S. W. WARDWELL & C. RYDEN.

UNROLLING DEVICE.

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956,457. **Patented Apr. 26, 1910.**

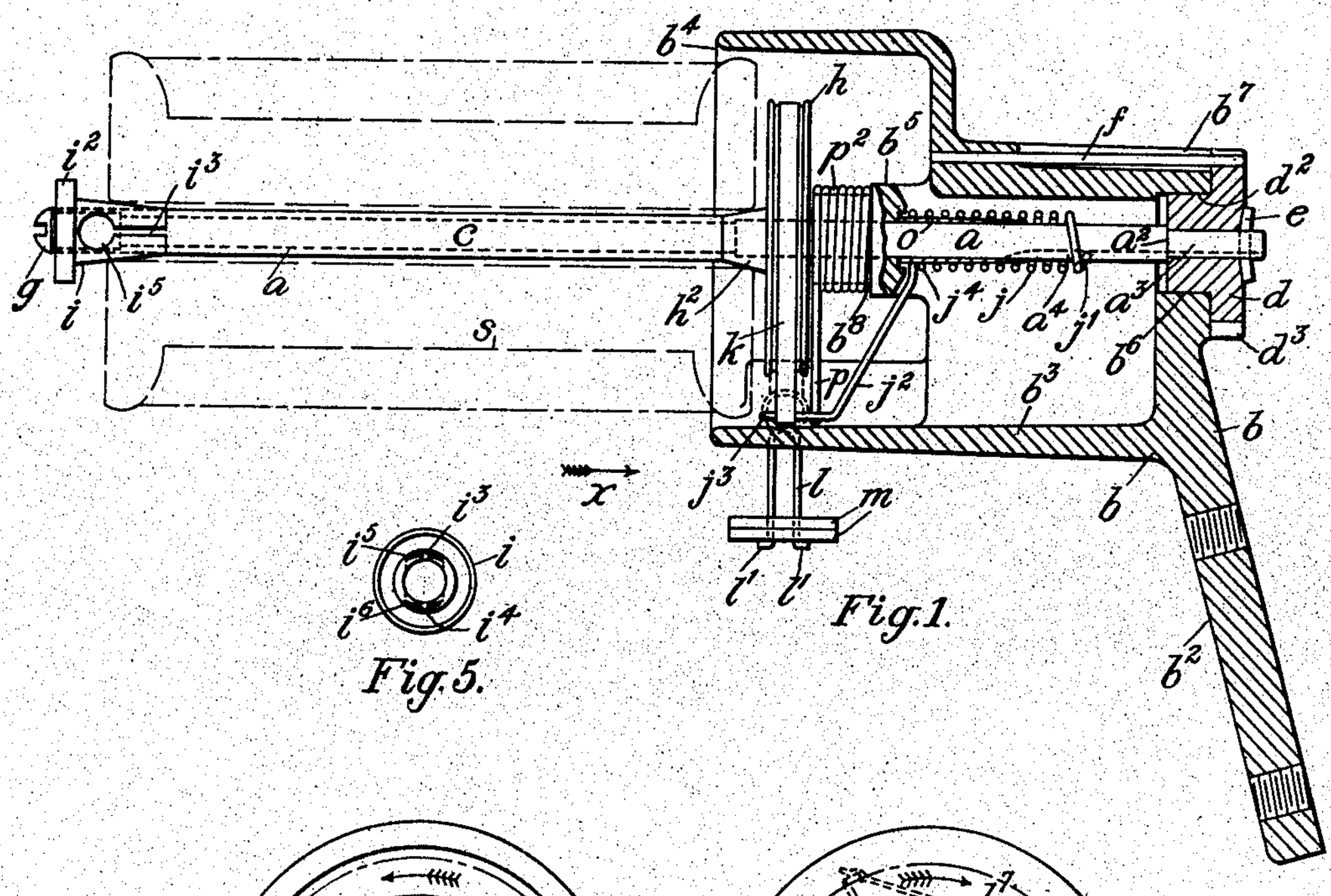

Fig. 1.

Fig. 5.

