Jan. 14, 1941. W. SHAW 2,228,710

YARN WINDING AND ANALOGOUS MACHINES

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Fig. 2.

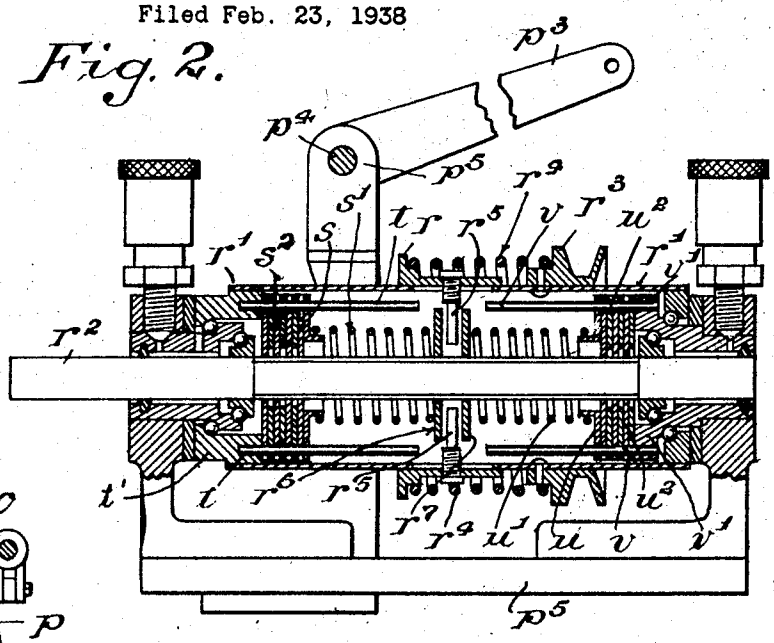


Fig. 1.

