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STRAND-CRIMPING APPARATUS

Filed May 13, 1959

Fig. 1.

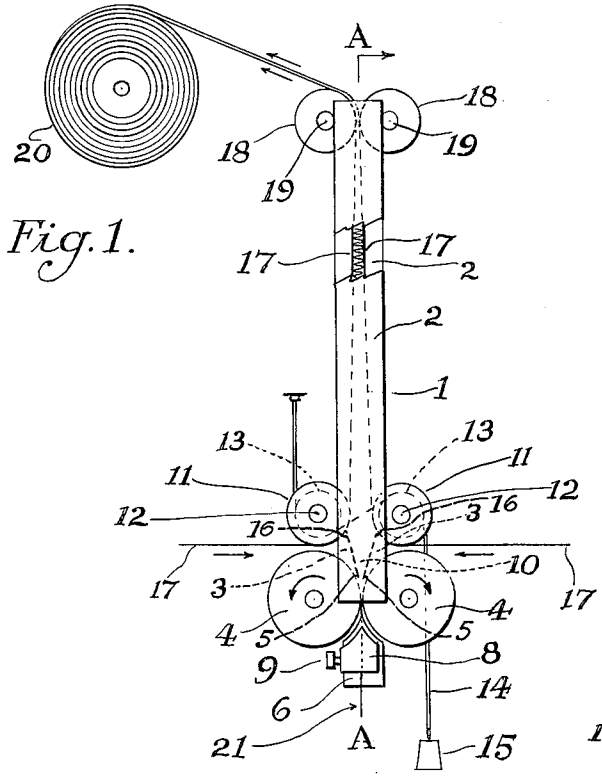


Fig. 2.

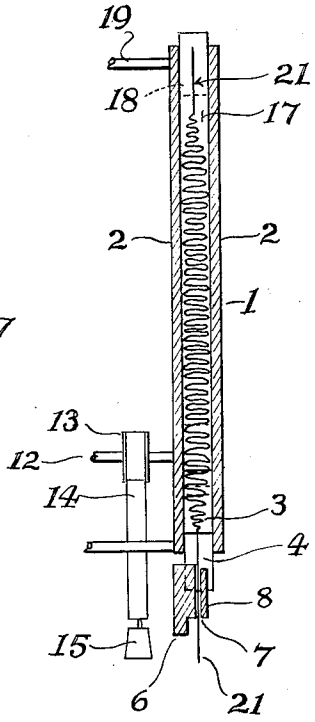
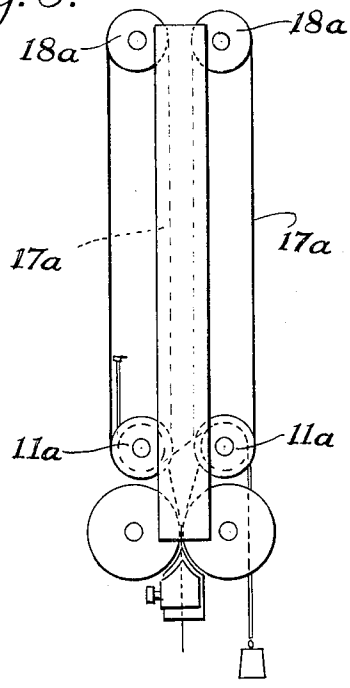


Fig. 3.



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STRAND-CRIMPING APPARATUS

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This invention relates to the crimping of continuous strands of textile fibers so that yarn produced therefrom will be bulky and soft, and have improved hand.

More particularly, the present invention is directed to an improvement in stuffer-crimping apparatus of the type disclosed in application Serial No. 624,613, filed November 27, 1956, and issued April 3, 1962 as Patent 3,027,619. In the operation of such a stuffer-crimper a strand is crimped by feeding it on the run into and past a region of confinement, applying independently of the feeding rate an impeding force at a certain location relative to the confining region to accumulate the strand continuously therein during its passage therethrough, and releasing the leading terminal portion of the strand accumulation continuously and substantially uniformly from the applied impeding force while the following confined portions of the strand accumulation are maintained bunched together by the impeding force.

