Oct. 23, 1945. E. W. COFFEY 2,387,644

REWINDING MECHANISM

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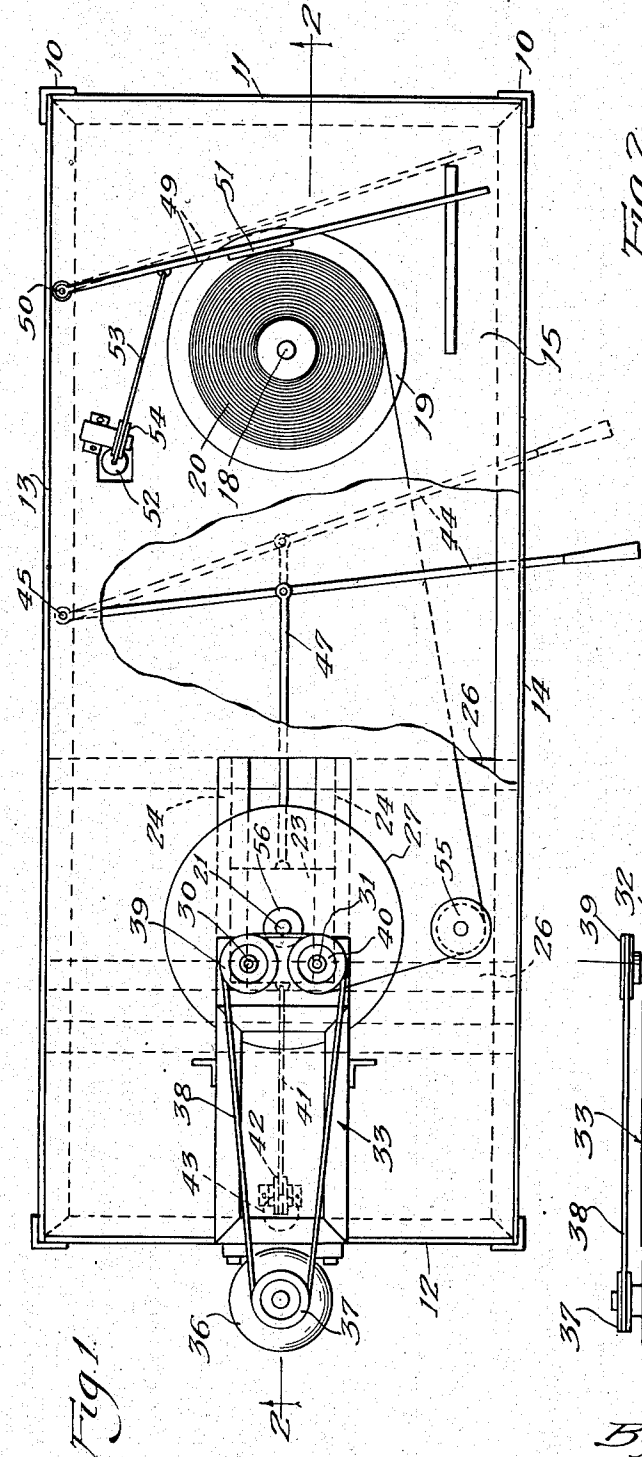

Fig. 1.

