

[54] **COMBINATION TENSION CONTROL AND SLUB CATCHING DEVICE**

[75] Inventor: **Samuel L. Abbott**, Wilton, N.H.

[73] Assignee: **Abbott Machine Co. Inc.**, Wilton, N.H.

[22] Filed: **June 2, 1972**

[21] Appl. No.: **258,993**

[52] U.S. Cl. **28/64**

[51] Int. Cl. **D01h 13/22**

[58] Field of Search **28/64**

[56] **References Cited**

UNITED STATES PATENTS

3,543,357	12/1970	Abbott.....	28/64
3,501,820	3/1970	Abbott.....	28/64

Primary Examiner—Louis K. Rimrodt

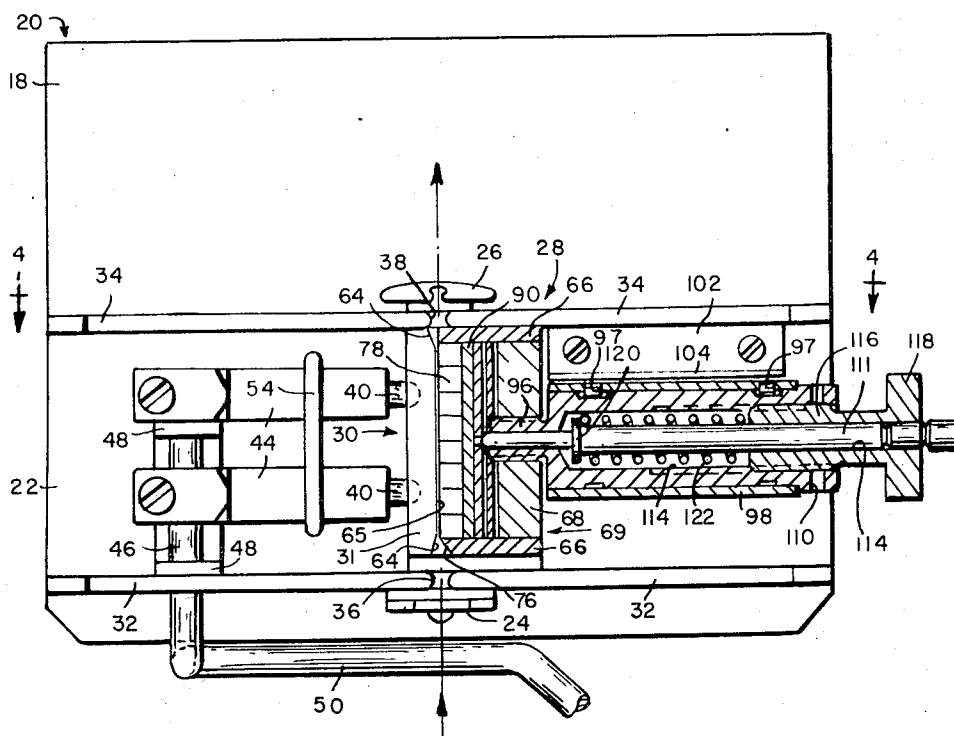
Attorney—Robert T. Gammons

[57]

ABSTRACT

A combination tension control and slub catching device wherein there are confronting fixed and movable members provided with confronting surfaces between which the yarn moves. The movable member is yieldably held engaged with the fixed member and there is an array of parallel bars mounted on the fixed member edge to edge transverse of the direction of movement of the yarn with the surfaces thereof at one side engaged with the surface of the movable member. An adjustable support on the fixed member arranged in engagement with the ends of the bars at the opposite sides limits displacement of the bars relative to the surface of the movable member, and a spring-pressed plunger supported on the fixed member in engagement with a pressure plate applies pressure to the bars in a direction to press them against the surface of the movable member.