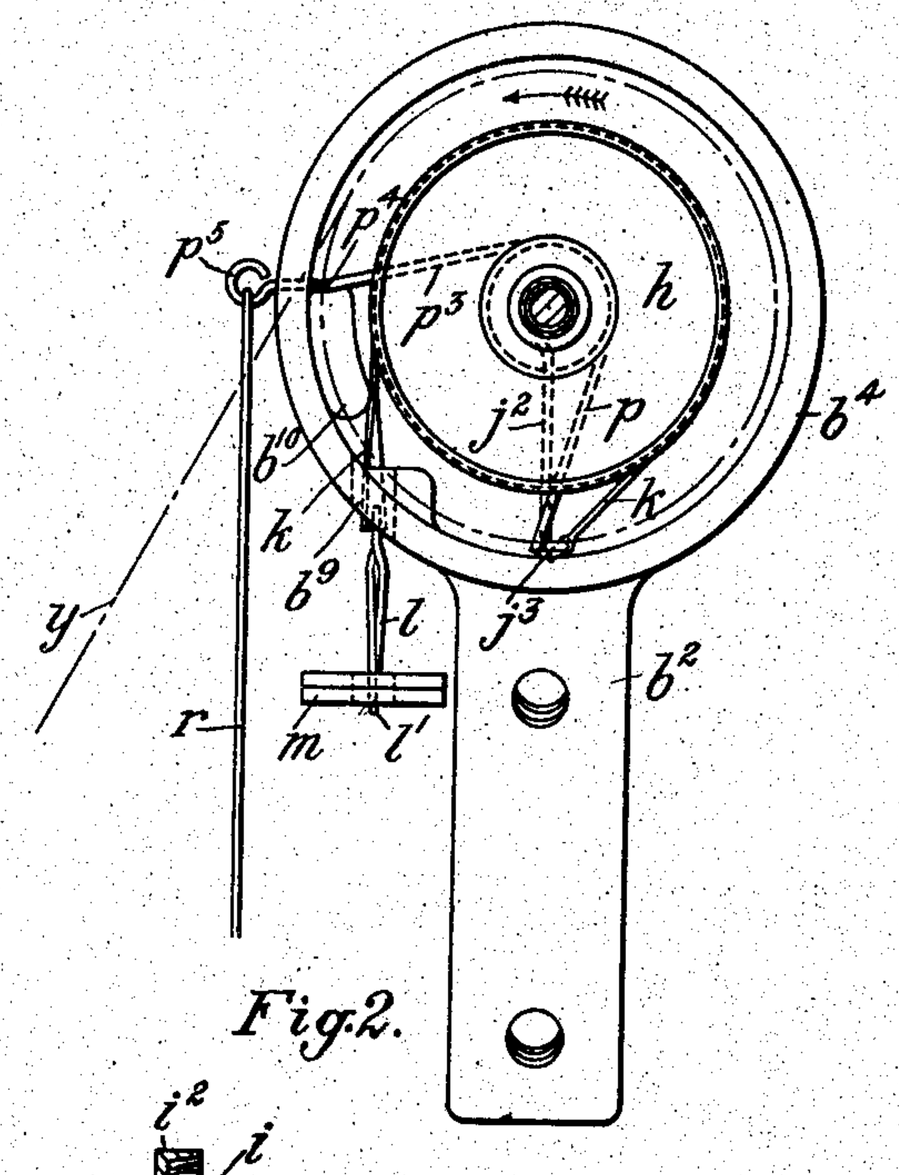

Fig. 2.

