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DRAWINGS ATTACHED

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(54) IMPROVED STUFFER CRIMPER

(71) We, JOSEPH BANCROFT & SONS Co., a Corporation organised and existing under the laws of the State of Delaware, United States of America, of P.O. Box 245, Wilmington, Delaware 19889, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to stuffer crimpers and in its preferred form to an improved stuffer crimper which is capable of operating at high temperatures such as the temperatures required for crimping glass, quartz, or ceramic fibres.

According to the present invention there is provided a stuffer crimper comprising a chamber having a saddle, a pair of feed rolls mounted to feed filaments into said saddle, a sliding support at one side of the chamber, a fixed stop adjacent said saddle to position the saddle with respect to the feed rolls, a spring holding said saddle against said stop and adapted to permit sliding movement of said chamber along said sliding support to accommodate longitudinal expansion thereof, and resilient means engaging the other side of said chamber for holding said chamber in engagement with said sliding support while permitting expansion of said chamber in a transverse direction.

The features of the invention will be better understood from the following description, taken in connection with the following description of a specific embodiment which has been set forth merely for purposes of illustration. Reference will be made to the accompanying drawings in which:

Figure 1 is a plan view, with parts broken away, showing a crimping apparatus embodying the present invention;

Figure 2 is a longitudinal section taken on the line II—II of Figure 1;

Figure 3 is a perspective view of the feed rolls and the drive mechanism;

Figure 4 is a section taken on the line IV—IV of Figure 2;

Figure 5 is a section taken on the line V—V of Figure 1;

Figure 6 is a transverse section taken on the line VI—VI of Figure 1; and

Figure 7 is a transverse section taken on the line VII—VII of Figure 2.

Referring to the drawings in more detail, there is shown a stuffer crimper having a crimping chamber 10 and feed rolls 11 and 12 positioned to feed a yarn 13 into one end of the crimping chamber 10 for crimping therewithin. The crimping chamber 10 is formed in two halves 14 which are held together by screws 15. The chamber is shown as being rectangular in cross-section, having flat sides 16 and top and bottom arcuate walls 17 and 18 respectively as shown in Figure 7. The side walls 16 are cut away at their inlet ends shown in Figure 4 to form a saddle 19 having arcuate faces 20 which register and have adjustable clearance with the peripheries of the feed rolls 11 and 12. Figure 2 shows more clearly that the top and bottom walls 17 and 18, have surfaces 21 extending over a portion of the flat end surfaces of the feed rolls 11 and 12 to form with the side walls 16 edges of the saddle 19.

The apparatus is mounted in a bracket arrangement comprising upper and lower plates 25 and 26 respectively which are connected and supported by vertical plates 27. The bottom outer surface of the chamber 10 comprising the two halves 14 is formed with a longitudinal V-shaped groove 31 (Figures 2 and 7) which accommodates a rod 32 carried in a similar groove 33 in the top of a bar 34 slidable vertically and restrained against horizontal movement by means of a pair of spaced pins 35 and 36 which extend upwardly from the lower plate 26 through suitable apertures in the bar 34. The pins 35 and 36 are spaced apart to engage the ends of the rod 32 for preventing longitudinal movement thereof. An adjusting screw 37 in the lower plate 26 engages the bottom of the bar 34 for effecting movement vertically and thus adjusting the positioning of the crimping

chamber 10 axially of the feed rolls 11 and 12.

5 The pin 35 enters a groove 41 in the bottom surface of the chamber walls 14 which groove extends inwardly from the saddle 19 and terminates in a shoulder 42 forming a stop to position the saddle. A similar pin 43 carried by the upper plate 25 engages a groove 44 on the top surface of the unit comprising 10 the two halves 14 of the crimping chamber 10, and a spring-pressed pin 45 mounted in the upper plate 25 holds the chamber 10 in position against the bar 34 while permitting vertical adjustment of the position of the 15 chamber 10 as well as allowing expansion and contraction of its vertical dimensions.

A bracket member 14a (Figure 1) is fixed to each vertical side 16 of the crimper and screws 46 carrying coaxially arranged helical 20 compression springs 47 pass through holes in each bracket leg 14b of an associated one of the brackets 14a and are threadedly received in plate members 27d fixed to the vertical frame members 27. The springs 47 are located 25 between the head portions of each screw 46 and the associated bracket legs 14b. The chamber is thus urged leftwardly against the locating pins 35 and 43 (Figure 2) so that a fixed clearance is maintained between the 30 cylindrical surfaces of the feed rolls 11 and 12 and the concave cylindrical faces 20 of the chamber while allowing longitudinal expansion and contraction of the chamber.

