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[54] YARN HANDLING APPARATUS

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[58] **Field of Search** 226/188, 145, 146, 147, 174, 226/179; 192/14

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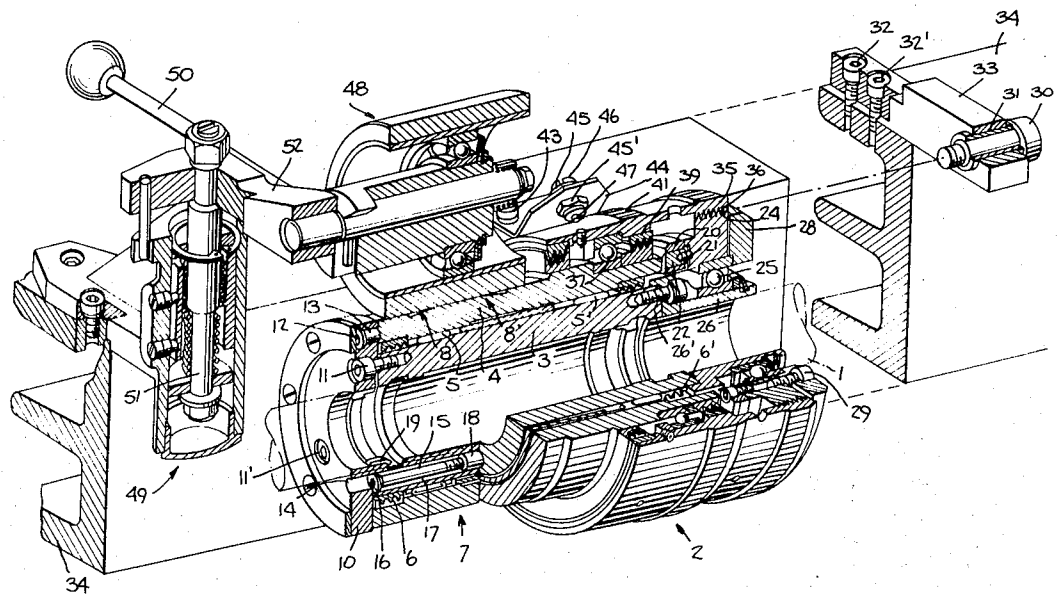
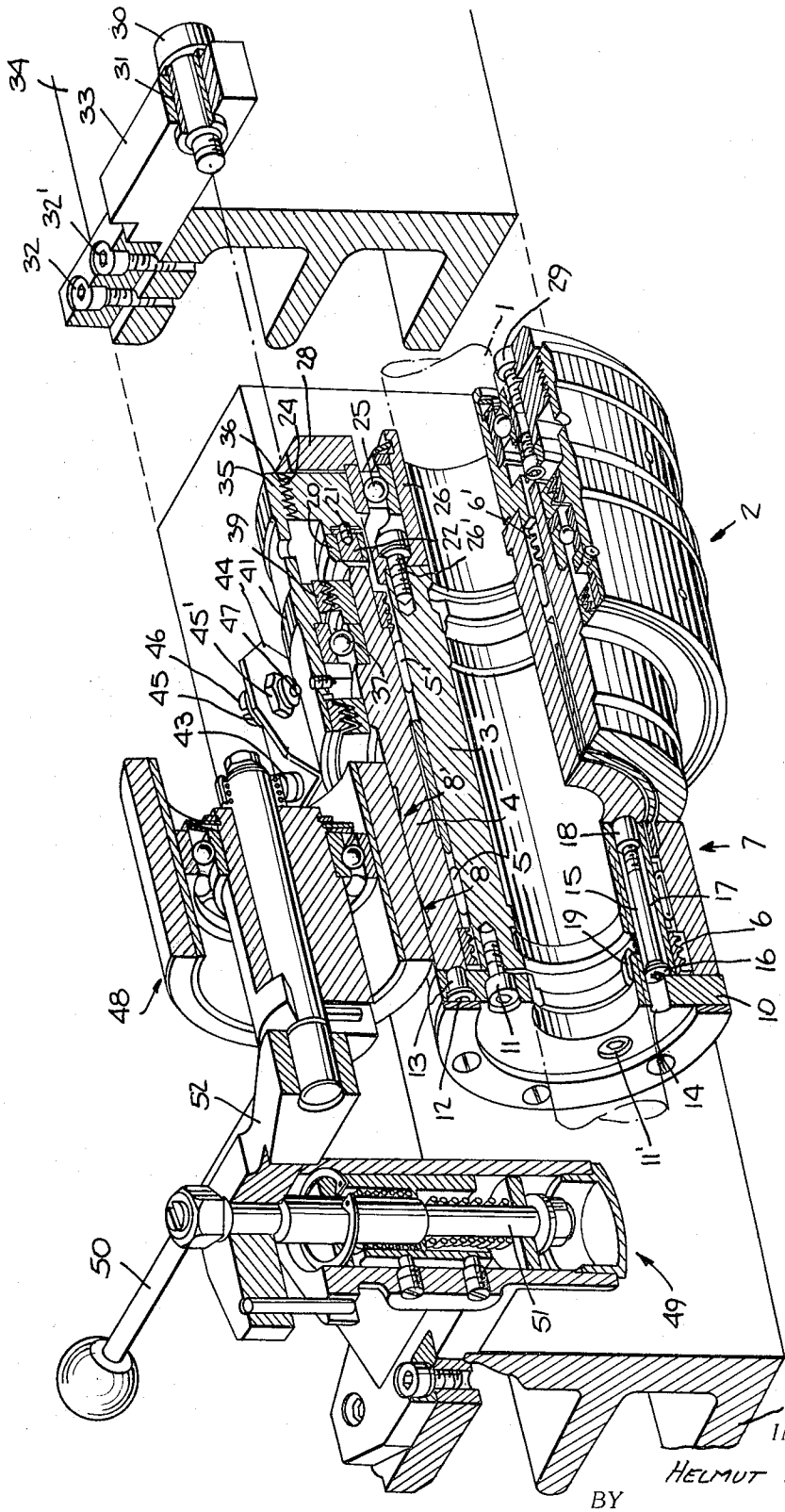
[57] **ABSTRACT**