In such operation some tension is necessarily applied to the crimped strand in withdrawing it from the region of confinement and winding it up, although this tension is much less than that employed in other conventional stuffer-crimping devices in which a hinged or reciprocable obstruction is employed to impede the passage of the strand and in which a dragging withdrawal is imposed on the strand that is so great as to impair or lessen the acquired crimp.

A principal object of the present invention is to minimize, if not altogether eliminate, the tension and drag applied to the crimped strand in withdrawing it from the region of confinement in a stuffer-crimper and winding it up, so as to preserve the crimp which has been imposed upon it and thus prevent the acquired crimp from being impaired or lessened.

Other objects of the invention, as well as benefits and advantages of practicing it, will be apparent from the following description and the accompanying drawing illustrating two forms of apparatus which may be employed.

In the drawing:

FIG. 1 is a front view (partly broken away) of one form of apparatus according to the present invention;

FIG. 2 is a vertical section from the line AA of FIG. 1; and

FIG. 3 is a front view (partly broken away) of another form of apparatus of this invention.

In general, the objects of the present invention are accomplished, in a stuffer-crimper comprising a crimping chamber having a passage therethrough from the entrance to the exit thereof and means for feeding a strand into the entrance of the passage, by means of opposed rotatable wheel-like impeding elements mounted a fixed distance from the entrance to the crimping chamber and projecting into and intercepting the passage to accumulate and crimp the strand, means for frictionally retarding the rotation of the impeding elements, the rotatable elements being movable by the adjacent strand accumulation, withdrawing means for forwarding the strand accumulation toward the chamber exit while maintaining its crimped condition, the withdrawing means including bands engaged and movable with the respective impeding elements in the direction of the movement of the strand accumulation through the passage, and means adjacent the exit end of the passage for supporting the bands.

One form of apparatus according to this invention is illustrated in FIGS. 1 and 2 of the drawing. In such views **1** designates a hollow member having a chamber or passage extending therethrough for receiving a textile strand. This hollow member has front and rear walls **2** and side walls **3**, the side walls being relatively short compared to the vertical extent of the front and rear walls. At the lower end of the member is a pair of feed rolls **4** which are suitably mounted for rotation in the direction shown by the arrows (in FIG. 1) and driven by suitable means (not shown). The feed rolls are located just below the sides walls **3**, the lower ends of which converge, as indicated at **5**, toward and terminate adjacent the nip of the feed rolls so as to provide a saddle like opening at the inlet end of the hollow member. The lower ends of the front and rear walls extend downwardly beyond the side walls and on either side of the feed rolls and across the nip thereof. Below the feed rolls is an infeed guide **6** which is preferably tapered to extend upward toward the nip of the feed rolls and is provided in one face with a groove **7** to receive a strand fed to the nip of the rolls and crimped. Extending over and closing the groove is a face plate **8** movably secured to the infeed guide, as by a screw **9**, so that the face plate can be readily removed to insert a strand in the groove **7** preliminary to introducing the strand between the nip of the rolls.

The inner faces of the side walls **3** preferably diverge slightly in an upward direction to provide in the lower portion of the hollow member an upwardly flared throat **10** which constitutes the actual crimping chamber. At the upper ends of the side walls there is mounted a pair of opposed wheel-like impeding elements **11** which intercept the chamber through the hollow member just above the throat to impede the passage of the strand therethrough, these wheel-like elements being carried by shafts **12** rotatably supported in suitable mountings (not shown). Each shaft is also provided with a pulley **13**. A belt **14** is fixed at one end and passes around one of the pulleys **13** and then partly around the other pulley, with a weight **15** attached to its free end. The belt thus provides a frictional resistance to the rotation of the shafts **12** and hence to the rotation of the wheel-like impeding elements **11**.

The upper end of each side wall **3** is of arcuate form, as indicated at **16**, to conform to the curvature of the corresponding wheel-like impeding element **11** and is slightly spaced therefrom in order to accommodate an endless band **17** (preferably in the form of a tape of woven material) which is led between the upper end of each side wall and the corresponding wheel-like impeding element and passes partly around such impeding element and then upwardly between the front and rear walls of the hollow member to the exit end thereof where it is engaged in the nip of a pair of band supporting rolls **18** which are supported for free rotation on shafts **19** mounted in suitable bearings (not shown).