35 Figure 6 shows the feed roll 11 as being mounted on a shaft 51 which is journaled eccentrically in upper and lower bearing housings 52 and 53 respectively, received in the upper and lower plates 25 and 26. The 40 eccentric bearing housings are adapted to be rotatably adjusted for positioning the feed roll clearance with the cylindrical faces 20 of the saddle 19. The lower end of the shaft 51 is formed with a shoulder 54 which is held against a ball bearing assembly 53a by means 45 of a spring 55 in the upper housing 52 and thus expansion and contraction of the feed roll is permitted and also bearing chatter is reduced. Similarly, the feed roll 12 is carried on a shaft 56 journaled eccentrically in bearing 50 housings 57 and 58 and thus both feed rolls 11 and 12 can be adjusted to effect the desired clearance with the faces 20 of the saddle 19 by suitable rotation of the eccentric bearing housings 52, 53, 57 and 58.

55 As shown in Figure 5, the longitudinal axis of the feed roll 12 is adjusted so that a parallel relationship between it and the longitudinal axis of the non-adjustable feed roll is maintained by positioning arms 61 and 62 so that 60 shaft 56 carried in bearing housings 57 and 58 is parallel to shaft 51. The arms 61 and 62 are fixed in position after suitable adjustment for parallelism by lock nuts 69a on the ends of a stabilising bar 66 the ends of which

bar extend through oversized apertures 68 in 65 the arms 61 and 62.

The feed roll 12 is pivotally mounted with respect to the feed roll 11 by means of a rod 63 in brackets 65 (Figure 6) carried by the 70 upper and lower plates 25 and 26.

The entire yoke assembly comprising arms 61 and 62, pivot rod 63, stabilising bar 66 and feed roll 12, is also adjustable vertically with respect to feed roll 11 so that the ends 75 of feed roll 12 may be aligned with the ends of feed roll 11. For this purpose, as shown in Figure 5, both ends 63a of pivot rod 63 are journaled in axially movable bearings 63b located in bores in bracket portions 65a and 80 65b of the upper and lower brackets 65. The lower bearing is adjustably positioned along its axis by a set screw 67 which is threaded into an end cap 67a secured to bracket portion 65b of the lower bracket 65. A 85 bearing cap 67b is slidably disposed between the outer ring of the lower bearing 63b and set screw 67 so that as the position of the set screw is adjusted in the end cap 67a it will contact the bearing cap 67b and thus move the entire yoke assembly 90 in a direction such that the upper lateral surfaces 11a and 12a of the feed rolls 11 and 12 will then be axially aligned as shown in Figure 5.

95 Thermal expansion in the longitudinal direction of the feed rolls 11 and 12 and the pivot rod 63 is permitted by the spring assemblies contained within eccentric housings 52 and 57 and also in the housing 57a, the latter being positioned in axial alignment 100 with rod 63 and mounted on the upper bracket portion 65a. The mechanisms associated with housings 52 and 57 are substantially identical.

A bearing cap 57b, similar to the cap 67b, 105 is located within a bore in the upper bearing portion 65a. A threaded centre shaft 57c is fixed to the cap 57b and extends freely through a bore in a threaded end closure 57d. A disc member 57e is slidably mounted on 110 the centre shaft 57c and provides a bearing surface for one end of a helical compression spring 57f.

In operation the spring 57f is compressed by 115 threadedly moving the end closure 57d toward disc member 57e thus varying the end pressure on the shaft 63, this pressure keeping the yoke assembly in proper alignment as described above. When the crimper reaches 120 temperatures which produce expansion in the shafts 51, 56 and 63, the upper bearings contained in these shafts will slide within their respective bores and, through the bearing caps and discs, will compress the springs so that the thermal expansion will not warp the 125 associated frame elements.

As shown in Figure 3, the shaft 56 carrying the movable feed roll 12 has a gear 56a meshing with a gear 70 on a stub shaft 71.

The shaft 71 is rotated in such a sense and the point of meshing is so disposed with respect to the axes of shafts 51, 56 and 71 that a moment is produced which urges the feed roll 12 into engagement with the feed roll 11, thereby holding the feed rolls in pressure-engagement during operation. A cord 73 (Figure 1) anchored to the movable arm 61 by a bracket 61a has a weight (not shown) attached thereto for biasing the feed rolls together.

The shaft 51 of the feed roll 11 carries a gear 77 (Figure 3) meshing with a gear 78 on a drive shaft 79 which also carries a gear 80 meshing with a gear 81 on the stub shaft 71. The drive shaft 79 is driven by suitable means such as a motor (not shown). The arrangement is such that the feed rolls 11 and 12 are driven at a 1:1 ratio in the direction to feed the yarn 13 into the crimping chamber 10.