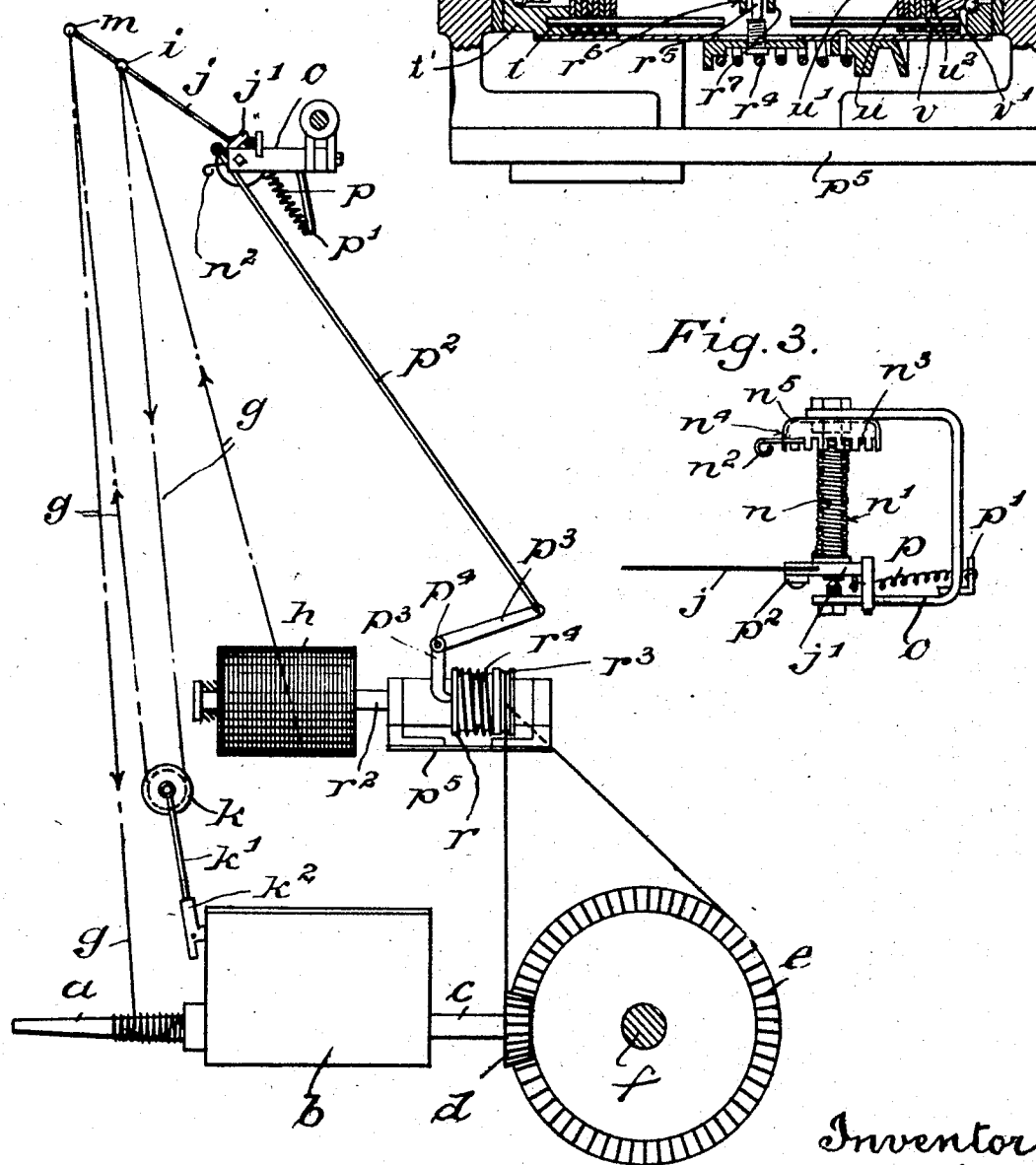


Fig. 3.

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YARN WINDING AND ANALOGOUS MACHINES

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8 Claims. (Cl. 242—45)

My invention in or relating to yarn winding and analogous machines has particular reference to machines for winding pirns of artificial silk.

In these machines it is essential, as is well known, to control accurately the tension imposed upon the yarn. If the package from which the yarn supply is being taken is in the form of a rotatably-mounted bobbin, and such bobbin together with its yarn mass is of relatively considerable weight, it may and frequently does occur that the effort required to be exerted by the yarn to rotate the bobbin imposes a greater tension on the yarn than is desirable or even renders it impossible for the yarn to pull around the bobbin.

When, therefore, very fine yarns are being wound at high speed from a rotatably-mounted bobbin it is necessary to provide means for driving or rotating the bobbin independently of the pull of the yarn. It is necessary, moreover, that provision be made for varying the speed of rotation of the bobbin in synchronism with that of the winding spindle, so that the tension on the yarn will be maintained constant. Further it is necessary to make provision whereby in the event of the rotation of the winding spindle being suddenly stopped, an adequate brake will be applied to the supply bobbin to bring it quickly to rest and prevent over-running.

The object of the present invention is to provide mechanism by means of which the desiderata referred to will be attained, together with other advantages which will be mentioned later.

The invention is characterized in that a member controlled by movements of an angularly-movable and adjustably-loaded compensator arm, over a guide or guides on which the yarn passes on its way from a rotatable supply bobbin to the winding spindle, is arranged to control a drive for the supply bobbin obtained from the winding spindle or from a shaft driving said spindle, the said drive being at all times effected against a brake load and an additional brake load being brought into action by the operation of the compensator arm if, on sudden stoppage of the winding spindle, the constantly-acting brake load does not suffice, owing to the momentum of the supply bobbin, to bring said bobbin quickly to rest when the drive ceases.

The accompanying drawing, shows in Fig. 1 a diagrammatic sketch of a winding unit embodying the invention; and in

Fig. 2 a sectional elevation on an enlarged scale of the particular form or construction of clutch and brake arrangement shown in Fig. 1;

Fig. 3 is a plan view of the compensator arm mounting.

Referring to the drawing a represents a winding spindle, rotated and reciprocated axially by known means housed in a casing b and driven by shaft c and bevels d and e from a shaft f which receives motion from any convenient source.

The supply bobbin from which the yarn g to be wound is drawn is indicated at h. The yarn passes from this supply bobbin to the winding spindle over a guide member i on an angularly-movable compensator arm j, thence beneath a pulley k and over a second guide member m on the compensator arm to the winding spindle. The pulley k is carried by an arm k' connected in the illustrated embodiment to a lever k^2 which is arranged, in known manner to actuate means to arrest quickly the rotation of the winding spindle if the yarn supply should fail and thus permit the arm k' to swing towards the left in Fig. 1. Alternatively the pulley k might be carried by a fixed part.

The guide members i and m are, it will be noted disposed at two different points in the length of the compensator arm j, the purpose of this arrangement being described later.