23 Claims, 7 Drawing Figures



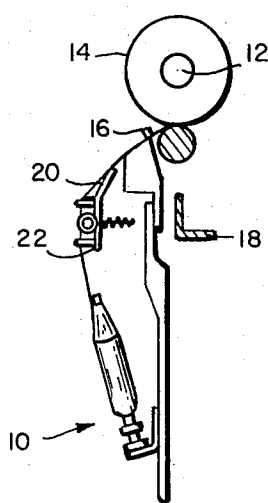


FIG. 1

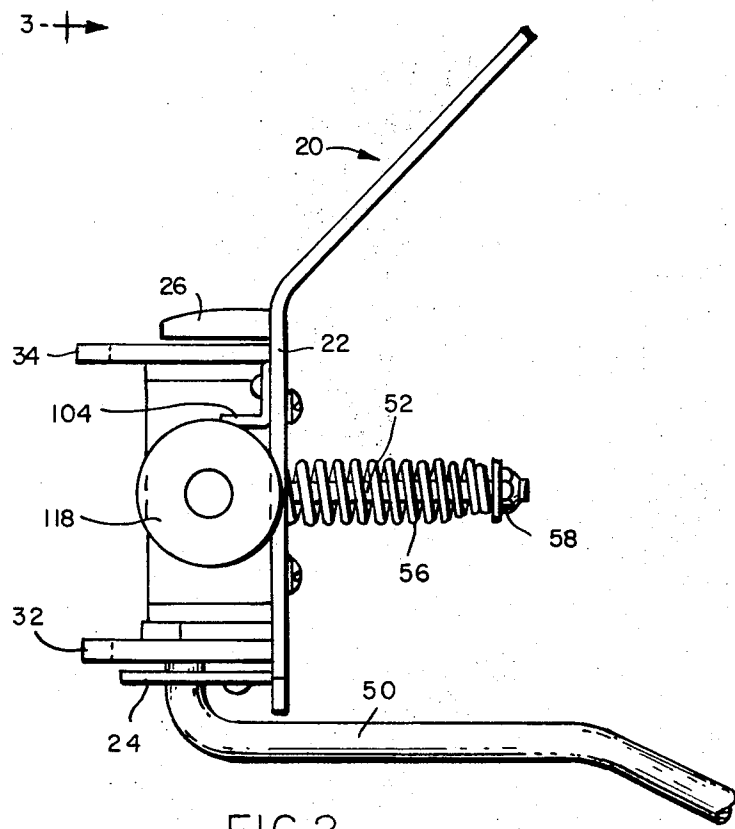


FIG. 2

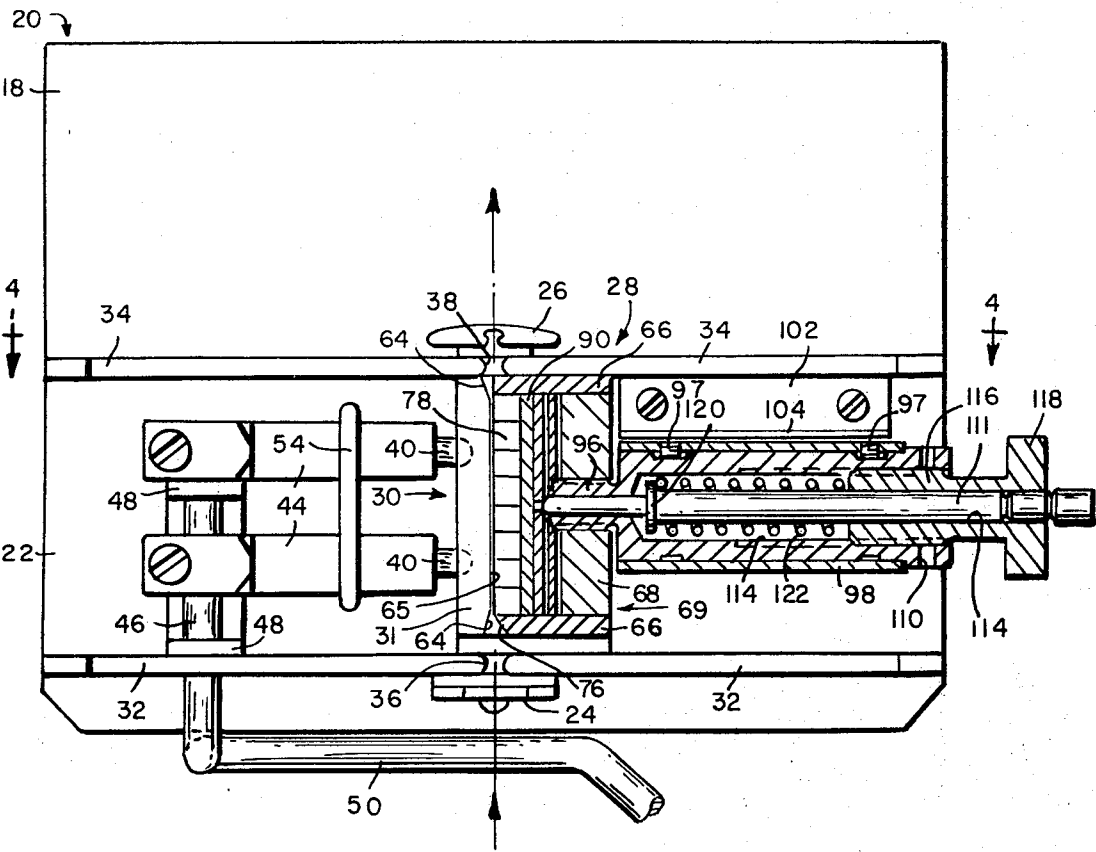


FIG. 3

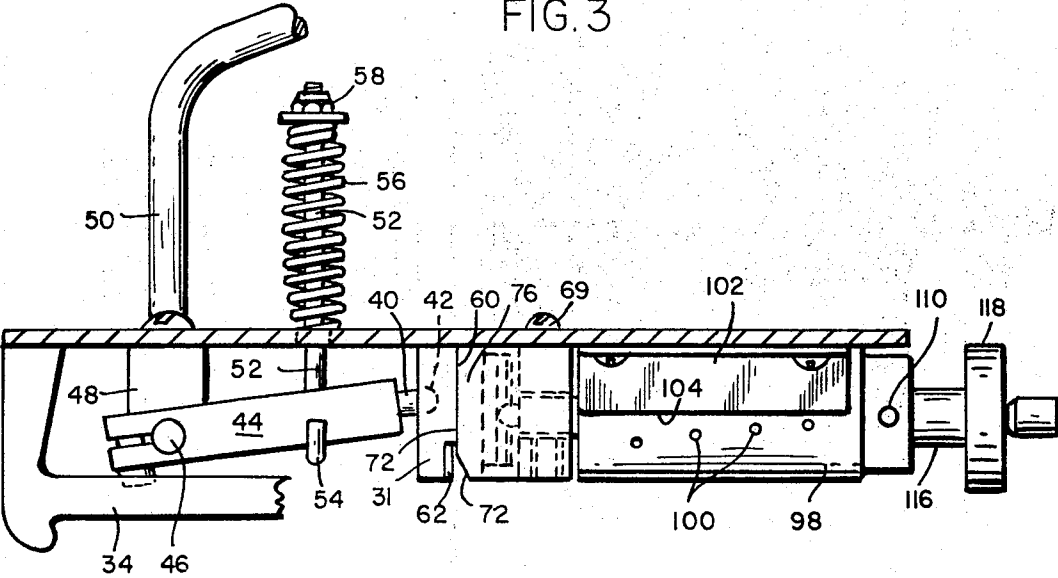


FIG. 4

COMBINATION TENSION CONTROL AND SLUB CATCHING DEVICE

BACKGROUND OF THE INVENTION

Yarn tensioning devices and slub catchers are conventionally independently operable instrumentalities which operate in succession on a yarn travelling from one operation to another as disclosed in my U.S. Pat. Nos. 2,623,265, 3,254,388, 3,461,520, 3,501,820 and 3,543,357 and others. The purpose of this invention is to combine tensioning and slub detection in one instrumentality in such a way as to maintain tension in the yarn while at the same time effectively detecting the presence of a slub or enlargement and to keep control of the yarn constantly in contrast, for example, to the disc-type tensioning device wherein passage of a slub between the discs opens them, thus temporarily losing control of the yarn; to provide for control over a substantially greater distance than is possible with the disc-type tensioning device; and to minimize the effect of inertia characteristics of the disc-type tensioning device which frequently brings about breakage of yarn. Additionally, by combining a slub catching and tensioning in one unit greater fan length is available without increasing the height of the machine, thus insuring tracking when winding large packages.