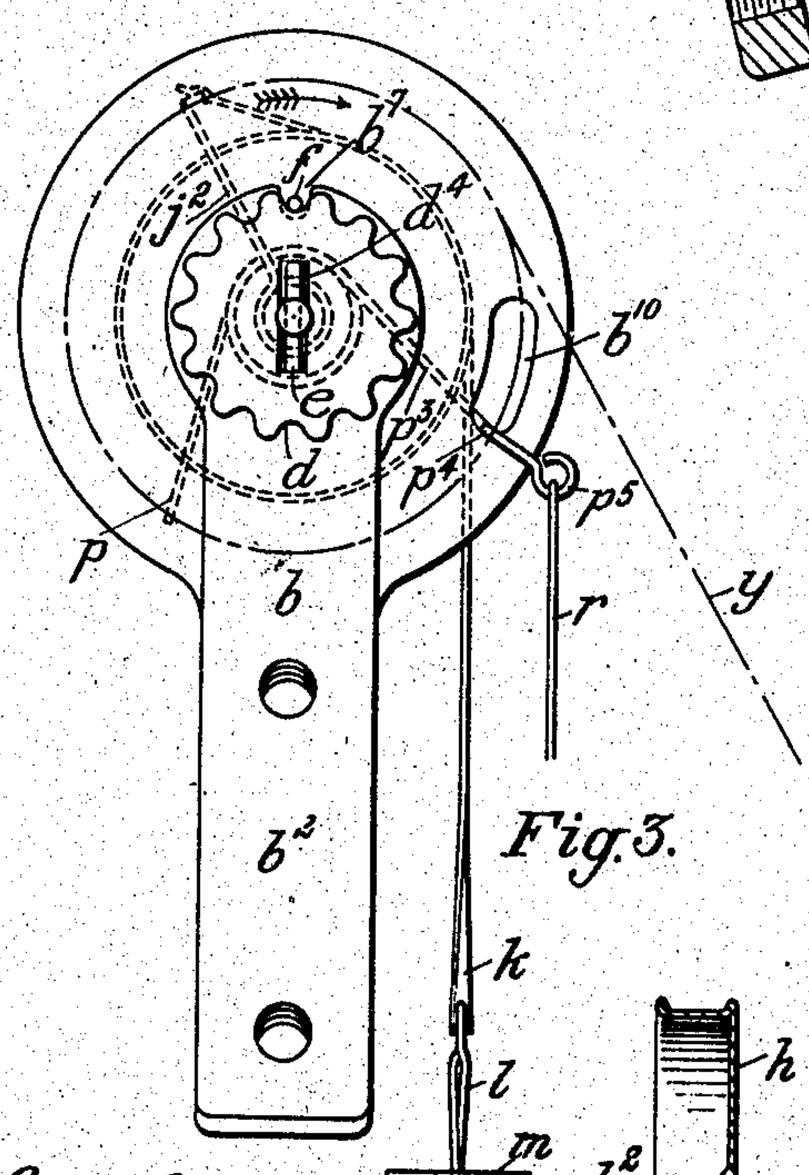

Fig. 3.

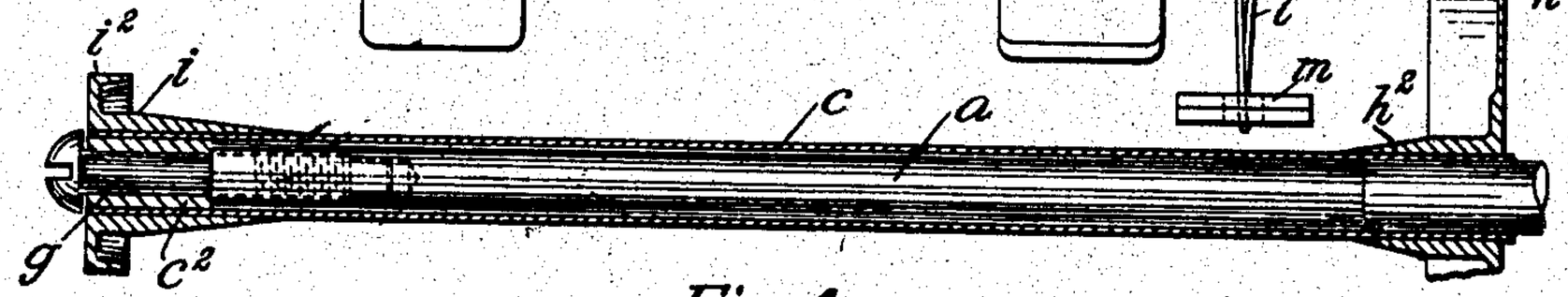

Fig. 4.

WITNESSES

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UNROLLING DEVICE.

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To all whom it may concern:

Be it known that we, SIMON W. WARDWELL and CLAES RYDEN, citizens of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Unrolling Devices, of which the following is a specification.

Our invention relates to controlling devices for regulating the delivery of thread, yarn or other similar materials in unrolling the same from rotating supplies such as spools or bobbins.

