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SHUT-OFF MECHANISM FOR BOBBIN WINDING MACHINES

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Fig. 1

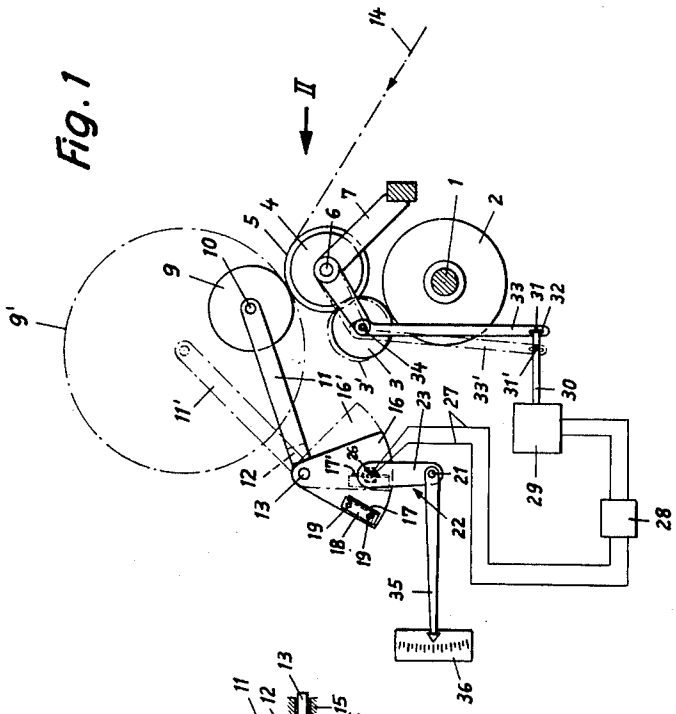
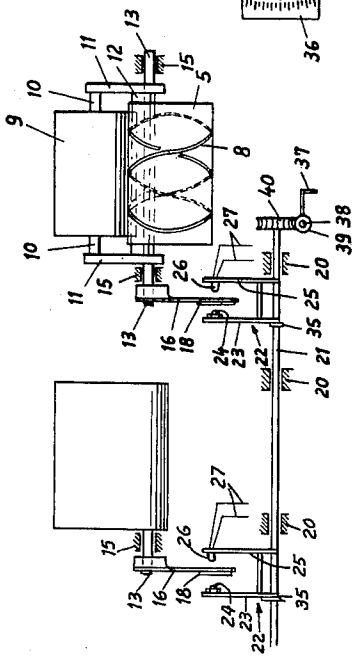


Fig. 2



INVENTORS:
HERMANN METTLER
AND TOBIAS HAURI

BY Robert K. Jacob.

AGT.

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SHUT-OFF MECHANISM FOR BOBBIN WINDING MACHINES

Hermann Mettler and Tobias Hauri, both of Arth am See, Switzerland, assignors to Aktiengesellschaft Fr. Mettler's Sohne Maschinenfabrik, Arth am See, Switzerland

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4 Claims. (Cl. 242—39)

The invention relates to a shut-off mechanism for a coiling machine having at least one winding unit wherein the spool to be wound is journalled in a support which is movable relative to a driving drum, and wherein said driving drum contacts the spool at its circumference and drives it by friction.

The driving drum may be constructed in such winding machines for example as a grooved or slotted drum, the groove or slot being provided for guiding the thread to-and-fro along the drum and accordingly along the spool. However, alternative thread guiding means may be provided, which are separate from the driving drum. In such winding machines it has already been proposed to arrange a sensing member at each winding unit, which senses the spool in the process of being wound and which closes an electric switch e.g. a snap switch, as soon as the coil diameter has reached a predetermined magnitude, in order to initiate the shutting off operation. Such switches have the disadvantage of not operating accurately enough as will be explained later in more detail.

The present invention has the primary object of obviating these disadvantages. With this and other objects in view which will become apparent later from this specification and the accompanying drawing, we provide a shut-off mechanism for a winding machine having at least one winding unit, comprising in combination: a driving drum, a support movably mounted relative to said driving drum, a bobbin to be wound journalled in said support and being driven by said driving drum by frictional contact of its surface, a photoelectric cell device having a first member operatively connected with said support and movable in accordance with the relative movements of the latter with respect to said driving drum, and a second member adjustable along the path of movement of said first member, a lamp and a photoelectric cell being mounted in juxtaposition on said first member, a diaphragm having an aperture mounted on said second member between said lamp and said photoelectric cell, and a device disengaging the frictional contact between said driving drum and said bobbin or spool upon the latter attaining a predetermined coil diameter, said device being electrically connected with said photoelectric cell and being operated when the beam from said lamp passes through said aperture of said diaphragm to said photoelectric cell at the position of said support corresponding to said predetermined diameter of said spool.

