

April 22, 1941.

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2,239,472

PAPER WINDING REGULATOR

Filed May 8, 1939

2 Sheets-Sheet 1

Fig. 1.

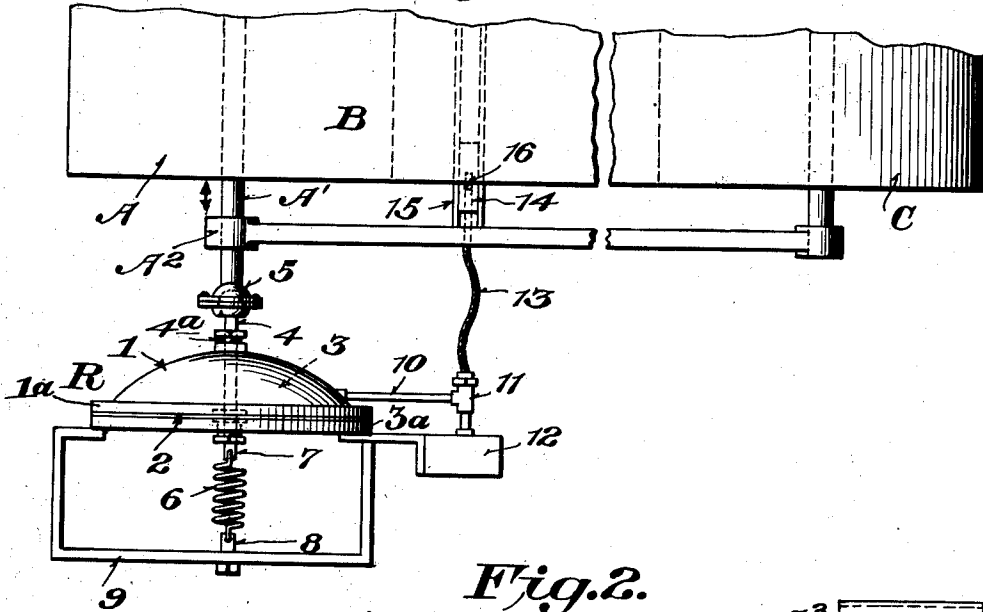
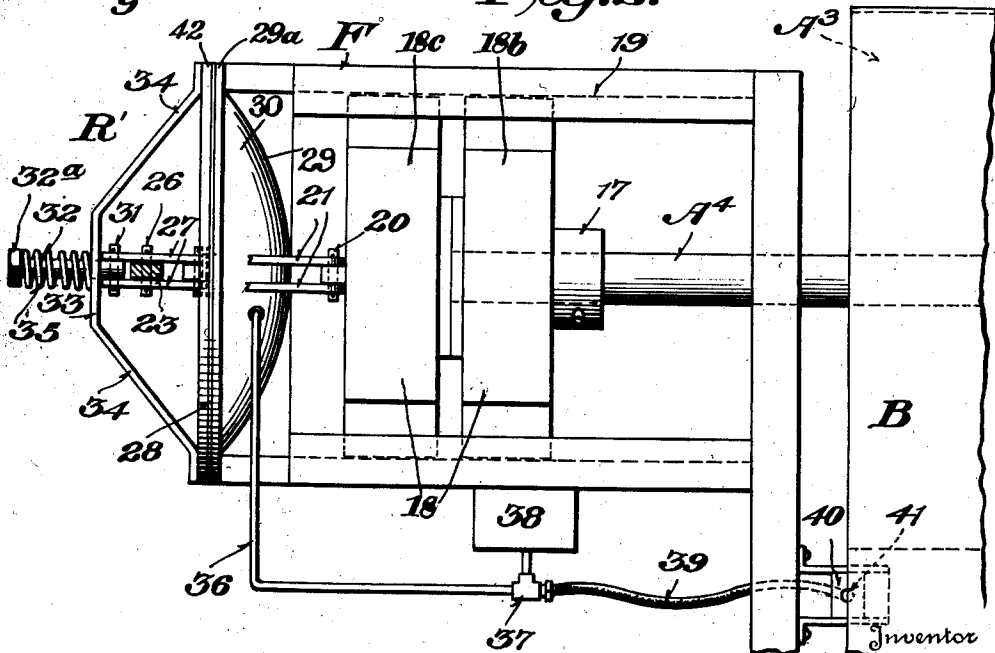


Fig. 2.



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Fig. 4.

