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(71) Applicant: **RIETER SCRAGG LIMITED**
**Macclesfield Cheshire, SK11 0DF (GB)**

(72) Inventor: **Naylor, Geoffrey**
**Macclesfield, Cheshire (GB)**

(74) Representative: **Graves, Ronald**
**Rieter Scragg Limited**
**Langley**
**Macclesfield Cheshire, SK11 0DF (GB)**

## (54) Textile machine arrangement

(57) An ergonomically acceptable configuration of textile machine arrangement (10) is presented which allows processing at higher surge speeds than is the case with known heater and cooling plate arrangements without detriment to the yarn properties, and in which the temperature settings and hence the power consumption of the heater (18) are minimised and the processing is more uniform. The machine (10) has a heating device (18) with a substantially vertical heated surface (20) and the yarn (23) is fed along a yarn path upwardly from a creel (11) to an inlet end (32) of the heating device (18), downwardly in contact with the heated surface (20), through a cooling device (19, 39) and to a false twisting device (16), and the yarn path between the heating device (18) and the false twisting device (16) is inclined to the vertical out of the plane of the heating surface (20). The yarn path through the cooling device (19, 39) is curved, either along a curved track (19) or helically around the surface of a straight tube (39).

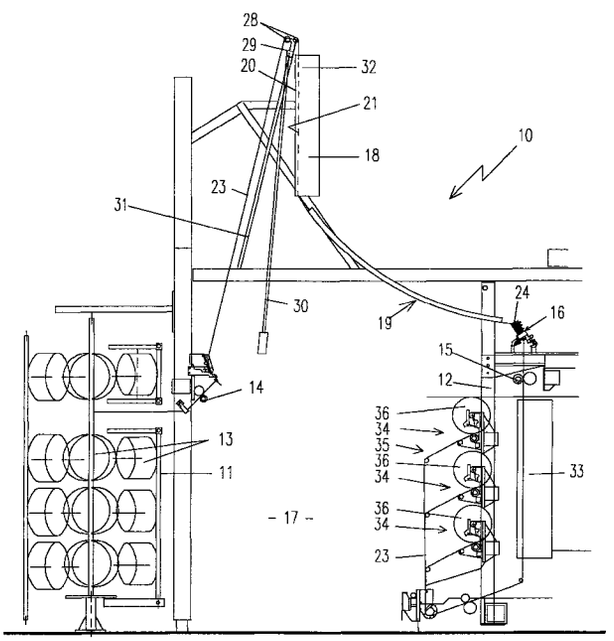


Fig. 1

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## Description

**[0001]** This invention relates to textile machines, and in particular to machines for texturing textile yarns by false twisting, heating and cooling the false twisted yarns, and winding up such yarns.

**[0002]** Textile machines of this type are well known. Conventionally, in many false twist texturing machines, the heating and cooling of the yarns is performed by passing the yarns in contact with the surface of a heated plate and then an unheated, or even cooled, plate. It is an obvious aim of textured yarn producers to maximise the production of textured yarn from any texturing machine, by increasing the machine speed and hence the throughput speed of the yarn. It is also desirable to minimise the length of the heating and cooling plates by maximising the rate of heat transfer between the plates and the yarn. One of the limitations to increasing the speed of the machine is the 'surge speed', a yarn throughput speed at which dynamic threadline instability occurs. This speed is affected by yarn tension, the rate of twist insertion and machine configuration. At this speed, the high rotational speed of the twisting yarn tends to create uncontrolled vibrations in the running yarn and this causes rapid variations in tension and in the twist level inserted in the yarn by the twisting unit, thereby producing unacceptable yarn. It is preferable for some yarns that the yarn path through the heating and cooling zones is straight so as to allow free passage of the twist back from the twisting unit to the start of the heating zone, although other yarns may be acceptably processed despite a severe change of direction between the heating zone and the cooling zone. Machine configurations are a compromise between providing for satisfactory processing for stability and yarn quality and acceptable ergonomics.

**[0003]** It is an object of the present invention to provide an ergonomically acceptable configuration of textile machine arrangement in which the surge speed is higher and the processing is more uniform than is the case with known heater and cooling plate arrangements. It is also an object of the present invention to provide a machine configuration which allows processing at the higher surge speeds without detriment to the yarn properties and to minimise the temperature settings and hence the power consumption of the heater.