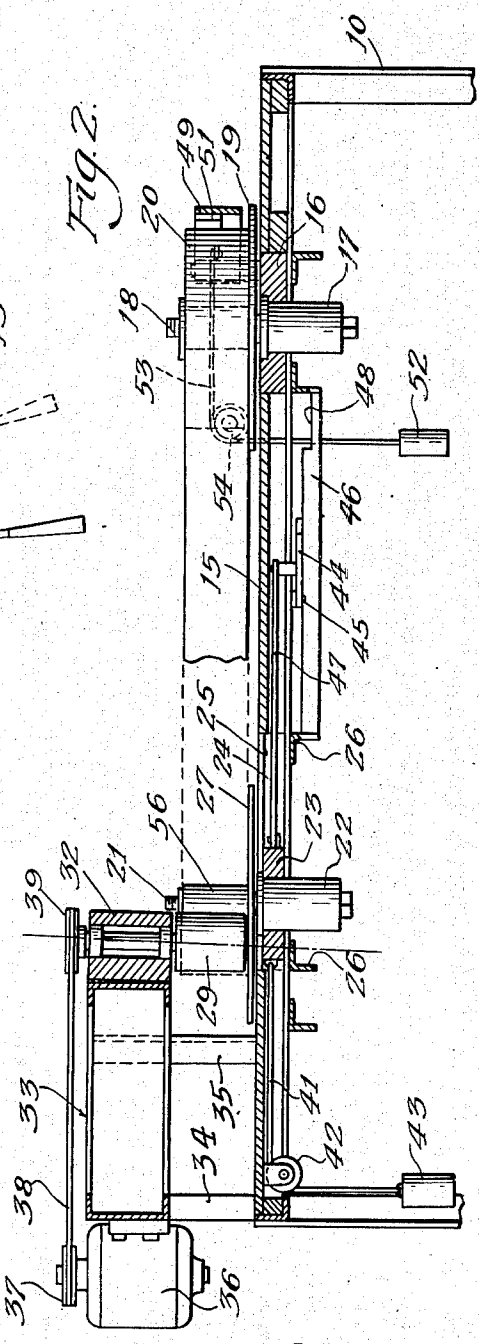

Fig. 2.

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Fig. 3.

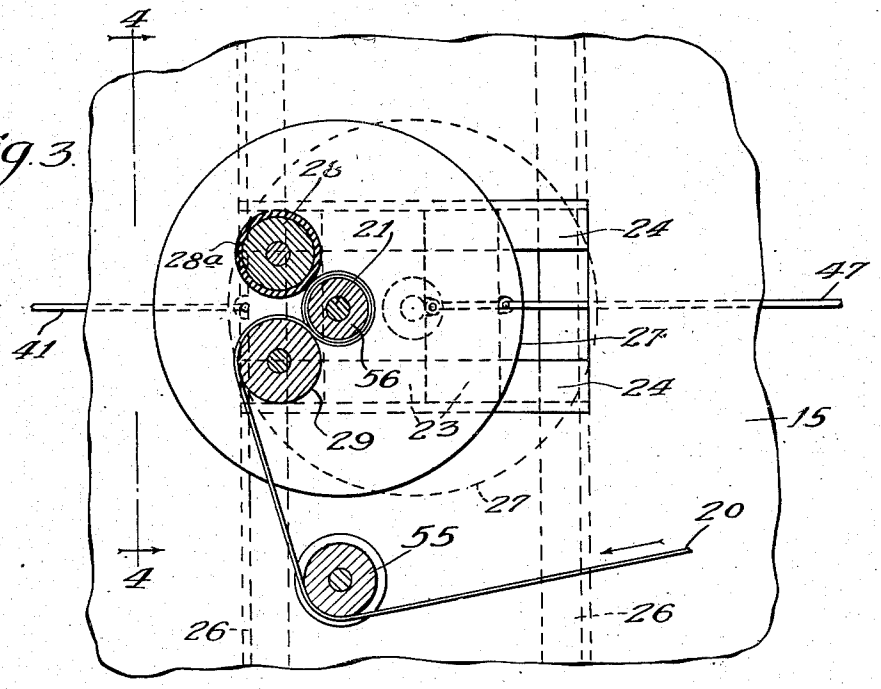
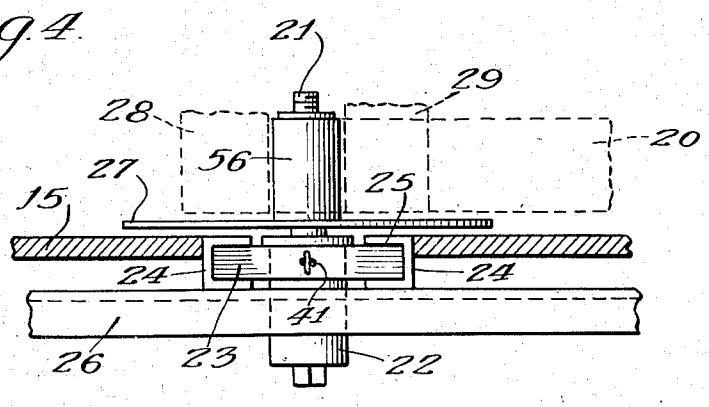


