F. A. HOLT & G. KERSHAW.

WINDING MACHINE.

APPLICATION FILED FEB. 25, 1916.

1,277,933.

Patented Sept. 3, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

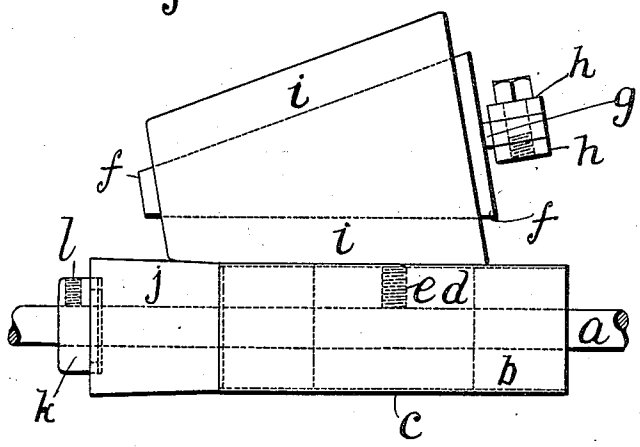
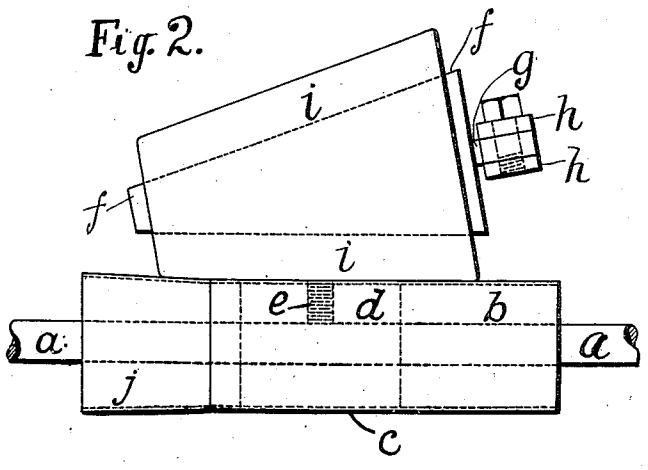


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

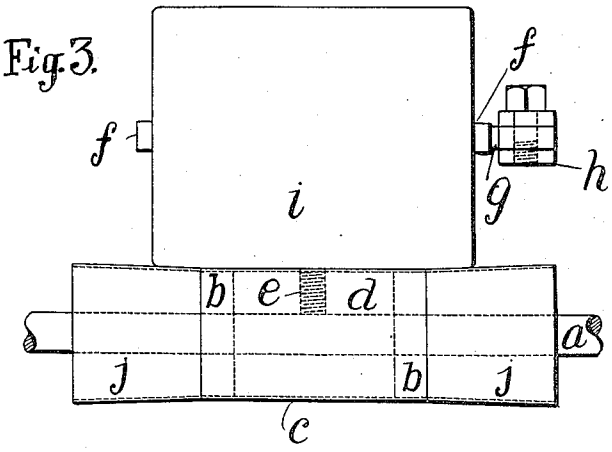


Fig. 4.

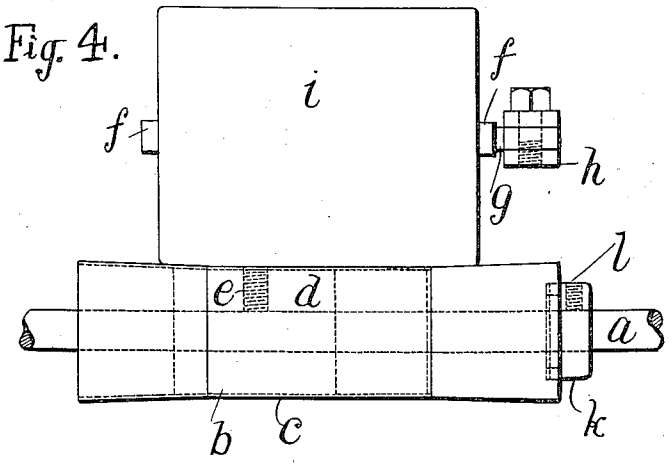
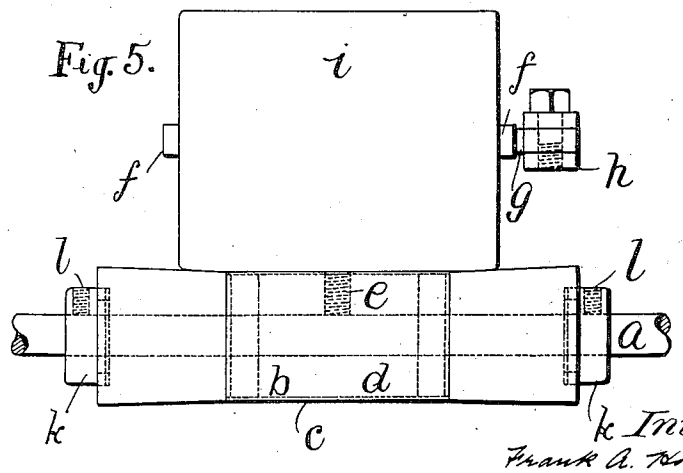


