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54 **Jointing flexible fibrous strands.**

57 A method of jointing flexible fibrous strands, the method includes the steps of:
placing on the ends 3, 4 of the fibrous strands to be joined a heated thermoplastic glue;
butt jointing the ends together;
rolling the butt joint 17 to maintain a constant thickness in the strands and to cause the glue to wick within the fibres of the ends to thereby produce an improved joint. The invention further provides apparatus for jointing flexible fibrous strands, the apparatus including guide means (12) and clamping means 5,6 for holding the ends 3,4 together, cutting means 11 for squaring the ends, means 14 for applying a measured quantity of a hot melt glue to the ends 3,4 means for moving the ends to abutt each other to allow the glue to wick within the fibres of the ends 3,4 and means 18 for rolling the joint to even the diameter thereof to produce a joint 17 with no obvious variations in the strands.

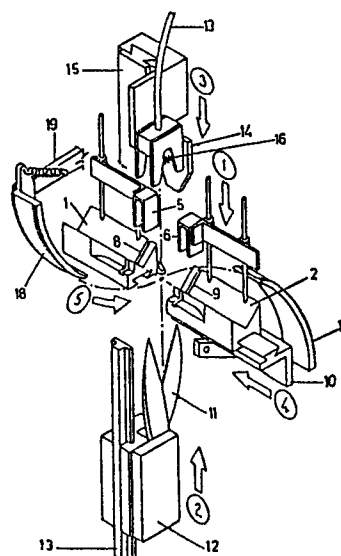


FIGURE 1

Description

JOINTING FLEXIBLE FIBROUS STRANDS

The invention relates to jointing flexible fibrous strands, for example, yarn for use in textile processing.

At present in the textile processing industry when yarn is used in carpet manufacture, weaving or knitting with both natural or synthetic fibres it has been a problem to join the yarn and produce a joint with an acceptable appearance at the same time as maintaining tensile strength in the yarn.

Known methods of jointing yarn ends together have included wrapping, glueing, welding, mechanical splicing, electrostatic splicing and pneumatic splicing of the yarn. A detailed assessment of the theory and practice of splicing and its advantages for carpet yarns was published by Schlafharst of West Germany in the Journal of Carpet Manufacture International, 2/1985.

In this assessment under the heading glueing method it states that the yarns are overlapped and glued together. A joint with good strength is produced but the disadvantages are the long drying time, the rigidity of the glued portion and the thickness of the joint. Under the heading of welding it mentions the use of this method for synthetic nylon fibres.

An object of the present invention is to overcome at least in part the abovementioned disadvantages of existing jointing methods.

According to a broadest aspect of the present invention there is provided a method of jointing flexible fibrous strands, the method including the steps of:

placing on the ends of the fibrous strands to be joined a heated thermoplastic glue;
butt jointing the ends together;
rolling the butt joint to maintain a constant thickness in the strands and to cause the glue to wick within the fibres of the ends to thereby produce an improved joint.

The flexible fibrous strands may be lengths of yarn, rope, twine or cord.

According to a preferred aspect of the invention there is provided a method of yarn jointing, the method comprising the steps of:

placing the yarn ends in association with a hot melt polyamide glue;
butt jointing the yarn ends together;
rolling the butt joint to maintain a constant thickness in the yarn and to allow the glue to wick within the fibres of the yarn to thereby produce an improved yarn joint.

According to another aspect of the present invention there is provided an apparatus for jointing ends of flexible fibrous strands, the apparatus including guide and clamping means for holding the ends together, cutting means for squaring the ends, means for applying a measured quantity of a hot melt glue to the ends, means for moving the ends to abut each other to allow the glue to wick within the fibres of the yarn ends and means for rolling the joint to even the diameter thereof to produce a joint with no

obvious variations in the strands.

Further aspects of the present invention will become apparent from the following description which is given by way of example only.

An example of yarn jointer incorporating the invention will now be described with reference to the accompanying drawing in which:

Figure 1: shows a diagrammatic perspective from one side of a yarn jointer with the parts thereof exploded apart; and

Figure 2: shows in sequence five numbered steps performed by the yarn jointer shown in Figure 1.

The example of jointer according to the invention will be described with reference to the flexible fibrous strands being yarn ends and it is envisaged that with minor modifications the invention can be used to join lengths of rope, twine or cord.

The yarn jointer shown in Figure 1 is advantageously a hand held unit the base and handle of which is not shown in Figure 1 for clarity purposes.

