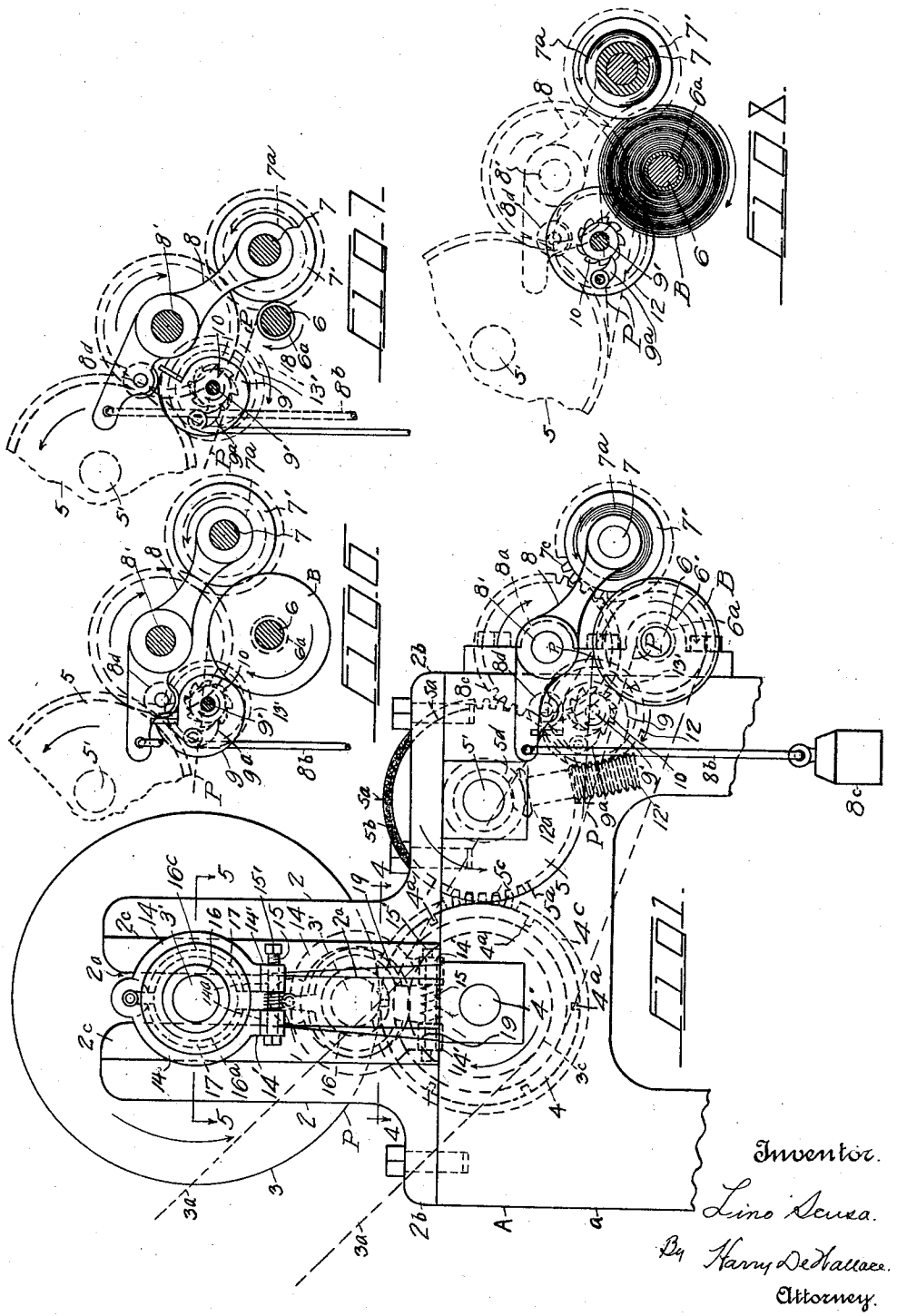
Oct. 28, 1930. L. SCUSA 1,779,562

MACHINE FOR REWINDING PAPER

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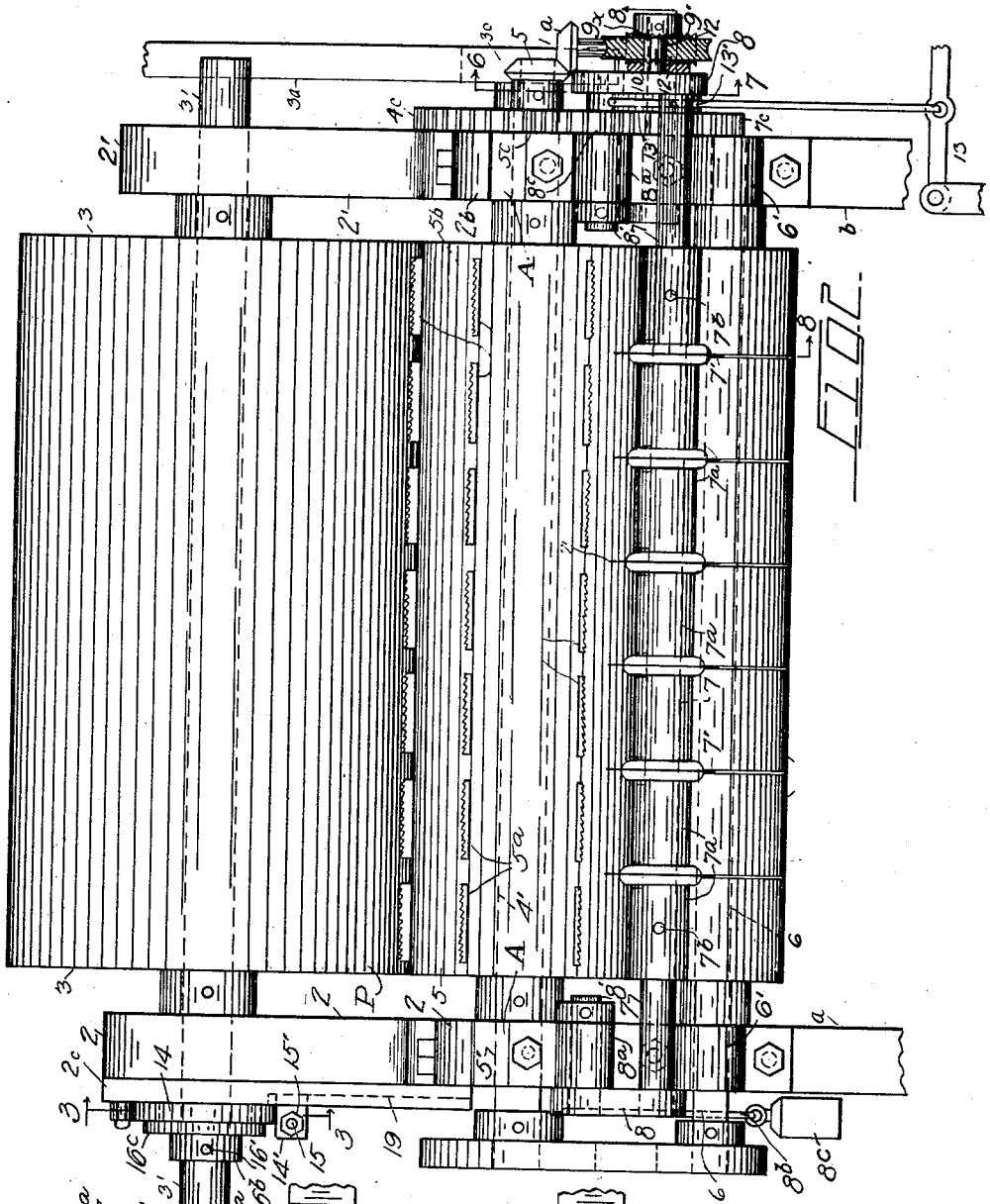


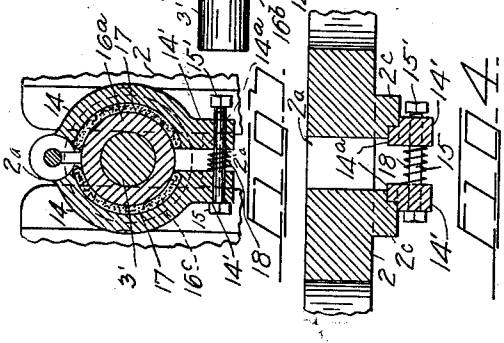
Inventor.
Lino Scusa.
By Harry DeWallace.
Attorney.

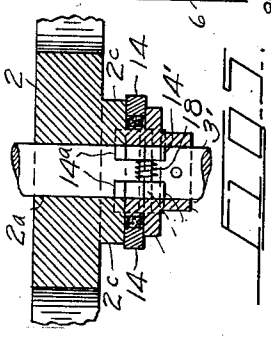
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Inventor.
Lino Scusa.
By Harry DeWallace
Attorney.

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UNITED STATES PATENT OFFICE

LINO SCUSA, OF PHOENIX, NEW YORK

MACHINE FOR REWINDING PAPER

Application filed April 11, 1929. Serial No. 354,243.