SUMMARY

As herein illustrated, the combined slub catcher and yarn tensioning device comprises opposed fixed and movable members embodying opposed surfaces arranged to engage the opposite sides of a running yarn, means yieldably supporting the movable member in engagement with the fixed member, means on the fixed member yieldably urged toward the movable member such as to apply frictional resistance to movement of the running yarn, said means being displaceable by entrance of an enlargement between the fixed and movable members, and means for limiting displacement of said means relative to the fixed and movable members.

The invention will now be described in greater detail with reference to the accompanying drawings, wherein:

FIG. 1 diagrammatically illustrates the combination slub catcher and yarn tensioning device mounted on the apron of a winding machine provided with a single winding head or multiple winding heads;

FIG. 2 is an enlarged elevation of the device as seen from one side mounted on the apron of the winding machine;

FIG. 3 is an elevation as seen in the direction of the arrows 3—3 of FIG. 2;

FIG. 4 is a plan view taken on the line 4—4 of FIG. 3;

FIG. 5 is a fragmentary view, partly in section and to larger scale, of the righthand portion of FIG. 3;

FIG. 6 is a fragmentary view to the same scale as shown in FIG. 5 taken at right angles thereto; and

FIG. 7 is a perspective view of the rigid plate which constitutes the movable side of the yarn passage.

The invention, as herein illustrated, may be used in conjunction with winding machines in which the winding units are stationary, as shown in U.S. Pat. No. 2,277,574, or travelling, as shown in U.S. Pat. No. 2,266,726, and in particular to winding machines provided with winding heads of fixed or movable type embodying (FIG. 1) a spindle 10 for holding a yarn mass from which yarn is to be unwound; a spindle 12 upon

which the yarn is to be wound in the form of a package 14; and a yarn traversing device 16 for laying the yarn upon the package. Such an arrangement is shown in U.S. Pat. No. 2,623,265 and in this particular instance the head travels continuously along a rail 18. In this machine the yarn travels upwardly from the spindle 10 through a tensioning device, through a slub catcher and over an upwardly inclined apron 20 through the traversing device onto the package, the apron supporting the tensioning device and slub catcher.

In accordance with this invention the tensioning device and slub catcher supported by the apron are replaced by a combination slub catcher and tensioning device wherein the tensioning is incorporated in the slub catcher device and wherein the latter is of the kind disclosed in the several patents referred to above in such a manner as to be particularly adapted for a multi-head machine and for automatic adjustment of the slub catcher opening, as disclosed in U.S. Pat. No. 3,501,820.

Referring specifically to FIGS. 2 to 6, the combination device is shown mounted to the vertical portion 22 of the apron 20 between a yarn hook 24 and a porcelain yarn guide 26 (FIG. 2). The device comprises fixed and movable parts 28 and 30 (FIG. 3) supported in confronting relation with each other,—at their lower ends by a shelf member 32 secured to the apron and projecting horizontally forward therefrom and at their upper ends by a cover member 34 secured to the apron and projecting horizontally forward therefrom parallel to the shelf member 32. Both the shelf and the cover contain, respectively, yarn passages 36 and 38 which are in alignment with the yarn hook and the porcelain guide. The fixed member 28 is fastened by screw bolts at its lower end to the shelf and at its upper end to the cover and the movable member 30 is slidable forwardly and rearwardly with respect to the fixed member while being yieldably held engaged therewith by spring-pressed plungers 40—40 (FIG. 3). The spring-pressed plungers 40—40 are supported with their ends engaged within openings 42—42 in the movable member, the latter comprising, as shown, a substantially flat, rectangular plate 31, by a pair of sleeve members 44—44 mounted on and clamped to a vertically disposed spindle 46 supported in a vertical position parallel to the face of the apron 22 in forwardly projecting bearing members 48—48. The spindle 46 extends downwardly through the shelf 32 and has at its lower end a laterally and rearwardly extending arm 50 by means of which it may be rotated to move the sleeves forwardly and in turn to move the movable member 30 forwardly relative to the fixed member. Such movement is for the purpose of clearing the device of accumulated fragments of yarn. The movable member 30 is normally held in operative position, as shown in FIG. 4, engaged with the apron by a rod 52 mounted at the rear side of the apron and extending forwardly through an aperture therein which has on it a pair of hooks 54—54 engaged, respectively, with the sleeves 44—44. A spring 56 is mounted on the rod rearwardly of the apron and is confined between the rear side of the apron and a nut 58 screwed onto the distal end thereof for yieldingly holding the sleeves 44—44 in a position such that the movable member is retained in its operative position. Springs (not shown) mounted within the sleeves 44—44 hold the plungers extended in engagement with the movable member.