**[0004]** The invention provides a textile machine arrangement for texturing textile yarns by false twisting, heating and cooling the false twisted yarns, comprising spaced first and second frames with an operator's aisle between, a creel disposed in the first frame, yarn feeding devices, a heating device and a cooling device disposed above the operator's aisle, and a false twisting device mounted on the second frame, wherein the heating device has a substantially vertical heated surface and wherein the feeding devices are operable to feed a yarn along a yarn path upwardly from the creel to an inlet end of the heating device, downwardly in contact with the heated surface, through the cooling device and to the false twisting device, and the yarn path between the heating device and the false twisting device is inclined to the vertical out of the plane of the heating surface.

**[0005]** The cooling device may extend downwardly from the heating device to the false twisting device. The yarn path between the heating device and the false twisting device may be curved, in which case the cooling device may be a plate which is longitudinally curved through an angle of between 20° and 45°. Alternatively, the cooling device may be a substantially straight tube which is inclined at between 30° and 80° to the vertical. The tube may have yarn guides disposed adjacent the inlet and outlet ends thereof and positioned to guide a running yarn in a substantially helical path along the outer surface of the tube. In operation of such a cooling device, a running yarn may make a plurality of turns around the surface of the cooling tube between the inlet and outlet guides, and the tube may have additional yarn guides located along a helical path between the inlet and outlet guides. A cooling fluid may be passed through the cooling tube.

**[0006]** The heating device may have a temperature of between 150 °C and 800 °C. The heated surface may have a groove therein for receiving a running yarn. The heating device may have a longitudinally curved heated surface with which the yarn runs in contact, or a substantially flat heated surface.

**[0007]** The invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a threadline diagram of one embodiment of machine, and

Fig. 2 shows an alternative cooling device of the machine of Fig. 1.

**[0008]** Referring to Fig. 1, there is shown a textile machine 10, comprising a first frame or creel 11 and a second frame 12. Mounted in the first frame or creel 11 are several packages 13 of supply yarn. Also mounted on the first frame 11 is a first feed device 14 in the form of a feed and nip roller pair. Mounted on the second frame 12 is a second feed device 15, also in the form of a feed and nip roller pair, and a false-twist device 16. The frames 11, 12 are spaced from each other to provide an operator's aisle 17 between them. Above the operator's aisle 17 is a substantially vertically disposed first heating device 18 and a cooling device 19 The heating device 18, which may have a length of between 0.5 and 2.5 m, has a longitudinally curved or substantially flat heated surface 20 facing the creel 11, and in which there is a groove 21. In the case of a longitudinally curved surface, the radius of curvature may be of the order of 18 m. To reduce the length of heating device required for adequate heating of the yarn 23, the first heating device 18 may operate at a temperature at or above the melting point of the yarn 23, i.e. above 150 °C and up to 800 °C. The cooling device 19 is in the form of a plate which is

curved through an angle of approximately 35°, thereby limiting the angular deflection of the yarn 23 as it leaves the heater 18 whilst aligning the incoming yarn 23 to pass over the surface of the first working disc 24 of the false twist device 16 at the desired angle. The cooling plate 19 also has a longitudinal groove therein to receive the running yarn 23, the bottom of which groove has a radius comparable with that of the yarn 23, e.g. 0.5 mm.

**[0009]** Initially the yarn 23 is threaded through the machine 10 to extend in a straight line between the first yarn feed device 14 and the false twist device 16. The yarn 23 is then passed over the yarn guides 28 on a sledge 29 which is pushed either pneumatically or by means of a rod 30 so as to slide upwardly along a sledge track 31 extending between the first yarn feed device 14 and the inlet end 32 of the first heating device 18. This places the yarn 23 in contact with the groove 21 in the heated surface 20 of the first heating device 18 and with the cooling plate 19. After passing through the false-twist device 16, the yarn 23 passes through the second feed device 15 to an optional second heating device 33 and to a package winding mechanism 34 located in a take-up section 35. The second heating device 33, if fitted, and the take-up section 35 are disposed in the second frame 12, the take-up section 35 facing the first frame 11 across the operator's aisle 17. In this case the packages 36 of textured yarn are removed from the machine 10 by the operator or by an automatic doffing mechanism (not shown) operating in the operator's aisle 17.

