tends to hold the roller 63 against the edge of the belt whereby the rack 60 moves back and forth in accordance with the slow back and forth movement of said belt.

For example, if said belt, during operation of the drier, begins towork to the left, the roller and the fork of which it forms a part, are moved to the left, thereby moving the rack and swinging the pin 58 against the left-hand pin 56, as shown in Fig. 7, thus tilting the upper part of the T-shaped plate 52 and the switch 48 to the right, resulting in the closing of the corresponding circuit, the circuit of the other switch being open when the T-shaped plate is in mid-position, or normal position, and remaining open as said plate tilts to the right.

On closing said circuit, the motor operates in a direction to move the left-hand end of the roller 16 toward the operator, i. e., to the right as shown in Fig. 6, in which the rack is shown in a position corresponding to that in Fig. 7, and this swinging movement of one end of the roller about its other end as a pivot, causes the belt to begin to travel back slowly toward mid-position. During such movement of the left-hand end of the roller and of the nut 34 toward the operator, the pin 36 (see Fig. 6) on the curved arm 35, in traveling toward the right, engages one of the two inclined pins 66 on a tiltable T-shaped member 67, which is also mounted on the shaft 53, and gradually tilts said member about said shaft to the position shown in Fig. 7, in which the right-hand end of said member engages the right-hand one of two screws 68, each passing through one of the brackets 50 and gradually tilts the mercury switch 48 until the mercury runs down to the left-hand end and thus opens the circuit, stopping the motor.

If the belt continues to travel toward the right along the roller, such travel will be exceedingly slow and if it continues far enough, the fork 62 which follows it to the right in its movement, will eventually cause said T-shaped plate 52 to tilt to the position shown in Fig. 9, in which the mercury switch 47 is closed, causing reverse rotation of the motor.

During the movement of the rack 60 from left to right, i. e. from the position shown in Fig. 7 to that shown in Fig. 9, the plate 52 is gradually restored to normal position by the spring 69, (Fig. 12), which spring during such return movement holds the pin 56 against the pin 58, the circuits remaining unchanged. As said rack continues to move beyond mid-positions, the plate 52 remains in mid-position until the pin 58 engages the other one of the two pins 56, thus swinging the plate 52 in the opposite direction against the action of said spring 69.

Since the pins 56 are adjustable, i. e. their location on the segment 54 being varied by inserting them through any one of a number of different openings therein, the movement of the belt toward

one end of the roller or the other may be checked at an earlier or later stage of said movement as may be desired. For example, when the belt is new, said pins may be close together, possibly a half inch apart as a new belt is at its maximum width and may not have to deviate very far from its normal position without over running the edge of the roller. Therefore, such movement may be checked almost in its incipiency if desired. After said belt has stretched, it becomes somewhat narrower and would deviate somewhat farther from its normal course before causing the engagement of the pins 56 and 58. Therefore, to check such deviation promptly the pins may be set more closely together. If it is desired to operate the motor as little as possible, said pins may be set farther apart.

The screws 68 provide an adjustment whereby the circuit may be opened at an earlier or later stage with reference to the time the motor begins to operate. In other words, the shifting of the axis of the shaft 17 may be varied as desired. The pivoting of the mercury switches in the opposite direction, i. e. the angle which they assume in normal position, is controlled by the screws 70. See Fig. 12 which is a rear view of the plate 52 and the parts associated therewith. These screws are engaged by the pivoted brackets 50 and are preferably so adjusted as to just safely insure an open circuit position when said plate is in mid-position. By rotating said screws to increase the inclination of the mercury switches, the plate 52 must be swung through a greater angle to close either circuit. Said brackets are normally held against the lower ends of said screws 70 by spring 71 engaging the two.

One advantage of the construction described herein is that there is substantially no up or down pressure on the edge of the belt tending to stretch the same and the mechanism actuated by the fork bearing the roller 63 operates readily through the engagement of said roller with one side only of said belt, thus obviating the necessity of special appliances engaging both sides of the belt and depending for their operation on the pressure of said belt downwardly or upwardly against the same.

