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Brooks

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[54] **SPLICING HEAT DEFORMABLE YARNS**

[75] Inventor: **Charles T. Brooks**, Summerville, Ga.

[73] Assignee: **Bigelow-Sanford, Inc.**, Greenville, S.C.

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[51] **Int. Cl.**..... **B65h 69/06,** B65h 69/08

[58] **Field of Search** ... 156/158, 159, 306, 296, 433, 156/502, 507, 544

[56] **References Cited**

UNITED STATES PATENTS

3,055,786	9/1962	Hendrix	156/158
3,695,975	10/1972	Williams	156/158 X
3,741,836	6/1973	Williams	156/158

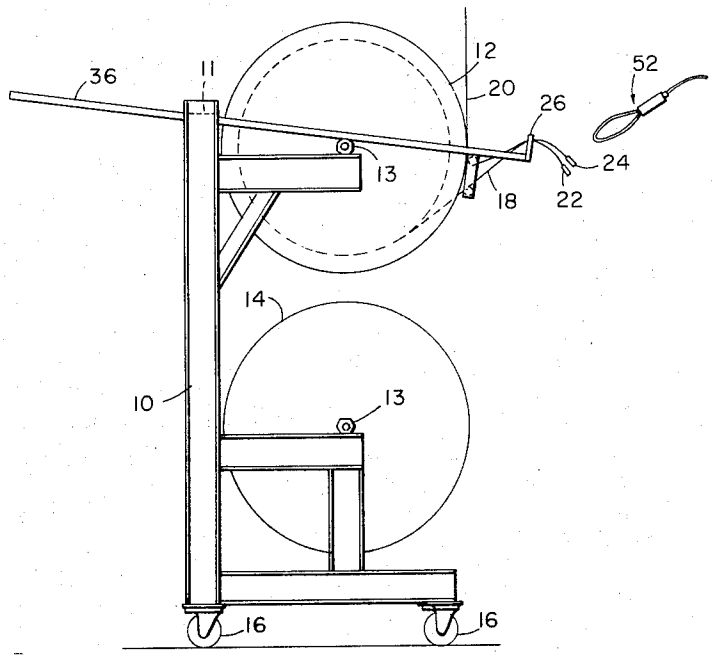
Primary Examiner—William A. Powell

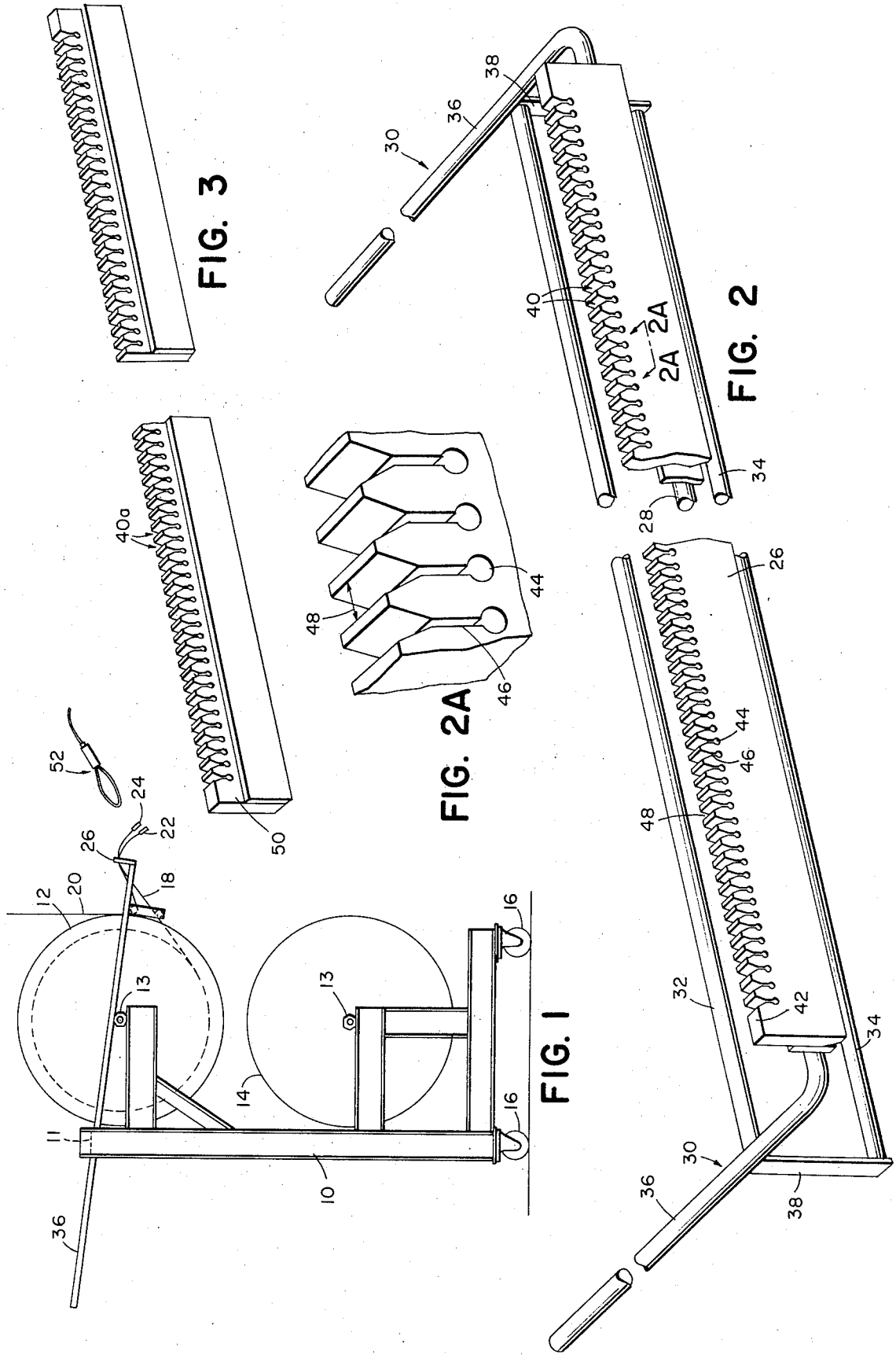
Attorney, Agent, or Firm—H. L. Kirkpatrick

[57] **ABSTRACT**

Shown is apparatus for fusing together pairs of thermally deformable yarn ends, each pair comprising a first yarn end wound on a multiple-yarn beam and a second yarn end. The apparatus comprises a first thermally insulating multiply-dented comb-like member releasably mountable adjacent the beam and extending the full length of the beam for receiving a single yarn end from the beam in each dent. A second multiply-dented comb-like member is provided for receiving the second yarn end of each pair in the individual dents thereof for transfer to the individual dents of the first comb-like member. Means are provided for applying heat successively to the pairs adjacent the first comb-like member.

3 Claims, 4 Drawing Figures




FIG. 3
FIG. 2
FIG. 2A
FIG. 1
30
36
38
40
2A
28
34
40a
48
44
46
50
52
24
22
26
18
20
12
13
14
16
11
10
32
42

SPLICING HEAT DEFORMABLE YARNS

This invention relates to apparatus for splicing pairs of thermally deformable yarn ends by fusing together the same.

In the manufacture of tufted carpet, the tufting machine is supplied with a large number (e.g., 1,100) of individual yarn ends from a series of yarn beams. In a typical operation there may be ten yarn beams each supplying 110 or more individual yarn ends to the tufting machine. When a beam becomes exhausted and beam change is required, the 1,100 individual yarn ends from the tufting needles must be paired with and joined to 1,100 fresh yarn ends from new yarn beams. The typical prior art techniques of knotting, latex splicing, or yarn fusing require a large input of labor. Efforts to mechanize this operation have resulted in complex and expensive apparatus.

In view of the foregoing, it is a principal oject of the present invention to provide a method of, and apparatus for achieving the splicing of the large number of pairs of yarn ends so as to substantially reduce the required labor and yet avoid the necessity of complex and expensive machinery.