The bands **17** have a non-slipping contact with their respective wheel-like impeding elements so as to move therewith as the impeding elements are rotated in the direction of the passage of the strand through the hollow member and against the frictional resistance provided by the pulleys **13** and the weighted belt **14**. The periphery of each impeding element and the adjacent surface of its band may be roughened or otherwise treated, if desired, to insure such a non-slipping contact. The bands thus move upwardly toward the exit end of the hollow member and it is to be noted that they converge upwardly as they approach that end and are pressed together in the nip of

the band supporting rolls 18. The bands thus engage the leading portion of the crimped strand as it emerges from the strand accumulation in the throat 10 and is released from the impeding elements 11, and carry the crimped strand upwardly to the exit end of the member 1 with little or no tension on the crimped strand and with a minimum of frictional resistance in its passage through the chamber of the hollow member. As it emerges from the exit of the hollow member the crimped strand is interposed between the two bands 17 and held therebetween as the bands with the interposed crimped strand pass through the nip of the band supporting rolls 18. From the rolls 18 the bands with the interposed strand are led to a suitable takeup mechanism, as by being reeled together on a takeup spool 20.

In this form of apparatus the side walls 3 terminate just below the wheel-like impeding elements 11, being omitted above and between the same and the exit end of the hollow member. Nevertheless the chamber of the hollow member is closed at each side by the upwardly moving bands 17 which in effect form moving side walls therefor. However, it is to be understood that the side walls 3 may be continued between the impeding elements 11 and the exit end of the hollow member so as to provide a rigid structure throughout the length of the hollow member. In the latter instance the bands 17 of course move upwardly between and in spaced relation to the upwardly extended portions of such side walls.

In operation the strand 21 to be crimped is supplied from a bobbin or pirn (not shown) located below the feed rolls and is inserted in the groove of the infeed guide 6 and between the feed rolls 4 with its end inserted in the inlet of the throat 10 directly above the nip of the feed rolls. On rotation of the feed rolls the strand is stuffed into the throat, which soon becomes filled up to the level of the impeding elements 11 (in FIG. 2, for clarity, the strand 21 is not shown in bunched condition in throat 10 since the continuity of the strand would be obscured in any attempt to show the strand bunched together in closely packed condition). Thereafter, upon entering the throat, the strand bends back and forth and from side to side as it is stuffed into the bottom end of the throat, much as is customary in previously known stuffer-crimpers, and these various deviations of the strand from the original rectilinear configuration are emphasized to the extent of becoming a relatively permanent crimp.

With continued operation, as more and more strand is fed upward into the throat, the accumulation of crimped strand begins to force its way upward through the throat, and upon contacting the bands 17 it rotates the impeding elements 11 that partially obstruct its passage through the chamber of the hollow member. The frictional resistance applied to the impeding elements by the pulleys 13 and weighted belt 14 retard the rotation of the impeding elements 11 to provide the essential crimping impedance. The bands 17, which move with the impeding elements 11, travel upwardly toward the nip of the band supporting rolls 18 and engage the crimped strand as it is released from the impeding elements. The bands carry the strand upwardly to the exit end of the hollow member with little or no withdrawing tension upon the strand and with a minimum of friction with the chamber of the hollow member as the strand passes therethrough. The upwardly converging arrangement of the bands causes them to exert a gradually increasing hold on the strand as the strand moves upwardly in the upper portion of the hollow member and thus avoids the strand slipping backwardly as its upward lifting proceeds. From the nip of the band supporting rolls 18 the two bands with the crimped strand interposed therebetween are reeled together on the takeup spool 20. When this spool has been suitably wound it may be removed and placed in a heat treating chamber in order to set the crimped strand. The heat treatment may also be accomplished in a hot dye bath in which the

crimped strand is simultaneously heat set and dyed while still held between the two bands. In this connection the use of pervious bands of woven tape or the like is of obvious advantage since they will permit the hot dye bath to permeate the takeup package and reach the crimped strand wound on the spool while still interposed between the tapes.

After the heat treatment, with or without dyeing, the takeup package is of course unwound and the crimped strand suitably reeled for use while the bands are separately reeled for subsequent use in the process.

