Linear Motion in Winding Systems

In winding machines or take up systems the traversing assembly is the component which moves the material being spooled back and forth across the spool/reel core (fig. 1). The traversing assembly usually includes a "nut" which holds a guide or roller for the wire, rope or other material (fig. 2). To achieve a finished spool with smooth, evenly spaced rows of material, it is necessary to synchronize the linear motion of the traversing nut with the rotation of the take up spool.

Fig. 1
Traverse assembly on winding machine.

Fig. 2
Wire guide mounted on top of traversing nut.

For example, suppose the application is level winding of wire that is 0.375 inches thick. For a level wind, the traversing nut must travel in a linear direction 0.375 inch per one spool revolution. This assures that each row of wire is correctly spaced across the spool core from one spool flange to the opposite flange. If the nut moves less than 0.375 inches, the material will overlap; if more than 0.375 inches then there will be spaces between the rows.

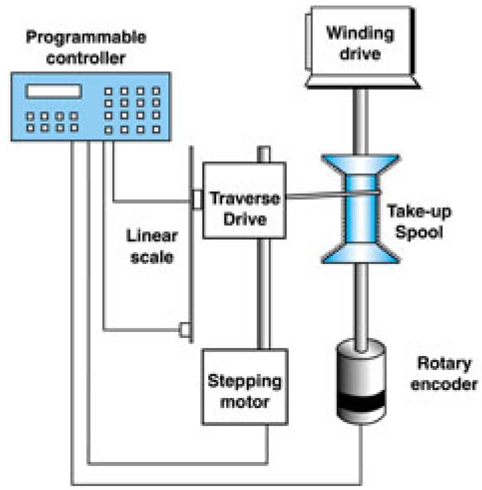

Fig. 3
A screw is cut to a specific linear pitch which cannot be changed. If material with a different thickness or diameter is spooled, a different pitch for the traversing nut is needed. This is accomplished with a controller which integrates the traverse assembly drive motor with the spool drive motor to synchronize the linear motion of the traversing nut with the rotation motion of the spool.

The linear distance traveled by the traversing nut -- 0.375 inches in the example above -- is referred to as the linear pitch of the nut. Screw-based traversing assemblies use electronic controls to synchronize pitch with spool rotation (fig. 3). Mechanical traversing assemblies do not require an electronic control system (fig. 4). However, whereas the electronically controlled systems offer essentially unlimited pitch adjustment capability, mechanical methods do not. In a mechanical system the pitch adjustment is either fixed or it is adjustable but within a limited range.

There is a way to modify the pitch in mechanical traversing devices in order to expand the range of application. Looking again at fig. 4, the traversing nut shaft is driven via a belt to the spool shaft. The pitch of the nut is set by moving the pitch control lever (fig. 5). In mechanical systems like this, regardless of spool shaft rotational speed, the traversing nut will always travel the same linear distance (pitch) per shaft revolution.

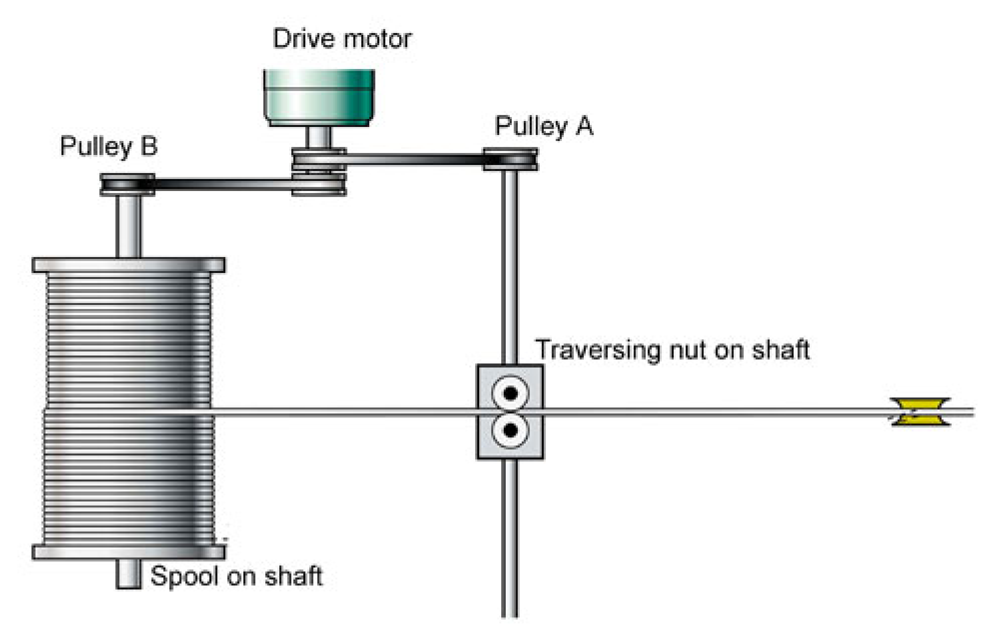

Fig. 4
A mechanical system does require a controller or electronics.

The pitch control lever affords a 10:1 pitch turndown capability. For example, if the thickest material being spooled is 0.500 inches, this system will accommodate material as thin as 0.050 inches using just the pitch control lever. This assumes the pulley wheel A and B are of equal size.

What if the operator needs to set a pitch that is outside of the 10:1 range? In an electronically controlled system this is a simple matter of adjusting controls. In a mechanical system such as shown in fig. 6, this is accomplished by varying the size ratios of pulley wheels A and B.

Fig. 5
Pitch control lever on mechanical traverse drive.

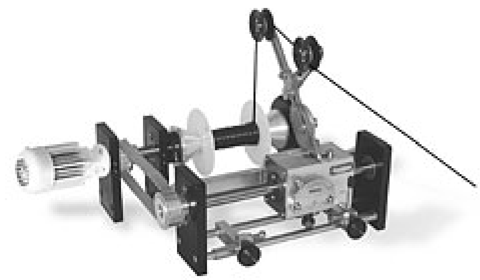

Fig. 6
A winding system based on a mechanical traversing assembly requires no electronic controls or programming.

If the size of pulley wheel A increased relative to wheel B, the traversing nut shaft will turn slower, and vice versa. Therefore -- even though the nut still moves the same linear distance per shaft revolution -- it will do so at a slower or faster rate of speed depending on the size ratio of the pulley wheels. This effectively enables the operator to meet different pitch requirements without having to resort to an electronic control system.