United States Patent

Taki et al.

[15] **3,695,528**

[45] **Oct. 3, 1972**

[54] **SNAGGER FOR A CONTINUOUS WINDING MACHINE**

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[22] Filed: **Nov. 16, 1970**

[21] Appl. No.: **89,946**

[30] **Foreign Application Priority Data**

Nov. 25, 1969 Japan 44/112039

[52] **U.S. Cl.** .....**242/25 A**

[51] **Int. Cl.**.....**B65w 54/00**

[58] **Field of Search**.....242/25 A

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[57] **ABSTRACT**

A snagger comprises a stationary element adapted to be secured to the periphery of the snagger plate of the winding machine and a movable element pivotally secured to the stationary element. Both elements are provided with a curved surface to cooperate with each other to form a wedge to grasp a wire between them when the movable element is placed in an operative position by a reel mounted to the snagger plate.

5 Claims, 8 Drawing Figures

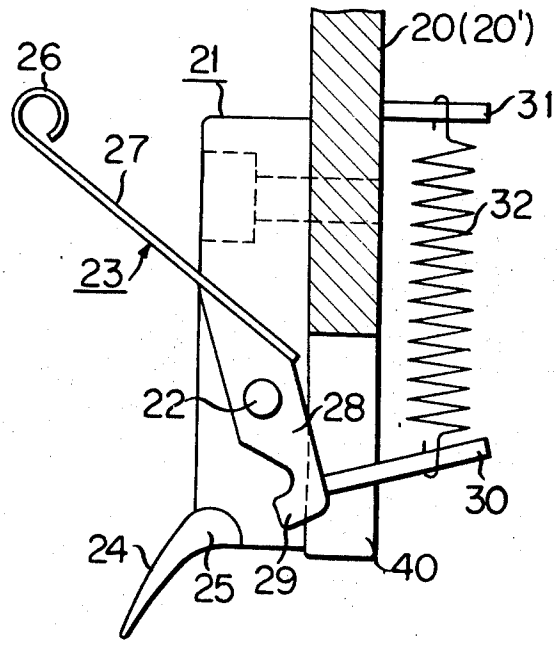


FIG. 1

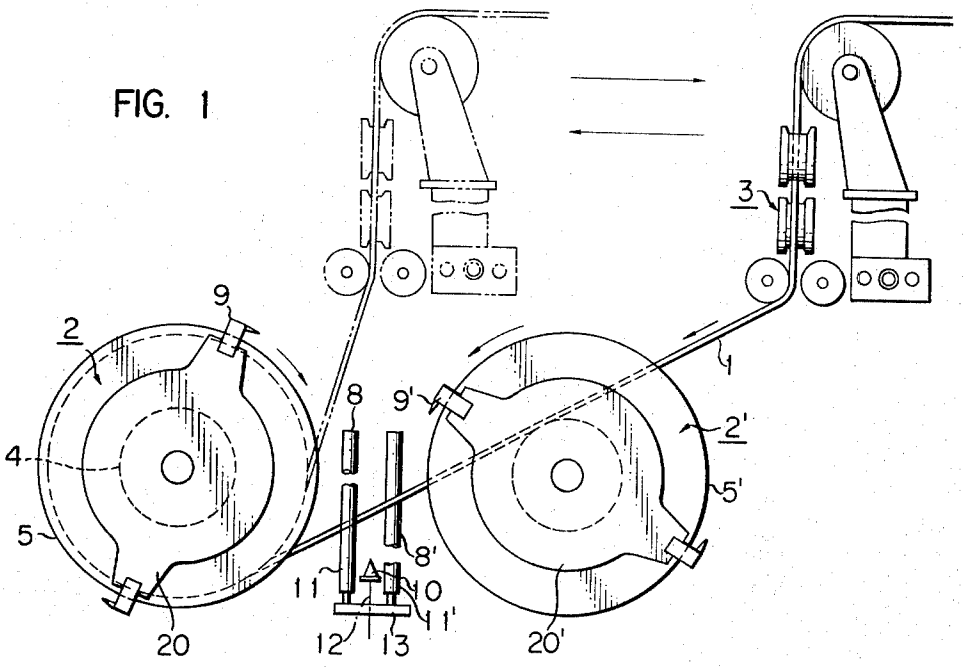
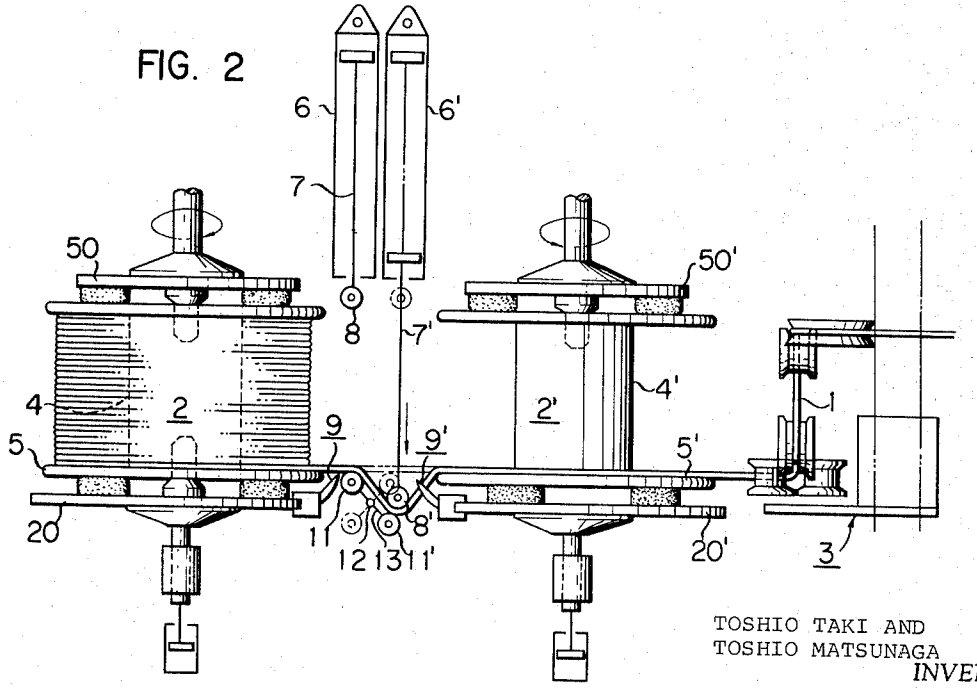