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANK ASHWORTH HOLT, OF ROCHDALE, AND GRINDROD KERSHAW, OF WHITWORTH, ENGLAND.

WINDING-MACHINE.

1,277,933. Specification of Letters Patent. Patented Sept. 3, 1918.

Application filed February 25, 1916. Serial No. 80,448.

To all whom it may concern:

Be it known that we, FRANK ASHWORTH HOLT, a subject of the King of the United Kingdom of Great Britain and Ireland, and resident of Noon Sun House, Whitworth Road, Rochdale, in the county of Lancaster, England, and GRINDROD KERSHAW, a subject of the King of the United Kingdom of Great Britain and Ireland, and resident of 62 Market street, Whitworth, in the county of Lancaster, England, have invented new and useful Improvements in Winding-Machines, of which the following is a specification.

This invention relates to winding machines and particularly to winding machines of the kind in which a roll kept revolving is employed to revolve a winding holder by friction against such holder or a spool placed upon it or yarn or thread or twine or the like wound thereon.

The object of this invention is to insure that in machines of the said kind yarn or thread or twine or the like shall be wound into packages truly of the form intended and to obviate the tendency hitherto experienced of packages of yarn or thread or twine or the like especially of soft yarn and of "open wind" to be wound or built of diameter larger than the intended diameter corresponding to the number of layers or coils wound at the ends of the packages and especially at the smaller ends of conical packages and at the ends of cylindrical packages.

This invention essentially consists in devices by which packages of yarn or thread or twine or the like being wound in contact with driving rolls are subjected to more intense pressure and wound more tightly than elsewhere at the parts which tend to be wound or built of larger than the intended diameter corresponding to the number of coils or layers wound and by being subjected to more intense pressure and wound more tightly at those parts are prevented from there increasing in diameter more quickly than they ought.

This invention also comprises driving rolls of simple and advantageous formation for enabling winding to be effected under more intense pressure and more tightly at the parts of yarn packages which tend as aforesaid to be wound or built of larger than the intended diameter corresponding to the number of coils or layers wound.

Other features of this invention are hereinafter pointed out.

In the description and claims following the word "yarn" is used to mean yarn or thread or twine or the like.

According to this invention opposite the end or each of the ends and adjacent parts at which it is desired to check the tendency of a yarn package being wound against a driving roll to be wound or built of diameter larger than the intended diameter corresponding to the number of coils or layers of yarn wound upon it, the driving roll is provided with a taper piece increasing in diameter in the direction away from the adjacent part of the roll and in the winding of a yarn package against the driving roll first the yarn carrier and then part of the yarn package in process of formation is made to bear against the taper piece while being revolved and the bearing and rolling of the yarn package against the taper piece cause the parts wound against the taper piece to be subject to pressure and other influences which are more intense than those affecting the parts presented to the adjacent part of the driving roll and increase in intensity toward the larger end of the taper piece and cause the parts wound against the taper piece to be wound under conditions insuring that the length and tension of the yarn wound into such parts shall be such as to insure that those parts shall not be of a diameter larger than that properly corresponding to the number of layers or coils of yarn wound into them. The tendency of the package to "build" or be wound unduly large toward and at the end is thus counteracted by a resistance increasing in a corresponding manner.

In the accompanying drawings which show illustrative embodiments of this invention, Figure 1 is a side elevation of a driving roll with a taper piece at one end loose from the driving roll and increasing in diameter toward that end and a conical package of yarn bearing thereon.

