Feb. 6, 1923. 1,444,590.

S. B. CRESPI.

CIRCULAR WEAVING LOOM.

FILED SEPT. 6, 1919. 3 SHEETS—SHEET 1.

Fig. 1.

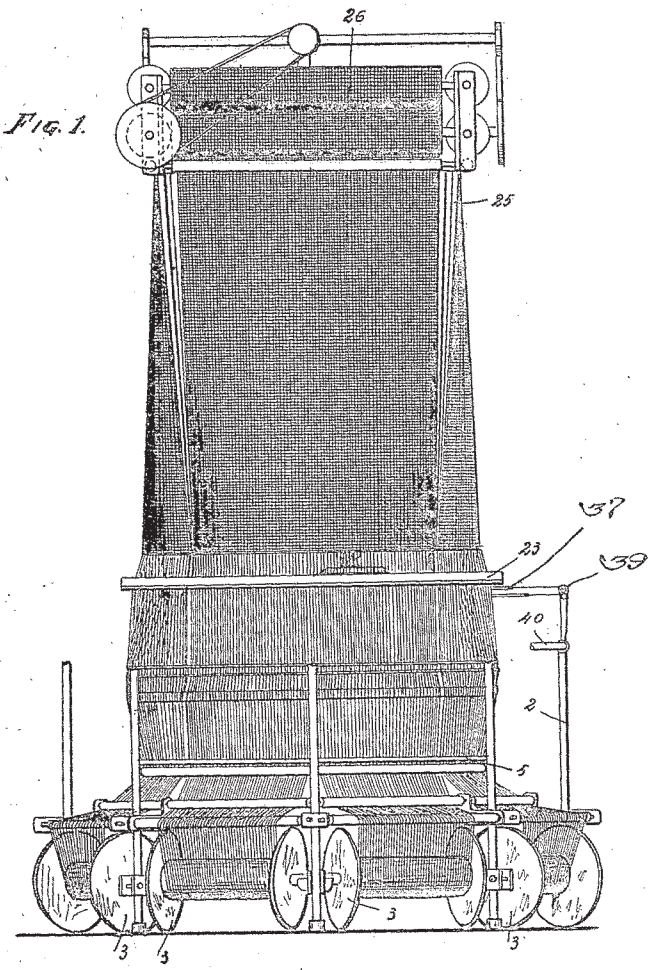


Fig. 5.

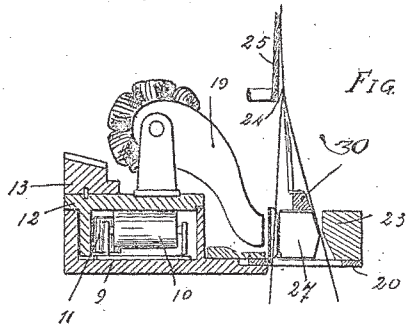
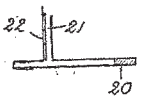


Fig. 9.



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CIRCULAR WEAVING LOOM.

FILED SEPT. 6, 1919. 3 SHEETS—SHEET 2.

Fig. 3.