Fig. 4.



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REWINDING MECHANISM

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Application August 23, 1944, Serial No. 550,705

9 Claims. (Cl. 242—66)

This invention relates to rewinding or roll forming mechanism for paper, cloth, or similar strip or web-like material.

Paper in roll form frequently is rewound for inspection purposes and sometimes must be rewound prior to use in packaging printing or other machines to provide rolls that are wound with uniform tension and uniform edge surfaces. The machine shown in the accompanying drawings and hereinafter described is for use in such rewinding operations, and is particularly adapted for rewinding rolls of paper of relatively narrow width as distinguished from wide rolls used in newspaper work for example.

One object of the present invention is to provide a rewinding machine on which paper or like rolls can be positioned readily in rewinding position and the rewinding operation effected expeditiously without first spindling adjusting and aligning parts as frequently is necessary where narrow rolls are rewound on machines adapted to rewind relatively wide rolls.

Another object of the invention is to provide a rewinding machine that not only exerts suitable tension on the stock being wound to insure adequate tightness in the rewound roll, but which also avoids shifting of the web of stock to one side or the other of the rewinding roll and thereby form rolls having smooth edge surfaces.

An additional object of the invention is to provide mechanism that effects a uniform linear rate of travel of the stock during the rewinding operation and uniform driving engagement of driving means with the rewinding roll to effect uniformity of tension on successive convolutions of stock during the winding operation.

Other objects of the invention relate to various features of construction and arrangement of parts that will be apparent from a consideration of the following specification and accompanying drawings wherein:

Fig. 1 is a broken top plan view of a rewinding machine that is illustrative of the present invention;

Fig. 2 is a sectional view of the machine taken substantially on line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary top plan view, partly in section, illustrating the relation of the driving rolls to the wind-up roll and the path of travel of the paper strip to and about the latter;

Fig. 4 is a broken sectional view taken on line 4—4 of Fig. 3.

In the drawings a rewinding machine is shown comprising a support provided with legs 10, end frame members 11 and 12 and side frame members 13 and 14 which are illustrated as being of angle form. As shown in Figs. 1 and 2, table top 15 is shown supported by the end frame members 11 and 12 and side members 13 and 14. Within a recess provided in the table top 15 is a bearing support 16 for a vertical bearing 17, preferably provided with roller bearings (not shown) which rotatably support a vertical spindle 18 that projects above the upper surface of the table 15. To the spindle 18 is secured a disc 19, shown suitably spaced above the upper surface of the table 15 for supporting a roll of stock, such as a roll of paper 20 that is to be rewound.

A vertical wind-up spindle 21 is provided adjacent the opposite end of the table. The spindle 21 is journaled in a bearing member 22 which is mounted in a slidable support 23, the opposite side edges of which are arranged to slide in similar tracks or guide-ways 24 positioned adjacent the longitudinal edges of an aperture 25 provided in the table top. The tracks 24 are supported by transverse members 26 secured by any suitable means, as by welding, to the side frame members 13 and 14.

The spindle 21 is provided with a horizontal disc 27 disposed in the horizontal plane of the disc 19, as shown in Fig. 2, for supporting the rewound rolls as the same are formed during the operation of the machine.