The movable member 30, as related above, comprises a rigid plate 31 (FIG. 7) which has at the side confronting the fixed member a flat surface 61 and a stepped or recess surface 63 which extends from bottom to top, the depth of which is determined by the size of the yarn being slubbed. Different members will be employed for different diameter yarns. The opposite ends of the recess surface 63 are beveled at 64—64. The recessed surface 63 is parallel to the acting surface of the fixed member and in conjunction therewith provides a vertically disposed yarn passage 65 between the fixed and movable members.

The fixed member 28 (FIGS. 3 and 5) comprises a pair of vertically spaced parallel plate members 66—66 which project forwardly from the apron between which there is mounted a block 68, the latter being fixed to the apron by screw bolts 69 (FIG. 6). Plate members 66—66 and blocks 68 constitute a holder 69 containing a recess 70 confronting the plate 31. The forward corners of the plate member 66—66 are beveled at 72—72 and the lower corner of the lower plate member 66 is beveled at 76. The beveled surfaces permit entrance and exit of the yarn without scuffing and permit enlargements or slubs of permissible size to pass through without such shock as to break the yarn.

Friction engendering means (FIGS. 3, 5 and 6) is mounted in the recess 70 of the holder 69 in the form of an array of independently movable parallel bars 78 arranged edge to edge and extending from the front to rear with their sides 80 engaged with the surface 61 of the rigid plate 31 and the sides 82 confronting the bottom of the recess. The forward sides 80 of the bars 78 form the side of the yarn passage opposite the recessed surface 63 and the forward ends of the bars are beveled at 74. A U-shaped structure 84 (FIGS. 4 and 6) is mounted in the recess 70 behind the bars, that is, between them and the bottom of the recess, with its legs 86—86 engaged with the opposite ends of the bars. A pressure plate 88 is mounted in the recess between the rear sides 82 of the bars and the U-shaped member 84 which has on it a yieldable pad 90, the plate and pad being secured to each other in face-to-face relation by a suitable adhesive.

The block 68 contains a threaded opening 92 centrally thereof in which there is arranged means for effecting movement of the part 84 relative to the bottom of the recess and means for yieldably applying pressure to the pressure plate. The aforesaid means comprises a barrel member 95 provided with a threaded stem 96 rotatably mounted to the block by threaded engagement of the stem 96 with the threaded opening 92. Rotation of the barrel will move the stem 96 longitudinally within the block. The stem extends through the opening 92 into engagement with the back 85 of the part 84 so that rotation of the barrel will move the part 84 relative to the bottom of the recess. The position of the part 84 as determined by adjustment of the barrel will thus limit the extent of displacement of the pressure plate 88 and hence the bars 78 relative to the surface 61 of the rigid plate 31 when enlargements or slubs enter the yarn passage 65 between the fixed and movable members. Thus by limiting the displacement of the bars the device functions as a slub catcher and by adjustment the device can be set to intercept enlargements or slubs of a predetermined size, while allowing slubs of smaller size to pass through. To assist in making the desired adjustment a sleeve 98 is mounted on the barrel on which

there are arranged along a line diverging with respect to the axis of rotation a plurality of spaced index marks 100. A bracket plate 102 is mounted on the apron above the barrel and has on it a straight edge 104 which is parallel to the axis of the barrel. Rotation of the barrel will bring the marks successively into alignment with the straight edge 104. The index marks are so displaced that rotation of the barrel from one index mark to the next into alignment with the straight edge 104 will effect an axial movement of the stem of approximately 0.010 inches. Diametrically disposed openings 110—110 at the distal ends of the barrel provide for inserting an implement for the purpose of effecting its rotation. A set screw 94 is provided for fixing the stem 96 in a predetermined position of adjustment and set screws 97—97 provide for fixing the sleeve 98 in a predetermined position of adjustment on the barrel.

