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CIRCULAR LOOM AND DRIVING MEANS THEREFOR

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FIG. 2

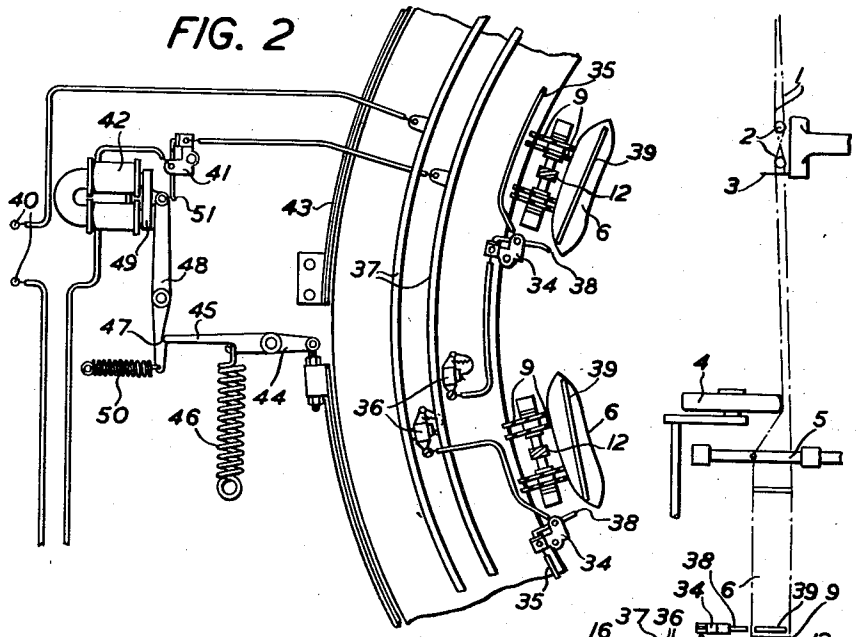
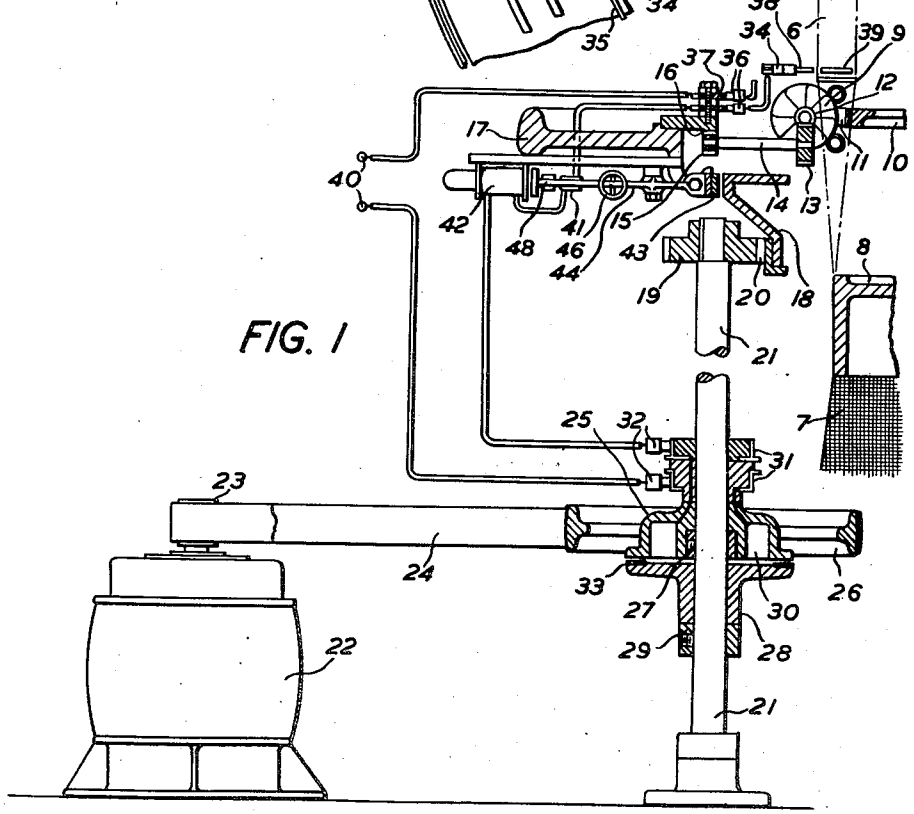


FIG. 1



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CIRCULAR LOOM AND DRIVING MEANS THEREFOR

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2 Claims. (Cl. 139—13)

This invention relates to circular looms, and in particular to the positioning of the shuttles in such looms, the driving of the shuttles relatively to the warps, and the stopping of the loom in the event of thread failure or breakage. The invention relates particularly to circular looms of the type in which the shuttles are positioned within the sheds formed by the warps disposed cylindrically or substantially cylindrically by means of rotating vane wheels penetrating one sheet of warps at each shuttle and entering recesses in the shuttle, slots between the vanes permitting the threads of the penetrated sheet of warps to pass the vane wheels as the vane wheels rotate.

