WIRE TENSIONING DEVICE FOR COIL WINDING MACHINES

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When manufacturing wire coils which are mechanically rotated, certain difficulties are still encountered in connection with the unwinding of the wire from a separate supply drum. Thus for instance during acceleration, the wire becomes stretched or even breaks, due to overstressing, and the quality of the coil therefore depends on the perception and skill of the winder. The wire tension should, however, not depend on this but should be kept constant automatically.

It is not sufficient to control the braking power acting on the supply drum by means of the wire tension itself. Up to the present this has generally been done by passing the wire over a pulley arranged at the end of a lever the movement of which lifts the brake of the supply drum by a variable amount. The movements of the lever thus act directly on the brake and are much too large to ensure an accurate regulation of the power; with this arrangement variations in braking power amounting to several times the prescribed value have to be taken into account.

Furthermore the wire tension is produced by a spring whose force varies with the movements of the wire guide lever. If on the other hand the tension in the wire were produced by a weight, forces would have to be overcome which could easily cause the wire to be too highly stressed. The spring, and the power depending on the spring tension, cannot therefore be dispensed with.

The aforementioned drawbacks are overcome according to the present invention by locating between the wire guide lever and the spring an intermediate element with a constantly varying transmission ratio depending on the position of the wire guide lever, whereby this element causes the wire tension to remain constant independently of the travel of the free end of the spring.

A constructional example of the invention is illustrated diagrammatically in Fig. 1 (elevation) and in Fig. 2 (plan) of the accompanying drawing.

The supply drum $a$ is fixed by means of clamping cones $e$, to a mandrel $b$ which is supported between pivot bearings $d$. The brake disc $c$, having a brake band $f$ cooperating therewith, is also fixed to the mandrel $b$. A brake lever $g$, pivoted at $g'$, has unequal arms. The shorter arm is connected at $f'$ to the brake band $f$ and the longer arm is operatively connected by a link $h$ to a lever $i$, the link being pivoted to lever $g$ and lever $i$ by pins $x$ and $y$, respectively. The lever $i$ is provided with a guiding cam $i'$ and is supported on the shaft $j$ of the long lever $k$. At the outer free end of lever $k$ a roller $m$ is located over which the wire $n$ slides, and passes to the coil which is to be wound, as indicated by the arrow in Fig. 1. The tension spring $o$ presses the movable roller $p$ carried by a link $t$ having a fixed pivot $n$ against the cam portion $i'$ of lever $i$ which has such a shape that the leverage varies inversely proportionally to the applied spring force, so that the torque exerted by the spring on the lever system $f$, $j$, $k$ and thus also the tension on the wire $n$ remains constant. At the same time as lever $k$ drops, brake band $f$ is released. When arm $k$ is again joined to its normal position by spring $o$, the brake band $f$ is again applied more tightly.

The spring tension can be adjusted by means of the set screw $q$. This screw has a pointer $r$ connected to it which moves along a scale, this latter can be calibrated to indicate the diameter of wire which will just not be stretched at that position of the pointer.

The ratio of the movement of the brake band $f$ to that of the wire guide roller $m$ should be at least 1:30 so that the braking power varies with the required accuracy. Brake band $f$ preferably consists of a woven belt of linen, cotton or silk and it is an advantage to provide the braking surface of the brake drum $e$ with fine grooves, by this means it is possible to obtain smooth braking suitable for fine winding wires.

In operation, as the tension on the wire $n$ increases, due to winding conditions, the long lever $k$ moves counterclockwise and carries with it the cam lever $i$. This movement causes the link $h$ to rock the lever $g$ counterclockwise and thus releases some of the tension on the brake band $f$. This permits the drum $a$ to rotate more freely and the tension on the wire $n$ is correspondingly reduced. At the same time the roller $p$ is moved in a clockwise direction about the pivot and the tension of the spring $o$ is correspondingly increased. However, the shape of the cam surface $i'$ is such that the torque resulting from this increased spring tension is not transmitted to the long lever $k$ but, instead remains substantially constant. The reverse of the foregoing sequence of functions takes place when the tension of the wire $n$ is restored to normal.

Instead of a band brake it is of course possible to employ any other sort of brake, it only being necessary to arrange the brake to suit the means for regulating the braking power.

1. In a device for maintaining an allowable wire tension at the supply drum of a coil winding machine where the drum has a brake acting on it in
dependence on the tension in the wire and the coil is mechanically driven, in combination, a wire guide lever, a roller carried by said lever over which the wire passes, a counter spring for biasing said lever to tension the wire, the tension in said spring being variable with any momentary variation in wire tension, and means maintaining the biasing effect of said spring on said lever substantially constant regardless of any fluctuation in spring tension comprising an intermediate element with a variable transmission ratio depending on its position operatively interconnecting said lever and said spring, said transmission ratio varying inversely with the spring tension.

2. Device as in claim 1, characterized by the feature that the intermediate element is a lever whose effective length with respect to the force applied by the spring varies with its position.

3. Device as in claim 1, characterized by the feature that the intermediate element is a lever having a cam surface arranged and adapted to vary the effective length of the lever with respect to the force applied by the spring as the lever position varies.

4. Device as in claim 1, characterized by the feature that the brake on the supply drum is operatively connected to and is controlled by the same lever system as the counter spring.

5. Device as in claim 1, characterized by the feature that the brake on the supply drum is operatively connected to and is controlled by the same lever system as the counter spring, and by the feature that the ratio of the movement of the movable part of the brake to that of the wire guide roller is at least 1:50.

OTTO WIRTH.

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