Apparatus for driving individual selected driving rollers in a multi-station textile machine wherein the rollers are shiftable longitudinally between a braking position and an accelerating position on a main drive shaft.

11 Claims, 1 Drawing Figure





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YARN HANDLING APPARATUS

This invention relates to apparatus for driving individual selected drive rollers at processing stations of a multi-station textile machine wherein the delivery devices for all stations are driven by a common drive shaft, each delivery device comprising a driving roller fixed on the shaft, the advancement of the threads, yarns or ply-yarns being effected between these driving rollers and the delivery rollers, the latter receiving the rotation of the driving rollers by friction.

In order to thread the yarn, e.g. after a cop has been exchanged or after thread breakage, the advance roller must be removed from the drive roller. In so doing, the delivery roller is immobilized, whereas the drive roller, in the devices known up to now, continued to rotate with unvaried speed. The delivery roller, therefore, had to be brought into contact again with this still rotating drive roller after threading of the yarn.

In industry nowadays, equipment is required which can thread yarns or threads into delivery devices having advancing speeds of between 500 and 1,000 meters per minute without causing any difficulties; and threading should be possible with a running as well as with an immobile thread or yarn.

A further difficulty with the abovementioned high advance speeds of 500 meters per minute and more, consists in that the driving rollers tend readily to vibrate on the drive shafts which cause the delivery rollers to be lifted away from the driving rollers; this occurs particularly in all systems wherein the delivery roller is self-supporting or pressed against the drive roller by means of springs. This vibration causes interruptions in yarn delivery.

Furthermore, the sudden contact of the immobile delivery roller with the drive roller rotating at high speed may cause a change in the structure of the yarn passing between the two rollers, or, even worse, may cause a rupture of the yarn.