The purpose of our improvement is to provide means for controlling the rotation of the spool or bobbin to neutralize the shock of the sudden pull on the thread in starting the delivery, and to prevent the spool from overrunning when the thread breaks or its draft is arrested; so that fine, delicate materials may be delivered at high speed with an even tension and without undue strain or breakage.

Our invention is particularly adapted for use with winding machines and includes devices for automatically controlling the stopping of the machine when the thread breaks or is exhausted.

The invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a longitudinal elevation of the device, with the bracket and casing represented in section to show the operating parts therein; Fig. 2, an end view looking in the direction indicated by the arrow *x*, Fig. 1; Fig. 3, an end view looking in the opposite direction; Fig. 4, a part sectional view of the spool holding spindle; Fig. 5, a detail of the same.

Referring to Fig. 1, *a* represents a "dead" spindle held in bearings in the bracket *b* and supporting a rotatable sleeve *c* adapted to hold the spool *s*, shown by dash lines, on which the thread is wound. The bracket *b* comprises an arm b^2 adapted to be secured to the frame of the machine to which the device is applied, and a casing b^3 which incloses the operating parts of the device. The casing b^3 is formed with a cylindrical hood b^4 which projects out over the inner flange of the spool *s*, to exclude dust and lint from the mechanism.

The spindle *a* projects through a bearing b^5 near the front of the casing and its end a^3 is reduced in diameter to form the shoulder a^2, with the reduced portion entering a bore in the nut *d*. The nut *d* has a cylindrical portion d^2 fitted to a bore b^6 at the rear of the casing b^3, and is formed with a fluted flange d^3 which abuts the end of the casing. The nut *d* is secured to the spindle *a* by a spring-pin *e* driven through a hole at the end of the spindle and located in a transverse slot d^4 in the face of the nut (see Fig. 3). The slot d^4 is preferably formed with a curved bottom so that when the pin *e* is driven through the spindle it will be bowed-in, causing it to exert a spring pressure to hold the nut snugly against the shoulder a^2 on the spindle. The pin *e* engages the sides of the slot d^4 to secure the nut rotatively on the spindle, so that the latter may be turned by turning the nut manually for the purpose of adjustment hereafter described. A longitudinal groove b^7 is formed along the top of the casing b^3 and a spring wire *f* is driven into the casing at the end of the groove. The opposite, free end of the wire *f* engages with the flutes in the flange d^3 of the nut *d* and serves as a yielding detent to restrain the nut from accidental turning. When the nut is turned by hand the wire *f* rises up out of the flutes with only a slight resistance to its rotation.

The spindle *a* is turned down throughout the greater part of its length projecting from the bearing b^5 and the sleeve *c* bears only on the portion of largest diameter adjacent the hub b^8. A plug c^2 (see Fig. 4) is secured in the outer end of the sleeve *c*, and projecting through its bore for a bearing is a screw *g* screwed into the end of the spindle *a*. The plug c^2 bears against the head of the screw and the end of the spindle to locate the sleeve longitudinally on the spindle. At the inner end of the sleeve *c* is secured a flanged brake-wheel *h*. The hub h^2 of the brake-wheel is tapered to adapt it to enter the bore in the spool *s* and a removable spring bushing *i*, similarly tapered, is fitted to the outer end of the sleeve *c*. The bushing *i* has a flange or head i^2, to adapt it to be grasped conveniently in the fingers, and is split at i^3 and i^4 (Fig. 5) with openings i^5 and i^6 at the ends of the splits. The splits in the bushing *i* adapt the two sections to spread slightly to allow it to be pushed on to the sleeve *c* and when the tapered end of the bushing is forced into the bore of the spool *s* the two sections are con-

tracted to grip the sleeve *c*. It will be understood that the bushing *i* is removed from the sleeve *c* in applying the spool to the latter and after the spool is in place the bushing *i* is then replaced and forced into the bore of the spool with the opposite end of the spool forced on to the tapered hub h^2. In this way the spool is centered on the sleeve *c* and held rotatively by the wedging action of the two bearings.