Fig. 2 is a side elevation of a driving roll with a taper piece fast with it at one end increasing in diameter toward that end and

a conical package of yarn bearing thereon. Fig. 3 is a side elevation of a driving roll with taper pieces fast upon each end increasing in diameter outward toward the ends and a cylindrical package of yarn bearing thereon. Fig. 4 is a side elevation of a driving roll with taper pieces increasing in diameter outward toward the ends one of which taper pieces is loose from the driving roll and a cylindrical package of yarn bearing thereon.

Fig. 5 is a side elevation of a driving roll with taper pieces increasing in diameter toward the ends both of which taper pieces are loose from the driving roll with a cylindrical package of yarn bearing thereon.

The same letters of reference are employed to indicate corresponding parts in all the figures.

In the drawings, in each figure *a* is a shaft supported in any suitable way and revolved by any suitable means and *b* is a driving roll secured upon it. In each case represented, the driving roll *b* is formed cylindrical in part and of a tube *c* furnished with and secured by any suitable means upon an internal boss *d* provided with a screw threaded hole receiving a screw *e* by which the boss *d* and the driving roll *b* are secured in position upon the shaft *a*. *f* is a carrier for yarn or thread on which yarn is to be wound by the carrier *f* or yarn wound upon it being made to bear on the driving roll *b* so as to be revolved by friction against it.

The carrier *f* may be mounted in any suitable manner in the machine in which it is to be used. For simplicity and convenience of illustration each of the carriers *f* represented in the accompanying drawings is shown as mounted to be revolved about an axle *g* carried by a movable support *h* mounted in any suitable way in the winding machine.

In Fig. 1 there is provided at the end of the driving roll *b* which in use is nearer the smaller end of the conical yarn package *i* in process of formation a taper piece *j*, which at its smaller end is shouldered or reduced in diameter to enter the adjacent part of the roll *b* and is of increasing diameter in the direction away from the adjacent part of the roll *b*. *k* is a collar with a screw threaded hole receiving a screw *l* by means of which the collar *k* is fixed in position upon the shaft *a* to hold the taper piece *j* to the driving roll *b* while permitting it to be turned upon the shaft *a* relatively to the roll *b*. The taper piece *j* may be of any suitable material for example advantageously of vulcanized fiber or of metal. The yarn to be wound may be single yarn or two or more threads brought to the carrier *f* side by side and is preferably made to reach first the carrier *f* and later the yarn package *i* wound thereon as closely as is practicable to the parts by which the carrier *f* and yarn package *i* bear against the driving roll *b* and taper piece *j*.

The driving roll *b* being made to revolve and the carrier *f* with yarn attached to it being made to bear upon the taper piece *j* is driven thereby until the winding of yarn has proceeded so far that the layers or coils of yarn wound on the parts opposite to the cylindrical part of the driving roll *b* are sufficient for contact between the yarn package *i* being formed and the cylindrical part to drive the yarn package *i* and thereafter the surface speed of the yarn package *i* determines the speed of the taper piece *j* so that rubbing of the yarn against the taper piece *j* will be obviated so nearly that injury to the yarn will be obviated. Until the winding of yarn on the carrier *f* causes the package *i* in process of formation to bear on the cylindrical part the pressure of the package *i* is against the taper piece *j* and is more intense in the parts against larger parts of the taper piece *j* and after the partly formed package *i* bears on the cylindrical part of the driving roll the yarn package bears and rolls against the taper piece *j* throughout the winding of a yarn package *i* with a pressure more intense than the pressure with which the yarn package bears and rolls against the cylindrical part of the driving roll *b* and more and more intense toward the narrower end of the package *i* and the parts of the yarn package bearing and rolling against the taper piece *j* by rolling against it are subjected to other influences which are more intense than those affecting the part presented to the cylindrical part of the driving roll and increase in intensity toward the larger end of the taper piece.

Through the pressure and other influences which affect the part of the yarn package bearing and rolling against the taper piece *j* increasing in intensity toward the larger end of such taper piece *j* and being more intense against the taper piece *j* than against the cylindrical part of the driving roll *b* the yarn wound into the parts of the yarn package bearing and rolling against the taper piece will be of such length and under such tension as to insure that such parts of the yarn package shall not be of a diameter larger than that properly corresponding to the number of layers or coils of yarn wound into them.

The parts of the yarn package wound against the taper piece *j* will thus be wound so tightly as to be prevented from becoming larger than they should be for the number of layers or coils of yarn wound.