The terms "horizontal" "vertical" and similar phrases used herein are not intended to be used in a limiting sense but in a relative sense to facilitate an understanding of the mechanism, as various changes may be made in this and other respects without departing from the spirit of the invention as expressed in the appended claims.

What I claim is:

1. In a device of the class described, a roller, a shaft therefor, a pivotal support for one end of said shaft, means for moving the other end of said shaft back and forth horizontally, a belt passing over said roller and extending therefrom in a free span, a reversible electric motor for operating said means in either of two directions, an electric switch connected to said motor for closing and opening the circuit thereto, means cooperating with one margin only of the free span of said belt and controlled by the movement of said belt sideways with reference to said roller, and mechanism between said means and said switch for actuating said switch and causing said motor to rotate in one direction or the other, said mechanism including a weighted member for maintaining said cooperation between said means and said belt margin.

2. A device of the class described comprising a supporting frame, a shaft, a roller thereon, an endless belt passing part way around said roller whereby free spans are provided adjacent said roller, a pivotal support on said frame for one end of said shaft, a nut carried by the other end, anti-friction means cooperating with said end and the opposite side of said frame for accommodating horizontal, pivotal movement of said roller shaft, a screw threaded shaft passing through said nut for effecting said pivotal movement of said roller shaft, a motor for rotating said threaded shaft in one direction or the other, a motor circuit including two switches controlling the operation of the motor in one direction or the other, means for engaging one edge only of one of said free spans, and lost-motion connections between the same and said switches to operate the latter as the belt shifts laterally on said roller

3. In a device of the class described, a tiltable support, a pair of mercury switches mounted thereon, a reversible motor controlled by said switches, belt adjusting means actuated by said motor, a rack and pinion for tilting said support, and means yieldingly engaging the edge of a belt for actuating said rack and pinion.

4. In a device of the class described, a tiltable support, a pair of mercury switches each pivotally mounted thereon, a reversible motor controlled by said switches, belt adjusting means actuated by said motor, a rack and pinion for tilting said support, means yieldingly engaging the edge of a belt for actuating said rack and pinion, and means for tilting said switches independently of the position of said tiltable support.

5. Apparatus as in claim 4 in which said tilting means is adjustable.

6. In a device of the class described, a tiltable support, a pair of mercury switches mounted thereon, a rack and pinion for tilting said support and closing one or the other of said switches, means of engaging the edge of a belt for actuating said rack and pinion, motor actuated means controlled by the circuits of said switches for causing said belt to travel sideways while it is traveling longitudinally and means controlled by said last mentioned means for restoring said switches to normal open circuit position.

7. In a belt adjusting device, a frame, a pivotal support thereof, an arc-shaped extension thereon with openings therein, a pair of pins insertable in any two of said openings, a rack and pinion, a member on said pinion projecting between said pins whereby movement of said rack will cause said member to engage one pin or the other and tilt said frame, and means associated with said rack for engaging the edge of a belt.

8. In a device of the class described, a roller, a belt passing over the same, a shaft for said roller, a wheeled carriage for one end of said shaft, a nut associated therewith, a screw threaded shaft passing through said nut, a reversible motor for rotating said shaft in one direction or the other, a tiltable member, inclined guides thereon, a projection associated with said nut, and cooperating with said guides to tilt said member as said nut is moved back or forth on said screw threaded shaft, and switches controlling the rotation of the motor actuated by the tilting of said member.

9. Apparatus of the class described comprising a reversible motor, a belt roll having a swingable shaft, means actuated by said motor for swinging said shaft for causing a belt to move laterally of said roll in one direction or the other, switch means for controlling the direction of

rotation of said motor, a member engaging an edge of said belt and being mounted to follow the lateral movements of the same, and mechanism comprising a rack and pinion operable by said member for selectively actuating said switch means.