By way of illustration another form of apparatus of this invention is shown in FIG. 3. This device is essentially the same as that illustrated in FIGS. 1 and 2 except that two endless bands 17*a* are employed, each band passing around one of the impeding elements 11*a* and one of the band supporting rolls 18*a*. In this instance the rolls are separated and not brought together as in the device of FIGS. 1 and 2, and the bands travel upwardly in substantially parallel relation between the impeding elements and the exit end of the hollow member. The crimped strand on being released from the impeding elements is engaged by the opposed inner reaches of the endless bands and carried upwardly to the exit end of the hollow member with little or no tension applied to the strand and with a minimum of friction against the chamber in the passage of the strand therethrough. As it emerges from the upper end of the hollow member the crimped strand is led with a minimum of tension to suitable takeup mechanism for winding. In this instance the strand is not wound between the bands, as in the form of apparatus shown in FIGS. 1 and 2, but the bands are disengaged from the strand as it so emerges and, being endless, pass around the respective band supporting rolls 18*a* and return to the corresponding impeding elements 11*a* for continuous operation.

While two impeding elements and two bands have been shown and described in the illustrative forms of apparatus, other arrangements may be employed in which three or more impeding elements and a corresponding number of bands may be utilized.

It is to be understood that various modifications as to form, use and arrangement of parts of the apparatus may be made without departing from the spirit and scope of the invention as claimed.

The claimed invention:

1. In a stuffer-crimper comprising a hollow crimping chamber, means for feeding a strand into one end of the crimping chamber, and means associated with the crimping chamber for exerting impeding force on the strand to crimp it, the improvement comprising rotatable wheel-like impeding elements projecting from opposite sides into the crimping chamber to exert impeding forces on the strand and thereby to accumulate and crimp the strand means operatively connected to the wheel-like elements and effective to exert a frictional drag thereon, bands engaging and movable with the wheel-like impeding elements in the direction of strand travel through the hollow crimping chamber for withdrawing the strand from the crimping chamber and maintaining its crimped condition, and means mounted adjacent the exit end of said stuffer-crimper for supporting said bands.

2. In a stuffer-crimper comprising a crimping chamber having a passage therethrough from the entrance to the exit thereof and means for feeding a strand into the entrance of the passage, the improvement comprising opposed rotatable wheel-like impeding elements mounted a fixed distance from the entrance to the crimping chamber and projecting into and intercepting the passage to accumulate and crimp the strand, means for frictionally retarding the rotation of the impeding elements, the rotatable elements being movable by the adjacent strand accumulation, withdrawing means for forwarding the strand accumulation toward the chamber exit while maintaining

its crimped condition, the withdrawing means including a plurality of bands, each band being engaged by and movable with one of the impeding elements in the direction of the movement of the strand accumulation through the passage, and means adjacent the exit end of the passage for supporting the bands.

3. The apparatus of claim 2 in which the last named means constitutes rolls adjacent the exit of the passage, between which the bands are nipped with the strand accumulation therebetween.

4. The apparatus of claim 2 having a takeup spool on which the bands with the crimped strand accumulation therebetween are wound.

5. In apparatus adapted to stuffer-crimp a textile strand by feeding the strand into a confining region and, at a fixed location relative to the confining region, continuously impeding the passage of the strand therethrough by means of a unidirectionally movable impeding element having an endless strand-engaging periphery to accumulate and crimp the strand in the confining region, and releasing the accumulated and crimped strand from the applied impedance by directing the force of the crimped strand against the impeding element to move the same,

the improvement comprising a plurality of the impeding elements, including a pair thereof located opposite one another, each of the elements in the pair having a similarly unidirectionally movable rectilinear surface substantially parallel to a like surface of the other and extending away from the fixed location in contact with the crimped strand accumulation.

References Cited in the file of this patent

UNITED STATES PATENTS

2,187,567	Esselmann et al.	Jan. 16, 1940
2,311,174	Hitt	Feb. 16, 1943
2,500,690	Lannan	Mar. 14, 1950
2,575,781	Barach	Nov. 20, 1951
2,575,833	Pfaw et al.	Nov. 20, 1951
2,575,839	Rainard	Nov. 20, 1951
2,715,309	Rosenstein et al.	Aug. 16, 1955
2,820,278	Mariani et al.	Jan. 1, 1958
2,854,729	Russo et al.	Oct. 7, 1958

FOREIGN PATENTS

219,688	Australia	Jan. 14, 1959