The jointer has a pair of guides 1, 2 onto which ends 3, 4 (only shown in Figure 2) of yarn to be joined are laid. The ends of the yarn are clamped by clamping means 5, 6 which are mounted on supports 7 relative to the guides 1, 2. As shown in the first step 1 in Figure 2 parts 5 and 6 of the clamp means 5 and 6 engage in slots 8, 9 in the guides 1, 2 to hold the yarn ends 3, 4. Preferably the yarn guides 1, 2 are mounted to slide on member 10 into the correct position for the next step 2 which is a cutting operation which cuts the waste ends and squares of the yarn ends 3, 4.

The cutter in the example is a pair of blades 11 mounted in a housing 12 which reciprocates on rail 13. The cutting step is shown in step 2 of Figure 2. After the yarn ends 3, 4 are cut square the blades 11 reciprocate down from their cutting position to the position as shown in step 2 of Figure 2.

The guides 1, 2 can then move apart slightly to the position shown as step 3 in Figure 2. In this position the squared ends of the yarn are spaced apart for step 3 in the jointing operation.

The step 3 as shown in Figure 2 is the application of a spot of hot melt glue to the yarn ends. The glue is fed from a reservoir (not shown) via a tube 13 to a glue applicator 14. The glue applicator 14 reciprocates on guide 15 and includes a heating means 16 which melts the glue when it is applied between the yarn ends 3, 4.

The glue applicator 14 after it has retracted to the position shown in step 4 of Figure 2 allows the yarn ends 3, 4 to be butt-jointed.

In this condition and as shown in step 5 of Figure 2 the joint 17 is rubbed between the arc shaped rubbing members 18 mounted on arms 19 which move so that the members 18 contact each other and roll and even the joint and thereby cause the still melted glue to wick within the fibres forming the yarn. The members 18 being automatically retracted when the rubbing operation is completed.

The invention can be used for jointing of woollen yarn used in carpet manufacturing, weaving or knitting.

The ends of the yarn to be joined are initially trimmed by cutting means 11 to form similar shapes which are complementary to each other when butt jointed.

The thermoplastic glue is preferably a hot melt polyamide resin. Preferably the polyamide resin is heat resistant so that after jointing the yarn can withstand other higher than normal temperature treatment processes. The resin is also selected to be fast setting. For example, in the applicants' trials, it has been discovered that a polyamide resin with a softening point of about 185° (measured by the Ring & Ball method), a viscosity (Poise)/Temperature (°C) of about 40/210, tensile strength (Kilos/cm²) 130 and elongation (%) 250 produces an excellent joint.

The ends of the yarn are dipped into or have dropped onto the end thereof a small proportion of resin which wicks into the entangled fibres forming the yarn.

The ends are butt jointed and rolled to maintain a thickness of joint similar to that of the thickness of the yarn to thereby form a joint which produces no obvious variation in the yarn. The joint, in use, having high tensile strength and creating a minimal distortion in the yarn.

Claims

1. A method of jointing flexible fibrous strands, the method comprising the steps of:
placing on the ends (3,4) of the fibrous strands to be joined a heated thermoplastic glue;
butt jointing the ends together;
rolling the butt joint (17) to maintain a constant thickness in the strands and to cause the glue to wick within the fibres of the ends to thereby produce an improved joint.

2. A method of yarn jointing, the method comprising the steps of:
placing the yarn ends (3,4) in association with a hot melt polyamide glue;
butt jointing the yarn ends together;
rolling the butt joint (17) to maintain a constant thickness in the yarn and to allow the glue to wick within the fibres of the yarn to thereby produce an improved yarn joint.

3. A method according to claim 1 or 2 in which the thermoplastic glue is a polyamide resin.

4. Apparatus for jointing flexible fibrous strands, the apparatus comprising guide (1,2) and clamping (5,6) means for holding the ends (3,4) of the fibrous strands together, cutting means (11) for squaring the ends, means (14) for applying a measured quantity of a hot melt glue to the ends, means for moving the ends to abutt each other to allow the glue to wick within the fibres of the ends and means (18) for rubbing rolling the joint to even the diameter

thereof to produce a joint (17) with no obvious variations in the strands.

5. Apparatus according to claim 4 in which the parts thereof are formed as a hand held unit supporting or connected to a glue reservoir.