Means for driving the wind-up spindle 21 preferably comprises a pair of depending driving rolls 28 and 29 mounted on drive shafts 30, 31 respectively, which are similarly journaled in an overhead bearing support 32, as indicated in Fig. 2. The support 32 is attached, to a bracket or frame 33 which is supported at a proper elevation above the table top 15 by any suitable means, such as legs 34 and 35 which may be attached to end frame member 12 and a cross member attached to side frame members 13 and 14.

Secured to the bracket 33 is shown an electrical motor 36 having a belt pulley 37 for driving, by means of a belt 38, pulleys 39 and 40 provided on the upper ends of the shafts 30, and 31. Rotation of the motor effects uniform rotation of the rolls 28 and 29 clockwise, as viewed in Fig. 1. The rolls 28 and 29 normally have surface engagement with the stock on the wound-up spindle 21 for effecting rotation thereof.

The spindle 21 being mounted in the slide 23 and hence movable to the right, as viewed in Fig. 1, as the roll on the spindle increases in diameter, is biased against such movement by any

suitable means for maintaining the roll being formed in uniform driven contact with the driving rolls 28, 29. In the drawings the biasing means are shown as comprising a cable 41 attached to the slide 23 and passing over a pulley 42 and provided with a counter-weight 43 beneath the table top. The counter-weight maintains the roll being formed on the spindle 21 in uniform frictional driven engagement with the driving rolls.

For the purposes of putting a core onto spindle 21, threading the machine or to remove a wound roll from spindle 21 the slide member 23 can be moved to the right, or forwardly as viewed in Fig. 1. For such purposes, a lever 44 is shown loosely pivoted at 45 to the lower surface of frame member 13 and extending transversely of the table and supported also adjacent the free end by a bracket 46 attached to the frame member 14. As will be apparent, the lever shown in Figs. 1 and 2 is operable manually for shifting the slide 23 forwardly when desired. A link 47 connects the lever to the forward end of the slide as shown for moving the latter as the lever is swung to the right. The bracket 46 is provided with a notch 48, as shown in Figs. 1 and 2 for receiving the lever 44 when moved to the dotted line position of Fig. 1, for retaining the slide 23 in a forward position against the biasing action of the weight 43.

Brake or drag means preferably are provided for preventing overrunning of the roll 20 and thereby producing slack in the web of stock and loss of proper tension in the outer convolution of the roll of stock being formed on spindle 21. The brake means shown comprises a lever 49 pivoted at 50 to the side frame 13 and projecting tangentially of the roll 20. A pad 51, which may be of brake lining or other suitable friction material, is secured to the lever and bears against the upper peripheral portion of the roll while permitting the lower peripheral portion to be unconfined to result in greater pressure and resistance to unwinding at the top of the roll and to thereby exert a downward component on the unwinding roll 20. To provide uniform braking effect in the roll 20, the lever is biased clockwise, as viewed in Fig. 1, by a counter-weight 52 suspended by a cable 53 which passes over a pulley 54 and is secured to the lever, as illustrated. The point of attachment of the cable to the lever is selected to provide the braking effect required to avoid unwinding of the roll 20 by overrunning when the rewinding operation is interrupted and to provide the desired tension on the paper web during the operation of the machine.

In use, the roll 20 to be rewound is placed on the spindle 18 and the web of stock is passed around a vertically adjustable flanged fixed guide spool 55, thence passed clockwise about the roll 29 and counterclockwise about a spool or core 56 on the wind-up spindle 21. The relation of drive rolls 28, 29, to the wind-up spindle 21 is such that both drive rolls bear upon the periphery of the spool, or paper thereon, for rotating the same. The roll 28 preferably is covered with rubber 28a or other suitable frictional material while roll 29 may be of polished steel. The drive rolls 28, 29 are shown as of the same diameter since both are positively driven by the belt 38 and tend to impart like peripheral velocity to the wind-up roll on the spindle 21.

