Aug. 13, 1968 W. PARKER 3,396,524

YARN HEATING MEANS IN TEXTILE APPARATUS

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Fig. 1.

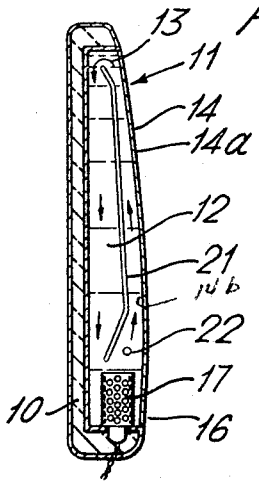

Fig. 2.

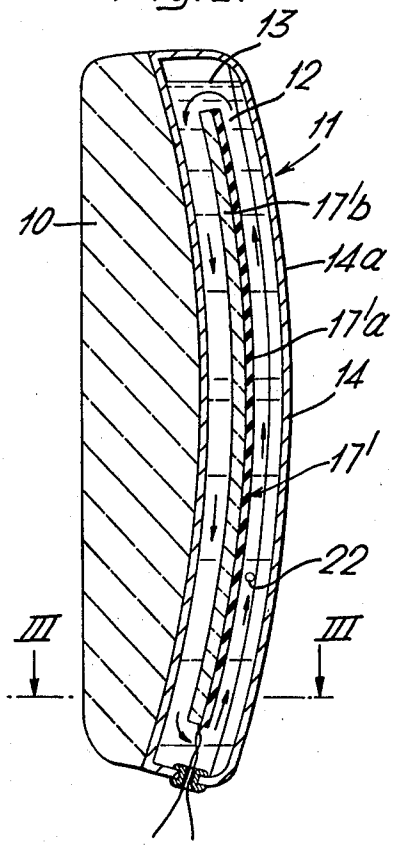

Fig. 3.

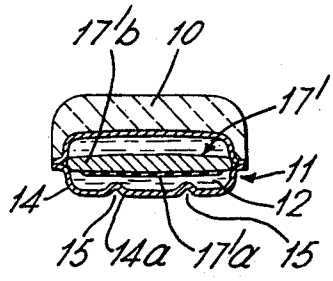

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Fig. 4.

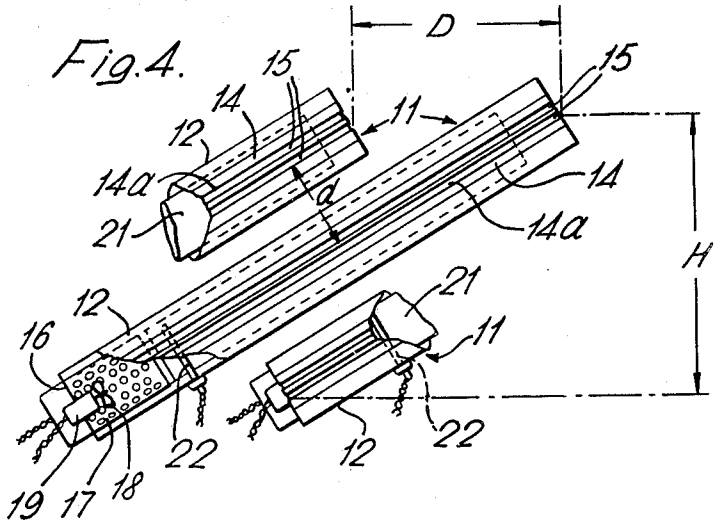
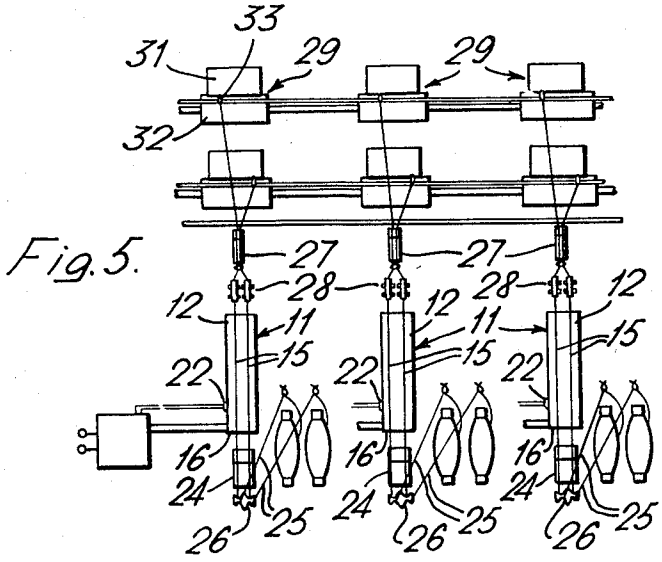