For the winding of fine or soft yarns it is very desirable or almost necessary or for the finest and softest yarns quite necessary that the taper piece *j* shall be able to be turned

relatively to the driving roll *b* when the yarn package *i* is driven by contact with the cylindrical part of the driving roll *b* in order that the difference between the surface speed of the driving roll *b* and the smaller end of the yarn package *i* may not cause the yarn to be rubbed or polished at the smaller end of the yarn package. In any case however in which rubbing of yarn at the smaller ends of conical yarn packages is of little or no importance the taper piece *j* provided at the end of the cylindrical driving roll *b* may be made always to revolve turn for turn with it.

Fig. 2 shows a driving roll with a taper piece *j* in one with the cylindrical part of the driving roll *b*. The taper piece *j* in this case may very advantageously be formed by the whole driving roll *b* being formed as a cylindrical tube and expanded at the one end to form the taper piece *j*. The fixity of the taper piece *j* relatively to the cylindrical part causes the surface speed of the taper piece *j* to be higher at every part than that of the cylindrical part of the driving roll *b* as well as increasing from the smaller to the larger end of the taper piece and causes the yarn package to be driven partly by the cylindrical part *b* and partly by the taper piece *j* and the differences of surface speed of the parts of the driving roll *b* and the parts of the yarn package in contact being greater causes more rubbing of yarn than in the case represented in Fig. 1, but in other respects the action of the driving roll *b* and taper piece *j* shown in Fig. 2 is similar to that of those shown in Fig. 1.

In Fig. 3 the driving roll *b* is provided at each end of the cylindrical part with a taper piece *j* in one with the cylindrical part and increasing in diameter in the direction away from the adjacent part of the roll *b*. Very advantageously the driving roll *b* may be formed as a cylindrical tube and be expanded in order that the taper pieces *j* may be formed.

The driving roll *b* being made to revolve and the carrier *f* with yarn attached to it being made to bear upon the taper pieces *j* is driven thereby until the winding of yarn has proceeded so far that the coils of yarn wound on the part opposite to the cylindrical part of the driving roll *b* are sufficient for the contact between the yarn package *i* and the cylindrical part to drive the yarn package *i* and thereafter the driving of the yarn package *i* is effected partly by the contact of the package *i* and the cylindrical part *b* and partly by the contact of the package *i* with the taper pieces. Until the winding of yarn on the carrier *f* causes the package *i* in process of formation to bear and roll on the cylindrical part of the driving roll *b*, the pressure of the package *i* bears and rolls against the taper pieces *j* only and with a pressure more intense in the parts pressed against the larger parts of the taper pieces *j* and after the partly formed package *i* bears and rolls on the cylindrical part of the driving roll *b*, the pressure of the yarn wound upon the carrier *f* against the taper pieces *j* will be more intense than the pressure against the cylindrical part of the driving roll *b* and will be more and more intense toward the ends of the package *i* and the parts of the yarn package bearing and rolling against the taper pieces *j* by rolling against them are subjected to other influences which are more intense than those affecting the parts presented to the cylindrical part of the driving roll and increase in intensity toward the larger ends of the taper pieces *j*. Through the pressure and other influences which affect the parts of the yarn package bearing and rolling against the taper pieces *j* increasing in intensity toward the larger ends of such pieces *j* and being more intense against the taper pieces *j* than against the cylindrical part of the driving roll *b*, the yarn wound into the parts of the yarn package *i* bearing and rolling against the taper pieces *j* will be of such length and under such tension as to insure that such parts of the yarn package shall not be of a diameter larger than that properly corresponding to the number of layers or coils of yarn wound into them.

The parts of the yarn package *i* wound against the taper pieces *j* will thus be wound so tightly as to be prevented from becoming larger than they should be for the number of layers or coils of yarn wound.

Ordinarily the difference between the surface speeds of the different parts of the taper piece *j* and between the taper pieces *j* and the cylindrical part of the driving roll *b* will be insufficient to cause any objectionable rubbing or polishing of the yarn but in some cases as for example in winding very fine or very soft yarn in which it is desirable in order to guard against objectionable rubbing or polishing of the yarn, one or both of the taper pieces *j* used according to this invention in winding yarn into cylindrical packages is or are and capable of being turned relatively to the cylindrical part of the driving roll by contact with the carrier in the earlier part of the formation of a package and afterward by contact with the yarn wound thereon.