These and other features of our said invention will be clearly understood from the following description of a preferred embodiment thereof shown by way of example with reference to the accompanying drawing, in which:

FIG. 1 is a diagrammatic end elevation of a shut off mechanism, and

FIG. 2 is a side elevation of some parts of this mechanism as viewed in the direction of the arrow II of FIG. 1.

The mechanism illustrated serves for shutting-off the winding operation at one winding unit of a winding machine, whose main drive shaft is denoted 1. On the shaft 1 there is mounted a friction wheel 2, which by way of a friction wheel 3 drives a friction wheel 4, which is keyed on the same shaft 6 as a grooved drum 5. The shaft 6 is journalled in a bracket 7, which is fixed to the machine frame (not shown). Adjacent the grooved drum 5, whose groove 8 runs helically in the usual manner, as shown in FIG. 2, there is mounted a helical coil 9 in the process of being wound, whose spool sleeve (not shown) is journalled by means of two pivots 10 at the free ends of two parallel arms 11, which at their other ends are fixedly connected with one another and with a shaft 13. The grooved drum 5 drives the bobbin or coil 9 by friction and at the same time guides the thread to be wound to-and-fro along the coil 9 by means of groove 8, so that a so-called "wild" coil is formed on coil 9.

During winding, the diameter of the bobbin 9 increases, and the spool support 11, 12 with the shaft 13 turns in bearing 15 fixed to the machine frame. It may be assumed, that the winding operation is to be shut-off, when the coil has attained the position and size indicated in FIG. 1 in chain-dotted lines. In this position the coil is denoted 9', and the arms are denoted 11'.

On the shaft 13 a sector-shaped diaphragm 16 is mounted which has a radial slot 17 which is partly overlapped by a small plate 18. The small plate 18 is mounted adjustably by means of two screws 19 on said diaphragm 16, so that the optically effective width of the slot 17 can be adjusted. On a shaft 21 journalled in bearings 20 fixed to the machine frame a U-shaped support 22 is mounted. One leg 23 of said support 22 carries an electric lamp 24, in juxtaposition with which a photoelectric cell 26 is mounted on the other leg 25 thereof. The diaphragm 16 extends between the said legs 23 and 25, so that a light beam from the lamp 24 can impinge on the photoelectric cell 26 only when the slot 17 clears its path.

The photoelectric cell 26 lies in the input circuit 27 of an amplifier 28, whose output feeds a solenoid 29, whose armature is constructed as a plunger 30. The plunger 30 is biased outwardly by a spring (not shown) arranged in the interior of the solenoid, and upon energizing said solenoid is pulled by the latter inwardly against the bias of said spring.

At the free end of the plunger 30 a transverse pin 31 is arranged, which extends into a hole or slot 32 provided at the free end of the angular operating lever 33 which in its longitudinal direction allows some play to the transverse pin 31. The angular lever 33 is pivotally mounted on the shaft 6 and carries near the apex of its angle a pivot 34, on which the friction wheel 3 is journalled. When the solenoid 29 is deenergized the lever 33 is in the position shown in full lines, the friction wheel 3 contacting the friction wheels 2 and 4.

On the shaft 21 carrying the photoelectric cell and lamp support 22 a pointer 35 is keyed, which by turning the shaft 21 can be adjusted on a diameter scale 36 fixed to the machine frame to a magnitude desired. For turning the shaft 21 a crank 37 is provided, which is keyed to a shaft 38 carrying a worm 39. This worm 39 meshes with a worm wheel 40, which is mounted on the shaft 21.

The components 37–40, which are omitted in FIG. 1 for simplicity's sake, may obviously be replaced by any other adjustment mechanism for the pointer 35 and support 22, respectively.

The manner of operation of the shut-off mechanism illustrated follows directly from the foregoing description: when the bobbin 9 has moved from its starting position illustrated in full lines, in which it corresponds to the spool sleeve, into the desired end position 9', the diaphragm is in the position 16' and the slot of the diaphragm is in the position 17' as determined by the adjustment of the indicator 35 on the scale 36, in which this slot clears the path of the light beam between the lamp 24 and the photoelectric cell 26. Consequently the solenoid 29 is energized, whose plunger 30 is drawn inwardly and, by means of the pin 31 reaching the position 31'

brings the angular lever 33 into the position 33'. Thereby the friction wheel 3 comes into the position 3', in which it is lifted off the friction wheels 2 and 4, so that the drive of the grooved drum 5 is interrupted.

The shut-off device described has considerable advantages over those shut-off devices wherein a feeler is provided which senses the bobbin or spool 9 in the process of being wound, and which closes an electrical switch when the spool has reached a predetermined diameter. Since the diameter of the spool increases gradually, the distance of the two contact pieces of the switch diminishes only gradually—unless special measures are taken—so that no accurate switching moment is defined. Moreover the contact pieces are rapidly destroyed by arcing.

