March 20, 1956 R. H. ROUGHSEDGE 2,738,937

TEXTILE APPARATUS

Filed Oct. 6, 1951

FIG.1.

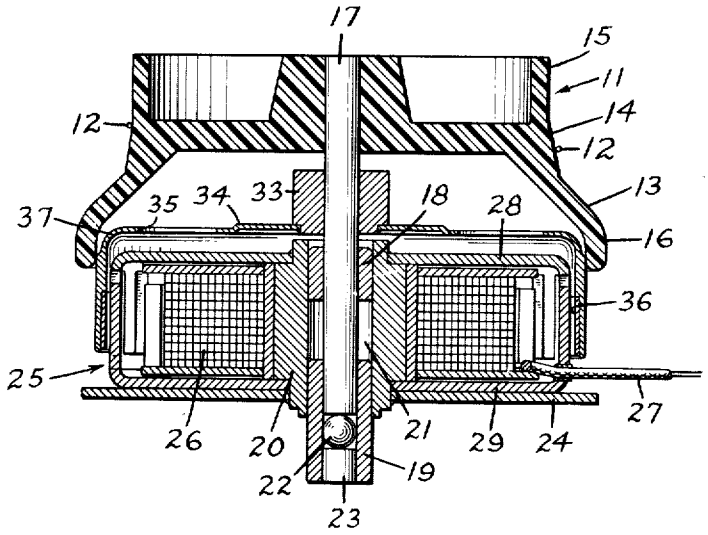
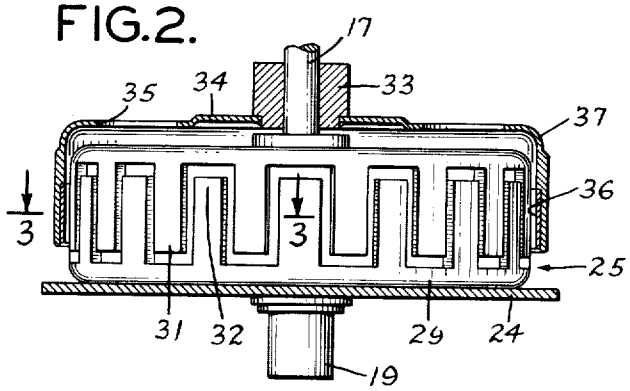


FIG.2.



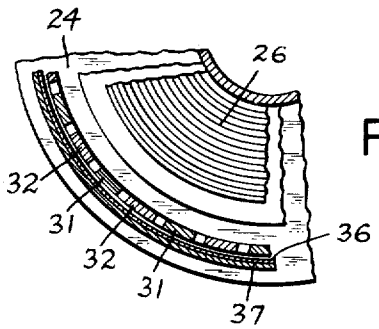


FIG.3.

INVENTOR.
ROBERT H. ROUGHSEDGE
BY
ATTORNEYS.

United States Patent Office 2,738,937 Patented Mar. 20, 1956

2,738,937

TEXTILE APPARATUS

Robert H. Roughsedge, Ramsey, N. J., assignor to Celanese Corporation of America, New York, N. Y., a corporation of Delaware

Application October 6, 1951, Serial No. 250,079

6 Claims. (Cl. 242—155)

This invention relates to textile apparatus and relates more particularly to yarn tension devices for use in textile apparatus.

In my copending application Serial No. 166,020 filed June 3, 1950, now Patent No. 2,705,363, there is disclosed a novel yarn tension device in which the yarn tension is developed by the movement of an electric conductor through a magnetic field. In this device, the yarn is trained around a wheel which is rotatably mounted in any suitable manner and is operatively connected to a soft iron disc positioned adjacent one end of an electromagnet. As the yarn moves through the yarn tension device, with the electromagnet energized, it rotates the wheel around which it is trained, causing the soft iron disc to move through the magnetic field and thereby developing a braking force on the wheel and a tension in the yarn.