While the action of driving roll 29 upon the wind-up roll is such as to tend to loosen the outer convolution of the paper stock thereon, the convolution is retained against slippage by contact through a substantial arc with the subjacent convolution and by the frictional engagement of the web with the roll 28 as shown in Fig. 3. In said figure the paper stock contacts the roll 29 through approximately 180° of arc, the large area affording sufficient frictional engagement to resist slippage of the outer convolution of the wind-up roll by the driving action of the drive rolls and insures the production of tightly wound rolls on the wind-up spindle. The guide spool 55 is so located with respect to roll 29 as to provide such relatively large area of surface contact of the web with the peripheral surface of the roll 29 to afford the frictional contact required. More particularly the flanged spool 55 guides the paper web in its path to wind up spindle 21 and aids in vertical alignment of the edges of the paper web, the spool being mounted for vertical adjustment by having the shaft thereof threaded in the table top 15.

As a wind-up roll increases in diameter, the spindle 21 advances to the right, as viewed in Figs. 1 to 3, the biasing means maintaining constant driving pressure of the roll being formed against the driving rolls.

The disclosed construction including the vertical arrangement of the spindles 18 and 21 tends to prevent vertical shifting of the web from the horizontal path determined by the co-planar discs 19 and 27, that is, it tends to prevent the formation of alternate ascending and descending spirals in the convolutions in the rolls being formed. However, merely the weight of the web, under all conditions, is not sufficient to maintain the lower edge of the web uniformly in guided contact with the upper surface of the disc 27 and hence the drive rolls 28 and 29 are preferably inclined slightly to the right, that is, they are, in effect, rotated from a vertical position clockwise on a horizontal, transverse axis a slight extent as viewed in Fig. 2. (Fig. 2 shows the center line of drive roll 29, for the purpose of illustration, at an exaggerated inclination.) However, in the end view the axis of both the rolls 28 and 29 lie in vertical longitudinal planes. The slight canting or tilting of the drive rolls 28 and 29, as described, causes them to exert a slightly downward component on each outer convolution as the same is wound upon the spindle, and thereby tends to maintain the lower edges of successive convolutions in uniform relation with respect to the upper surface of the disc 27. Such canting or tilting of the axes of the rolls also resists the upward spiralling of the convolutions. Hence the arrangement retains the lower edge of web of stock in aligned contact with the supporting surface of the disc 27, thereby forming rolls with smooth or uniform edge surfaces.

The driving engagement of the rolls 28 and 29 with the roll of stock upon the spool or spindle provides a uniform rate of linear movement of the web from the spindle 18, or other convenient supporting means, to the wind-up spindle 21 which facilitates inspection of the stock during rewinding operations and by making feasible the application of uniform tension on the web insures uniformity of tightness between successive convolutions of the formed rolls.

I claim as my invention:

1. A machine for winding stock in web form upon a spool comprising a vertical spindle for the spool, a pair of driving rolls arranged to contact peripherally and rotate the stock upon the spool, means supporting the spindle for movement away

from said driving rolls as the diameter of the rolled stock on the spool increases, and biasing means for said supporting means for retaining the roll of stock in uniform peripheral driven contact with said driving rolls.

2. A machine for winding stock in web form upon a spool comprising a vertical spindle for the spool, a pair of driving rolls arranged to contact peripherally and rotate the spooled stock upon the spindle, means supporting the spindle for movement away from the driving rolls as the rolled stock on the spool increases in diameter, biasing means for said supporting means for retaining the roll of stock in uniform peripheral driven contact with said driving rolls, and means for maintaining uniform tension on the web of stock during the winding operation.