Fig. 5.



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YARN HEATING MEANS IN TEXTILE APPARATUS

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16 Claims. (Cl. 57—34)

ABSTRACT OF THE DISCLOSURE

Yarn heating means for yarn processing machines including wall means defining a chamber containing heating fluid. These wall means include a heat conducting member over which a yarn to be heated is guided. Furthermore, a heating element is arranged at one end of the yarn path and the chamber is adapted to be mounted in a yarn processing machine. The chamber also includes means for assisting circulation of the fluid in the chamber.

This invention relates to textile apparatus.

The invention comprises yarn heating means for a yarn processing machine, comprising a chamber adapted to contain fluid bounded on one face by a heat conductive member having an outer surface affording at least one yarn path on which yarn can run in contact with the surface, and adapted to receive a heating element, the chamber being adapted for mounting in a yarn processing machine so that fluid in said chamber can circulate around said chamber over the inner face of said heat conductive member in a direction substantially parallel to said yarn path.

Said heat conductive member may be curved so that a yarn running on said yarn path is held against the outer surface by tension in the yarn. Said yarn path may be defined by a groove or channel in said outer surface.

Said heat conductive member may comprise a thin membrane of material having good thermal conductivity, such as metal.

The yarn heating means may comprise a heat source situated at one end of said yarn path, and the chamber may be adapted to be mounted in a yarn processing machine with said one end of said yarn path lowermost, so that fluid when heated at said one end will pass by convection upwardly over said inner surface. A heat source may otherwise extend substantially the full length of said yarn path. A heat source may comprise an electric resistance heating element.

The yarn heating means may be adapted to be mounted in a yarn processing machine with the yarn path in a substantially vertical plane or may be adapted to be mounted in a yarn processing machine with the yarn path inclined to the vertical so that a long yarn path can be accommodated within a small vertical extent.

Said chamber may be so formed or guide or baffle means may be so arranged in said chamber as to guide the circulation of said fluid around said chamber over said inner face of said heat conductive member in a direction from one end to the opposite end of said yarn path.

The yarn heating means may comprise means adapted to circulate or to assist convection of fluid around said chamber.

The yarn heating means may comprise temperature sensitive means adapted to sense the temperature of the fluid in the chamber at a location near said heat source. Said temperature sensitive means may be connectible through control means to control the supply of energy to said heating element.

The fluid may be oil.

The invention also comprises a yarn processing machine comprising yarn heating means as herein described.

The machine may afford a plurality of yarn paths in substantially vertical planes spaced apart lengthwise of the machine or may afford a plurality of parallel yarn paths inclined to the vertical so that said plurality of paths can be accommodated within a vertical extent small by comparison with the length of each path.

The machine may be a false twist crimping machine.

Embodiments of the invention will now be described with reference to the accompanying drawing in which

FIGURE 1 is a sectional elevation of one embodiment of yarn heater,

FIGURE 2 is a sectional elevation of another embodiment,

FIGURE 3 is a section on the line III—III of FIGURE 2,

FIGURE 4 is a front elevation of a yarn heater showing its relationship in a textile machine to neighbouring yarn heaters, and

FIGURE 5 is a front elevation of a textile machine embodying heaters according to the invention.