When the electromagnet of the yarn tension device described in my aforementioned application is energized, it develops a force tending to draw the soft iron disc axially toward the end of the electromagnet. This axial force produces considerable pressure on the bearings supporting the wheel to which the soft iron disc is operatively connected. With continued use, the pressure on the bearings will cause the same to wear, thereby producing a change in the braking force on the wheel and in the tension on the yarn. When a number of the yarn tension devices are operated together to develop tension in a plurality of ends of yarn, as in a warper, the changes in yarn tension due to wear will not be the same for all the ends of yarn. As a result, it is necessary to adjust the individual yarn tension devices periodically to avoid the production of defective warps. The labor involved in making these periodic adjustments of the yarn tension devices increases the cost of operating the textile apparatus in which said yarn tension devices are employed.

It is an important object of this invention to provide a yarn tension device which will be free from the foregoing and other difficulties and which will be especially simple in construction and efficient in use.

A further object of this invention is to provide a yarn tension device which will maintain a substantially constant yarn tension without the necessity for periodic adjustments.

Another object of this invention is to provide a yarn tension device of the aforementioned type in which the magnetic forces are balanced so that they will not tend to produce any relative motion of the electric conductor and the magnetic field.

Other objects of this invention, together with certain details of construction and combinations of parts, will be apparent from the following detailed description and claims.

According to the present invention, there is provided a yarn tension device for applying tension to a travelling yarn comprising a member movable by said yarn, such as a rotatable wheel around which the yarn is adapted to be trained, and magnetic means for applying a braking force to said wheel to develop tension in the yarn without the use of friction. The magnetic braking means comprises a magnet and an electric conductor spaced from and out of contact with the magnet but positioned in the magnetic field produced by said magnet. Either the magnet or the electric conductor is fastened to the rotatable wheel so that, as the yarn causes said wheel to rotate, the electric conductor will be moved with respect to the magnetic field, generating an electric current therein. As is well known, the generation of an electric current in the conductor will tend to oppose the motion of said conductor with respect to the magnetic field, thereby applying a braking force to the wheel to develop tension in the yarn. The magnet and electric conductor are so disposed with respect to one another that there will be no tendency for the magnetic field to move the electric conductor. As a result, there will be no extra pressures imposed on the bearings in the yarn tension device as the result of magnetic forces and the yarn tension device will develop a substantially uniform tension on the yarn without the necessity for periodic adjustments.

One suitable form of yarn tension device comprises an electromagnet having upper and lower pole pieces positioned parallel to one another and spaced apart. From the upper pole piece there projects downwardly a plurality of spaced teeth, arranged in a circle, which are separated from and interdigitated with a plurality of spaced teeth arranged in a circle and projecting upwardly from the lower pole piece. When the electromagnet is energized there will be produced a plurality of magnetic fields between the teeth of the upper and lower pole pieces. A ring of electrically conducting material, which ring may be formed of aluminum, copper or the like but which is preferably formed of a ferromagnetic material, is positioned concentrically of the teeth of the upper and lower pole pieces and is centered vertically with respect to said pole pieces. The ring of ferromagnetic material is fastened in any suitable manner to the wheel around which the yarn is trained and, as the yarn is drawn through the yarn tension device and causes the said wheel to rotate, the ring of ferromagnetic material will be rotated with respect to the magnetic field developing a braking force on the wheel and a tension in the yarn. Because the magnet and electric conductor are disposed symmetrically with respect to one another, there will be no forces tending to move the said two elements toward each other and no extra pressures imposed on the bearings in the yarn tension device so that the yarn tension device will not require periodic adjustments to maintain a substantially uniform yarn tension.

A preferred embodiment of this invention is shown in the accompanying drawing wherein—

Fig. 1 is a cross-sectional view of the yarn tension device,

Fig. 2 is a side elevational view of the yarn tension device with certain parts in cross-section, and

Fig. 3 is a detail cross-sectional view taken on the line 3—3 in Fig. 2 in the direction of the arrows.