In order to carry the vane wheels and the driving means for rotating them about their axes, and other associated mechanism, a ring is provided outside and close to the warp threads, and in the case (with which the present invention is concerned) wherein the warps are non-rotating, the ring is caused to rotate about the central axis of the loom in order to drive the shuttles round the loom. In the event of thread failure or breakage it becomes necessary to prevent the continued rotation of this driven member—a problem that becomes increasingly more difficult as the speed of operation of the loom increases, for in order to avoid warp damage, the relative motion between warps and shuttles must cease within the same linear space with high speeds of operation as with low speeds, and therefore the time in which stoppage of weaving must be accomplished is proportionately less as the speed of operation increases.

The rapid stopping of weaving is effected according to the invention by interposing in the drive to the vane-wheel supporting ring a magnetic clutch which is operated immediately upon detection of thread failure or breakage to disconnect the ring practically instantaneously from the driving means of the loom. With this arrangement, the shuttle-supporting ring is practically the sole moving part to be brought to rest, and a powerful brake actuated simultaneously with the release of the clutch stops the ring after only a very small angular movement of the ring. Thus, the ring may be formed or provided with an annular gear driven by a pinion on a shaft in which the clutch is incorporated. Therefore, when the clutch is de-energized, the brake has merely to bring to rest the ring and the pinion together, of course, with the vane-wheel shafts and their driving gear carried by the ring and the shuttles supported by the vane wheels. All these members, though rigid in structure, can be made of light material so that the parts to be brought to rest have a mass as low as possible.

The magnetic clutch is preferably controlled electrically, as, for example, by the use of electric detecting means in connection with the shuttles, as described in U. S. Patent No. 2,027,459, actuation of the brake to bring the shuttle-holding ring to rest and of the clutch to throw out the drive following detection of warp jamming with extreme rapidity. With advantage the pivotally hung warp feeler described in U. S. Patent No. 1,968,041 is employed on the shuttles, this providing rapid detection of warp jamming. The same stop mechanism may also be employed to detect weft breakage, the detector member described in U. S. Patent No. 2,019,608 being particularly suitable for use in this connection.

By way of example one form of loom in accordance with the present invention will now be described in greater detail with reference to the accompanying drawing in which

Fig. 1 is a sectional view of one side of the loom, and

Fig. 2 is a plan view showing the details of Fig. 1.

In the drawing the warp threads 1 are disposed in the form of a cylinder and pass downwardly past lease rods 2 and a spacing comb 3 to shedding wheels 4 and a shedding reed 5. The shedding wheels 4 and the shedding reed 5 separate the warp threads 1 into two sheets between which are disposed the shuttles 6. Below the shuttles 6 the fabric 7 is formed, and proceeds downwards past a fabric ring 8 to a fabric take-up device (not shown). The shuttles 6 are held between the sheets of warp threads by means of vane wheels 9 passing between warp threads on one side of the shuttle, and engaging with flanged rollers on the shuttles as described in U. S. Patent No. 2,050,328. The shuttle 6 is supported on the other side by an annular race 10 acting through the warp threads upon a roller 11 carried by the shuttle. The vane wheels are provided with driving gears 12, 13 driven by a shaft 14 carrying a further gear 15 which engages with a stationary annular gear 16 carried on an annular ring 17. The vane wheels 9, gears 12, 13, 15 and shaft 14 are carried on a shuttle supporting ring 18 which is rotated by means of a gear 19 mounted on a shaft 21 engaging with an annular gear 20 beneath the ring. The rotation of the vane wheels 9 causes them to pass through the warp threads and to engage with the shuttles 6 whereby the shuttles are caused to rotate with the ring 18.

The shedding wheels 4 are required to rotate at the same speed as the shuttles 6, and are therefore conveniently driven from the shuttle supporting ring 18. Since they are simple in construction and light in weight, they do not add substantially to the inertia of the ring 18, shuttles 6 and associated parts.

The shaft 21 is driven from a motor 22 by means of a pulley 23 and a belt 24. Surrounding the shaft 22 is a clutch member 25 formed integrally with a pulley 26 which is engaged by the belt 24 so that the pulley and the clutch member 25 are caused to rotate by the motor 22. The clutch member 25 is supported freely on the shaft 21 by means of a collar 27. Beneath the clutch member is an armature 28 slidably keyed to the shaft 21 and supported a little below the clutch member 25 by means of a collar 29. Within the member 25 are provided electrical windings forming an annular ring round the shaft 21, the windings 30 being connected to slip rings 31 engaged by contact brushes 32. Cork facings 33 are provided between the faces of the armature 28 and the member 25. When current is running in the windings 30, the armature 29 is drawn up into firm engagement with the clutch member 25, so that the clutch member 25 is connected to the shaft 21.