**[0010]** Referring now to Fig. 2, there is shown a machine 10 which is identical with that shown in Fig. 1 except for an alternative cooling device 39 instead of the plate 19. The cooling device 39 is in the form of a tube having guides 37 disposed adjacent the inlet and outlet ends thereof to guide the running yarn 23 in a helical path, making two or three turns as it travels the length of the cooling device 39. There may be additional guides 38 located on the tube 39 along the helical yarn path to aid the stability of the yarn 23 in this region. With this arrangement, a cooling fluid may be passed through the tube 39 This may be effected by withdrawing air from the tube 39 through an aperture adjacent the inlet end as part of a fume extraction system. cooler air entering the tube 39 at the outlet end. Alternatively the cooling fluid may be supplied from a cooling fluid supply device 22 to circulate through the cooling tube 39 to enhance the cooling effect and thereby reduce the length of the cooling device 19 required for adequate cooling of the yarn 23. The cooling device 39 is inclined downwardly towards the false-twist device 16 at an angle of between 30° and 80° to the vertical, thereby aligning the incoming yarn 23 to pass over the surface of the first working friction disc 24 of the false twist device 16 at the desired angle. The yarn 23 is threaded around the cooling tube 39 so as to extend in a straight line between the first yarn feed device 14 and the yarn guide 37 at the inlet end of the cooling tube 39. The yarn 23 is then introduced to the surface 20 of the heater 18 by raising the sledge 29 as described above.

**[0011]** With the vertically disposed heater 18, the yarn 23 carries heat downwardly against the natural upward flow of heat in the heated surface, leading to a more even temperature profile along the heated surface 20 and consequential better heating of the yarn 23. With this arrangement and with the, not excessive, change of yarn direction due to the cooling device 19, 39 being inclined to the vertical, the surge speed is increased significantly, particularly in the case of a substantially flat heater 18, whilst maintaining satisfactory migration of the twist back to the start of the heating zone. Surprisingly, it has been found that an increase in the surge speed of up to 200 metres/min can be obtained using the present arrangement compared with the known heater/cooling device configurations with heaters of similar dimensions and heating capabilities. Furthermore it has been found that increasing the yarn throughput speed downwardly through the vertical substantially flat heater 18, whilst maintaining the heater temperature constant, can produce an increase in the temperature of the yarn 23 on exit from the heater 18. This effect is opposite to that experienced with conventional contact heaters. The effects on surge speed and heat transfer in the present case are believed to result from the better temperature profile along the heated surface 20 and vibration restriction in the cooling zone due to the change in direction of the yarn path between the heater 18 and the cooling device 19, 39 together with the curvature of the yarn path along the plate 19 or around the tube 39.

## Claims

1. A textile machine arrangement for texturing textile yarns by false twisting, heating and cooling the false twisted yarns, comprising spaced first and second frames with an operator's aisle between, yarn feeding devices, a heating device and a cooling device disposed above the operator's aisle, and a false twisting device mounted on the second frame, the first frame comprising a creel, wherein the heating device has a substantially vertical heated surface, characterised in that the feeding devices are operable to feed a yarn along a yarn path upwardly from the creel, downwardly in contact with the heated surface, through the cooling device and to the false twisting device, and in that the yarn path between the heating device and the false twisting device is inclined to the vertical out of the plane of the heating surface.

2. A textile machine arrangement according to claim 1, characterised in that the cooling device extends downwardly from the heating device to the false twisting device.

3. A textile machine arrangement according to claim 1 or claim 2, characterised in that the yarn path between the heating device and the false twisting device is curved.

4. A textile machine arrangement according to claim 3, characterised in that the cooling device is a plate which is longitudinally curved through an angle of between 20° and 45°.

5. A textile machine arrangement according claim 3, characterised in that the cooling device is a straight tube inclined at between 30° and 80° to the vertical.

6. A textile machine arrangement according to claim 5, characterised in that the tube has yarn guides disposed adjacent the inlet and outlet ends thereof and positioned to guide a running yarn in a substantially helical path along the outer surface of the tube.