3. A machine for winding stock in web form upon a spool comprising a vertical spindle for the spool, a pair of driving rolls arranged to contact peripherally and rotate the spooled stock, means for operating said driving rolls, slidable means supporting the spindle for movement away from the driving rolls with increase in diameter of the roll of stock on the spindle, means biasing said slidable means against such movement for holding the rolled stock in uniform peripheral contact with said driving rolls, and manually operable means for moving said slidable means in opposition to said biasing means and out of contact with said driving rolls.

4. Rewinding mechanism for stock in web-form comprising a spindle for rotatably supporting a roll of stock to be rewound, a second spindle arranged vertically and provided with a horizontal disc for supporting the stock as the same is rewound thereupon, and a pair of driving rolls arranged peripherally to contact the rolled stock on said wound spindle for rotating the same during the rewinding operation, the axis of said driving rolls being arranged in a position inclined from the vertical to provide a downward component on succeeding surface convolutions of the rewound stock for aligning the lower edge of the same with the upper surface of said disc.

5. Mechanism for winding web-form stock into rolls comprising a vertical spindle around which the stock is to be wound in roll form, a pair of driving rolls arranged for peripheral frictional contact with the stock on said spindle for rotating the same during the winding operation, said driving rolls being disposed at an angle for effecting a downward component on successive outer convolutions of the stock on the spindle for inhibiting the formation of ascending web spirals in the wound-up roll, and means accommodating relative movement of said spindle relative to said driving rolls as the diameter of the roll of stock increases.

6. Mechanism for winding web-form stock into rolls comprising means for supporting stock to be wound, a vertical spindle around which the stock is to be wound, driving rolls arranged for peripheral contact with the successive outer convolutions of stock on the spindle for rotating the same, said driving rolls being arranged at an angle to exert a downward component on each successive outer convolution for inhibiting the formation of an ascending spiral of the web as the same is wound into roll form, and a horizontal disc for supporting the roll on the spindle and effecting horizontal alignment of the lower edges of successive convolutions as the same are wound upon the spindle.

7. Mechanism for winding web-form stock into rolls comprising a vertical spindle around which the stock is to be wound, and a pair of driving rolls arranged for peripheral contact with successive outer convolutions of stock upon the spindle for rotating the same during the winding operations, said driving rolls being disposed at an angle for effecting a downward component on successive outer convolutions of the stock on the spindle for inhibiting the formation of ascending web spirals in the wound-up roll, one of said rolls being positioned for contacting a portion of the unwound web frictionally for resisting peripheral slippage of successive outer convolutions of the wound-up stock by the driving force exerted thereon by said driving rolls.

8. Mechanism for winding web-form stock into rolls comprising a vertical wind-up spindle for a roll to be formed, a horizontal disc carried by said spindle for supporting a roll formed upon the spindle, means for guiding a vertically disposed web of stock to the spindle with the lower edge of the stock in substantial alignment with the upper edge of said disc, a substantially horizontal support disposed at an elevation above said disc, a pair of driving rolls journaled in said support and depending therefrom above said disc into peripheral driving contact with the cylindrical surface of the stock on said spindle for rotating the same, means mounting said spindle for horizontal sliding movement in a direction for retaining the roll of stock thereon in driven contact with said driving rolls as the diameter of the roll of stock increases during the winding operation, and means biasing said mounting means in the opposite direction for retaining the roll in uniform driven contact with said driving rolls.

9. Rewinding mechanism for stock in web-form comprising a spindle for rotatably supporting a roll of stock to be rewound, a second spindle arranged vertically and provided with a horizontal disc for supporting the stock as the same is rewound thereupon, and a pair of driving rolls arranged peripherally to contact the rolled stock on said wound spindle for rotating the same during the rewinding operation, the axis of said driving rolls being arranged in a position inclined from the vertical to provide a downward component on succeeding surface convolutions of the rewound stock for aligning the lower edge of the same with the upper surface of said disc, surface brake means for exerting a downward component against the roll to be rewound, and vertically adjustable guide means interposed between said spindles for guiding the web in its path to the rewinding spindle.

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