This invention relates to a machine for producing by rewinding, rolls of toilet paper, and the like, and has for its object to provide novel construction and arrangement of the operating parts, to insure the smooth winding of the continuous web of the paper, the primary intent being to reduce the number of operating units, or the number of parts of the units, that comprise the ordinary rewinding mechanisms, and which perform such functions, as, the taking-off of the paper from the jumbo or supply roll; the perforating, as well as, the slitting of the web into a number of relatively narrow strips that are rewound into comparatively small rolls, for toilet and other uses. A further object is to eliminate certain parts of the conditioning and winding units, and to provide in a novel way, for the retained parts to perform the functions or work heretofore performed by the more complicated winding mechanisms. A further object is to provide novel means for tensioning the supply roll, in order to prevent recoil, or racing of said roll, after the power is shut off at the end of each winding interval, when the supply and other heavy rolls, are rotating at high speed under relatively great momentum. A particular object is to mount the supply roll directly upon one of the perforating rolls, and to so arrange the other perforating roll that it may perform the added function of the usual press-rolls, i. e. of exerting the constant tension required to effect the smooth, positive and orderly feeding and winding of the paper. A further object is to provide novel and extremely simple slitting mechanism, by which the web is reduced to the narrow strips that comprise toilet paper rolls, the said slitter comprising a shaft that supports a plural arrangement of single, equidistantly spaced, circular knives, that simultaneously and continuously slit the web during the winding of the rolls; the said slitting mechanism being swingably mounted close to the rewinding drum, and being arranged to effect the slitting after the integral web has become partially wound upon said drum, instead of said web being slitted at a distant point between the perforating and winding rolls, by shearing knives carried by two shafts. The slitting knives in the present case are preferably mounted upon a single shaft or drum, that is preferably driven in the opposite direction to, and at a higher speed than the winding drum, in order that the knives may effect slicing, rather than shearing cuts, of the paper, the slitter drum being controlled by novel automatic means, by which compensation is made for the progressive increase in the diameter of the rewound rolls, as well as for swinging the slitter drum back to the starting position, corresponding to the peripheral plane of the next series of empty cores, at the end of the winding periods. And a further object is to generally improve and simplify the construction, and to render toilet paper and other rewinding mechanisms more efficient and convenient; as well as less expensive to produce and operate, than heretofore.

I attain these objects by the means set forth in the detailed description which follows, and as illustrated by the accompanying drawings, in which—

Figure 1 is a broken front end elevation of the rewinding machine. Fig. 2 is a front side elevation of the same. Fig. 3 is a vertical cross-section, taken on line 3—3 of Fig. 2, showing the construction of the supply-roll tension means. Fig. 4 is a horizontal section, taken on line 4—4 of Fig. 1, showing the guiding parts of the tension device partially expanded for lessening the tension when the supply roll is reduced. Fig. 5 is a similar horizontal section, taken on line 5—5 of Fig. 1, showing the position of the parts at the start of the rewinding, also showing the packing that produces the tension friction. Fig. 6 is a vertical cross-section, taken substantially on line 6—7 of Fig. 2, certain parts being omitted, showing the winding and slitting parts at the end of the winding periods. Fig. 7 is a similar section, also taken on line 6—7 of Fig. 2, showing the cam rotated for lowering the slitter shaft at the start of the next slitting period at a plane corresponding to the circumference of the cores. And Fig. 8 is a vertical cross-section, taken substantially on line 8—8 of Fig. 2, showing one of the knives in relation to a completely rewound roll.

In the drawings, A represents the main

frame of the machine, comprising front and rear ends *a*—*b*, upon which are mounted similar upstanding portions 2—2′, having lateral feet 2^b which may be bolted to the main frame, as shown. The portions 2—2′ are slotted at 2^a to provide coinciding vertical ways to receive and guide the projecting ends of a shaft 3′ that supports the usual supply or jumbo roll, as 3, of paper to be rewound. The guide 2 is preferably formed with outwardly facing parallel ribs or bosses 2^c, that border the slot 2^a. 4 and 5 represent the perforating rolls, which are mounted upon shafts 4′—5′, the latter being journaled in the main frame, the circumference of roll 4 being provided with grooves or sockets 4^a, to receive and enable corresponding knives or blades, 5^a of the roll 5 to perforate the web of the paper P. The roll 4 is preferably disposed beneath and supports by direct contact, the roll 3. Rolls 3, 4 and 5 rotate in the directions indicated by the arrows in Fig. 1. This carries the web P from roll 3 forwardly and downwardly between the rolls 4 and 5, and thence towards the rewinding drum or roll 6. The gravitative pressure of the jumbo roll insures the free and positive unwinding, without danger of distorting the paper. The roll 5 is preferably covered with a layer of felt, or other suitable compressible cushion material, 5^b, through which the blades 5^a protrude. This enables said roll, when properly tensioned, to perform the functions of the ordinary press-rolls, which are dispensed with in the present machine. By this arrangement, the web P unwinds steadily and without the usual pull exerted by rolls 4 and 5 and one or more press-rolls, in order to effect the continuous and positive feed of the web towards the rewinding position, and when roll 3 is provided with properly regulated tension means, its rotation is entirely controlled by the roll 4, and jerking and breaking of the web is obviated. The roll 4 may be driven by any suitable power, by means of a belt 3^a and a pulley 3^c, shown in Figs. 1 and 2. Toilet paper is usually wound upon tubular cores, as 6^a, which telescope the shaft 6.