The contact brushes 32 are connected in series with a loom stop circuit, e. g. of the type described in U. S. Patent No. 2,027,459 and Patent No. 2,019,608, adapted to stop the loom on thread breakage or failure. Each of the shuttles 6 is provided with a switch 34, the several switches being connected in series by means of leads 35 and the whole series of switches being connected to stationary slip rings 37 by means of brushes 36. Each of the switches 34 has a projecting tail 38 adapted to be engaged by means of a rod 39 carried by each of the shuttles. This rod is adapted to be pushed back on thread breakage or failure as described in U. S. Patent No. 2,027,459, so as to open the corresponding switch.

One of the slip rings 37 is connected to a source of power 40. The other slip ring 37 is connected through a switch 41 similar to the switches 34 to an electro-magnet 42. The electro-magnet 42 is connected in turn to one of the contact brushes 32 while the other contact brush 32 is connected to the other pole of the source of power 40 thus completing the circuit. Around the edge of the ring 18 is provided a brake band 43 operated by means of a lever 44 to one end 45 of which is attached a powerful spring 46 for applying the brake band 43 to the ring 18. The end 45 of the lever 44, however, is normally held so that the brake is in the off position by a notch 47 in a lever 48. The lever 48 carries an armature 49 which is attracted by the electro-magnet 42. A spring 50 however is provided so that when the electro-magnet 42 is deenergized the lever 48 is pulled back. The end 45 of the lever 44 is then disengaged from the notch 47 and the brake band 43 is applied.

In operation, upon thread failure or breakage, the rod 39 on the shuttle next encountering the failure or breakage is pushed back in the manner described in U. S. Patent No. 2,027,459. The rod 39 engages with the tail 38 of the corresponding switch 34 and breaks the electric circuit. As a result of this the electro-magnet 42 is deenergized and the brake-band 43 is firmly applied to the edge of the ring 18 by means of the powerful spring 46. At the same time the current ceases to flow through the windings 30 within the clutch member 25, and in consequence the armature 28 drops away from the member 25 on to the collar 29 and the motor 22 is disconnected from the shaft 21. In this manner the inertia of the moving parts to be stopped by the action of the brake-band 43 is greatly reduced and the loom is brought quickly to rest. When the loom is brought to rest the lever 48 engages the tail 51 of the switch 41 and breaks the circuit at this point also. As a result the circuit cannot be remade until the brake-band 43 has been released, and the notch 47 on the lever 48 has been caused to engage with the end 45 of the lever 44 so as to hold the brake-band 43 in released position. This prevents the motor 22 from being connected to the shaft 21 until the brake band 43 has been released from the ring 18.

A further switch similar to and actuated in the same way as the switch 41 may be included in the circuit of the motor, so that when the loom is stopped, the motor is switched off. Since, however, the driving torque of the motor is in any case disconnected from the ring 18, this provision is not essential, and the motor may be stopped by hand after the ring 18 has been brought to rest.

What we claim and desire to secure by Letters Patent is:—

1. A circular loom for weaving with non-rotating warp threads, comprising weft shuttles completely surrounded by said warp threads and associated parts carried upon a ring surrounding the warps and adapted to rotate, a brake band surrounding said ring, an electro-magnet adapted to hold said brake band out of engagement with said ring, a closed stop circuit including said electro-magnet and adapted to be opened on thread failure or breakage so as to cause said brake band to be applied to said ring, means for driving said ring, shuttles and other associated parts and an electro-magnetic friction clutch interposed in said drive, the windings of said clutch being included in said closed circuit whereby on opening of said circuit said electro-magnetic clutch is de-energized and the resistance to stopping of the parts to be brought to rest by said brake band is reduced.

2. A circular loom for weaving with non-rotating warp threads, comprising weft shuttles completely surrounded by said warp threads and associated parts carried upon a ring surrounding the warps and adapted to rotate, a brake band surrounding said ring, a lever mechanism for operating said brake band, an electro-magnet for controlling said lever mechanism and adapted thereby to hold said brake band out of engagement with said ring, a closed stop circuit including said electro-magnet and adapted to be opened on thread failure or breakage so as to cause said brake band to be applied to said ring, means for driving said ring, shuttles and other associated parts round the loom axis, an electro-magnetic friction clutch interposed in said drive, the windings of said clutch being included in said closed circuit whereby on opening of said circuit said electro-magnetic clutch is de-energized and the resistance to stopping of the parts to be brought to rest by said brake band is reduced, and a switch included in said circuit and controlled by said lever mechanism, said switch being opened by said lever mechanism automatically when the stop mechanism is in operation to stop or prevent weaving.

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