The yarn 13 is fed to the nip of the feed rolls by an eye 82 mounted on a traverse block 83 which slides on guide rods 84 and is caused to move in a traversing sense by a traverse roll 85 having a traverse groove 86. The traverse roll 85 is mounted on a shaft 87 which is driven by suitable means (not shown).

As shown in Figure 2, the traverse roll support shaft 87 and the traverse block guide rods 84 are mounted in an adjustable bracket 27a comprising upper and lower plates 25a and 26a which are connected to and supported by a vertical plate 27b.

Figure 1 shows that the bracket 27a is adjustably fixed to the vertical side plate 27 through a Z-shaped brace 88 fixed at its one end to the plate 27 by screws 89a, and at its opposite end to the plate 27b by bolts 89b which project through elongated slots 89c in the brace 88 and thread into plate 27b. Adjustment in the direction of arrow 27c (Figure 1) will adjust the spacing of the eye 82 from the nip of the feed rolls 11 and 12 so as to vary the throw or lateral spread of the yarn in its traverse along the feed rolls 11 and 12.

Two side plates 90 (Figure 2) are disposed at the discharge end of the chamber 10 and extend rearwardly through an opening 91 in a plate 92 which is mounted on brackets 93 attached to the upper and lower plates 25 and 26. A bottom spring plate 97 extends rearwardly between the plates 90 to support the core of crimped yarn discharged from the end of the chamber 10 and carries an arm 98 which is adapted to actuate a control switch 99 for controlling the operation of either the feed-roll-drive motor or the drive motor of a suitable take-up or winder mechanism so as to maintain the discharge end of the core of crimped yarn at a substantially constant location. A second or upper plate 100 is

pivotaly mounted between the side plates 90 and extends rearwardly therebetween to rest on the top of the core for holding the core compacted and resting on the bottom spring plate 97. The crimped yarn is extracted from the core onto a winder or other suitable take-up means (not shown).

The above described apparatus is designed for use at high temperatures and suitable means may be provided for heating the crimping chamber 10 to the temperature required to soften and anneal filaments of materials, such as glass, which are to be crimped therein. Such filaments may, if desired, be preheated to a temperature just below their softening point so as to minimize their tendency to break during the crimping operation. They remain in the chamber 10 for a sufficiently long time for annealing to take place so as to reduce the strains which may have been developed at the crimp angles. After discharge from the chamber 10 and during their travel between the discharge plates 90 the filaments are cooled to a temperature such that the crimp is permanently set in the filaments and is not removed by winding the filaments under tension. When the tension is released the crimp will reform as the filaments tend to return to the form in which they were annealed.

While the apparatus has been shown and described as particularly adapted for the treatment of yarns or filaments at high temperatures it is obvious that various features thereof may be used in crimping apparatus which is operated at lower temperatures and that the apparatus may be mounted to feed the filaments vertically or in directions other than horizontal as shown.

Various aspects of the stuffer crimper described above have also been described and claimed in our co-pending British Patent Applications Nos. 44001/71 (Serial No. 1268884) and 44002/71 (Serial No. 1268885).

WHAT WE CLAIM IS:—

1. A stuffer crimper comprising a chamber having a saddle, a pair of feed rolls mounted to feed filaments into said saddle, a sliding support at one side of the chamber, a fixed stop adjacent said saddle to position the saddle with respect to the feed rolls, a spring holding said saddle against said stop and adapted to permit sliding movement of said chamber along said sliding support to accommodate longitudinal expansion thereof, and resilient means engaging the other side of said chamber for holding said chamber in engagement with said sliding support while permitting expansion of said chamber in a transverse direction.

2. A stuffer crimper according to claim 1, and including members supporting a core of the filaments upon discharge from said



The shaft 71 is rotated in such a sense and the point of meshing is so disposed with respect to the axes of shafts 51, 56 and 71 that a moment is produced which urges the feed roll 12 into engagement with the feed roll 11, thereby holding the feed rolls in pressure-engagement during operation. A cord 73 (Figure 1) anchored to the movable arm 61 by a bracket 61a has a weight (not shown) attached thereto for biasing the feed rolls together.

The shaft 51 of the feed roll 11 carries a gear 77 (Figure 3) meshing with a gear 78 on a drive shaft 79 which also carries a gear 80 meshing with a gear 81 on the stub shaft 71. The drive shaft 79 is driven by suitable means such as a motor (not shown). The arrangement is such that the feed rolls 11 and 12 are driven at a 1:1 ratio in the direction to feed the yarn 13 into the crimping chamber 10.

The yarn 13 is fed to the nip of the feed rolls by an eye 82 mounted on a traverse block 83 which slides on guide rods 84 and is caused to move in a traversing sense by a traverse roll 85 having a traverse groove 86. The traverse roll 85 is mounted on a shaft 87 which is driven by suitable means (not shown).