Application Ser. No. 745,017 filed July 15th, 1968 of the same applicant deals with the problem of providing an apparatus for the feed or delivery of threads, yarns or ply-yarns into textile machines, which, in this particular case, is a single-point roller delivery device which makes possible soft adaptation of the revolution speed of a driving roller to a delivery roller of a delivery mechanism while the threads are moving before both rollers enter into pressure contact with the yarn running between them, and without adversely influencing the yarn. Thereby, the applicant has resolved the problem of constant pressure between the driving and the delivery roller as well as that of avoiding disturbing vibrations, and, furthermore, the problem of threading threads, yarns or ply-yarns while the material is advanced without any difficulty.

A further problem has now to be resolved which consists in creating an apparatus for the drawing off of endless yarns of all types and of a nearly unlimited titer range and delivery speeds of more than 0 and up to more than 1,000 meters per minute which apparatus permits selective immobilization of individual processing stations of a machine wherein the remaining stations of the machine can continue to operate normally. Particularly, there is a need for apparatus by which immobile threads, even of extremely low titers, can be softly and gradually accelerated to high speeds and to the normal operating speed of the machine.

Accordingly, I have conceived apparatus of the class described by which I am able to overcome the foregoing difficulties and disadvantages. Thus, I contribute apparatus for operation at selected individual stations of multi-station textile machine wherein the yarn delivery devices of all stations are driven by a common drive shaft each delivery device consisting of a rotatable driving roller as well as of a delivery roller which may be disengaged from the moving surface of the drive roller and brought into linear contact with the same and which, by means of resilient devices coupled with the latter, exercise a constant pressure the amount of which is not limited, but may not be influenced manually, characterized in that a rotating ring supported for rotation and axial displacement on a hub engagingly connected with a drive shaft of a driving mechanism may be brought selectively into contact with a coupling disc effecting rotational acceleration of the same or with a braking disc effecting its immobilization by means of a rotatable coupling ring effecting axial movement thereof. The construction is such that the rotating and axial movement of the coupling ring may be adjusted.

The coupling ring may be formed with a knurled or profiled surface for engagement by a resiliently mounted member to maintain the ring against rotation from any desired annular position.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent construction as do not depart from the spirit and scope of the invention.

A specific embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification wherein:

The single FIGURE is a perspective sectional view of one example of apparatus according to the present invention.

Referring to the drawings, it will be seen that a hollow cylindrical hub **3** of the drive roller **2** is fixedly mounted on a drive shaft **1** and supports a rotating ring **4** through needles **5, 5'** for rotary and axial movement. Lubricant for the needles is prevented from escaping laterally by labyrinth packing rings. The contact surface **7** of the rotating ring **4** is provided with grooves **8, 8'** which serve, among other things, to improve removability of a thread which has entangled on the running surface **7**. The rotating ring **4** is axially connected with the coupling ring **35** by means of a ball bearing **37**, which renders possible axial shifting of the rotating ring **4**. Such axial movement of the rotating ring **4** is limited by a circular annular coupling disc **10** which is rigidly connected with the hub **3** by means of screws **11, 11'** and runs at equal speed with the hub. On the inner face of the coupling disc, there are provided gliding bolts **13**, the inner faces of which are pressed by means of springs **12** so that the opposite ends thereof contact the lateral face of the ring **4**. The mobility of bolts **13** is axially limited, and upon contact with the lateral face of the rotating ring **4**, these bolts effect its soft or gradual acceleration up to normal working speed. Bores **14** in the coupling disc **10** enable tightening screws **15**, which each have a conical head **16** and conical tightening bolts **18** arranged in bores **17** in the hub, to be tightened and loosened. When tightening the screws **15**, their conical heads **16** and the tightening bolts **18**, the shape of the end of which (not shown) corresponds to the conical head **16**, are pressed against resilient segments **19** which, by pressure against the driving shaft **1** effect engaging contact between the shaft and the hub **3**.