FIGURES 1 to 4 illustrate yarn heating means **11** for a yarn processing machine, comprising a chamber **12** adapted to contain fluid **13** bounded on one face by a heat conductive member **14** having an outer surface **14***a* affording two yarn paths **15** (FIGURES 3 and 4) on which yarn can run in contact with the surface **14***a*. The heating means illustrated in FIGURES 1 and 2 have at one end **16** of said yarn paths **15** an electric resistance heating element **17**. The heating means illustrated in FIGURES 2 and 3 have an electric resistance heating element **17'** extending from end to end of the yarn paths **15** and comprising a wire or strip winding **17'***a* supported on a backing **17'***b* of thermal and electrical insulating material. The chamber **12** in each case is adapted for mounting in a yarn processing machine so that fluid **13** in said chamber **12** can circulate around said chamber **12** over the inner face **14***b* (FIGURE 1) of said heat conductive member **14** in a direction from said one end **16** to the opposite end of said yarn paths **15**, as indicated by the arrows in FIGURE 1. The back and ends of the chamber **12** are covered by thermal insulating material **10**.

Said heat conductive member **14** is curved so that a yarn running on one of said yarn paths **15** is held against the outer surface **14***a* by tension in the yarn.

FIGURES 2, 3 and 4 illustrate embodiments wherein said yarn paths **15** are defined by grooves or channels in said outer surface **14***a*.

Said heat conductive member **14** comprises a thin metallic membrane having good thermal conductivity.

The embodiment illustrated in FIGURE 1 can be mounted as shown in FIGURE 5 in a yarn processing machine with said one end **16** of said yarn path **15** lowermost, so that fluid **13** when heated at said one end **16** will pass by convection upwardly over said inner surface **14***b*.

The embodiment illustrated in FIGURE 4 comprises means including an impeller **18** driven by an electric motor **19** adapted to circulate or to assist convection of fluid **13** around said chamber **12**.

FIGURES 1 and 4 illustrate yarn heating means in which guide or baffle means **21** are so arranged in said chamber **12** as to guide the circulation of said fluid **13** around said chamber **12** as described.

The embodiment illustrated in FIGURE 1 can also be mounted in a yarn processing machine as shown in FIGURE 5 with the yarn path **15** in a substantially vertical plane.

The embodiment illustrated in FIGURE 4 is adapted to be mounted in a yarn processing machine with the yarn path inclined to the vertical so that a long yarn path **15** can be accommodated within a small vertical extent H. FIGURE 4 illustrates a complete heater **11** with frag-

ments of neighbouring heaters as they would be disposed in a yarn processing machine indicating that a plurality of parallel yarn paths are afforded inclined to the vertical, the spacing between adjacent paths, *d*, being less than the spacing, D, between the ends of the same paths.

The temperature sensitive means **22** are provided adapted to sense the temperature of the fluid **13** in the chamber **12** at a location near said one end **16** of the yarn path (but above the heater **17** in the case of the embodiment of FIGURE 1). Said temperature sensitive means **22** are connected, as illustrated in FIGURE 5, through control means **23** to control the supply of energy to the heating elements **17**. One such control means **23** can be provided for each heater **11**, or a single control means may be provided common to a plurality of such heaters **11**.

The fluid **13** should be capable of working at the temperatures required to process yarn. Such temperatures, in the case of a machine for processing nylon and other synthetic materials, range from about 180° C. to 250° C. The fluid should not be too viscous at this temperature. It should be capable of transferring a large quantity of heat rapidly from the heating element to the inner surface of the member **14** so that heat lost from the surface to a travelling yarn is rapidly made up and the temperature of any point on the surface **14***a* is substantially constant in time during steady state conditions and is substantially unaffected by thhe presence of a running yarn leading to improved uniformity of processing especially as between yarns of different types and deniers. It may also be arranged, by suitable design of the heat source, chamber and baffle means, or by the selection of fluid, that the temperature of the surface **14***a* is substantially uniform along the length of the heater, or conforms to a desired temperature "profile," such, for example, as one which rises from a low to a high temperature and then remains at the high temperature as one proceeds from end to end of the heater in the direction of yarn advance.