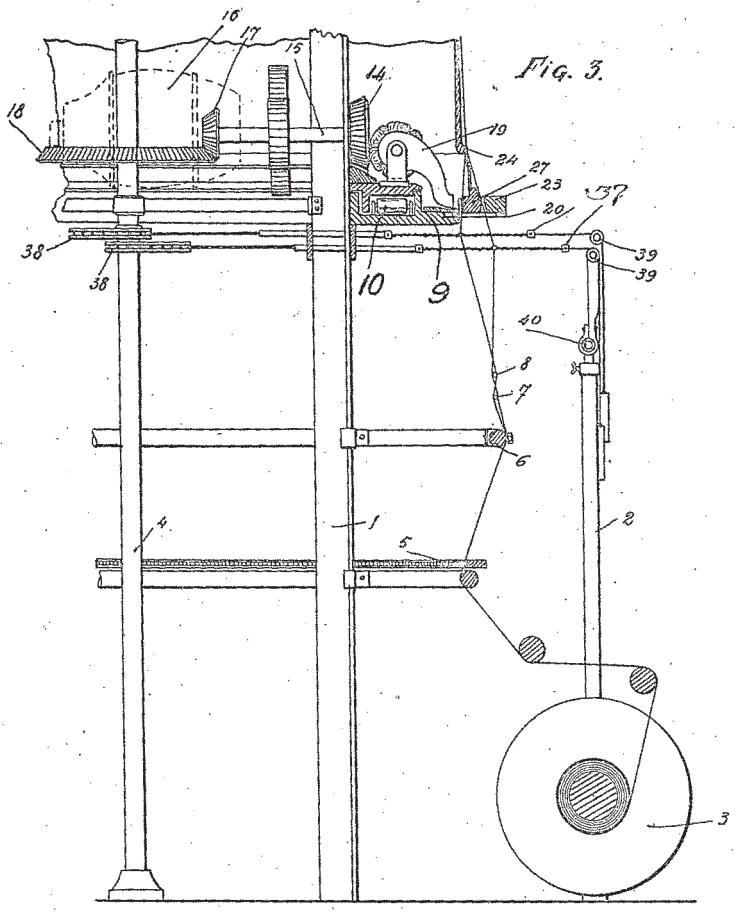


Fig. 6.

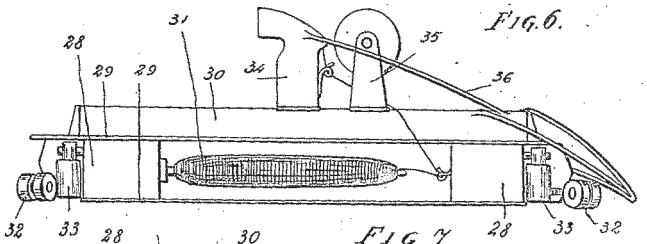
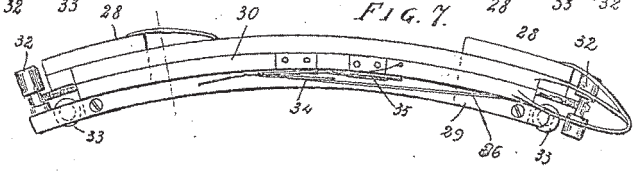


Fig. 7.



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CIRCULAR WEAVING LOOM.

FILED SEPT. 6, 1919. 3 SHEETS—SHEET 3.

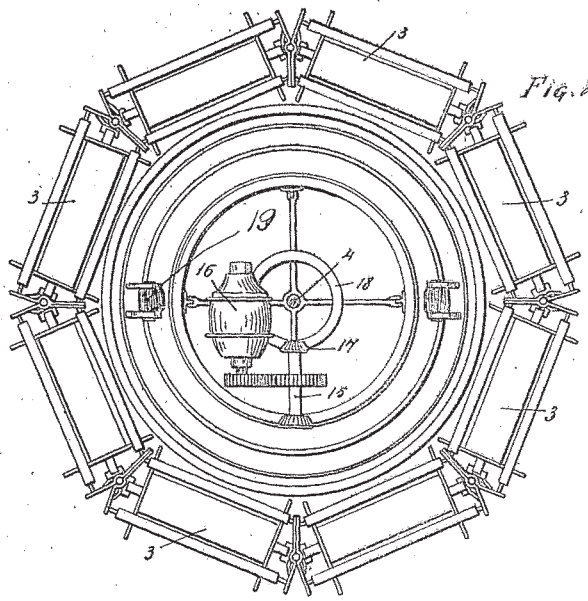

Fig. 2.

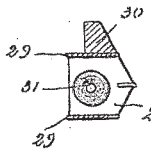

Fig. 3.

Fig. 4.

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Patented Feb. 6, 1923. 1,444,590

UNITED STATES PATENT OFFICE.

SILVIO BENIGNO CRESPI, OF MILAN, ITALY.

CIRCULAR-WEAVING LOOM.

Application filed September 6, 1919. Serial No. 322,216.

To all whom it may concern:

Be it known that I, SILVIO BENIGNO CRESPI, of 18 Via Borgonuovo, Milan, in the Kingdom of Italy, manufacturer, have invented certain new and useful Improvements in Circular-Weaving Looms, of which the following is specification.

Circular weaving looms are already known, in which the shuttle, instead of having a reciprocating backward and forward motion, is caused to travel in a circular path by magnetic means, and to run between the warp-threads which are opened by heddles arranged in different planes round a circle and so actuated as to move radially with respect to the shuttle path.