6. Apparatus according to claim 4 or 5 in which the guide means (1,2) comprises a pair of guide members and the clamping means (5,6) comprises a pair of clamping members, so that each one of the ends (3,4) of the fibrous strands can be held in a respective one of the pair of guide members by a respective one of the pair of clamping members, a first one of the pair of guide members and a first one of the pair of clamping members being mounted on a mounting member (10) for movement relative to the other guide member and the other clamping member.

7. Apparatus according to claim 6 in which the second one of the pair of guide members (3,4) and the second one of the pair of clamping members (5,6) are mounted on a second mounting member.

8. Apparatus according to claim 6 or 7 in which the mounting members (10) for the guide means (1,2) and the clamping means (5,6) each support one of a pair of pivoting arms (19), each pivoting arm having a rubbing or rolling member (18) mounted thereon.

9. Apparatus according to claim 4, 5, 6, 7 or 8 in which the means (14) for applying the glue and the cutting means (11) reciprocate on respective mounting members (15,13) in sequence.

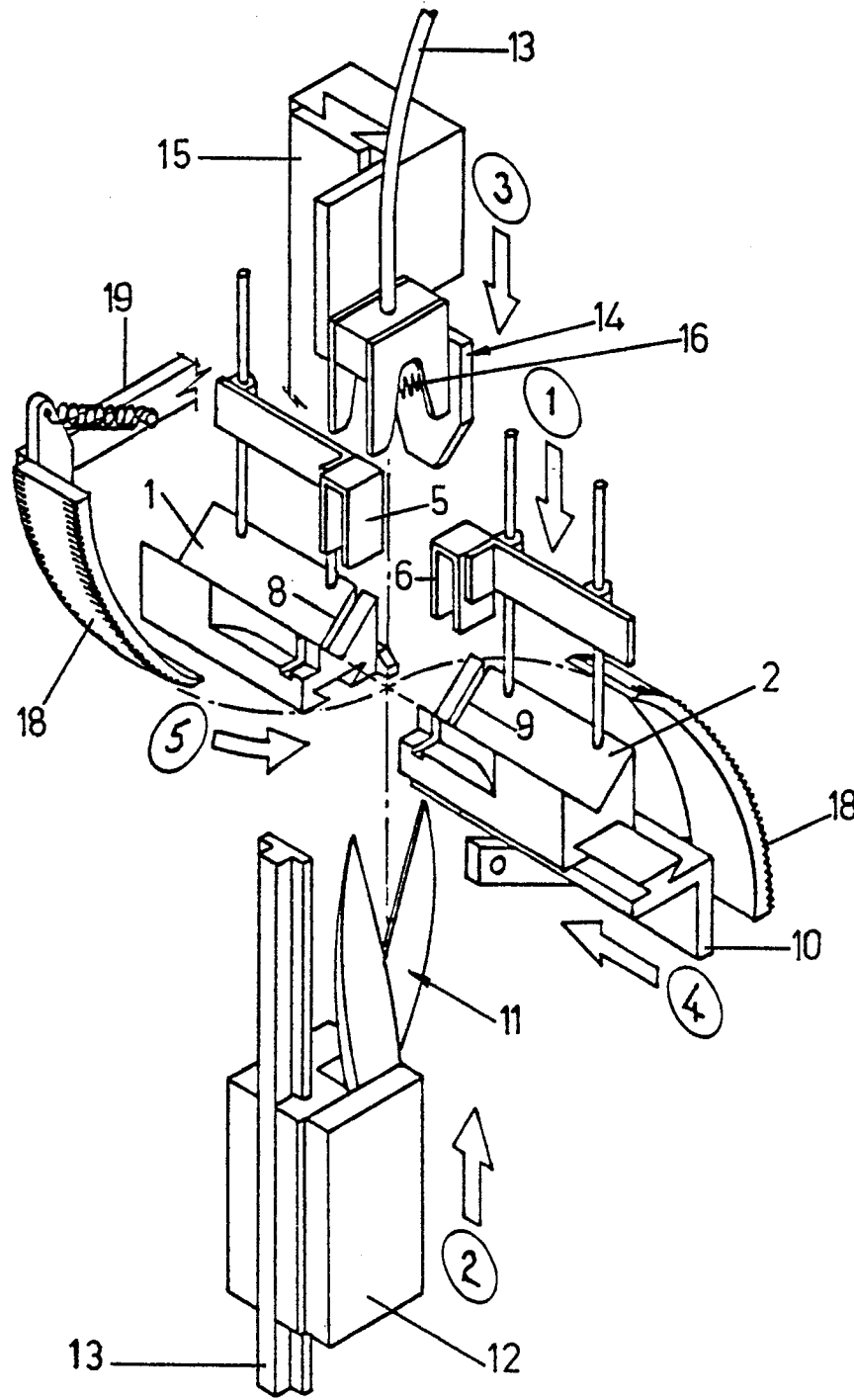


FIGURE 1

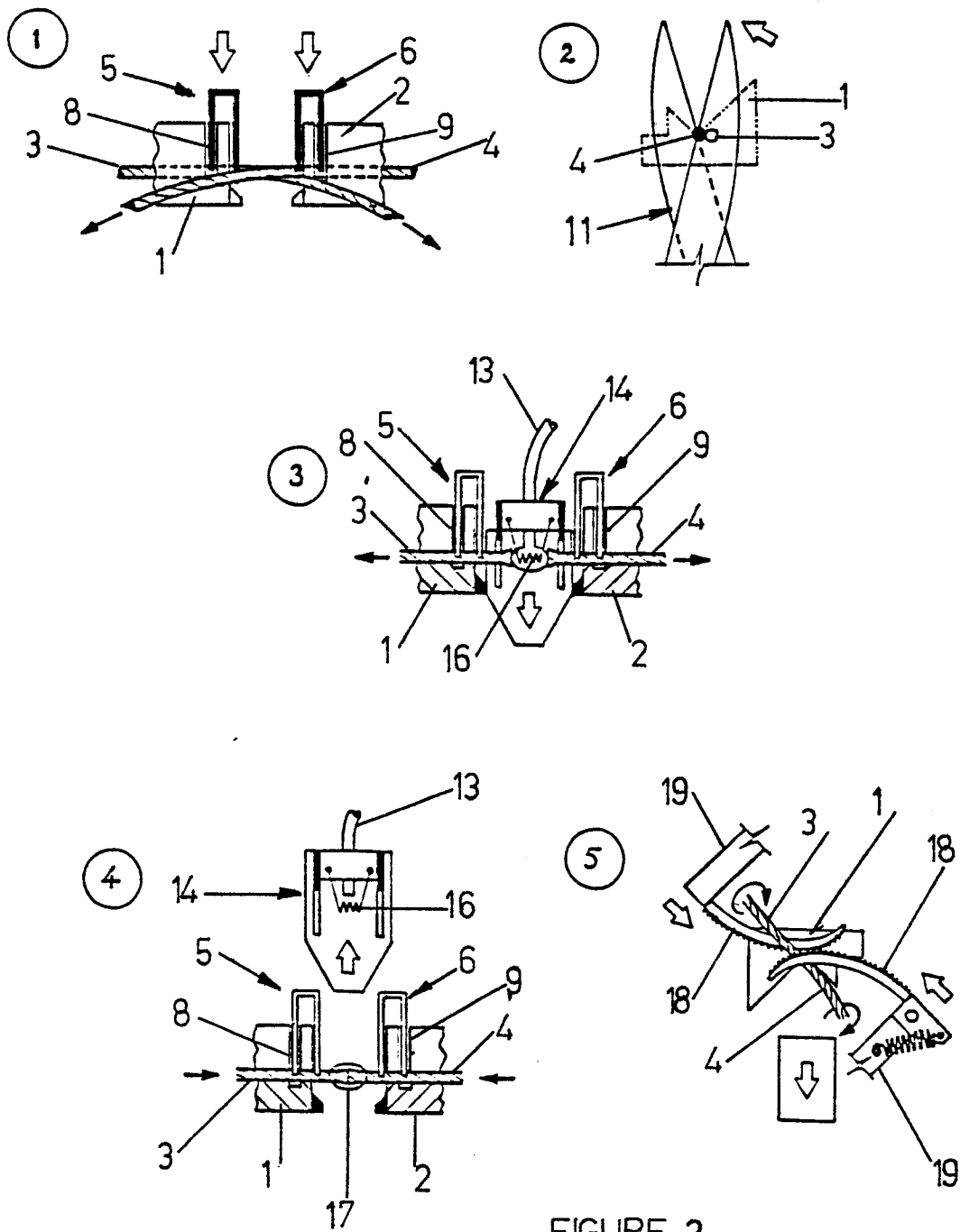


FIGURE 2