Apparatus constructed according to the invention includes a first thermally insulating comb-like member releasably mountable on a beam supporting frame adjacent the beam. The member extends the full length of the beam and is located to receive each of the yarn ends from the beam in separate dents. A second similar comb-like member is provided for receiving the second yarn end of each pair to be spliced in the individual dents of that second member, for transfer of those yarn ends to the individual dents of the first comb-like member. Hand-held means are provided for providing heat successively to the pairs of yarn ends at locations adjacent the first member.

Other objects, features, and advantages of the invention will appear from the following description of a preferred embodiment taken together with the accompanying drawing.

In the drawing:

FIG. 1 is a side elevation of a frame supporting a pair of yarn beams and a portion of apparatus constructed according to the invention;

FIG. 2 is an enlarged perspective view of a portion of apparatus constructed according to the invention;

FIG. 2A is a further enlarged view of a portion of FIG. 2; and

FIG. 3 is a perspective view of an additional portion of apparatus constructed according to the invention.

FIG. 1 illustrates a frame **10** which includes upper cross member **11** and which rotatably supports yarn beams **12** and **14** in journals **13.** The frame is provided with casters **16** so that spent beams may be easily removed from the vicinity of the tufting machine (not shown) and fresh beams wheeled into place. As mentioned above, the tufting machine itself may be up to 15 feet wide, requiring ten frame-supported beams to supply it, each beam **12** or **14** being wound with 110 separate yarn ends.

As shown in FIG. **1,** apparatus constructed according to the invention is mounted adjacent beam **12** for splicing each of the 110 individual yarn ends wound on beam **12** to the associated yarn end which extends from the tufting machine (these latter yarn ends having been severed from the spent beam and the beam wheeled out of the way). While in the end view of FIG. **1** only the end pair of yarn ends is visible, it will be understood that a multiplicity (e.g., 110) of such pairs are actually present. The yarn end from the fresh beam **12** is indicated at **18** and the yarn end extending from the tufting machine is indicated at **20.** (The yarn end **20** hangs vertically, along with all other yarn ends extending from the tufting machine, from elevated supporting members about which the yarn ends are trained between the supply beams and the tufting machine. These dangling yarn ends are often referred to as "sheet.") The terminal portions of yarn ends **18** and **20** are adhered to strips of adhesive tape **22, 24** respectively. Each strip of tape **22, 24** extends the width of beam **12** and each has the appropriate set of 110 yarns adhered thereto with a uniform, predetermined spacing (e.g., one-half inch) between adjacent yarns on each tape.

Each pair of yarn ends **18, 20** is retained in a dent in a comb-like member **26** which extends the length of beam **12.** As best seen in FIG. **2,** the member **26** is attached to the base **28** of a U-shaped rod **30.** Rods **32** and **34** also extend the length of beam **12** and are parallel to the base portion **28** of rod **30.** The rods **32** and **34** are rigidly attached to the legs **36** of rod **30** by rigid plates **38** which are permanently secured to the legs **36.**

The member **26** is formed from a heat-resistant plastic. A multiplicity of dents **40** are provided in the upper surface **42** of the member **26.** There are as many dents **40** as yarn ends **18** of the beam **12** (e.g., 110 in the example above). As best seen in FIG. **2A,** each dent **40** includes a circular portion **44** having its center spaced one-half inch from the surface **42.** A slot **46** of less width than the diameter of circular portion **44** communicates with the circular portion **44.** The slot **46** flares to provide a wider mouth **48** for the dent at the surface **42.** Neighboring pairs of dents **40** have a center-to-center spacing of one-half inch.

A second comb-like member **50** (see FIG. **3**) is provided having a like number of similarly shaped and spaced dents **40***a*. Also provided are means for applying heat to the thermally deformable fusible yarn ends **18, 20,** those means preferably being in the form of a hand-held electrical resistive heater **52** (see FIG. **1**).