Between the bearing b^5 of the bracket *b* and the nut *d* a helical wire spring *j* is coiled around the spindle *a*. One end of the spring *j* is secured to the spindle by means of a slot a^4 in the latter which is engaged by the hooked extremity j^1 of the wire. At the other end the wire extends downward in the arm j^2 with its end j^3 bent in a plane parallel to the face of the wheel *h*. Fastened to the end j^3 of the arm j^2 is a flexible band *k*, of leather or other suitable material, arranged to wrap around the periphery of the wheel *h* and held in place by the flanges of the wheel. The free end of the band *k* passes through an opening b^9 in the casing b^8 (see Fig. 2) and secured to it is a wire *l* of hair-pin shape having its ends bent outward at l^1—l^1. The wire *l* is adapted to hold weights *m*, *m*, etc., which are provided with central openings through which the ends of the wire project. As the spool *s* is rotated in the direction of the arrow, Fig. 2, by the draft of the thread, the turning of the wheel *h* causes the band *k* to follow around the periphery of the wheel through the frictional contact caused by the weights *m*, *m*, in the same way as a rope rides on a sheave. The movement of the band *k* is regulated and limited by the arm j^2 held under tension of the spring *j*. Preferably the end coil j^4 of the spring is secured to a bushing *o* which turns on the spindle *a*. The bushing *o* is tapered slightly so that the free coils cannot bind upon its surface when they contract in being wound up, and this arrangement gives a free bearing for the spring without any tendency of its coils to wrap tightly about the spindle and lessen its resiliency.

The stop device, for connecting the unroller to control the stopping of the machine with which it is used, consists of an arm *p* adapted to be moved by the arm j^2 when the latter swings back to its initial position upon the release of tension on the thread. The arm *p* is preferably formed of wire coiled at p^2 to provide a bearing on the hub b^8 of the bearing b^5. The opposite end of the coil extends outward in the arm p^3 which is bent at p^4 to adapt it to project through an opening b^{10} in the rear end of the hood b^4 (see Figs. 2 and 3). At the end of the arm p^3 is an eye p^5 into which is hooked a wire link or connection *r*. The link *r* is connected at its lower end to the usual detent lever which maintains the clutch devices of the winding machine in operative connection.

Having now explained the construction and arrangement of the parts of our invention the operation of the whole device will next be described.

As before explained the bushing *i* is removed from the sleeve *c* and the spool of thread or other material pushed on to the spindle with its rear end seated on the tapered hub h^2. The bushing *i* is then replaced on the sleeve *c* and its tapered end forced into the outer end of the spool. The thread or yarn *y* is led down to the winding spindle and its end properly secured thereto. The parts of the controlling mechanism will then be in the positions illustrated in Fig. 2. When the winding machine is started the draft on the thread rotates the spool *s* in the direction indicated by the arrows, Figs. 2 and 3, and the sleeve *c* and brake wheel *h* are rotated with it. As the wheel *h* starts to rotate the friction of the band *k* upon its periphery causes the band to follow around the wheel in the same way that a belt rides on a pulley. Under this movement of the band *k* the arm j^2 swings upward, as shown in Fig. 3, the movement of the arm being controlled and limited by the spring *j*. As the arm j^2 swings upward and the weights *m*, *m*, are lowered the contact of the band *k* with the wheel *h* is lessened in extent to automatically reduce the braking effect of the band. When the thread *y* is being drawn off from the spool at a high rate of speed the tendency will be to carry the arm j^2 upward a maximum extent until there is only a small portion of the band in contact with the wheel and, therefore, there will be but a slight resistance to the rotation of the spool; but when the draft on the thread is of slower speed the arm j^2 will swing back under influence of its spring *j* to give a more extended wrap of the band around the wheel and, therefore, an increased braking effect. In this way an irregular draft in taking up the thread is compensated for by the automatic control of the braking effect. This is particularly advantageous in winding shuttle bobbins or cops having tapered ends on which the winding is performed. In winding upon a conical surface, in traversing the yarn from the large diameter to the small diameter of the cone, and vice versa, there will be an appreciable variation in the draft on the thread. That is, with a uniform speed of rotation of the winding spindle the yarn will be taken up at a higher lineal rate when winding upon the large diameter than when winding upon the small diameter. Under these conditions, if the braking action on the spool remained constant there would be an irregular tension exerted on the delivering

yarn. Under a quick draft of the thread the spool would receive an impetus to rotate faster than required for a slower draft, and unless this excessive speed of rotation were checked the spool would run ahead and deliver more thread than could be immediately taken up by the winding. After this excessive delivery the spool would slow down while the free length was being taken up, and in some cases it might even come to a full stop. The next pull on the thread would then have to overcome the inertia of the mass, in starting the spool to rotate again, and in this way the tension would be very irregular with the liability of straining and breaking the thread. With our improved device the tension on the thread is maintained uniform by regulating the braking effect on the spool according to the draft on the thread. Further, this is accomplished without the use of controlling or take-up arms moved by the thread itself, which are common to most unrolling devices.