At the end opposite the coupling disc of the rotating ring **4**, its axial shiftability is limited by a stationary braking disc **20** on the side of which, facing the lateral face of the rotating ring **4**, are arranged gliding bolts **22** of limited axial movement, pressed against the rotating ring **4** by means of pressure springs for soft braking of rotation of the ring **4** until the same is immobilized. The braking disc **20** is connected by means of screws **27** with an exteriorly threaded ring **23** supported on a flange **26** by means of a ball bearing, and the flange **26** is in turn fixedly mounted on the hub **3**. Six fixing screws **27**, and four interior screws **29** are used to assemble the disc **20**, ring **23** and bearing cover **28**, as shown. The bearing cover **28** itself is fixed in a dampening cylinder **31** which is supported in a torsional moment support **33** fixed on the frame part **34** of the machine by means of two screws **32, 32'**.

A hollow cylindrical coupling 35 encloses the rotating ring 4 from the labyrinth packings 38 to the threaded ring 23. An interior thread 36 provided at the end of the coupling ring 35 engages the exterior thread 24 of the stationary threaded ring 23. The coupling ring 35 is supported on the rotating ring 4 by means of a ball bearing 37, the exterior ring of the ball bearing being fixed to the coupling ring 35, and the inner ring of ball bearing 37 being fixedly mounted on the rotating ring 4. The ball bearing 37 is secured against lubricant loss by means of labyrinth packings 38, 39. This arrangement of the coupling hub makes possible selective axial shifting of the coupling ring 4 in a range of movement between the coupling disc 10 to effect rotational acceleration of the ring, and the braking disc effecting deceleration of same to a stop, by turning the coupling ring 35, the axial movement being effected by the threads 24, 26.

For fixing the position of the coupling ring 35, the same is provided with a profiled or knurled ring 41; and a resting piece 44 of sheet iron fixed on a frame part 34 by means of two screws 43, 43' carries a resilient pressure piece 46 mounted by means of two screwnuts 45, 45' which, by means of a resilient resting piece 47, presses on the profiled rim 41 of the coupling ring 35 and thereby effects its fixation. This resting piece permits any desired position of the rotating ring 4 between the working and braking positions since, in absence of this apparatus, the bearing friction of the rotating ball bearing 37 would effect rotational movement of the coupling 35 on the thread 24, 36.

When the rotating rotating ring 4 is braked, insertion of the stationary yarn is effected between the stationary contact surface 7 of the driving roller 2 and the periphery of a delivery roller 48. Contact and removal of this roller 48 with ring 4 is effected by actuation of a lever 50 of a known pressure device 49 fixed on the machine frame 34' which transmits a defined and constant pressing force to the delivery roller via a shaft 51 and a shoulder piece 52. If a safety force existing within the housing of the pressing device which essentially exceeds this constant pressing force is exceeded, e.g. owing to the formation of wrappings around one of the rollers or to other irregularities in yarn transport, the pressing device 49 automatically disengages the delivery roller 48 from the driving roller and interrupts thread delivery. It is obvious to persons acquainted with the textile art that the delivery roller 48 can thus be connected with the coupling ring 35 by a switching bar system so that approach or removal of the roller 48 relative to the rotating ring 4, effects braking or acceleration of the rotating ring of the driving roller 2 caused by simultaneous proportional movement of the coupling ring 35 and that, inversely, the rotation of the coupling ring which effects braking or acceleration of the running ring 4 causes removal of the roller 48 from the moving periphery 7 of the rotating ring or pressing thereof against the same.

The advantages of the apparatus of the present invention consist in that the construction of the hub for mounting and demounting makes possible easy fastening of the driving roller on the driving shaft and equally easy loosening of the engaging connection. It is particularly advantageous that, because of soft or gradual acceleration of the drive roller from immobility to the highest working speed, stationary yarns even of the finest titers may be threaded and inserted at speeds even exceeding 1,000 m/min. in connection with a delivery roller which exercises constant pressure on the rotating periphery of the drive roller without the danger of yarn breakage or structural changes in the same by excessive stretching because of too high acceleration.