Referring now to the drawing, the reference numeral 11 designates a wheel around which is trained a yarn 12 to which it is desired to apply tension. The periphery of the wheel 11 is divided into three sections, a lower section 13 that is tapered at a relatively sharp angle, an intermediate section 14 that is tapered at a smaller angle than the lower section 13, and an upper section 15 that is tapered at a smaller angle than the intermediate section 14. Because of the taper of the intermediate section 14, around which the yarn 12 is trained, the said yarn 12 tends to move upwardly on said section in passing around the periphery of the wheel 11, thereby preventing the overlapping of two turns of yarn with possible damage to or breakage of said yarn. Depending from the lower section 13 of the wheel 11 is a skirt 16 whose function will

be set forth hereinafter. The wheel **11** is fastened to a hardened steel shaft **17** rotatably mounted in spaced, annular, oil-impregnated, sintered metal bearings **18** and **19** fitted within a bushing **20**. The space **21** between the bearings **18** and **19** acts as a reservoir to receive the oil that tends to leave the bearings **18** and **19** during use and to return the said oil to the bearings. One end of shaft **17** bears against a hardened steel ball **22** which is held in place in the bearing **19** by means of a plug **23**. Fitted to the bushing **20** is a base plate **24** which supports an electromagnet indicated generally by reference numeral **25**.

The electromagnet comprises a coil **26** to which current is supplied through a lead **27**, an upper pole piece **28** and a lower pole piece **29**. The upper pole piece **28** has projecting downwardly therefrom a plurality of spaced teeth **31** arranged in a circle which are separated from and interdigitated with a plurality of spaced teeth **32** arranged in a circle and projecting upwardly from the lower pole piece **29**. Mounted on the shaft **17** is a fitting **33** which carries a light aluminum flange **34** that fits snugly within the skirt **16** of the wheel **11** and is provided with a plurality of weight reducing perforations **35** therein. The skirt **16** on the wheel **11** and the flange **34** act effectively to prevent the yarn **12** from sliding under wheel **11** and coming into contact with the shaft **17** which would cause the said yarn **12** to break. A ring **36** of ferromagnetic material is mounted inside a depending rim **37** of the flange **34** concentric with the teeth **31** and **32** and centered with respect to the said teeth **31** and **32**.

During use a current is caused to flow through the coil **26** producing a magnetic field between the teeth **31** and **32** of the pole pieces **28** and **29**, respectively. With the electromagnet **25** thus energized, movement of the yarn **12** through the yarn tension device which will cause the wheel **11** to rotate thereby rotating the ring **36** with respect to the magnetic field between the teeth **31** and **32**. The movement of the ring **36** with respect to the magnetic field will produce a braking force tending to oppose the rotation of the wheel **11** and thereby impose a tension on the yarn **12**. Because the electromagnet **25** is disposed symmetrically of the ring **36** there will be no tendency for any relative movement to occur between said elements and, as a result, no extra pressure on the bearings supporting the shaft **17** due to the magnetic forces. The yarn tension device will, accordingly, maintain a substantially uniform yarn tension without the necessity for periodic adjustment.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

I claim:

1. A yarn tension device comprising a magnet including a circular coil, means movable by a traveling yarn, a vertical shaft supporting said yarn movable means, a bearing supporting the lower end of said vertical shaft, a circular rim operatively connected to said yarn movable means, and a ring of electrically conducting material secured to said rim and positioned in the magnetic field produced by said magnet so that movement of the yarn movable means by the traveling yarn will move said ring with respect to the magnetic field to apply a braking force to said yarn movable means whereby tension is applied to the yarn, said ring of electrically conducting material being disposed concentrically about the vertical axis of said coil and symmetrically of said coil in the horizontal plane so that tendency for the magnetic field produced by the magnet to move the ring of electrically conducting material and apply pressure on the bearing will be avoided.

2. A yarn tension device comprising a magnet including a circular coil, a ring of ferromagnetic material positioned in the magnetic field produced by said magnet, means movable by a travelling yarn to move the ring of ferromagnetic material with respect to the magnetic field to apply a braking force to said yarn movable means whereby tension is applied to the yarn, a vertical shaft supporting said yarn movable means, and a bearing supporting the lower end of said vertical shaft, said ring of ferromagnetic material being disposed concentrically of said coil of said magnet about a vertical axis so that tendency for the magnetic field produced by the magnet to move the ring of ferromagnetic material toward said magnet and apply additional pressure on the bearing will be avoided.