FIG. 2



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FIG. 3

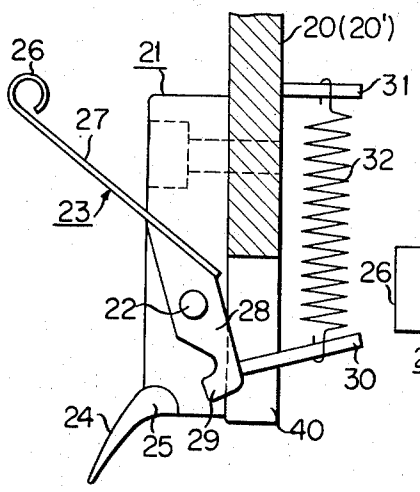


FIG. 4

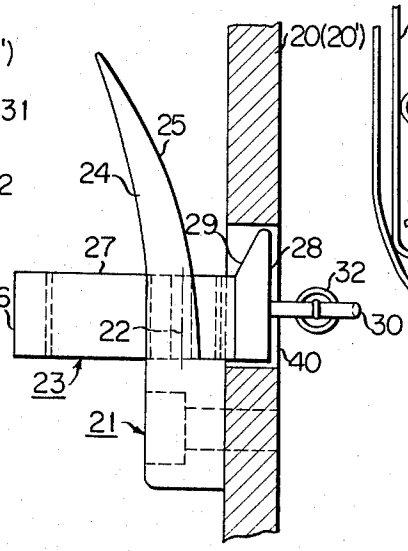


FIG. 5

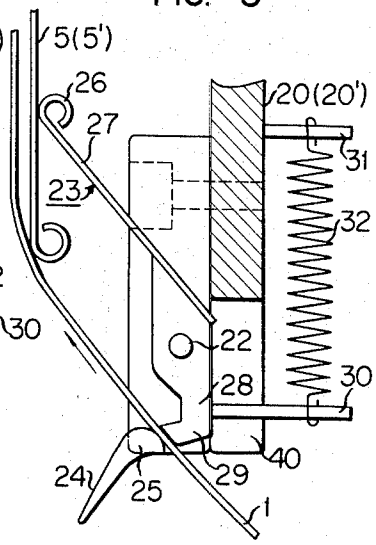


FIG. 6

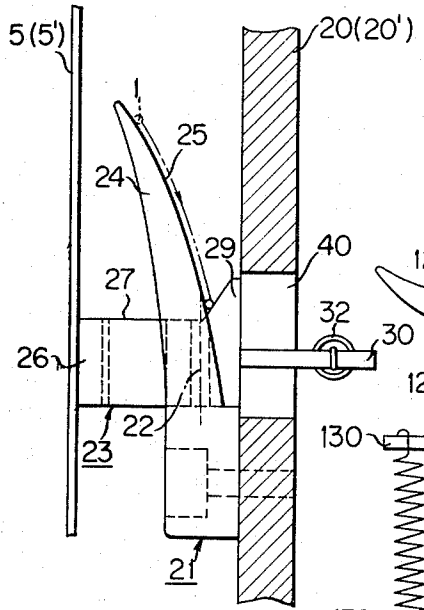


FIG. 7

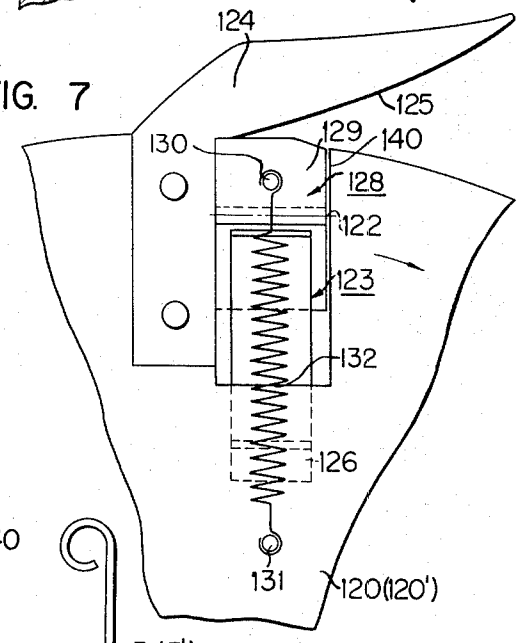
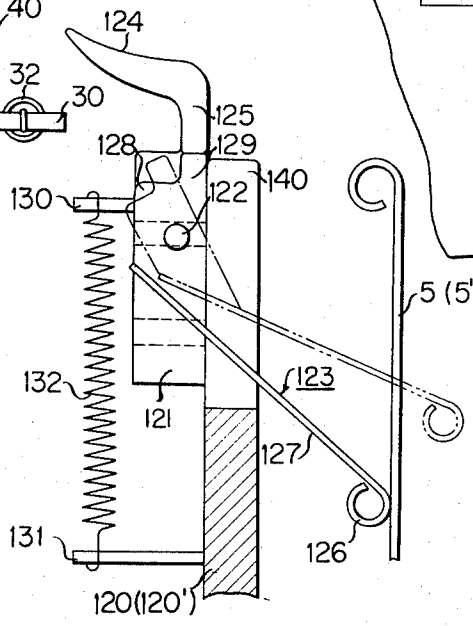


FIG. 8



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SNAGGER FOR A CONTINUOUS WINDING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to a continuous winding machine, and more particularly to a snagger for a continuous winding machine.

A snagger is used in a continuous winding machine for winding metal wires or insulated wires to switch the winding of the wire from a fully wound reel to an empty reel without stopping the operation of the machine.

It is also known that a snagger of this kind is divided into two types, that is, one is the stationary type and the other the movable. Both types have their disadvantages respectively. In the stationary type, since the snagger remains to hold the end of a wire after the winding operation has finished, the wire must be manually removed. The movable type has to be so constructed that, after completion of the winding, the snagger is made to be automatically opened, at an appropriate time before the beginning of the next winding operation, to expel the end of the wire having been previously grasped.

In this movable type, the grasping force is induced either from the centrifugal force or the reel's pressure incidental to its contact with the winding machine on which it is equipped. However, the former has a defect in that the grasping force of the snagger is small, and therefore ineffective when the reel is rotating at a relatively slow speed, while the latter's disadvantage is that the snagger cannot be constructed lightweight due to its complicated construction, resulting in that there is the danger due to centrifugal force and also causes the snagging force to be due to errors in the dimensions of the reels.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a snagger for a continuous winding machine of the type utilizing the reel's pressure incidental to its contact with the winding machine when it is equipped thereon, as the result of which, it is possible to make the snagger simple and lightweight in construction thereby eliminating the danger due to centrifugal force, and without the snagger's grasping force being hampered by a slight difference in the dimensions of the reels.