The boss j' of the compensator arm is fixed upon a spindle n carried in bearings in a suitable bracket o. To the boss j' there is secured one end of a spring n' coiled about the spindle n and having its opposite end n^2 fashioned as a radial finger adapted to be registered in any one of a series of open-ended slots n^3 spaced circumferentially around the annular flange n^4 of a disc n^5 fast on the spindle n. By varying the position of anchorage of the end n^2 of the spring around disc n^5 so can the action of the spring to resist angular movement of the compensator arm be varied. The boss j' of the compensator arm has also connected to it one end of a spring p, the other end of which is anchored to a part p' carried by the bracket o. The boss j' is further connected by a rod p^2 with one arm of an angle lever p pivoted at p^4 to a bracket p^5. The other arm of the lever p^3 is arranged to bear against a boss r slidable longitudinally upon a sleeve r' mounted rotatably about the spindle r^2 for the supply bobbin h which spindle is journalled in the bracket p^5. Between the boss r and a pulley r^3 fast on the sleeve r' there is disposed a coiled spring r^4 which acts to move the boss in a direction contrary to that in which it is moved by the lever p^3. The pulley r receives motion from any suitable source at, preferably a relatively high speed, co-ordinated to that of the winding spindle

and, in the present instance, is shown as being driven by belt from a pulley or shaft *f*.

Projecting radially inwards from the boss *r*, through slots in the sleeve *r'* are pins r^5 which engage between discs r^6 and r^7 slidable upon the spindle r^2.

Between the disc r^6 and a pressure plate *s* there is disposed a spring *s'*. The plate *s* is adapted to exert pressure against a series of discs *s* alternate ones of which are splined on the spindle r^2 and the intervening ones carried by pins *t* projecting horizontally from a part *t'* fast with the sleeve *r'*. It follows, therefore, that the proportion of the speed of rotation of the sleeve *r'* imparted to the spindle r^2 of the supply bobbin depends upon the pressure with which the discs s^2 are pressed together by the plate *s* under the action of the spring *s'* and disc r^6.

Between the disc r^7 and a second pressure plate *u* there is disposed a spring *u'*. The plate *u* is adapted to exert pressure against a series of discs u^2 alternate ones of which are splined on the spindle r^2 whilst the intervening ones are carried by pins *v* projecting horizontally from a part *v'* fast with the bracket p^5. It follows, therefore, that when the plate *u* is caused to exert pressure against the discs u^2 a braking action is exerted upon the spindle r^2 by reason of the discs keyed upon it being pressed against the stationary discs carried by the pins *v*.

The spring *p* is so designed in strength and arranged in its angular setting or direction of pulls as to balance the effects of the springs r^4, *s'*, and *n'* in such a manner that when the spring *n'* is free there is little or no upward pull on the compensator arm *j*. The arm is thus capable of resting in any position between the extremities of its permissible movement. The very smallest amount of tension can thus be applied to the yarn and increases in tension can be made by "winding up" the spring *n'*.

The normal angular position of the compensator arm is determined according to the tension it is desired to impose upon the yarn. In this normal running position of the arm the lever p^3, the spring *s'* exerts sufficient pressure on the clutch discs s^2 to cause the spindle r^2 of the supply bobbin to be driven at the speed required to maintain constant the tension on the yarn. Any variation in the tension on the yarn tends to cause a change in the angular position of the compensator arm and thus to vary the driving action of the clutch discs s^2. It is believed to be apparent that the tension of the spring *s'* is determined by the pressure imposed thereupon by the spring r^4 by contact of the pins r^5 with the disc r^6. During the time the pins r^5 are effected the tension of the spring *u'* will be sufficient to maintain the discs u^2 in such frictional contact whereby there is maintained at all times a brake load on the spindle.

If, for any reason such as quick stoppage of the winding spindle, there is a cessation of tension on the yarn, the spring *n'* acts to move the compensator arm *j* to an angular position in which the action of the spring r^4 is overcome to an extent sufficient to increase the braking action of the series of discs u^2 constituting the brake for the spindle r^2 and give an additional brake load to bring the bobbin quickly to rest if the constantly acting brake load referred to above does not suffice. It is believed to be apparent that this increased braking action of the discs u^2 results from the contact of the fingers r^5 with the discs r^7 as the rim *r* is moved against the tension of the spring r^4 as the rod p^2 imposes pull upon the angle lever p^3.