7. A textile machine arrangement according to claim 6, characterised in that the tube has additional yarn guides located along a helical path between the inlet and outlet guides.

8. A textile machine arrangement according to claim 6 or claim 7, characterised in that a cooling fluid is passed through the tube.

9. A textile machine arrangement according to any one of claims 1 to 8, characterised in that the heating device has a temperature of between 150 °C and 800 °C.

10. A textile machine arrangement according to any one of claims 1 to 9, wherein the heating device has a substantially flat heated surface.

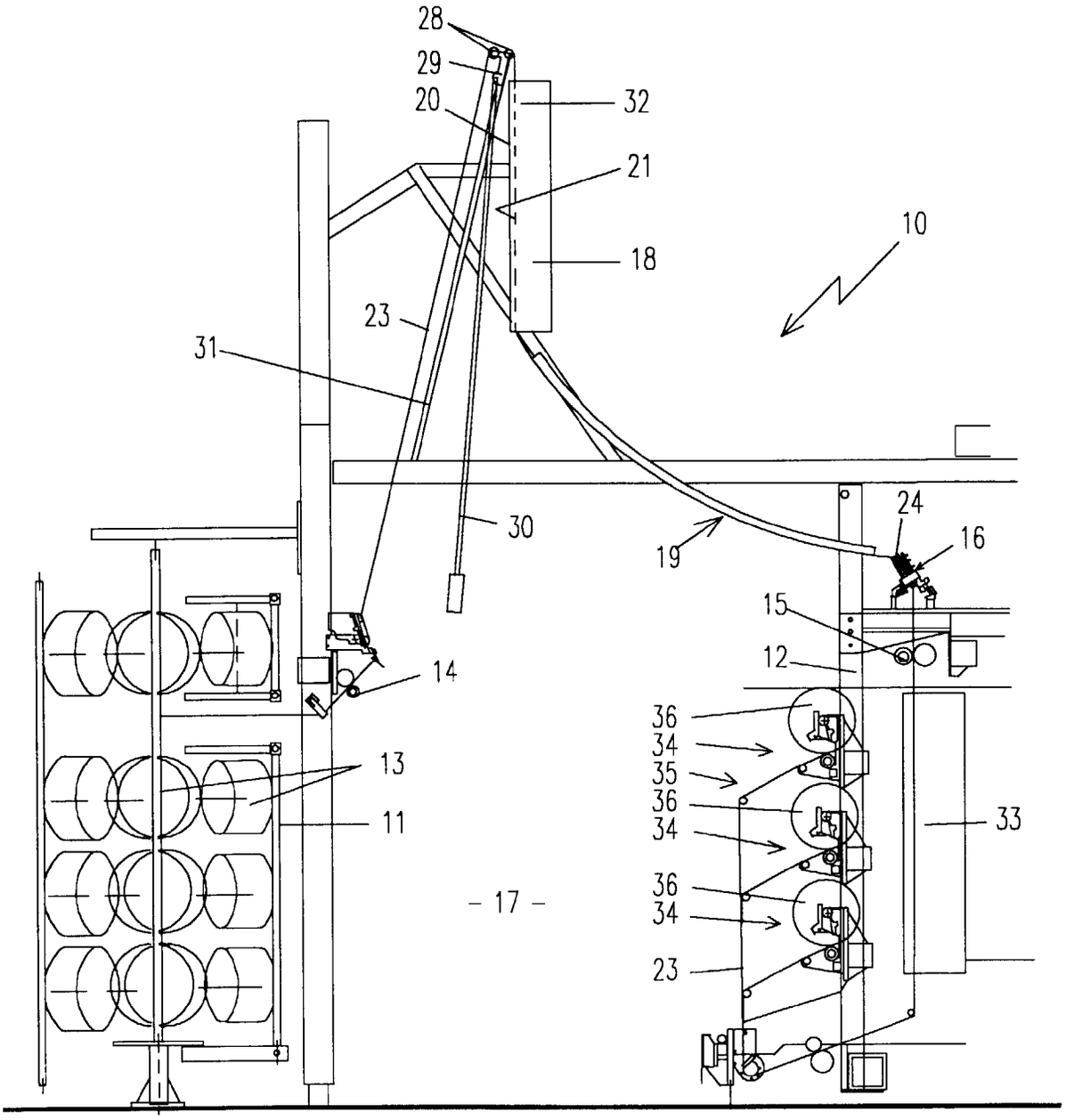
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Fig. 1