In Fig. 4 is shown a driving roll with one taper piece *j* formed in one with the cylindrical part and very advantageously by the driving roll *b* being formed as a cylindrical tube and expanded at the one end to form the taper piece *j* and with one taper piece *j* separate from the cylindrical part and loose so that it may be turned around the shaft *a* relatively to the cylindrical part. The loose taper piece *j* shown in Fig. 4 like that

shown in Fig. 1 may be of any suitable material for example advantageously of vulcanized fiber or of metal and is formed at its smaller end with a shoulder so that it may be made to enter the adjacent end of the cylindrical part of the driving roll *b* and is secured in position lengthwise of the shaft *a* by means of a collar *l* made to enter a recess in the taper piece *j* secured in position upon the shaft *a* by means of a screw *l*.

In Fig. 5 is shown a driving roll *b* with two taper pieces *j* separate and loose from the cylindrical part so that they may each be turned around the shaft *a* relatively to the cylindrical part. Each of the loose taper parts *j* which may be of any suitable material, for example advantageously of vulcanized fiber or metal, is formed and secured in position similarly to the loose taper piece shown in Fig. 1.

In the use of a driving roll *b* with a loose taper piece *j* shown in Fig. 4, the loose taper piece *j* will or may be driven either by friction against the shaft *a* or by contact with the carrier *f* or yarn wound thereon in the commencement and earlier stages in the winding of a yarn package *i* and in the use of the driving roll *b* with two loose taper pieces *j* shown in Fig. 5, the friction between the taper pieces *j* and the shaft *a* will cause them to turn and revolve the carrier *f* by contact with it or with yarn wound upon it but after the yarn package *i* contains coils of yarn sufficient to bring its surface sufficiently into contact with the cylindrical part of the driving roll, the yarn package will be driven partly by the cylindrical part and the taper piece *j* fast therewith in the case represented in Fig. 4 and by the cylindrical part in the case represented in Fig. 5 and the yarn package will determine the speed of the loose taper piece or pieces *j* which will then act like the taper piece *j* shown in Fig. 1. In other respects the action of the driving rolls *b* and taper pieces *j* shown in Figs. 4 and 5 is similar to that of the driving roll *b* with taper pieces *j* in one with it shown in Fig. 3.

The provision of taper pieces *j* to receive contact of the ends of yarn packages and especially of the smaller ends of conical yarn packages and the ends of cylindrical yarn packages during the formation of such yarn packages very effectively overcomes the tendency of yarns particularly soft yarns especially if wound in an "open wind" formation to be wound or built of diameter larger than the intended diameter corresponding to the number of layers or coils of yarn wound into the yarn packages at the ends and especially at the smaller ends of conical packages and at both ends of cylindrical packages and the formation of driving rolls in tubular form with one or each end expanded to form a taper piece is a very simple and convenient way of forming the taper pieces and avoiding any interval in which yarn may catch in cases in which it is possible for the taper pieces to be in one with the adjacent parts of the driving rolls with which they are to be used.

Loose taper pieces for use in the manner hereinbefore described adjacent to the driving rolls which are driven to effect winding may be applied to or on driving rolls of any forms at one or both ends thereof and may be mounted and kept in position in other ways than those illustrated in the accompanying drawings and described herein by way of example.

What we do claim as our invention and desire to secure by Letters Patent is:—

1. In a winding machine, a driving roll, a tapered roll mounted adjacent one end of the driving roll to be turned in relation thereto and increasing in diameter in the direction from the adjacent part of the driving roll and means for rotatably mounting said tapered roll.

2. In a winding machine, a driving roll, a tapered roll mounted adjacent each end of the driving roll and increasing in diameter in the direction from the adjacent part of the driving roll, one of which tapered rolls is mounted to be turned in relation to the adjacent part of the driving roll and means rotatably mounting said tapered roll.

3. In a winding machine, a driving roll, a tapered roll mounted adjacent each end of the driving roll and increasing in diameter in the direction from the adjacent part of the driving roll, each of which tapered rolls is mounted to be turned in relation to the adjacent part of the driving roll and means for rotatably mounting said tapered rolls.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this fourth day of February, 1916.

FRANK ASHWORTH HOLT.
GRINDROD KERSHAW.

Witnesses:
HOWARD CHEETHAM,
RUTH M. WILSON.