The tension applying means comprises a spindle 111 mounted in an axial passage 114 in the barrel with one end extending through the stem 96 and through the member 84 into engagement with the pressure plate 88. The other end extends from the barrel and is supported therein by a hollow adjusting screw 116 provided with a knurled head 118. The adjusting screw 116 is threaded into the barrel and between its inner end and a flange 120 on the spindle there is mounted a spring 122. By adjusting the screw 116 pressure can be applied by means of the spring 122 to the spindle to cause the latter to exert different degrees of pressure on the pressure plate. The stem has 24 threads per inch and so a quarter turn of the barrel will move the stem axially about 0.010 inches. As thus constructed, the pressure adjustment is in the order of one inch and so is not appreciably affected by the small movement of the barrel as a whole which determines the displacement.

The running yarn when moving through the device is acted on at any time the yarn diameter exceeds the width of the yarn passage between the ground surfaces at the forward ends of the plate and bars. In the absence of slubs or enlargements of a size in excess of that permitted, yarn tension is maintained by the pressure of the bars against the travelling yarn. Slubbing action will take place when the enlargements or slubs exceed the width of the yarn passage between the ground surfaces plus the limit determined by the adjustment of the barrel. Thus if the running yarn has a nominal diameter of 0.010 inches and the yarn passage is 0.005 inches in width, turning the barrel adjustment to allow the bars to open to 0.007 inches will make a total opening of 0.012 inches and rigid slubbing will take place to intercept yarn diameters greater than that or at diameters exceeding the yarn diameter of 0.010 by 0.002 or more inches.

The aforesaid structure has certain advantages, to wit, that as a tensioning device the bars divide the tension so that during the passage of a nib or nub only one bar is affected at a time, the remaining bars remaining in constant engagement with the yarn thus maintaining constant control. This differs from the disc-type tension device where the passage of a nib opens the disc in allowing the nib to pass between them thus losing temporarily control of the yarn. The relatively long travel of the yarn between the confronting surfaces of the plate and bars which is approximately two inches compared to the relatively short travel between the opposed discs of a disc-type tensioning device gives a greater degree of control and greater sensitivity with a

distribution of pressure which is not excessive or liable to break the yarn. It is also evident that the displacement of a single bar at a time by a travelling nib or nub because of its relatively small inertia to movement as compared to a single pressure applying element, is less apt to cause breakage of the yarn.

The device has the further advantage in current yarn processing in which large packages from 6 to 8 inches and 10 inches are employed and wherein a much greater fan length is required to insure tracking in that the reduction in depth by combining the tensioning device and slub catching device reduces the height requirements by approximately 2 inches, thus providing for greater fan length without increasing the height of the machine.

The combination tension and slub control device herein described can be readily adapted to provide for automatic adjustment on a multi-head machine such as shown in U.S. Pat. No. 3,501,820, by mounting levers on the barrels and the screws so as to extend rearwardly from the apron for engagement with cams such as shown in the aforesaid patent as the winding heads travel relative thereto to make the desired adjustments automatically.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. A combination slub catcher and yarn tensioning device comprising opposed members defining a yarn passage, means on one of the members at one side of the passage arranged to be displaced relative to the other side of the passage different amounts to determine the width of the passage according to the permissible slub size, and means yieldably urging said means at any predetermined position of displacement toward the other side of the yarn passage such as to maintain a predetermined tension in the yarn moving through the passage.

2. A combination slub catcher and yarn tensioning device according to claim 1, wherein the other of the opposed members contains a recess of predetermined depth, the bottom of which is spaced from and parallel to the one of the opposed members and constitutes one side of the yarn passage.

3. A combination slub catcher and yarn tensioning device according to claim 1, wherein the other of the opposed members contains a recess in the side confronting the one of the opposed members which extends from the lower end to the upper end in the direction of the yarn travel, the bottom of which is spaced from and parallel to said one of the opposed members and constitutes one side of the yarn passage.