Ths splicing of the yarn ends using apparatus according to the invention occurs as follows. As the supply of yarns on the set of ten beams supplying a tufting machine are almost exhausted, the machine is stopped and the 110 yarn ends from each beam are secured to a single strip of adhesive tape **24** and then cut below the location of the tape. The tapes **24** thus serve, for each individual sheet of 110 yarn ends, to preserve the approximate spacing of one-half inch between adjacent yarn ends **20.** With a fresh beam **12** in place adjacent the hanging set of **110** taped yarn ends, the comb-like member **26** is mounted adjacent the beam **12** by inserting the legs **36** of rod **30** over journals **13** and under cross-member **11** of the frame **10.** With the legs **36** fully inserted such that rods **32** and **34** are immediately adjacent the beam **12,** the member **26** is appropriately positioned to conveniently receive the associated pairs of yarn ends to be spliced.

As is conventional, each fresh beam **12** is provided with the individual yarn ends **18** adhered to a single strip of adhesive tape **22** with the appropriate spacing (i.e., one-half inch) maintained between each pair of neighboring yarn ends. Using the strip of tape **22** as a handle and guide, it is a simple matter to thread the en-

tire set of **110** yarn ends **18** over rod **34** and then over the upper edge **42** of member **26.** Because the appropriate spacing between yarn ends **18** has been maintained by the tape **22,** the yarn ends may be conveniently manually drawn into dents **40** in a one-to-one relationship.

As shown in FIG. **1,** the **110** yarn ends **20** are drawn beneath rod **32** and then over surface **42** of member **26.** Because the spacings between neighboring pairs of yarn ends **20** may vary slightly from the one-half inch spacing required for convenient insertion into dents **40** of member **26,** member **50** is employed to assist in aligning of the yarn ends **20** with the appropriate dent **40** in member **26** (as well as to simplify the entrainment of the set of yarns **20** beneath rod **32** and over member **26**). At a location of the yarn ends **20** above the strip of tape **24,** the member **50** is inserted behind the sheet of yarn ends **20** and the member **50** and the yarn ends **20** manipulated to cause insertion of yarn ends **20** into dents **40***a* in a one-to-one relationship. The member **50,** with the yarn ends **20** retained in its dents **40***a*, is then brought around rod **32** and over surface **42** of member **26.** Since the spacing of the dents of the members **50** and **26** is the same, the member **50** is employed to pull each of the **110** yarn ends **20** into the appropriate dent **40** of member **26** in a single operation. With the yarn ends **20** thus paired with the yarn ends **18** in the dents **40** of member **26,** the member **50** is withdrawn.

The heater **52** is then manually drawn across the series of paired yarn ends **18, 20** immediately adjacent the member **26** where each pair of ends **18, 20** are held in contact with each other by the wedging force of the dent **40.** The severed terminal portions of the sets of yarn ends **18, 20,** as well as the strips of tape **22** and **24,** merely drop to the floor and may be discarded. After the heater **52** is thus quickly drawn across the entire group of yarn pairs, the splicing of the beam **12** has been completed and the member **26** and the rods to which it is attached may be withdrawn and stored on the frame **10** itself.

It is especially convenient to provide each frame with its own member **26** mountable as shown in FIG. **1** and to arrange all pairs of yarn ends to be spliced (from all ten beams **12**) prior to employing the heater **52** to create the splices. In this way, a single quick pass of the heater **52** over the entire group of 1,100 pairs of yarn ends **18, 20** will complete the splicing of all the yarns required by the tufting machine.

While a particular embodiment of the invention has been described in detail, it will be apparent to those skilled in the art that other embodiments are within the scope of the invention in the following claims.

What is claimed is:

1. Apparatus for fusing together pairs of thermally deformable yarn ends, each pair comprising a first yarn end wound on a multiple-yarn beam and a second yarn end, the apparatus comprising a first thermally insulating multiply-dented comb-like member releasably mountable adjacent said beam and extending the full length of said beam for receiving a single yarn end from said beam in each said dent, a second multiply-dented comb-like member for receiving the second yarn end of each said pair in the individual dents thereof for transfer of said second yarn ends to the individual dents of said first comb-like member, and means for applying heat successively to said pairs adjacent said first comb-like member.

2. Apparatus as claimed in claim **1** wherein said means for applying heat comprise a hand-held electric resistance heater.

3. Apparatus as claimed in claim **1** wherein each dent of said first comb-like member comprises a portion removed from the adjacent edge of said member which is of greater cross-sectional area than portions closer to said edge.

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