The rewinding shaft 6 is supported by bearings 6′ mounted upon the front edges of frame portions *a*—*b*, and at the start of each winding operation, said shaft is loaded with the empty cores 6^a, as shown in Figs. 1, 6, 7 and 8. In the present case, the integral web P after being perforated is carried directly from roll 5 to the series of cores without being slitted, its free end usually being pasted or otherwise made to adhere to the cores, and is in fact partially wound around the cores, before the slitting work is started. This enables the operator to more readily, quickly and certainly attach the free end of the single web, than if he had to contend with and handle the loose ends of a large number of narrow strips such as heretofore produced by the older winding mechanisms, wherein the paper is slitted before it reaches the winding position.

The slitting in the present machine is effected by a single roll of shaft, 7, which is mounted slightly above and forwardly of the shaft 6, and comprises a plural arrangement of single circular knives, 7′, which are disposed in line axially and are clamped between flanged sleeves 7^a, that loosely telescope the shaft 7 and space the knives equidistantly, as shown in Fig. 2. The end sleeves 7^a may be pinned to shaft 7, as shown at 7^b in Fig. 2. The shaft 7 is journaled in the corresponding ends of similar rockable members 8, the latter being pivoted intermediate their ends on alining shafts 8′, whose extremities extend beyond the frames *a*—*b*, and are supported by bearings 8^a, which are mounted on said frames. The inwardly facing arm of one member 8 is perforated for attaching the cable 8^b of a counterweight 8^c, which balances, or regulates the amount of pressure the slitter knives shall exert while doing their work, and also to prevent undue straining of the parts that control the rocking of shaft 7, at the start of each winding interval, as shown in Figs. 1, 2, 6, 7. Rolls 4, 5, 8 and 7 are driven respectively by the power that operates roll 4, by means of a connected train of gears, as 4^c, 5^c, 8^c, and 7^c, as shown in Figs. 1 and 2. By this arrangement, the gears 7^c—8^c are in constant mesh, whether shaft 7 is being raised or lowered by the rocking of members 8. The members 8 are swung in vertical planes by a cam 9, which is loosely journaled on a shaft 9′, the latter being supported by the rear end *b* of the frame, the said cam being disposed below the corresponding rocking member 8 and controlling said member by means of a roller 8^d carried by said member, that constantly rides the cam. The cam 9 is rotated in the direction for swinging the slitter shaft upwardly away from the shaft 6 during the progressive enlarging of the rolls, as B, of toilet or other paper, by a ratchet wheel 10, which is driven by a worm-gear 12, in the direction of the arrow in Figs. 6 and 7, said ratchet wheel and gear being keyed to shaft 9′, as at 9^x, in Fig. 2, and gear 12 being driven during the winding periods by a worm 12′, which in turn is operated by bevel gears 12^a and 5^d, the latter being carried by shaft 5′. The speed of shaft 5′ is greatly reduced by the gear and worm drive, so that the cam makes a trifle less than one full turn during the entire winding period. The cam carries a pawl 9^a (see Figs. 1, 6 and 7) which constantly engages the ratchet wheel, and when the rolls B are completed, the operator steps upon a pedal 13 (see Fig. 2) which connects with a sheave 13′, also loosely journaled on shaft 9′ but is preferably rigid to the cam, and ef-

fects the rotation of the cam in the opposite direction, as from the position of Fig. 6 to that of Fig. 7, for lowering the slitter shaft in order to start the slitting of the next run of the paper at the plane of the cores 6^a, as best seen in Fig. 7. This latter view shows the relation of the parts referred to at the start of every winding operation, while Fig. 6 shows the finishing of the winding and slitting work. The shaft 7 is preferably rotated at slightly higher speed than the rewinding shaft 6, so as to enable the knives 7′, which preferably cut in the direction of the travel of the paper, to effect slicing rather than shearing cuts, while performing their work. The sleeves 7^a preferably are of such diameter that they never come into contact with nor effect any pressure upon the rolls B, during the winding.