4. A combination slub catcher and yarn tensioning device according to claim 3, wherein said recess is beveled at its lower and upper ends.

5. A combination slub catcher and yarn tensioning device comprising opposed members defining a yarn passage, means on one of the members at one side of the passage arranged to be displaced relative to the other side of the passage different amounts to determine the width of the passage according to the permissible slub size, means yieldably urging said means at any predetermined position of displacement toward the other side of the yarn passage, means for adjusting said means at the one side of the passage for predetermined

different displacements according to permissible slub size, and means for adjusting said means yieldably urging said means at the one side toward the other side to vary the tension in the running yarn according to the tension requirements.

6. A combination slub catcher and yarn tensioning device according to claim 5, wherein said means on the one side of the passage and said means yieldably urging it toward the other side of the yarn passage are separately adjustable.

7. A combination slub catcher and yarn tensioning device according to claim 5, wherein the means on said one side of the yarn passage comprises a plurality of parallel bars arranged edge-to-edge with their surfaces at one side collectively forming said one side of the passage, said bars extending transversely of the course of the yarn and being independently yieldable to displacement to the extent limited by said adjustable means.

8. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining a yarn passage, one of said members embodying fixed and movable parts, said movable parts being movable on the fixed part relative to the confronting side of the other member, means for limiting said movement, and means for yieldably urging said movable parts toward said confronting side of the other member.

9. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining a yarn passage, one of said members embodying fixed and movable parts, a threaded member arranged to limit displacement of the movable parts away from the confronting side of the other member, said threaded member being adjustable to vary the limit of displacement of the movable parts, and spring-pressed means carried by the threaded member, said spring-pressed means being engaged with said movable parts and operating to press said movable parts against the confronting side of said other member.

10. A combination slub catcher and yarn tensioning device according to claim 9, wherein a threaded member is mounted on the screw in engagement with the spring operable to vary the pressure applied by the spring to the spindle.

11. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining a yarn passage, one of said members embodying fixed and movable parts, a positioning member supported in engagement with the movable parts, a screw operable to effect movement of the positioning member relative to the fixed part to determine the limit of displacement of the movable parts relative to the fixed part and the confronting surface of the other member, and a spring-pressed spindle coaxial with the screw supported thereby with an end engaged with the movable parts, said spring-pressed spindle operating to yieldably hold the movable parts engaged with the confronting surface of the other member.

12. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining a yarn passage, one of said members embodying fixed and movable parts, a threaded member arranged to limit displacement of the movable parts away from the confronting surface of the other member, said threaded member being adjustable to vary the limit of displacement of the movable parts, a barrel coaxially with the threaded member, indicia on the sur-

face of the barrel disposed at equal axially spaced intervals therealong and displaced at equal angular intervals peripherally thereof, each angular interval representing a predetermined axial movement of the screw, and a bench mark situated parallel to the axis of the barrel adjacent the surface with which the indicia are adapted to be aligned.

13. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining a yarn passage, one of said members embodying fixed and movable parts, said movable parts being movable on the fixed part relative to the confronting side of the other member, a screw-threaded member arranged to limit displacement of the movable parts relative to the confronting side of the other member, a barrel coaxial with the screw, said barrel having means on its surface cooperable with fixed indicia adjacent the barrel to indicate the extent of rotation of the barrel and hence the axial movement of the screw, said screw and barrel containing an axially extending passage, a spindle mounted in said passage with an end extending therefrom into engagement with the movable parts, a second screw-threaded member threaded into the other end of the passage, and a spring mounted in the passage about the spindle with one end engaged with the screw and the other end engaged with the shoulder on the spindle.

14. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining a yarn passage, one of said members embodying fixed and movable parts, said movable parts being movable on the fixed part relative to the confronting side of the other member, a positioning member supported in engagement with the opposite ends of the parts, a screw operable to effect movement of the positioning member relative to the fixed part to determine the limit of displacement of the movable parts relative to the confronting side of the other member, a pressure applying plate supported in engagement with the parts intermediate the positioning member, a spindle mounted on the screw in coaxial relation thereto, said spindle being movable axially of the screw and having an end extending therefrom into engagement with said pressure-applying plate, and means yieldably pressing the spindle against said pressure-applying plate.