This improvement obviates the necessity of threading the material through guiding eyes and therefore our device is more convenient to operate, besides relieving the thread of contact with such eyes, liable to cause abrasion of delicate material like silk and fine yarn. Another advantage of our invention is the regulation of the braking effect in proportion to the variation in the diameter from which the thread is being unwound. In unwinding from a full spool the speed of rotation will be less than in unwinding from a less diameter at the barrel of the spool. In our improved device the braking action is automatically regulated in proportion to the speed of rotation of the spool so that the tension of delivery remains constant throughout the unwinding of the whole spool, notwithstanding the variations in speed of rotation of the spool caused by the decrease in diameter of the thread mass.

The tension of delivery of the thread can be adjusted by regulating the braking action on the wheel h through the following described means. By turning the hand-nut d the spring j can be wound up to adjust its tension, so that the arm j^2 is regulated to maintain a greater or less extent of bearing surface of the band k on the wheel h when the latter is rotating. The weights m, m, etc., are applied to the free end of the band k in proportion to the amount of tension under which the spring j is held, so that the force of the spring will be just enough to overbalance the effect of the weights when the wheel is at rest. As a result of this arrangement the arm j^2 will return toward its lower position as the draft on the thread is relieved. When the thread breaks or is exhausted the arm will swing clear back to its initial position to contact with the arm p. The contact of the arm j^2 with the arm p swings the latter and raises the arm p^3 to lift the link r which, in turn, releases the detents of the stopping device to operate the clutch and arrest the operation of the machine.

It will be evident that modifications might be made in the form and arrangement of parts of the device herein described without departing from the scope of our invention.

Therefore, without limiting ourselves to the precise structure and arrangement shown, what we claim is:—

1. In an unrolling-device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a friction band engaging said wheel, and means to automatically regulate the extent of contact of the band with the wheel according to the speed of rotation of the spool.

2. In an unrolling-device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a friction band engaging said wheel, and means to hold the ends of the band resiliently under tension, said means adapted to regulate the extent of contact of the band with the wheel according to the speed of rotation of the spool.

3. In an unrolling-device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a friction band arranged to partially wrap around the periphery of the wheel, means tending to cause the band to follow around the wheel when the latter rotates, and resilient means to resist the movement of the band with the wheel.

4. In an unrolling device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a flexible, friction band arranged to partially wrap around the periphery of the wheel, weights suspended at one end of the band, and a spring fastened to the opposite end of the band to allow the band to follow around the wheel when the latter rotates to alter the extent of contact of the band with the wheel.

5. In an unrolling device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a friction band engaging said wheel, separate means to hold each end of the band resiliently under tension to automatically regulate the extent of contact of the band with the wheel, and means to adjust the tension of each of the holding means.

6. In an unrolling device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a flexible, friction band engaging said wheel, weights suspended from one end of the band, an arm secured to the opposite end of the band, and a spring to control the position of the arm to regulate the extent of contact of the band with the wheel by allowing the

band to move bodily in the direction of rotation of the wheel.

7. In an unrolling device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a flexible, friction band hung on the periphery of said wheel, weights suspended from one end of the band, and a coiled spring formed with an arm having its end secured to the opposite end of the band and arranged to allow the band to move bodily around the wheel to remove a portion of its surface from contact with the wheel.

8. In an unrolling-device, the combination with a rotatable holder for the spool of a brake-wheel rotatable with the holder, a friction band engaging the wheel, weights suspended at one end of the band, a coiled spring formed with an arm engaging the opposite end of the band, and means to wind the spring up to adjust its tension.