In such known looms, due to the form of the shedding and to the radial attraction exerted on the shuttle by the magnets, which were necessarily arranged between the shuttle and the loom centre, and owing to the shuttle coming into contact with and bearing against the internal threads of the shed, and finally owing to the method by which the successive weft-picks were caused to be closed and beaten up by the shuttle which thus fulfilled also the duty of the beating-up reed of ordinary looms, frequent breakages of the warp and weft yarns occurred, with the consequent sticking of the shuttle or shuttles with further breakage of the warp yarns unwinding from the warp beams.

The object of the present invention is to provide an improvement in the loom and consequently also in the shuttle, by which the above mentioned inconveniences are obviated.

The annexed drawing shows by way of example an electromagnetically driven loom, designed according to the present invention.

Fig. 1 is a front view showing the loom with the warp beams, the warp yarns supplied by the beams and the cloth that is being formed, parts of the heddles being removed.

Fig. 2 shows the loom in plan, with the cloth beams and certain other parts removed.

Fig. 3 is a vertical section showing a portion of the loom, to a larger scale, up to above the line where the cloth is formed, the section being taken on a vertical line drawn through the center of the lower part of Fig. 2 so as to show the gear 14—17, and also showing one of the magnets.

Fig. 4 is a horizontal sectional view of a portion of the loom at the cloth's formation line.

Fig. 5 is a vertical sectional detail, to a larger scale, of the magnet and shuttle guiding system.

Fig. 6, is an elevation of the shuttle looking on the inner face.

Fig. 7 is a plan view of the shuttle projected from Fig. 6.

Fig. 8 is an enlarged cross-section showing the shuttle as in Fig. 5.

Fig. 9 shows the reed in section, i. e., an enlarged vertical section as shown in Fig. 5.

The loom framework comprises the uprights 1 supporting all the circular members of the frame as well as the side panels or plates, along which the cloth rises up, and the cloth beams 26. A kind of railing with columns 2 carries the rolls for counterweighing the heddles and carries at its lower portion the supports for the warp beams 3, which are arranged at the bottom of the loom and preferably in pairs, that is to say, two for each quadrant. A centre shaft 4 serves as a stiffening standard for the whole system and carries all the driving members which are described further on, and revolve with said shaft 4.

To the loom framework a fixed circular reed 5 is secured through whose horizontal slits the warp yarns are led up to a guiding circular rod 6 and thence to warp crossing rods 7, 8, this being the bottom end of the shed.

9 is a circular brass box, filled with oil, whose bottom is fitted with horizontal rollers 10 and vertical rollers 11 on which rests a revolving brass cover 12. To the top side of the cover 12 a circular bevel rack 13 is secured, which, by means of the bevel pinion 14 and shaft 15, is driven from the electric motor 16. The shaft 15 also actuates the vertical center shaft 4 by means of the bevel gears 17, 18.

The revolving cover 12 supports one, two or more electromagnets 19; in the example shown two magnets are employed—see Fig. 2. The magnetic circuit of the magnet core is open and the core shanks are bent downwards, as shown in Fig. 5.

The base of the box 9 extends outwardly into a flange supporting the main reed 20. This reed forms the shuttle race and is made of diamagnetic material and preferably consists of horizontal strips or dents equal in number to half the warp yarns. Over each

of the horizontal dents and as an extension thereof towards the inner end of the same, vertical dents 21 project, these dents being backed on their inner side by a surface 22 welded thereon so as to form a number of vertical recesses or niches for receiving and sheltering the internal warp yarns of the shed, that is to say, the threads which during the shedding are momentarily pulled towards the loom center.

At the outer edge of the reed 20 a soft iron ring 23 is arranged, the purpose of which is to close the magnetic circuit of the magnet shanks across the shuttle and two air gaps, the shuttle construction being as hereinafter described.

Above the reed 20, that is to say, approximately above the free upper end of the vertical dents 21, there is a circular ferrule 24 rigidly secured to the loom frame and forming the top end of the shed. To this ferrule are fixed the sheets or panels 25 forming continuous circular curved surfaces and gradually merging upwards into flat surfaces that build the separate sides of a square section tube along which rises the newly woven cloth.

At the top are arranged the cloth beams 26 which are actuated from the centre shaft 4 by means of reducing gears (see Fig. 1) and on which the cloth is wound up.