15. A combination slub catcher and yarn tensioning device according to claim 14, comprising means for adjusting the pressure of the spring on said spindle.

16. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining an elongate yarn passage, the yarn-engaging sides of which are long in comparison to the diameter of the yarn, one of said sides comprising a plurality of narrow parallel blades disposed transversely of the path of travel of the yarn; characterized in that there is means associated with the blades which limits their displacement individually and collectively relative to the confronting side of the other member, means yieldably applying pressure to the blades collectively to press them into engagement with the confronting side of the other member, and means permitting each blade to yield within said limit of displacement independently of every other blade.

17. A combination slub catcher and yarn tensioning device according to claim 16, wherein the means which limits displacement of the blades comprises a position-

ing member disposed in engagement with the opposite ends of the blades and a threaded member mounted on said member in engagement with the positioning member operable to effect movement of the positioning member relative to said member.

18. A combination slub catcher and yarn tensioning device according to claim 16, wherein the means yieldably applying pressure to the blades collectively to press them into engagement with the confronting side of the other member comprises a pressure-applying plate disposed in engagement with the blades, a spring-pressed spindle supported with an end in engagement with the pressure-applying plate and means for adjusting the compression of the spring.

19. A combination slub catcher and yarn tensioning device according to claim 16, wherein the means permitting each blade to yield within said limited displacement independently of every other blade comprises a pressure-applying plate and a yieldable pad affixed to the plate and to which the blades are affixed.

20. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining an elongate yarn passage, the yarn engaging sides of which are long in comparison to the dimension of the yarn, the side of one of said members comprising a plurality of narrow parallel blades disposed transversely of the path of travel of the yarn, a positioning member disposed in engagement with the opposite ends of the blades, a threaded member mounted on said one member in engagement with the positioning member operating to effect movement of the positioning member relative to said one member, said positioning member and threaded member being operable to limit displacement of the blades individually and collectively relative to the confronting side of the other of said members, a pressure-applying plate mounted in engagement with the blades intermediate their ends, a spindle yieldably supported on the threaded member in engagement with said pressure-applying plate, and means for adjusting the pressure on the spring, said pressure-applying plate, spindle and spring operating to apply pressure to the blades collectively to press them into engagement with the confronting side of said other member, and a yieldable member on the pressure-applying member situated between the pressure-applying member and the blades which permits displacement of the blades individually within said limit of displacement independently of each other.

21. A combination slub catcher and yarn tensioning device comprising opposed members having confronting sides defining an elongate yarn passage, the yarn engaging side of one of said members comprising a plurality of narrow members defining surfaces which are relatively short in the direction of travel of the yarn through the passage, each of said narrow members being limited as to displacement relative to the yarn-engaging side of the other of said members, spring-pressed toward said other of said members and yieldable within the limits imposed by said spring-pressure applied thereto.

22. A combination slub catcher and yarn tensioning device comprising opposed fixed and movable members having confronting sides defining an elongate yarn passage, means yieldably applying pressure to the movable member such as to hold the movable member against the fixed member, the yarn-engaging side of the fixed member embodying a movable means supported

thereon for movement relative to the yarn-engaging side of the movable member, an adjustable positioning member operably engaged with the movable means for limiting its displacement relative to the movable member, a spring-pressed member operatively engaged with the movable means pressing it against the movable member, and means yieldably supporting the movable means.

23. A combination slub catcher and yarn tensioning device comprising opposed members, one of which contains a recess of predetermined depth confronting the other and the other of which is comprised of an array of parallel bars disposed transversely of the direc-

tion of the yarn travel with the surfaces at one side confronting the bottom of the recess and forming in conjunction with the bottom of the recess a yarn passage of a predetermined width, means yieldably urging said bars at any predetermined position at the one side of the yarn passage toward the other side of the yarn passage such as to maintain a predetermined tension in the yarn moving through the passage, and means for controlling displacement of said bars at the one side of the passage relative to the other side of the passage different amounts to determine the width of the passage according to the permissible slub size.

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