9. In an unrolling-device, the combination with a spindle, of a spool-holder rotatable on the spindle, a brake-wheel rotatable with the holder, a friction band engaging the wheel, a coiled spring surrounding the spindle and secured thereto at one end with its opposite end forming an arm fastened to one end of the band, and means to turn the spindle to adjust the tension of the spring.

10. In an unrolling-device, the combination with a spindle, of a spool-holder rotatable on the spindle, a brake-wheel rotatable with the holder, a friction band engaging the wheel, a coiled spring secured at one end to the spindle and having an arm connected with the band, a nut for turning the spindle and a spring detent engaging said nut.

11. In an unrolling-device, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a friction band arranged to partially wrap around the periphery of the wheel, an arm fastened to the end of the band and pivoted on the axis of the wheel to adapt it to follow around the circumference of the wheel, and a spring to control the movement of the arm.

12. In an unrolling-device, the combination with a bracket b having a casing b^3, of a spindle a held in a bearing in the casing, a spool-holder c rotatable on the spindle, a brake-wheel h rotatable with the holder, friction means engaging said wheel, a spring for controlling said means, said spring coiled around the spindle and secured thereto at one end, a fluted nut d fastened to the end of the spindle, and a spring detent f secured in the casing and engaging the flutes of the nut d.

13. In an unrolling-device, the combination with a rotatable holder for the spool, of friction means to control the rotation of the holder, devices to regulate the action of the friction means, and a bracket for the holder formed with a casing inclosing said regulating devices and a circular hood extending out over the flange of the spool.

14. In an unrolling-device, the combination with a spindle, of a spool-holder rotatable on the spindle, friction means to control the rotation of the holder, devices to regulate the action of said friction means, and a bracket having bearings for the spindle and a casing inclosing the operating devices with a hood surrounding the flange of the spool.

15. In an unrolling-device for winding or like machines, the combination with a rotatable holder for the spool, of friction means to control the rotation of the holder, an arm to regulate the action of the friction means, said arm adapted to be moved by the rotation of the holder, a spring to control the movement of the arm, and means to control the operation of the machine, said means adapted to be moved by the arm when the latter returns to its normal position under action of the spring.

16. In an unrolling-device for winding or like machines, the combination with a rotatable holder for the spool, of a brake-wheel rotatable with the holder, a friction band engaging said wheel, an arm connected with the band and moved by the rotation of the holder, and means connected with the machine to arrest its operation, said means adapted to be engaged by the arm when the latter returns to its normal position.

17. The combination in an unrolling-device with means to control the stopping of a machine comprising a pivoted member p connected with the machine, of a rotatable spool-holder c, a brake-wheel h rotatable with the holder, a friction band k engaging said wheel, a pivoted arm j^2 connected with said band and adapted to be moved by the latter when the wheel rotates, and a spring j to resist the movement of the arm j^2 and to cause it to engage the member p to stop the machine when the impulse to rotation of the spool is relieved.

18. The combination in an unrolling-device with means for arresting the operation of a machine, of a rotatable holder for the spool, a brake-wheel rotatable with the holder, a friction band engaging the wheel, an arm j^2 pivoted on the axis of the wheel with its end secured to the end of the band, a spring to control the position of the arm rotatively in relation to the wheel, and a pivoted member p connected to cause the stopping of the machine and adapted to be moved by the arm j^2 under action of its spring.

19. The combination in an unrolling-device with means to control the stopping of a machine, of a rotatable holder for the spool, a brake-wheel rotatable with the holder, a

friction band engaging said wheel, and devices to regulate the extent of contact of the band with the wheel according to the speed of rotation of the latter, said devices adapted to engage the stop controlling means when the draft on the spool is released.

20. The combination in an unrolling-device with means to control the stopping of a machine, of a bracket *b*, a spindle *a* having bearings in the bracket, a rotatable spool-holder on the spindle, a brake-wheel rotatable with the holder, a friction band engaging said wheel, a coiled spring *j* formed with an arm j^2 secured to the end of the band, and a member *p* pivoted on the bearing of the spindle and having one arm connected with the machine and another arm adapted to be engaged by the arm j^2.

In testimony whereof we affix our signatures in presence of two witnesses.

SIMON W. WARDWELL.
CLAES RYDEN.

Witnesses:
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GRACE W. BROWN.