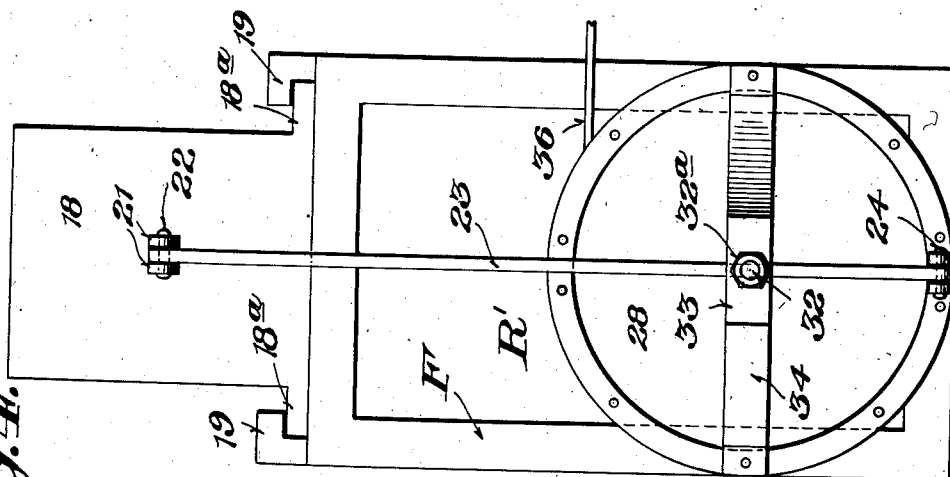
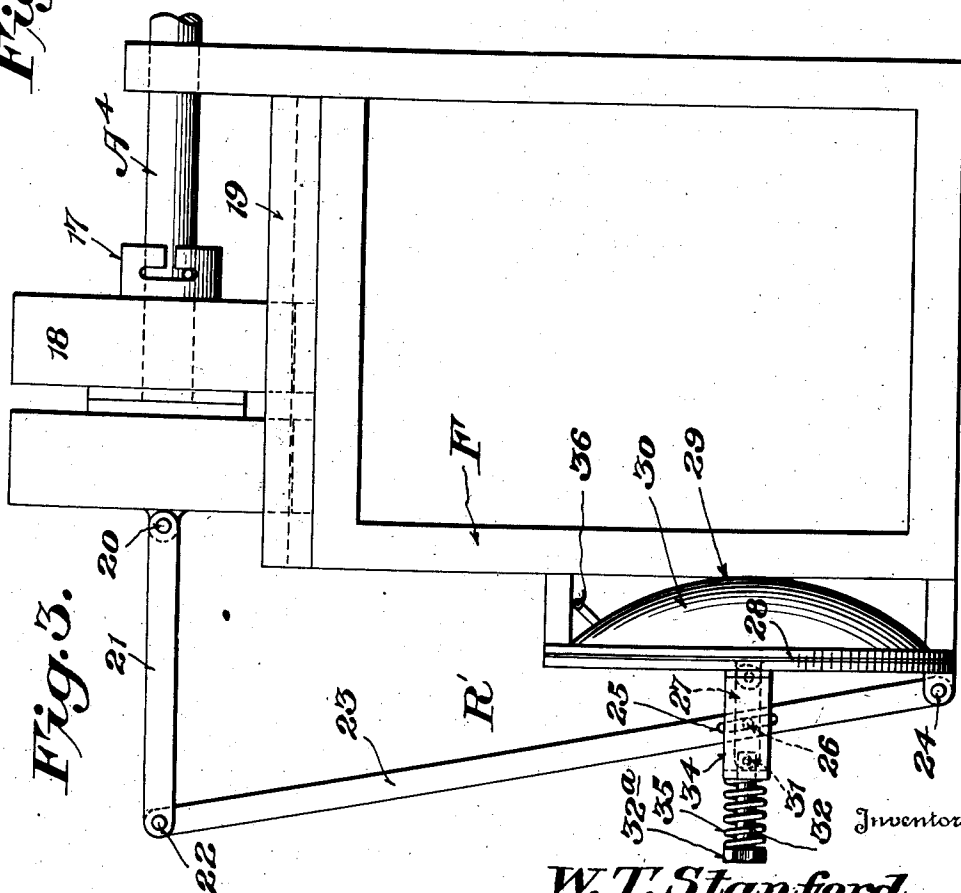


Fig. 3.



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UNITED STATES PATENT OFFICE

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PAPER WINDING REGULATOR

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6 Claims. (Cl. 242—76)

This invention relates to paper making machinery and more particularly to novel means for accurately controlling the winding of paper from one roll to another.