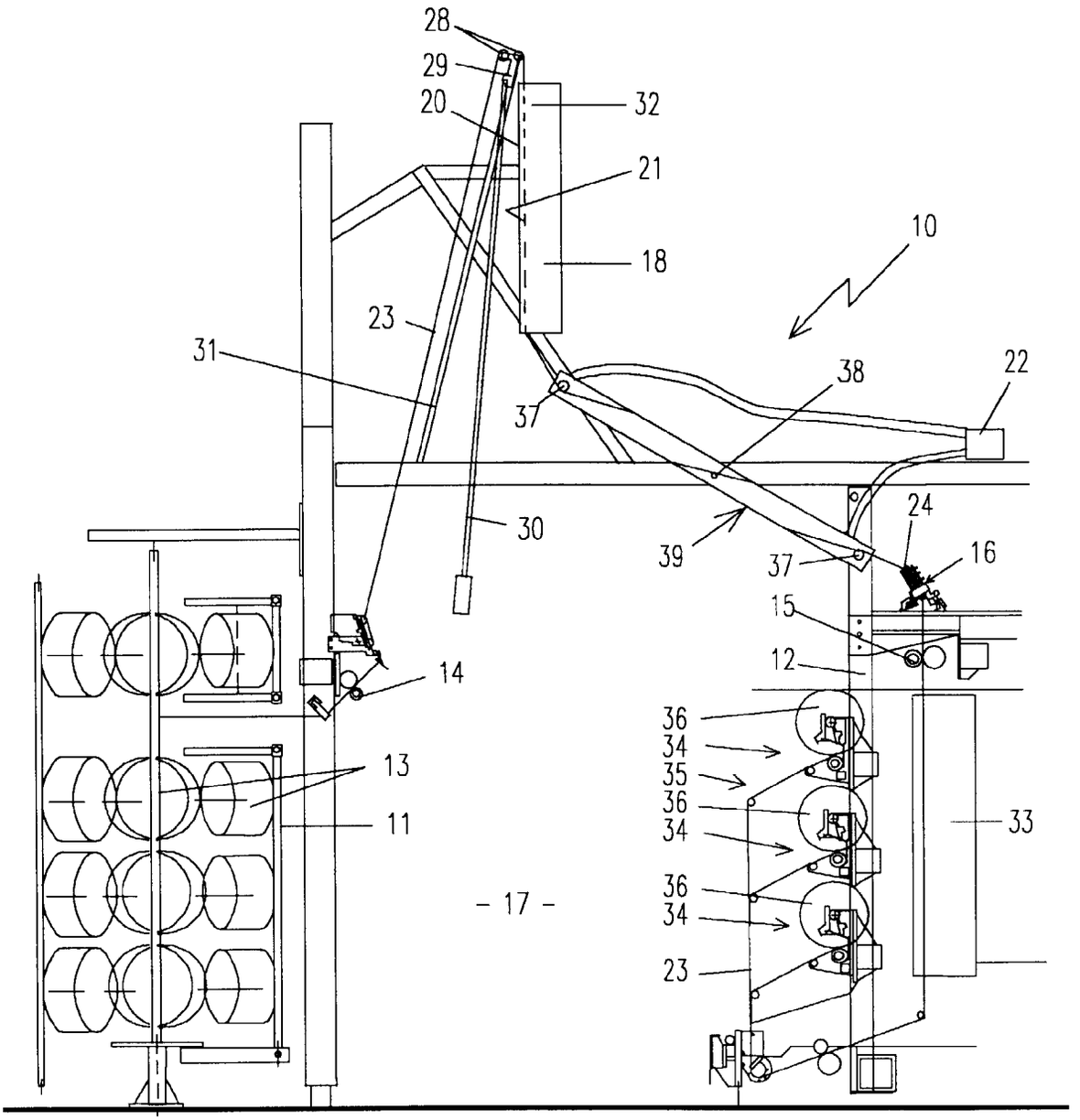
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Fig. 2