In order to prevent the supply roll 3 from rotating in either direction independently of the roll 4 and causing the slackening or breaking of the web P, I provide simple self-controlled tension of braking means, comprising similar substantially semi-circular clamping members 14, which are pivotally connected at their top ends, and are arranged to straddle the shaft 3′. This leaves said members free to expand and contract while performing their work. The bottom ends of members 14 comprise normally spaced parallel jaws 14′, having alining perforations to receive a bolt 15, by which the members are allowed a limited expanding and contracting range, as may be understood by comparing Figs. 3 and 4. Preparatory to installing the clamps 14, a sleeve or collar 16 is mounted upon one end of shaft 3′ and preferably secured thereto, by a pin 16′. This sleeve has a barrel 16^a and a hub 16^b which are separated by a flange 16^c. The barrel 16^a faces the forked member 2, but its flange is spaced therefrom to receive the clamps 14, as shown in Figs. 2, 3 and 5. The inner circumference of members 14 is preferably lined with leather or other suitable friction producing band-like segments 17, that are more or less compressible, which when the clamps are properly adjusted exert enough braking pressure upon the collar to prevent racing or recoil of the roll 3, especially when the power is suddenly shut-off, between the winding intervals. The bolt 15 is preferably loosely applied to the jaws 14′, as shown in Fig. 3, and does not cause the linings 17 to exert any pressure against the barrel 16^a, the nut 15′ preferably being so adjusted as to permit the jaws to expand (see Fig. 4), in order to gradually lessen the tension, as the roll 3 decreases in diameter. The actual clamping of members 14 is effected by similar inwardly projecting lugs 14^a, which are integral with the jaws and normally extend into the slot or opening 2^a, between the ribs 2^c of upright 2. When the tension device is originally applied to the shaft 3′, the lugs 14^a are spread apart to a greater extent than the normal span of the slot 2^a, as shown, for example, in Fig. 4, by a stout coil spring 18, which is mounted upon the bolt 15, between the lugs 14^a. When the shaft 3′ together with the roll 3 is afterwards applied to the machine, the said lugs are crowded into the slot 2^a, and assume the position shown in Figs. 1 and 5. When the parts are thus disposed in the initial position, of Figs. 1, 3 and 4, the lugs are compressed to their greatest extent operatively, and are held tightly engaged with the walls of the slot 2^a by the spring 18. This spring exerts its tension to spread the lugs and the members 14, for automatically relaxing the tension as the roll 3 decreases, as described, and in order to enable the spring to perform its work, the walls of the slot 2^a, at least for a portion of the depth of the ribs 2^c, are cut away at angles, as shown at 19, in Fig. 1. The progressive enlarging of the slot 2^a from said initial position downwardly effects the gradual weakening of the tension exerted by the clamps 14, at a rate that is proportionate to the size and weight of roll 3. The nut 15′ is preferably permanently adjusted when the device is first applied to shaft 3′, so as to limit the expansion of the clamps to correspond to the widest span of said tapered slot.

Having thus described my invention, what I claim, is—

1. In apparatus for perforating and winding web material, a supply roll, a pair of perforating rolls one of which supports the supply roll and over which the web passes downwardly betweeen the perforating rolls and thence under the other perforating roll, means for guiding the supply roll for gravitative action as it is unwound, means to drive said perforating rolls and thereby the supply roll, and a rewinding drum for receiving the web from said other perforating roll.

2. In apparatus for perforating and winding web material, a supply roll, a pair of perforating rolls one of which supports the supply roll and over which the web passes downwardly between the perforating rolls and thence under the other perforating roll, means for guiding the supply roll for gravitative action as it is unwound, means to drive said perforating rolls and thereby the supply roll, a rewinding drum for receiving the web from said other perforating roll, and braking means for the supply roll operable upon gravitative movement of the supply roll for progressively diminishing the braking action thereon.

3. In apparatus for perforating and winding web material, a supply roll, a pair of perforating rolls one of which supports the supply roll, means for guiding the supply roll for gravitative action as it is unwound, means to drive the perforating rolls and thereby the supply roll, braking means for the supply

roll operable upon gravitative movement of the supply roll for progressively diminishing the braking action thereon, and paper rewinding means.

4. In apparatus for perforating and winding web material, a supply roll, a pair of perforating rolls one of which supports the supply roll, means for guiding the supply roll for gravitative action as it is unwound, and means to drive the perforating rolls and thereby the supply roll.

In testimony whereof I affix my signature.

LINO SCUSA.