The snagger of the present invention is preferably composed of a stationary element adapted to be secured to the periphery of the snagger plate of a continuous winding machine and a movable element pivotally connected to the stationary element. The stationary and the movable elements have respectively a projection provided with a curved surface so that they cooperate to form a wedge between them when the movable element is placed in an operative position by equipping it on the machine. The movable element is usually maintained in a non-operative position by a resilient means such as a coil spring disposed between it and the snagger plate so that the wedge to be formed by both curved surfaces is inoperative. However, when a reel is mounted to the snagger plate, the moving element is forced to approach the curved surface of the stationary element so that both curved surfaces act to form a wedge between them to grasp the wire.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will become apparent from the following description taken in connection with the accompanying drawings in which like numerals indicate like parts throughout the figures thereof, and wherein:

FIG. **1** is an elevational view of a double-reel parallel-shaft type continuous winding machine providing a snagger according to the present invention to diagrammatically show the state of the switching of reels;

FIG. **2** is a plan view of the machine shown in FIG. **1**;

FIGS. **3** and **4** are respectively a side elevational view and a plan view of an embodiment of a snagger according to the present invention in the state that a reel is not mounted to the machine;

FIGS. **5** and **6** are respectively a side elevational view and a plan view of the snagger according to the present invention in the state that a reel is mounted to the machine; and

FIGS. **7** and **8** are respectively an elevational view and a side elevational view of another embodiment of a snagger according to the present invention as applied in a double-reel common-shaft type continuous winding machine.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2**, there are shown diagrammatically a preferred embodiment of a snagger according to the present invention as used in a double-reel parallel-shaft type winding machine. It will be recognized that all of the figures of the drawing are in part schematic in order to permit an understanding of the invention without showing and describing unnecessary details. Firstly, the operation of the winding machine just at the time of the switching of reels being carried out will be explained in conjunction with the figures. Shortly before the completion of the winding of a wire on a reel **2** secured between a snagger plate **20** and a driving disc **50** of the winding machine, a traverser **3** at a position shown by the dot-dash line in FIG. **1** is moved toward the empty reel **2'**, which is secured between a snagger plate **20'** and a driving disc **50'** of the winding machine, until it reaches a position where the wire **1** comes into contact with the barrel **4'** of the empty reel **2'** which is rotating at the same speed as the taking up speed of the wire. The traverser **3** stops its movement at the position shown by the solid line in FIG. **1**. Upon receipt of a switching signal issued from a device (not shown) indicating the completion of the winding on the reel **2**, the traverser **3** is shifted until the wire **1** comes into contact with the inner surface of the flange **5'** of the reel **2'**. Then an air cylinder **6'** is actuated to advance its piston rod **7'** so that an upright roller **8'** provided at the outer end of the rod **7'** pushes the wire **1** over the periphery of the flange **5'** to bend the wire **1** sharply at the edge of the flange **5'** as shown in FIG. **2**. The position of the traverser **3** at this state is shown by the solid line in FIG. **2**. Therefore, the wire **1** intersects the path described by a snagger **9'** provided on the periphery of the snagger plate **20'** of the machine which is rotating at the same speed as the reel **2'**, thereby the wire **1** is caught by the snagger **9'**. Directly thereafter, the wire **1** is severed by a cutter **10** and begins to be wound on the barrel **4'** of the new reel **2'**.

In connection with FIGS. 1 and 2, 11 and 11' show guide rollers provided at each end of a lever 13 pivotally secured to the machine frame at its mid point 12, and the lever 13 is arranged to be rotated in the clockwise direction as viewed in FIG. 2 about the pivot 12 by the pushing roller 8' interposed by the wire 1 when the roller 8' pushes the wire 1 outwardly over the periphery of the flange 5' of the reel 2' as stated above, thereby the guide roller 11 provided at the other end of the lever 13 pushes the wire 1 on the reel 2 inwardly to remove it from the path of the snagger 9 provided on the periphery of the snagger plate 20 of the machine.

Now, the construction of an embodiment of the snagger 9 or 9' according to the present invention will be explained more fully with reference to FIGS. 3 and 4.

The snagger comprises a stationary element 21 adapted to be secured to the periphery of the inner surface of the snagger plate 20 or 20' and a movable element 23 pivoted at 22 to the stationary element 21 on a longitudinal side surface thereof perpendicular to the surface of the snagger plate 20 or 20'.