The machine illustrated in FIGURE 5 is a false twist crimping machine and comprises feed rollers **24** feeding yarn **25** via guides **26** over the heaters **11** which afford a plurality of yarn paths in substantially vertical planes spaced apart lengthwise of the machine. The yarn **25** is drawn over the heaters **11** by output feed rolls **27** and is twisted by false twisting devices **28**. Yarn **25** from the output feed rolls **27** passes to wind-up means **29** comprising a wind-up package **31** and a package rotating bowl **32** and traverse means **33**. Each heater serves two years. If the length of the heaters **11** were such that if arranged as illustrated in FIGURE 5 the overall height of the machine would be excessive, the heaters could instead be arranged as illustrated in FIGURE 4, in which case the wind-up means **29** would be displaced from thhe feed rolls **24** laterally of the machine.

Machines, and heaters for them, may be designed in which the yarn runs more than once over the surface of the same heater, to increase the length of yarn being heated over a given length of heater, or to afford pre- or post-treatment affecting the properties of the processed yarn in any desired manner.

What I claim is:

1. Yarn heating means for a yarn processing machine, comprising wall means defining a chamber adapted to contain fluid, said wall means including a heat conductive member having an outer surface affording at least one yarn path on which yarn can run in contact with the surface and bounding one side of said chamber; a heating element arranged in said chamber at one end of said yarn path; said chamber being adapted for mounting in a yarn processing machine so that fluid contained in said chamber can circulate therewithin over the inner face of said heat conductive member in a direction from said one end to the opposite end of said yarn path; means positioned in said chamber and operative for assisting the circulation of fluid therein.

2. Yarn heating means according to claim **1**, wherein said heat conductive member is curved so that a yarn running on said yarn path is held against the outer surface by tension in the yarn.

3. Yarn heating means according to claim **1**, wherein said yarn path is defined by a groove or channel in said outer surface.

4. Yarn heating means according to claim **1**, wherein said heat conductive member comprises a thin membrane of material having good thermal conductivity.

5. Yarn heating means according to claim **1**, wherein said heat conductive member is of metal.

6. Yarn heating means according to claim **1**, wherein the chamber is adapted to be mounted in a yarn processing machine with said one end of said yarn path lowermost, so that fluid when heated at said one end will pass by convection upwardly over said inner surface.

7. Yarn heating means according to claim **1**, adapted to be mounted in a yarn processing machine with the yarn path in a substantially vertical plane.

8. Yarn heating means according to claim **1**, adapted to be mounted in a yarn processing machine with the yarn path inclined to the vertical so that a long yarn path can be accommodated within a small vertical extent.

9. Yarn heating means according to claim **1**, comprising a heating element received in said chamber at said one end of the yarn path.

10. Yarn heating means according to claim **9**, wherein said heating element comprises an electric resistance heating element.

11. Yarn heating means according to claim **1**, wherein said last mentioned means include guide means so arranged in said chamber, as to guide the circulation of said fluid within said chamber over said inner face of said heat conductive member in a direction from said one end to the opposite end of said yarn path.

12. Yarn heating means according to claim **1**, comprising temperature sensitive means adapted to sense the temperature of the fluid in the chamber at a location near said one end of the yarn path.

13. Yarn heating means according to claim **12**, wherein said temperature sensitive means are connectible through control means to control the supply of energy to said heating element.

14. Yarn heating means according to claim **1**, wherein the fluid is oil.

15. A yarn processing machine, comprising yarn heating means according to claim **1** which afford a plurality of yarn paths in substantially vertical planes spaced apart lengthwise of the machine.

16. A yarn processing machine according to claim **15**, affording a plurality of parallel yarn paths inclined to the vertical so that said plurality of paths can be accommodated within a vertical extent small by comparison with the length of each path.

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