I claim:

1. Apparatus of the class described which is operable at selected individual processing stations of a multi-station textile machine wherein the yarn delivery devices of all stations are driven by a common drive shaft, each delivery device consisting of a rotatable driving roller, as well as of a delivery roller which may be disengaged from the moving surface of the drive roller and brought into linear contact with the same and which, by means of resilient devices coupled with the latter, exercise a constant pressure the amount of which is not limited, but may not be influenced manually, characterized in that a rotating ring (4) formed with at least one conical groove (8) on its outer surface and supported for rotation and axial displacement on a hub (3) engagingly connected with a drive shaft (1) of a driving mechanism (2) may be brought selectively into contact with a coupling disc (10) effecting rotational acceleration of the same or with a braking disc (20) effecting its immobilization by means of a rotatable coupling ring (35) effecting axial movement thereof, and in that the rotating and axial movement of the coupling ring may be adjusted, the grooved surface of said rotatable ring facing the delivery roller.

2. Apparatus according to claim 1, characterized in that the coupling ring (35) is mounted on the rotating ring (4) via a ball bearing (37) by means of an exterior ring of the ball bearing (37) in the coupling ring (35) and an inner ring of the ball bearing (37) on the rotating ring (4), furthermore, that on the end of the coupling ring (35) facing the brake disc (20), there is arranged a thread (36) which is engaged with a threaded ring (23) effecting axial shifting of the rotating ring (35) upon rotation of the coupling ring (35) and in that the coupling ring (35) is provided with a profiled rim (41) for fixing its rotational and, therefore, also of its axial movement.

3. Apparatus according to claim 1, characterized in that the braking disc (20) is rigidly arranged on a frame part (34) of the machine by means of a threaded ring (23) with retaining screws (27) and by means of a bearing cover (28) with screws (29), a shoulder screw (30) and a dampening cylinder (31) as well as by means of a torsional moment support (33).

4. Apparatus according to claim 2, characterized in that the braking disc (20) is supported by means of threaded ring (23) and a ball bearing (25) on a bearing flange (26) which is rigidly connected with the hub (3) of the drive shaft (2).

5. Apparatus according to claim 1, characterized in that on the brake disc (20) on the side facing the rotating ring (4), there are provided slidable bolts (13) resiliently fixed by means of pressure springs (12) with axially limited mobility for softly braking the rotating ring (4).

6. Apparatus according to claim 1, characterized in that the coupling disc (10) is rigidly connected with the hub (3) at the end of the driving shaft (2) facing the braking disc (20) for effecting synchronous running with the hub (3).

7. Apparatus according to claim 1, characterized in that, on the side of the coupling disc (10) facing the rotating ring (4), there are arranged gliding bolts (22) resiliently fixed by means of pressure springs (21) with axially limited mobility for softly accelerating the rotating ring (4).

8. Apparatus according to claim 1, characterized in that hub (3) is cylindrical and needle bearings are positioned between the hub and the rotating ring (4), and that at the ends facing the coupling disc (10) and the braking disc (20), the hub is provided with labyrinth packings (6,6') preventing loss of bearing lubricant, for permitting rotation of the rotating ring (4) on the hub (3).

9. Apparatus according to claim 1, characterized in that, on the ring (23) threading (24) is provided for axially shifting the coupling ring (35) and the rotating ring (4) and, on its side facing the flange (29), bearing means (25) for rotating the flange (26) of the hub (3) in the threaded ring (23).

10. Apparatus according to claim 1, characterized in that, in the hub (3), concealable screws (15) with conical heads (16) and bolts (18) with conical heads are screwable, and in that resilient segments (19) are positioned against the drive shaft and may be tightened thereagainst by the concealable screws (15) and the bolts (18).

11. Apparatus according to claim 1, characterized in that the frame part (34) is provided with a resting piece (34) of sheet iron and with a pressure piece (46) resiliently fixed thereon with a spherical resting piece (47) resiliently fixed thereon for engaging the profiled rim (41) to fix the position of the coupling ring (35).

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