The element 21 is substantially rod-like shaped with a rectangular cross section, but has a projection 24 at its outer end corner elongating substantially tangentially relative to the rotational direction of the snagger plate 20 (20'). The projection 24 is curved somewhat outwardly relative to the plane of the snagger plate so that it has a curved surface 25 to form a wedge. The movable element 23 comprises a leaf spring 27 providing an eye 26 at its free end and a wedge piece 28 secured to the rear portion of the leaf spring 27 at one end surface thereof. The wedge piece 28 has the opposite end surface shaped as a projection provided with a curved surface 29 to cooperate with the curved surface 25 of the stationary element 21 to form a wedge. The movable element 23 is pivotally secured to the stationary element 21 at the mid portion of the wedge piece 28. Further, in the periphery of the snagger plate 20 or 20' there is provided a slot 40 allowing the free swing of the projection of the wedge piece 28 of the movable element 23. Between a pin 30 secured to the wedge piece 28 and projecting substantially opposite to the longitudinal direction of the leaf spring 27 and a pin 31 secured to the outside of the snagger plate 20 (20') is provided a coil spring 32 to bias the movable element 23 so that, in the non-operating position, the distance between the confronting faces of the eye 26 of the leaf spring 27 and the inner surface of the snagger plate 20 (20') becomes maximum as shown in FIG. 3.

When the flange 5 (5') of the reel 2 (2') is mounted to the snagger plate 20 (20') as shown in FIGS. 5 and 6, the leaf spring 27 of the movable element 23 is urged toward the surface of the snagger plate since the eye 26 is moved by the flange 5 (5') against the force of the coil spring 32. This causes the movable element 23 to swing about its pivot 22 to allow its wedge portion 29 to approach the projection 24 of the stationary element 21. Thus there is formed a wedge like gap between the curved surface 25 of the stationary element 21 and the curved surface 29 of the movable element 23 as shown in FIGS. 5 and 6.

When the wedge like gap thus formed crosses the path of the wire 1 running diagonally as shown in FIG. 5, the wire 1 is caught by the projection 24 of the snagger and caused to slide down into the wedge formed between curved surfaces 25 and 29, whereby it is grasped strongly by them.

Since the snagger (25, 29) is rotating at the same speed as the reel 2' with the wire 1 being strongly grasped, the wire 1 is wound around its barrel 4'. Upon completion of the winding on the reel 2', the snagger 9 similarly provided on the other snagger plate 20 grasps the wire 1 on the empty reel 2 in the like manner with the exception that the traverser 3 reverses the motion described above. Thus the wire is alternately continuously wound on empty reels by the operation of the snagger according to the present invention.

Upon completion of the winding on a reel, when the reel is dismounted from the machine, the movable element 23 is returned to the position shown in FIGS. 3 and 4 by the action of the coil spring 32 to cease the wedge action, whereby the wire 1 is easily released from the snagger.

The present invention has been described thus far as it is used in association with the double-reel parallel-shaft type continuous winding machine. It will be appreciated, however, that the snagger according to the present invention is also applicable to a double-reel common-shaft type continuous winding machine with a slight modification in the snagger described and shown in FIGS. 3 to 6. The fundamental construction of another embodiment of the snagger according to the present invention when it is applied to a common-shaft type winding machine is diagrammatically shown in FIGS. 7 and 8. In FIGS. 7 and 8, the snagger comprises a stationary element 121 adapted to be secured to the periphery of the snagger plate 120 or 120' and its outer surface, that is, the surface facing an adjoining snagger plate arranged side by side on a common axis, and a movable element 123 pivoted at 122 to the stationary element 121 on a longitudinal side surface thereof perpendicular to the surface of the snagger plate 120 or 120'.