As the diameter of the yarn mass on the supply bobbin decreases the bobbin obviously requires to be driven faster, but at the same time its weight is decreasing, so that the effort required to drive it remains substantially const nt. The result of this is that the angular position of the compensator arm *j* remains more or less constant from commencement to finish of a supply bobbin. An important advantage of this is that the compensator arm can be made relatively short and consequently lighter in weight and quicker in action all of which tends towards attainment of a more uniform yarn tension.

Attention was drawn hereinbefore to the fact that the yarn, on leaving the supply bobbin, is led through a guide *i* disposed between the ends of the compensator arm and after passing about the pulley *k* is led through a second guide *m* at the extremity of the compensator arm. This arrangement has an important advantage in that the tension is applied to the yarn gradually and the "draw" on the yarn as it leaves the supply bobbin is very light. A further important advantage is that by the employment of the two separated guides *i* and *m* the tendency towards vibration of the compensator arm is checked.

Although I have shown multi-disc friction clutch devices for transmitting drive to the spindle of the supply bobbin and for applying braking action to the said spindle in the event of the tension on the yarn ceasing, I wish it to be understood that so far as the drive is concerned I am by no means limited to the use of such devices. Moreover, I do not limit myself to the provision of two guides *m* and *i* on the compensator arm. In some cases only the guide *m* at the extremity of the arm may be required.

Whilst having been specially designed for application to yarn-winding machines the mechanism constituting the invention may be applied to analogous machines such for instance as warping machines.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a yarn winding or analogous machine, a rotatable supply bobbin, a winding spindle, and means for driving said bobbin and winding spindle, the combination including a movable compensator arm, a guide on said arm intermediate the ends thereof through which is first disposed the material leaving the bobbin, a fixed guide for such material after leaving the guide on the compensator arm, a second guide on the compensator arm at the extremity thereof for the material after leaving the fixed guide, and means under control of the compensator arm for regulating the rotation of the bobbin.

2. In a yarn winding machine, a winding spindle, a rotatable supply bobbin, a bobbin spindle, a sleeve surrounding the bobbin spindle, friction discs within the sleeve alternately keyed to the bobbin spindle and to the sleeve, a boss slidable on the sleeve and having a part extending within the sleeve, said sleeve being slotted for passage of such part to permit sliding movement of the boss along the sleeve, a pressure disc carried by the bobbin spindle to contact the inwardly disposed part of the sleeve, an expansion spring within the sleeve and surrounding the spindle and interposed between the friction discs and the last named disc, means carried by

the sleeve for constantly urging the boss and the part carried thereby toward the friction discs, means under control of the tension of the material drawn from the bobbin spindle for controlling such movement of the boss and thereby controlling the driving contact between the friction discs, and means for rotating the sleeve.

3. In a yarn winding machine, a winding spindle, a rotatable supply bobbin, a bobbin spindle, a sleeve surrounding the bobbin spindle, friction discs within the sleeve alternately keyed to the bobbin spindle and to the sleeve, a boss slidable on the sleeve and having a part extending within the sleeve, said sleeve being slotted for passage of such part to permit sliding movement of the boss along the sleeve, a pressure disc carried by the bobbin spindle to contact the inwardly disposed part of the sleeve, an expansion spring within the sleeve and surrounding the spindle and interposed between the friction discs and the last named disc, means carried by the sleeve for constantly urging the boss and the part carried thereby toward the friction discs, means under control of the tension of the material drawn from the bobbin spindle for controlling such movement of the boss and thereby controlling the driving contact between the friction discs, means for rotating the sleeve, said sleeve having an open end, a fixed part extending within the sleeve, friction braking discs alternately keyed to the bobbin spindle and to said fixed part, a second pressure disc carried by the bobbin spindle adjacent to the first named pressure disc, the inwardly disposed part of the boss extending between the two pressure discs, an expansible spring surrounding the bobbin spindle and interposed between the second pressure disc and the friction braking discs, said spring operating to normally maintain the friction braking discs in contact, movement of the boss along the sleeve in a direction away from the first named friction discs increasing the braking action of said braking discs.