3. A yarn tension device comprising a magnet including a circular coil, means movable by a traveling yarn, a vertical shaft supporting said yarn movable means, a bearing supporting the lower end of said vertical shaft, a circular rim operatively connected to said yarn movable means, and a ring of ferromagnetic material secured to said rim and positioned in the magnetic field produced by said magnet so that movement of the yarn movable means by the traveling yarn will move said ring with respect to the magnetic field to apply a braking force to said yarn movable means whereby tension is applied to the yarn, said ring of ferromagnetic material being disposed concentrically about the vertical axis of said coil and symmetrically of said coil in the horizontal plane so that tendency for the magnetic field produced by the magnet to move the ring of ferromagnetic material and apply pressure on the bearing will be avoided.

4. A yarn tension device comprising a magnet having upper and lower pole pieces circular in form, a ring of electrically conducting material positioned in the magnetic field produced by said magnet, means movable by a travelling yarn to move the ring of electrically conducting material with respect to the magnetic field to apply a braking force to said yarn movable means whereby tension is applied to the yarn, a vertical shaft supporting said yarn movable means, and a bearing supporting the lower end of said vertical shaft, said ring of electrically conducting material being disposed concentrically about a vertical axis and symmetrically with respect to said magnet in the horizontal plane so that tendency for the magnetic field produced by the magnet to move the ring of electrically conducting material and apply additional pressure on the bearing will be avoided.

5. A yarn tension device comprising a magnet having upper and lower pole pieces, a plurality of spaced teeth arranged in a circle projecting downwardly from the upper pole piece, a plurality of spaced teeth arranged in a circle projecting upwardly from the lower pole piece separated from and interdigitating with the teeth projecting from the upper pole piece, a ring of electrically conducting material positioned in the magnetic field produced by said magnet, means movable by a travelling yarn to move the ring of electrically conducting material with respect to the magnetic field to apply a braking force to said yarn movable means whereby tension is applied to the yarn, a vertical shaft supporting said yarn movable means, and a bearing supporting the lower end of said vertical shaft, said ring of electrically conducting material being disposed concentrically and symmetrically with respect to said magnet so that tendency for the magnetic field produced by the magnet to move the ring of electrically conducting material and apply additional pressure on the bearing will be avoided.

6. A yarn tension device comprising a magnet having upper and lower pole pieces, a plurality of spaced teeth arranged in a circle projecting downwardly from the upper pole piece, a plurality of spaced teeth arranged in a circle projecting upwardly from the lower pole piece separated from and interdigitating with the teeth projecting from the upper pole piece, a ring of ferromagnetic material positioned in the magnetic field produced by said magnet, means movable by a travelling yarn to move the ring of ferromagnetic material with respect to the magnetic field to apply a braking force to said yarn movable means whereby tension is applied to the yarn, a vertical shaft sup-

porting said yarn movable means, and a bearing supporting the lower end of said vertical shaft, said ring of ferromagnetic material being disposed concentrically and symmetrically with respect to said magnet so that tendency for the magnetic field produced by the magnet to move the ring of ferromagnetic material and apply additional pressure on the bearing will be avoided.

References Cited in the file of this patent

UNITED STATES PATENTS

1,528,796	Simmons	Mar. 10, 1925
2,293,748	Johnson	Aug. 25, 1942
2,361,239	Ransom	Oct. 24, 1944
2,364,808	Nelson	Dec. 12, 1944
2,465,932	Romine	Mar. 29, 1949
2,482,428	Miller	Sept. 20, 1949
2,519,882	Bullard et al.	Aug. 22, 1950
2,528,271	Gibbs et al.	Oct. 31, 1950
2,688,789	Duryee	Sept. 14, 1954

FOREIGN PATENTS

189,905	Great Britain	Dec. 14, 1922
263,090	Great Britain	Mar. 10, 1927