In transferring paper from one roll to another, as, for example, in re-winding operations, in the making of wax paper or the like, the paper frequently has a tendency to unevenly wind on the re-wind roll. Therefore, in order to avoid the necessity of trimming the re-wound paper, with consequent loss in trimming, it is desirable to provide means for regulating the position of the main or stock roll in such a way that the same is automatically shifted longitudinally on its axis as the paper is unwound therefrom thereby to cause the paper to be evenly fed and wound on the re-wind roll, the latter having a rotating shaft mounted in a fixed position. In this connection it is desirable that the means for regulating the position of the main roll be controlled by the web of paper passing between the main roll and the re-wind roll. While previous attempts have been made to accomplish this general purpose, nevertheless, in the majority of cases the expedients adopted are expensive to install and maintain, and the present invention aims to overcome this primary objection by providing simple, practical, and economical means for the purpose.

Accordingly, a primary object of the invention is to provide a fluid operated regulator device, preferably pneumatic, controlled by a pilot orifice traversed by the web of paper. This device may be readily installed as an attachment to existing paper machines, or supplied with new equipment, and, which because of its simplicity, performs the intended functions in a thoroughly practical and reliable manner.

A further object of the invention is to provide a device operating in conjunction with a vacuum pump which may be connected with the main roll either by a direct connection, or by suitable linkage.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings in which:

Figure 1 is a top plan view illustrating one form of the invention,

Figure 2 is a top plan view of a modified form of the invention.

Figure 3 is a front elevation of the construction shown in Figure 2.

Figure 4 is a side elevation of the construction shown in Figures 2 and 3.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

According to the embodiment of the invention shown in the drawings the invention consists of structural features and characteristics which may be embodied in the form of an attachment applied to any apparatus wherein paper is being, or is to be, wound from one roll onto another. For example, the invention includes a supply roll A having a shaft A' adapted to be shiftably mounted in suitable supports or bearings A². As usual this roll is adapted to carry the supply of paper which is to be unwound or unreel onto another roll. As is well known the paper may be a web B of any predetermined length and is unwound from the roll A onto the re-winding roll C. The shaft of the re-winding roll is rotatably journaled in suitable bearings but is relatively fixed in the sense that it does not shift in the direction of its axis. On the other hand, as previously indicated, the shaft A' of the supply roll A is so mounted that it can be shifted in the direction of its axis to assist in effecting even winding of the paper from the supply roll to the re-winding roll.

For the purpose of controlling the position of the supply roll relative to the re-winding roll a novel fluid regulator device is employed. That is to say, the shaft A' of the supply roll is connected with a regulator device which in turn is controlled by the web B passing from roll A to roll C.

According to the arrangement shown in Fig. 1 the said regulator device, designated generally as R, includes a casing or housing consisting of a rigid outer wall or dished member 1 and a flexible diaphragm 2 assembled in sealed relation to provide a vacuum chamber 3. As shown, dished member 1 is provided with a flange 1^a against which diaphragm 2 is held by clamping ring 3^a. The diaphragm 2 is connected by a rod 4 with a coupling device 5 for detachably securing the rod to the shaft A' of the supply roll. The rod 4 may be connected in any suitable manner with the diaphragm and extends through a suitable packing gland 4^a carried by the rigid wall 1. For the purpose of maintaining the diaphragm 2 in its normal position, suitable spring means 6 may

be employed. In the example shown said means consists of a coil spring having one end connected to an extension 7 of the rod 4 while its other end is adjustably anchored by means of the bolt 8 to a suitable frame element 9 which is supported by clamping ring 3^a by attachment to two spaced opposed points thereof. The sealed vacuum chamber 3 is provided with a conduit 10 which connects with a suitable fitting 11 which in turn directly communicates with a vacuum pump 12. The fitting 11 is also connected by a tube 13 with the pilot device 14. Since the pilot device 14 is intended to be adjustable relative to the path of the edge of the web it is preferred that the tube 13 be flexible. It will be observed from Fig. 1 that the pilot device 14 consists of a suitable head shiftably mounted in the guide members 15 arranged transversely of the path of the web and the said head includes an orifice 16 adapted to be covered, uncovered or partially covered by the edge of the paper web B.