10. The combination with a belt roll pivotally mounted at one end and having a movable housing at the other end, of a nut secured to said housing, a threaded shaft passing through said nut, a reversible motor for actuating said shaft in either of two directions for causing the shifting of said roll upon its pivot to cause said belt to move laterally of said roll, switch means for controlling the direction of rotation of said motor, a pinion for actuating said switching means, a rack engaging said pinion, and a yieldingly mounted member adapted to follow the lateral movements of said belt for actuating said rack.

11. The combination with a belt roll pivotally mounted at one end and having a movable housing at the other end, of a nut secured to said housing, a threaded shaft passing through said nut, a reversible motor for actuating said shaft for effecting the shifting of said roll upon its pivot to cause said belt to move laterally of said roll, switch means for controlling the direction of rotation of said motor, a pinion for actuating said means, a rack engaging said pinion, a yieldingly mounted member adapted to follow the lateral movements of said belt for actuating said rack, and means operable by said nut for opening said switches after predetermined shifting of said roll.

12. The combination with a belt roll pivotally mounted at one end whereby the opposite end can be moved in a direction to tighten or loosen the belt, of a reversible motor, a threaded shaft operable thereby, means connecting said shaft to said roll for effecting the said movement of the same, switch means for operating said motor in either of two directions, a swingingly mounted member for actuating said means, said member having a pair of spaced studs, an oscillatable pinion having a pin disposed between said studs for engaging one or the other of the same when said pinion is moved through a predetermined arc, a rack engaging said pinion, and a belt engaging member secured to said pinion for moving the same in a direction corresponding to the lateral shifting of said belt.

13. The combination with a belt roll pivotally mounted at one end whereby the opposite end can be moved in a direction to tighten or loosen the belt, of a reversible motor, a threaded shaft operable thereby, means connecting said shaft to said roll for effecting the said movement of the same, switch means for operating said motor in either of two directions, a swingingly mounted member for actuating said means, said member having a pair of spaced studs, an oscillatable pinion having a pin disposed between said studs for engaging one or the other of the same when said pinion is moved through a predetermined arc, a rack engaging said pinion, and a belt engaging member secured to said pinion for moving the same in a direction corresponding to the lateral shifting of said belt, said studs being adjustable on said swingingly mounted member for varying the arc through which said pin can move prior to actuating said member for effecting the actuation of said switch means.

14. In a blue print machine, a series of parallel rollers, an endless belt passing over said rollers, a shaft for one of said rollers having its ends adjustable substantially horizontally, said belt passing over said roller and being deflected at a substantial angle, whereby the tension of said belt may be increased by moving said adjustable roller to elongate said belt, one end of said shaft being movable also about a vertical axis, a rotatable screw threaded shaft associated with the other end, a reversible motor for rotating said screw threaded shaft in either direction to swing said adjustable roller about said vertical axis, a pair of tiltable switches for reversing said motor and a spool yieldingly held against one span of said belt to follow the same in its movement sideways as it passes over said adjustable roller, and connections from said spool to said switches to operate the latter in accordance with the side travel of said belt.

15. In a blue print machine, a series of parallel rollers, an endless belt passing over said rollers, a shaft for one of said rollers having its ends adjustable substantially horizontally, said belt passing over said roller and being deflected at a substantial angle, whereby the tension of said belt may be increased by moving said adjustable roller to elongate said belt, one end of said shaft being movable also about a vertical axis, a reversible motor for moving the other end of said shaft in either direction horizontally to swing said adjustable roller about said vertical axis, a pair of switches for reversing said motor, means cooperating with both switches for closing one or the other, a fork yieldingly held against one span of said belt to follow the same in its movement sideways as it passes over said adjustable roller, and a mechanical connection from said fork to said means whereby both switches are controlled from the same side of the belt to prevent more than a limited side travel thereof with respect to said roller.

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