In order to overcome this disadvantage it has been proposed to use snap switches whose contact pieces move jerkily towards one another after having reached a certain limit position. It has, however, been found, that with such snap switches the adjustment of the switching point varies in the course of time owing to vibrations, wear or the like, so that a time-wasting readjustment of the switching point soon becomes necessary.

Moreover, when on a winding machine having numerous winding units, such snap switches are provided, there results quite a considerable total loading of the mechanical components of a centrally adjustable diameter control shut-off device, in case all or many bobbins or spools reach the desired diameter almost at the same time. It should be considered, that e.g. all the switches having snap contacts are mounted on an adjustable axle which extends along the machine, assuming moreover that switches with a switching thrust of about 100 grams are to be used. When twenty coils reach the desired diameter approximately at the same time, this involves the switching off of twenty switches simultaneously. At this moment accordingly about 2 kilograms act on the shaft carrying the switches, which causes a resilient deformation of the shaft that affects the accuracy of the shut-off at a predetermined diameter.

When using the shut-off mechanism described, such mechanical forces are obviated owing to the photoelectric initiation of the shut-off operation, so that it is possible without difficulty, to mount as many supports 22 for photoelectric cells and lamps on the shaft 21 as desired, all of which co-operate with a single indicating device 35, 36 and can be adjusted by means of a single adjustment device 37–40. Any adjustment of the slot 17 and of the support remains once and for all, and variations of the desired diameter may be effected in a very quick and simple way by actuating a single crank 37 and observing a single indicating device 35, 36.

Although in the embodiment described hereinabove a sector-shaped diaphragm is attached on a pivotal spool support in a particularly convenient manner, this is by no means indispensable. For example, the bobbin support may be guided parallel to itself instead of being pivotally mounted, or the diaphragm may perform a straight line movement, when the support is rockable. It is also possible to fix the support to the machine frame, while the driving drum is carried by a pivotal or slidable support. In this case the diaphragm may be mounted on the driving drum. In principle, also the lamp with the photoelectric cell may be mounted on the movable support of the spool or driving drum, in which case the position of the diaphragm is to be adjusted in accordance with the desired spool diameter, at which the shut-off is to be effected.

While we have herein described and illustrated in the

accompanying drawing what may be considered a typical and particularly useful embodiment of our said invention, we do not wish to limit ourselves to the particular details and dimensions described and illustrated; for obvious modifications will occur to a person skilled in the art.

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

1. A shut-off mechanism for a bobbin winding machine having at least one winding unit comprising a bobbin support mounted on a pivot shaft, a bobbin rotatably mounted on said support, a drive shaft, a first friction drum mounted on said drive shaft for rotation therewith, a second friction drum in driving engagement with said bobbin, an intermediate friction drum in driving engagement with said first and said second friction drums for transmitting rotary movement to said bobbin, a movable operating lever supporting said intermediate friction drum, a photocell unit arrangement including a diaphragm having a slot mounted on said pivot shaft for pivotal movement with said bobbin relative to said second drum, an adjustable shaft provided with means for setting the angular position of said adjustable shaft, a U-shaped support mounted on said adjustable shaft and presenting a pair of legs, one said leg carrying a photo-cell and the other a lamp disposed in radiation relation to said photo-cell, said diaphragm being disposed intermediate said photo-cell and said lamp and adapted to render said photo-cell operative when said slot is aligned with said photo-cell and said lamp to permit actuation of said photo-cell and means responsive to actuation of said photo-cell for moving said operating lever and said intermediate friction drum so as to disengage said intermediate friction drum from driving engagement with said first and second friction drums.

2. A shut-off mechanism for a bobbin winding machine in accordance with claim 1, wherein a scale is mounted in fixed position relative to said adjustable shaft and a pointer is mounted on said adjustable shaft for movement relative to said scale for indicating the adjusted angular position of said shaft and U-shaped support, said photocell and said lamp relative to said diaphragm and said slot to determine the diameter of said bobbin at which said photo-cell responds.

3. A shut-off mechanism for a bobbin winding machine in accordance with claim 2 comprising a worm gear mounted on said adjustable shaft and a worm in engagement with said gear and having a crank operative to adjust the setting of said adjustable shaft.

4. A shut-off mechanism for a bobbin winding machine in accordance with claim 1 comprising a plurality of said winding units each including a photo-cell unit having a U-shaped support and where said adjustable shaft is common to all said U-shaped supports for simultaneously adjusting the setting of said plurality of winding units.

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STANLEY N. GILREATH, *Primary Examiner.*