As shown in Figure 2, the traverse roll support shaft 87 and the traverse block guide rods 84 are mounted in an adjustable bracket 27a comprising upper and lower plates 25a and 26a which are connected to and supported by a vertical plate 27b.

Figure 1 shows that the bracket 27a is adjustably fixed to the vertical side plate 27 through a Z-shaped brace 88 fixed at its one end to the plate 27 by screws 89a, and at its opposite end to the plate 27b by bolts 89b which project through elongated slots 89c in the brace 88 and thread into plate 27b. Adjustment in the direction of arrow 27c (Figure 1) will adjust the spacing of the eye 82 from the nip of the feed rolls 11 and 12 so as to vary the throw or lateral spread of the yarn in its traverse along the feed rolls 11 and 12.

Two side plates 90 (Figure 2) are disposed at the discharge end of the chamber 10 and extend rearwardly through an opening 91 in a plate 92 which is mounted on brackets 93 attached to the upper and lower plates 25 and 26. A bottom spring plate 97 extends rearwardly between the plates 90 to support the core of crimped yarn discharged from the end of the chamber 10 and carries an arm 98 which is adapted to actuate a control switch 99 for controlling the operation of either the feed-roll-drive motor or the drive motor of a suitable take-up or winder mechanism so as to maintain the discharge end of the core of crimped yarn at a substantially constant location. A second or upper plate 100 is

pivotaly mounted between the side plates 90 and extends rearwardly therebetween to rest on the top of the core for holding the core compacted and resting on the bottom spring plate 97. The crimped yarn is extracted from the core onto a winder or other suitable take-up means (not shown).

The above described apparatus is designed for use at high temperatures and suitable means may be provided for heating the crimping chamber 10 to the temperature required to soften and anneal filaments of materials, such as glass, which are to be crimped therein. Such filaments may, if desired, be preheated to a temperature just below their softening point so as to minimize their tendency to break during the crimping operation. They remain in the chamber 10 for a sufficiently long time for annealing to take place so as to reduce the strains which may have been developed at the crimp angles. After discharge from the chamber 10 and during their travel between the discharge plates 90 the filaments are cooled to a temperature such that the crimp is permanently set in the filaments and is not removed by winding the filaments under tension. When the tension is released the crimp will reform as the filaments tend to return to the form in which they were annealed.

While the apparatus has been shown and described as particularly adapted for the treatment of yarns or filaments at high temperatures it is obvious that various features thereof may be used in crimping apparatus which is operated at lower temperatures and that the apparatus may be mounted to feed the filaments vertically or in directions other than horizontal as shown.

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WHAT WE CLAIM IS:—

1. A stuffer crimper comprising a chamber having a saddle, a pair of feed rolls mounted to feed filaments into said saddle, a sliding support at one side of the chamber, a fixed stop adjacent said saddle to position the saddle with respect to the feed rolls, a spring holding said saddle against said stop and adapted to permit sliding movement of said chamber along said sliding support to accommodate longitudinal expansion thereof, and resilient means engaging the other side of said chamber for holding said chamber in engagement with said sliding support while permitting expansion of said chamber in a transverse direction.

2. A stuffer crimper according to claim 1, and including members supporting a core of the filaments upon discharge from said

5 crimping chamber and providing a cooling zone therefor; and feeler means actuated by one of said members to control the relative rates of feed and withdrawal in a sense to maintain the discharge end of said core at a substantially constant location.

10 3. A stuffer crimper according to claim 1 or 2, and including an adjuster for adjusting the position of said chamber axially of the feed rolls.

15 4. A stuffer crimper according to claim 3, wherein one of said feed rolls is mounted on a pivotable bracket, and in that a further adjuster is provided for adjusting the axial position of the one roll, whereby the adjusters enable alignment of the roll with the saddle.

20 5. A stuffer crimper according to claim 1, wherein the shaft carrying at least one of the feed rolls is journaled in bearings which are eccentrically mounted within rotatable housings whereby rotation of the housings enables adjustment of the relative position of the feed rolls with respect to said saddle.

25 6. A stuffer crimper according to any one of the preceding claims, wherein a bracket carries the bearing elements of one of the feed roll shafts for swinging movement in

a direction to vary the spacing between said feed rolls.

7. A stuffer crimper according to claim 6 when appendant to claim 3 or 4, wherein the first mentioned adjuster comprises means for adjusting the bracket in a direction axially of the feed rolls to bring the ends of the feed rolls into alignment.

8. A stuffer crimper according to claim 6 or claim 7, wherein said bracket includes a pair of pivoted arms disposed at opposite ends of the movable roll for supporting the associated shaft, means being provided for clamping said arms together for movement in unison, and an adjustment mechanism being provided to vary the relative positions of said arms to adjust the parallelism of said rolls.

9. A stuffer crimper constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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