The element 121 has a substantially rod-like shape with a rectangular cross section, and also has a projection 124 at its outer end corner elongating substantially tangentially relative to the rotational direction of the snagger plate 120 (120'). The projection 124 is curved somewhat outwardly relative to the plane of the snagger plate so that it has a curved surface 125 to form a wedge. The movable element 123 comprises a leaf spring 127 providing an eye 126 at its outer end and a wedge piece 128 secured to the rear portion of the leaf spring 127 at its one end surface. The wedge piece 128 has the opposite end surface shaped as a projection provided with a curved surface 129 to cooperate with the curved surface 125 of the stationary element 121 to form a wedge. The movable element 123 is pivotally secured to the stationary element 121 to the mid portion of the wedge piece 128 as stated above. Further, in the periphery of the snagger plate 120 or 120' there is provided a slot 140 allowing the leaf spring 127 to project through to the other side of the snagger plate 120 or 120'. Between a pin 130 secured to the wedge piece 128 and projecting substantially opposite to the longitudinal direction of the leaf spring 127 and a pin 131 secured to the surface of the snagger plate 120 or 120' at the same side of the stationary element 121 is provided a coil spring 132 to bias the movable element 123 in such a manner that, in the nonoperative position, the

distance between the eye **126** of the leaf spring **127** and the adjoining surface of the snagger plate **120** (**120'**) becomes maximum as shown in FIG. **8** by the dot-dash line.

When the flange **5**(**5'**) of the reel **2**(**2'**) is mounted to the snagger plate **120** (**120'**) as shown in FIG. **8** by the full line, the leaf spring **127** of the movable element **123** is urged toward the surface of the snagger plate since the eye **126** is moved by the flange **5** (**5'**) against the force of the coil spring **32**. This causes the movable element **123** to swing about its pivot **122** to allow its wedge piece **128** to approach the projection **124** of the stationary element **121**. Thus, there is formed a wedge-like gap between the curved surfaces **129** and **125** of the wedge piece **128** and the projection **124** of the stationary element **121** as shown in FIGS. **7** and **8** by the full line.

When the wedge-like gap thus formed crosses the path of the wire (not shown) running between the two snagger plates arranged side by side, the wire is caught by the projection **124** of the stationary element **121** and caused to slide down into the wedge formed between curved surfaces **125** and **129**, whereby it is grasped firmly by them as in the case of the embodiment shown in FIGS. **3** to **6**.

Since the snagger (**125**, **129**) is rotating at the same speed as the reel with the wire being firmly grasped, the wire is wound around its barrel. Upon completion of the winding on the reel, the snagger similarly provided on the adjoining snagger plate grasps the wire to wind it on the empty barrel.

Upon completion of the winding on a reel, when the reel is dismounted from the machine, the movable element **123** is returned to the position as shown in FIG. **8** by the dot-dash line by the action of the coil spring **132** to cease the wedge action, thereby the wire is immediately released from the snagger of the fully wound reel.

While the invention has been shown and described with reference to preferred embodiments thereof it will be apparent that other changes and modifications can be made in the present invention and therefore it is understood that all changes, equivalents, and modification within the spirit and scope of the present invention are here meant to be included in the appended claims.

What is claimed is:

1. A snagger for a continuous winding machine having a snagger plate, said snagger comprising a stationary element adapted to be secured to said snagger plate; and a movable element pivotally secured to said stationary element; said stationary element having a projection elongated substantially tangentially relative to the rotational direction of said snagger plate; said movable element having at one end thereof means to contact a reel of said machine to cause said movable element to swing about its pivot; said movable element having at the other end thereof a curved surface; whereby said projection and said curved surface are adapted to cooperate with each other to form a wedge to grasp a wire between them when a reel is mounted to the snagger plate.

2. A snagger for a double-reel parallel-shaft type continuous winding machine as claimed in claim **1**, wherein said snagger plate has an inner surface, said stationary element being secured to said inner surface; said other end of said movable element including a wedge piece having said curved surface; said snagger plate having a peripheral opening therethrough; said wedge piece having a pin projecting through said opening; and means connected to said pin for biasing said curved surface of said movable element away from said projection of said stationary element.

3. A snagger as claimed in claim **2**, wherein said means for biasing comprises resilient means positioned between said pin and a second pin secured to said snagger plate at the surface thereof opposite said inner surface.

4. A snagger for a double-reel common-shaft type continuous winding machine as claimed in claim **1**, wherein said stationary element is secured to the surface of said snagger plate which confronts a second snagger plate, said two snagger plates being axially aligned and disposed in parallel with each other; said other end of said movable element including a wedge piece having said curved surface; said snagger plate having a peripheral opening therethrough; said movable element extending through said opening; said wedge piece having a pin extending away from said snagger plate; and means connected to said pin for biasing said curved surface away from said projection of said stationary element.

5. A snagger as claimed in claim **4**, wherein said means for biasing comprises resilient means positioned between said pin and a second pin secured to said surface of said snagger plate.

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