The vacuum pump 12 is a constant speed pump intended to create approximately 2" of vacuum. If the edge of the paper web only partially covers the orifice 16 it will be apparent that only a partial vacuum will be created in the chamber 3 and consequently the diaphragm 2 will only be flexed accordingly against the tension of the spring 6. This, of course, is due to the fact that the full force of the vacuum generated by the pump 12 is not applied to the chamber 3 under these conditions. On the other hand if the paper web shifts relative to the pilot device to a sufficient degree to completely cover the orifice 16 it will be apparent that since the orifice is closed to the atmosphere, the full force of the vacuum pump will be exerted on the chamber 3 and consequently flex the diaphragm to its maximum degree and thereby move the shaft A' in proportion. In the event that the orifice 16 of the pilot device is completely uncovered, it will of course be understood that the vacuum in the chamber 3 will be nil or at least negligible so that the spring 6 will pull the diaphragm back to its normal position. Thus, as the paper web proceeds from the roll A to roll C and tends to move laterally the supply roll A will be continuously and automatically shifted in such a way as to move said supply roll in such a way as to evenly feed the unwinding paper therefrom to the re-winding roll. Under these conditions it will be apparent that the position of the roll A will be automatically corrected with reference to the roll C throughout the re-winding operation. It will of course be understood that the rolls A and C may be equipped with any suitable driving means as well as means for braking their action at required intervals, it being understood that the rolls operate at relatively high speed, for example, approximately 800 R. P. M.

A modification of the invention is shown in Figures 2, 3 and 4. In all respects, however, the essential features described in connection with Fig. 1 are preserved. Although the re-winding roll is not shown in connection with Figures 2-4, inclusive, it will be understood that one is employed, and for the sake of clarity only the supply roll is shown.

Referring first to Figure 2 it may be pointed out that the supply roll A³ is provided with a shaft A⁴ which may be detachably connected by a suitable coupling device 17 with friction block means 18. This block may consist of one or more connected sections 18^b, 18^c, as shown in Fig. 2, and is slidably and frictionally mounted in suit-

able guides 19 carried by the frame F of the regulator designated generally as R'. As will be observed from Fig. 4 the friction block means 18 is provided with outwardly extending flanges 18^a which ride beneath the guide means 19. The block means 18 acts as inertia means for stabilizing the shifting of the shaft A⁴ under the influence of the vacuum regulator.

The block means 18 is pivotally connected as indicated at 20 with a two-arm link 21 (Fig. 3). This link is pivotally connected as at 22 with a lever 23 whose lower end is pivotally mounted in a fixed position as indicated at 24 to the lower part of the frame F of the regulator. The intermediate portion of the link 23 is provided with a slot 25 for receiving a transverse pin 26 carried by the members 27 which constitute a rod connected with the flexible diaphragm 28. This diaphragm is covered at one side by a rigid dished plate 29 forming a vacuum chamber 30 which is connected with the vacuum pump as will presently appear. As shown, diaphragm 28 rests on flange 29^a of dished plate 29, and is held against flange 29^a by clamping ring 42. The members 27 which constitute in effect a rod corresponding to 4 in Fig. 1 are connected at their outer ends by means of a pin 31 with a post 32 which is slidably guided in the web 33 of a yoke 34 carried by clamping ring 42 which supports the diaphragm and yoke 34 is attached to two spaced opposed points of the clamping ring. This post 32 is provided at its outer end with a head which may be in the form of a nut 32^a adjustable on the post thereby to confine a spring 35 between the same and the portion 33 of the yoke. The spring 35 is therefore a compression spring as distinguished from a tension spring in Fig. 1 but performs the same function, namely, to actuate the diaphragm in opposition to the vacuum created in the chamber 30.

The said chamber 30 is connected by a conduit 36 with a fitting 37 associated with a vacuum pump 38. The fitting 37 or its equivalent, is connected by the flexible tubing 39 to the pilot device 40. The latter device is provided with an orifice 41 adapted to be covered and uncovered by the edge of the paper web B as it travels from one roll to the other.

In the construction shown in Figs. 2 to 4 inclusive, it will be apparent that the same idea is carried forward as illustrated in Fig. 1. That is to say, when the pilot orifice 41 is partially covered the diaphragm 28 will be flexed into the chamber 30 proportionately and thereby cause the members 27 to move the lever 23 whereby motion will be transmitted through the link element 21 to the friction blocks 18 thereby effecting required adjustment of the shaft A⁴. On the other hand if the edge of the web B completely covers the orifice the diaphragm 28 will be flexed inwardly to its maximum extent against the influence of the spring 35, and the lever and link means 23-21 will push the blocks 18 to one of their limits of movement. If the orifice 41 is completely uncovered the vacuum chamber 3 will of course be vented to the atmosphere and the energy of the compression spring 23 will tend to bring the diaphragm 28 back to its normal position.