Along the edges separating the adjacent faces of the square section tube well known devices can be arranged for the formation of the false selvages of the various pieces into which it is desired to cut the tubular cloth rising past the ferrule 24.

The putting in of the weft-picks between the warp threads takes place in front of the ferrule 24 and is performed by the shuttle 27 (Figs. 3 and 5) whose details are shown in Figs. 6, 7 and 8.

The shuttle comprises two soft iron blocks 28, 28 arranged at the opposite ends of a circular segment whose curvature suits the curvature of the reed 20 and whose chord is equal to the distance between the different poles of the magnet. The blocks 28, 28 support the spool or bobbin 31 and are connected with one another by diamagnetic curved plates 29 as well as by a soft iron curved bar 30. The cross section of the connecting bar 30 is much smaller than the cross section of the blocks 28 (see Fig. 5), and it is also much smaller than that of the soft iron ring 23 (see same figure), so that the magnetic resistance of the shunt through bar 30 is greater than the resistance offered to the passage of the magnetic flux through the blocks 28 and the ring 23. The shuttle is fitted with horizontal rollers 32 at each end and vertical rollers 33 adjacent to the rollers 32 in order that the shuttle friction against the bottom of the reed and vertical reed dents may be a rolling and not a sliding friction. The shuttle carries a projection 34, serving to lay the weft yarn between the warp yarns, and also carries a wheel 35 fulfilling the duty of the beating lay of the ordinary loom, that is to say, serving to tightly close up the newly laid weft-pick before the projection 34 lays the next successive pick.

The heddles are arranged in two sets of frames 37, the two sets being arranged above one another and the frames being shaped as circular segments. The frames 37 receive a radial motion from the centre shaft 4 through eccentrics 38 keyed on the said shaft and so set, relatively to the position of the electromagnets and thus of the shuttles, that the opening or shedding of the warp yarns corresponds to the position of the shuttles. The heddles are balanced by means of weights or springs attached to the free ends of ropes passing over rolls 39 carried by the railing 40 supported by the columns 2.

The working of the loom will be readily understood. The motor 16 actuates the bevel gears 14, 13 and the cover 12 of the box 9, and causes the electromagnets to revolve. The electromagnets, by their attraction, cause the shuttles to revolve along with them, whereby the shuttles enter the shed formed by the warp threads and lay down the weft thread that unwinds itself from the shuttle cop. The warp threads unwind from the warp beams at the bottom, and the cloth is wound up on the cloth beams at the top.

The objects and advantages of the adopted arrangements, which are different from the arrangements designed or proposed heretofore, are the following:—

The presence of the external soft iron ring 23 obviates the trouble experienced heretofore with shuttles actuated by magnets arranged inside the tube formed by the warp threads, namely that the shuttle pressure on the warp threads gave rise to heavy friction and was a source of wear for the threads. With the present arrangement the adjustment is obtained by means of the curved bar 30 forming a magnetic bridge between the two blocks 28, 28 and affording a passage for a portion of the magnetic flux, whereby the attraction developed by the external ring is proportionately reduced, in order to realize a better balancing of the shuttle, and to prevent any displacement of the shuttle upwardly or to ensure that no heavy friction shall be exerted against the horizontal reed, the surfaces of the blocks 28 and of the external ring 23 facing each other have the shape of opposed obtuse angles as shown at Fig. 5.

The reed extension at right angles offers the advantage that the warp threads can find a shelter in the recesses formed between the vertical dents while the shuttle is passing, so that the shuttle does not bear against the said threads, and moreover the ferrule

24 is located approximately vertically above the vertical reed, the inner threads of the shed stand practically vertical.

While the described arrangements serve to safeguard the warp threads, the closing-up wheel 35 provided in front of the shuttle projection 34 and relieving the said projection from the necessity of simultaneously working as beating up reed and as weft-pick laying apparatus, reduces the friction on the weft threads and thus also obviates the breaking of the warp threads and the consequent entanglement of the weft threads.

I claim:

In a circular magnetically operated shuttle loom a circular stationary reed forming the shuttle race, magnets travelling along the inner periphery thereof, the dents of the reed being provided with a substantially vertical extension towards their inner end, said vertical extensions being backed on their inner side by a surface, so as to form a number of vertical grooves into which the inner threads of the shed are brought and sheltered while the shuttle is passing.

SILVIO BENIGNO CRESPI.