4. In combination, a spindle, a sleeve surrounding said spindle, a disc clutch within one end portion of the sleeve comprising discs alternately keyed to the spindle and to the sleeve, one end of the sleeve being open, a fixed part at said open end of the sleeve, a friction brake within the sleeve and coacting with said fixed part, said friction brake comprising discs alternately keyed to the spindle and to the fixed part, two pressure discs carried by the spindle between the clutch and brake, a member slidable upon the sleeve, an inwardly disposed part carried by said member extending within the sleeve and between the pressure discs, said sleeve having a slot through which said part of the member passes, an expansible spring interposed between one of the pressure discs and the friction clutch, an expansible member surrounding the spindle and interposed between the second friction disc and the friction brake, means for rotating the sleeve, means for constantly urging the member in a direction toward the friction clutch, and means for controlling such movement of the member.

5. In combination, a spindle, a sleeve surrounding said spindle, a disc clutch within one end portion of the sleeve comprising discs alternately keyed to the spindle and to the sleeve, one end of the sleeve being open, a fixed part at said open end of the sleeve, a friction brake within the sleeve and coacting with said fixed part, said friction brake comprising discs alternately keyed to the spindle and to the fixed part, two pressure discs carried by the spindle between the clutch and brake, a member slidable upon the sleeve, an inwardly disposed part carried by said member extending within the sleeve and between the pressure discs, said sleeve having a slot through which said part of the member passes, an expansible spring interposed between one of the pressure discs and the friction clutch, an expansible member surrounding the spindle and in- terposed between the second friction disc and the friction brake, means for rotating the sleeve, means for constantly urging the member in a direction toward the friction clutch, and means for controlling such movement of the member, said last named means also operating to move the member toward the brake.

6. In combination, a spindle, a sleeve surrounding said spindle, a disc clutch within one end portion of the sleeve comprising discs alternately keyed to the spindle and to the sleeve, one end of the sleeve being open, a fixed part at said open end of the sleeve, a friction brake within the sleeve and coacting with said fixed part, said friction brake comprising discs alternately keyed to the spindle and to the fixed part, two pressure discs carried by the spindle between the clutch and brake, a member slidable upon the sleeve, an inwardly disposed part carried by said member extending within the sleeve and between the pressure discs, said sleeve having a slot through which said part of the member passes, an expansible spring interposed between one of the pressure discs and the friction clutch, an expansible member surrounding the spindle and interposed between the second friction disc and the friction brake, means for rotating the sleeve, means for constantly urging the member in a direction toward the friction clutch, and a movable lever supported in position for contact with the member for controlling the movement of the member toward the clutch or to move said member toward the brake.

7. In combination, a spindle, a sleeve surrounding said spindle, a disc clutch within one end portion of the sleeve comprising discs alternately keyed to the spindle and to the sleeve, one end of the sleeve being open, a fixed part at said open end of the sleeve, a friction brake within the sleeve and coacting with said fixed part, said friction brake comprising discs alternately keyed to the spindle and to the fixed part, two pressure discs carried by the spindle between the clutch and brake, a member slidable upon the sleeve, an inwardly disposed part carried by said member extending within the sleeve and between the pressure discs, said sleeve having a slot through which said part of the member passes, an expansible spring interposed between one of the pressure discs and the friction clutch, an expansible member surrounding the spindle and interposed between the second friction disc and the friction brake, means for rotating the sleeve, means for constantly urging the member in a direction toward the friction clutch, a movable lever supported in position for contact with the member for controlling the movement of the member toward the clutch or to move said member toward the brake, and tensioned means coacting with the lever for controlling the movement thereof.

8. In combination, a spindle, a sleeve surrounding said spindle, a disc clutch within one end portion of the sleeve comprising discs alternately keyed to the spindle and to the sleeve,

one end of the sleeve being open, a fixed part at said open end of the sleeve, a friction brake within the sleeve and coacting with said fixed part, said friction brake comprising discs alternately keyed to the spindle and to the fixed part, two pressure discs carried by the spindle between the clutch and brake, a member slidable upon the sleeve, an inwardly disposed part carried by said member extending within the sleeve and between the pressure discs, said sleeve having a slot through which said part of the member passes, an expansible spring interposed between one of the pressure discs and the friction clutch, an expansible member surrounding the spindle and interposed between the second friction disc and the friction brake, means for rotating the sleeve, means for constantly urging the member in a direction toward the friction clutch, a movable lever supported in position for contact with the member for controlling the movement of the member toward the clutch or to move said member toward the brake, a rod operatively connected to the lever, a movable arm, said rod being also operatively engaged with said movable arm, the movement of said arm in one direction imposing pull upon the rod and movement of said arm in the opposite direction imposing push upon the rod, and means for maintaining tension on the arm to normally hold the same in a predetermined position.

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