From the foregoing it will be apparent that the present invention provides simple, practical and reliable fluid operated means for controlling the position of the supply roll while it is in motion relative to the re-winding roll, thereby to effect even winding of the paper on the re-wind roll so

that trimming of the paper on the latter roll is unnecessary. Consequently waste of paper incident to trimming is eliminated.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will, of course, be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. In an apparatus for winding a paper web from one roll to another, a supply roll, a re-winding roll, means for shiftably mounting the supply roll on its axis relative to the re-winding roll, and means controlled by the paper web for automatically shifting the supply roll while unreeling the web, said means comprising a regulator including a housing formed by a rigid wall and a flexible diaphragm enclosing a vacuum chamber, spring means for maintaining the diaphragm in normal position, a vacuum pump, a conduit from the pump to the diaphragm, a rod connected to the diaphragm and passing through said rigid wall, means for coupling said rod to the supply roll, a pilot device positioned beneath the path of the web and having an orifice adapted to be covered and uncovered by the edge of the web, and a tube for establishing communication between the pilot device and the said conduit.

2. In an apparatus for winding a paper web from one roll to another, a supply roll, a re-winding roll, means for shiftably mounting the supply roll on its axis relative to the re-winding roll, said mounting means including a block slidably supported adjacent one end of the supply roll and connecting means for detachably connecting the block with said supply roll; and control means controlled by the paper web for automatically shifting said block while the supply roll is unreeling the web, said last mentioned control means comprising a regulator including a housing formed by a rigid wall and a flexible diaphragm enclosing a vacuum chamber, spring means for maintaining the diaphragm in normal position, a vacuum pump, a conduit from the pump to the vacuum chamber, a rod connected to the diaphragm, means for coupling said rod to the said block, said coupling means including a lever pivoted in a fixed position at its lower end and having said rod connected to its intermediate portion, and link means connecting the upper end of the lever with the block; a pilot device positioned beneath the path of the web and having an orifice adapted to be covered and uncovered by the edge of the web and a tube for establishing communication between the pilot device and the said conduit.

3. In an apparatus for winding a paper web from one roll to another, a supply roll, a re-winding roll, mounting means for shiftably mounting the supply roll on its axis relative to the re-winding roll, said means including a block

slidably supported adjacent one end of the supply roll and connecting means for detachably connecting the block with said supply roll; and control means controlled by the paper web for automatically shifting said block while the supply roll is unreeling the web, said last mentioned control means comprising a frame positioned below said block, a regulator device mounted in said frame, said device including a rigid wall and a flexible diaphragm forming a sealed vacuum chamber mounted in said frame, a yoke carried by the frame, a rod connected to the diaphragm and extending through the yoke, a spring confined between the outer face of the yoke and an abutment carried by the rod, a lever pivotally mounted in a fixed position at its lower end and having its intermediate portion connected to the rod, link means connecting the upper end of the lever with the block, a vacuum pump, a conduit connecting the pump with the vacuum chamber, and a pilot device positioned beneath the path of the web and having an orifice adapted to be covered and uncovered by the edge of the web, and a tube for establishing communication between the pilot device and the said conduit.

4. In an apparatus for winding a web from one roll to another, a supply roll, a re-winding roll, shafts respectively carrying said rolls, means for supporting said shafts for rotational and longitudinal movement thereof, a sealed diaphragm chamber comprising a rigid wall and a flexible diaphragm and mounting means for mounting said diaphragm on said rigid wall, a frame attached to said mounting means at two spaced points thereof and extending outwardly from said diaphragm between said two points of attachment, a resiliently urged displacing unit carried by said diaphragm and said frame and comprising structural means attached to said diaphragm and adapted to transmit tension in the direction of an axis thereof, said unit further comprising a spring coaxial with said structural means which at one end engages said structural means and at the other end is carried by said frame and tends to maintain said diaphragm in position corresponding to normal atmospheric pressure within said chamber, connecting means connecting said structural means with said displaceable shaft for displacing said shaft longitudinally, a vacuum pump connected to said chamber, a pilot device positioned beneath the path of the web and having an orifice positioned to be covered in whole or part by the edge portion of said web, and a tube connecting said orifice with said chamber.

5. An apparatus according to claim 4, said rod member being colinear with said displaceable shaft and passing through said rigid wall in hermetically packed relation thereto.

6. An apparatus according to claim 4, said connecting means comprising a lever of the third class.

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