This invention relates to improvements in fiber winding machines. In a further aspect, this invention relates to a releasable adapter for holding fiber winding tubes. In a still further aspect, this invention relates to a rotatable adapter which enables fiber-carrying tubes to be readily placed upon or removed therefrom.

In the fiber glass industry, strands of continuous fiber adapted for use in the weaving of cloth, are wound upon tubes immediately following their attenuation from molten streams of glass. The tubes are made of cardboard or plastic in the form of open-ended cylinders which are mounted for rotation upon a cylindrical collet of a winding machine. The continuous strands are wound in the manner of a spool of household sewing thread to form a "package." The "packages" of strand are then transferred from the collet of the winding machine to a transport rack provided with a plurality of dowels upon which the "packages" are placed. After transporting, the "packages" are removed from the transport rack and placed upon tube adapters of a machine where the strand is removed from the tube in a rewinding and twisting operation to provide a coherent strand suitable for weaving into cloth.

Tube adapters hereinafter employed on rewinding machines have comprised a rigid cylindrical assembly, fabricated of metal, having an outside diameter approximately equal to the normal inside diameter of the tubes. It will be readily apparent that the tubes become misshapen, distorted, and out of round through use and winding, both on the first stage winding machines and on the transport racks. Therefore, they become difficult for a machine operator, especially a woman, to load and unload from the tube adapters of the rewinding machines, which tube adapters are located at a distance of from five to six feet above the floor. It is therefore obvious that a tube adapter for a rewinding machine which could be readily loaded or unloaded with little effort would provide increased productivity from the rewinding machine operators through reduced fatigue and accordingly would provide a significant forward step in the art.

Accordingly it is an important object of this invention to provide a tube adapter of simple and sturdy construction consisting of a minimum of parts.

A further object is to provide a tube holder, which can be readily loaded and unloaded with new or used, misshapen tubes.

A still further object is to provide a tube-holding mechanism which maintains a secure positive grip of the tube at all times.

Other objects will appear hereinafter.

In the accompanying drawings in which like numerals are used to refer to like parts throughout:

Fig. 1 is a perspective view of the tube-holding mechanism as it appears without a tube affixed thereon;

Fig. 2 is an end view of the tube-holding mechanism of Fig. 1.

Fig. 3 is a cross-sectional view taken on the line 3-3 of Fig. 2.

Fig. 4 is a partial sectional view taken along the line 4-4 of Fig. 3.

Referring now to the drawings, there is shown a frame 10 preferably cast from a light metal alloy. The frame 10 has a central sleeve 11 provided with a bore 12 whereby it is adapted to fit upon a rotatable shaft (not shown). A keyway 13 is formed interiorly of bore 12 into which a key is inserted to lock the sleeve 11 and frame 10 to the shaft for rotation. The frame 10 also has a plurality of radially extending support vanes 14, and a disc-like reinforcing web 15. Each support vane 14 has an outer surface 16 extending axially on the frame 10 and a slot 17 disposed near the surface 16 and at a distance from the right end of the surface 16, Fig. 3, representing about 39% of the length of said surface.

Adapter segments 18 are pivotally attached to the support vanes 14 at the slots 17 by means of rivets 19. Each adapter segment 18 is provided with a flange 20 disposed at one end thereof to form a stop for tubular objects applied to the tube-holding mechanism 22. The adapter segments 18 are provided with side walls 23 and end walls 24 to provide chambers 25 within which surfaces 16 of support vanes 14 are operatively fitted.

A flat spring 26 is confined in each chamber 25 between each of the surfaces 16 of the support vanes 14 and the inner surfaces 27 of the adapter segments 18. When a tube 21 is not positioned upon the tube-holding mechanism 22, the flat springs 26 exert an outward force on the adapter segments 18 causing them to assume the extended position illustrated in Fig. 3.

The tube-holding mechanism 22 of this invention may be used for holding either a true cylindrical tube 21 as illustrated by the broken lines in Fig. 1 or an out-of-round tube as well. In applying the tube 21 to the holder 22, the tube is fitted over the converged ends 28 of the adapter segments 18 as shown at the right side of Fig. 3. As the entering end of the tube 21 is moved toward the pivot point 29, all segments 18 conform to the interior configuration of the tube which is centered with respect to the axis of the tube-holder 22. Upon further movement of the tube 21 as it is thrust over the tube-holder 22, the segments 18 are all pushed a small distance radially inwardly against the force of springs 26. This movement is accomplished by the displacement of rivets 19 in slots 17. As the end of the tube 21 passes the pivot point 29, the adapter segments 18 pivot into a position such that their outer surfaces 30 are substantially parallel to the center axis while being forced against the inner surface 31 of the tube 21 through the action of the flat springs 26. The tube 21 is moved laterally until its end abuts the flanges or stops 20. It is seen that in this position the tube is held securely. It will also be obvious that now, as well as used and out-of-round tubes are held by the present tube-holding mechanism with equal facility.

In the embodiment illustrated, six adapter segments are used together with a frame having six radially extending support vanes. It is contemplated that either more or less adapter segments may be used although six have been found to be particularly satisfactory.

Although a specific embodiment of this invention has been discussed it is to be understood that other embodiments may be used and the invention is to be limited only by the spirit and scope of the appended claims.

1. A tube-holding mechanism comprising a frame, a plurality of radially and axially extending support vanes integral with said frame, said support vanes having outer surfaces extending axially along the frame, adapter segments fitting over the outer surfaces of the vane members, each of said adapter segments being pivotally attached to a support vane at a point between the center and one end of the outer surface of the support vane, and
for yieldably urging said adapter segments into an extended position for engaging the inner wall of the tube.

2. A tube-holding mechanism comprising a frame, a plurality of radially and axially extending support vanes integral with said frame, said support vanes having outer surfaces extending axially along the frame, adapter segments fitting over the outer surfaces of the support vanes, each of said adapter segments being pivotally attached to a support vane and having stop means disposed at one end, and means for yieldably urging said adapter segments into an extended position for engaging the inner wall of the tube.

3. A tube-holding mechanism comprising a frame, a plurality of radially and axially extending support vanes integral with said frame, said support vanes having outer surfaces extending axially along the frame, adapter segments fitting over the outer surfaces of the support vanes, each of said adapter segments being pivotally attached to a support vane at a point between the center and one end of the outer surfaces of the support vane and having stop means positioned at the other end of the support vane, and flat spring means for yieldably urging said adapter segments into an extended position for engaging the inner wall of the tube.

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