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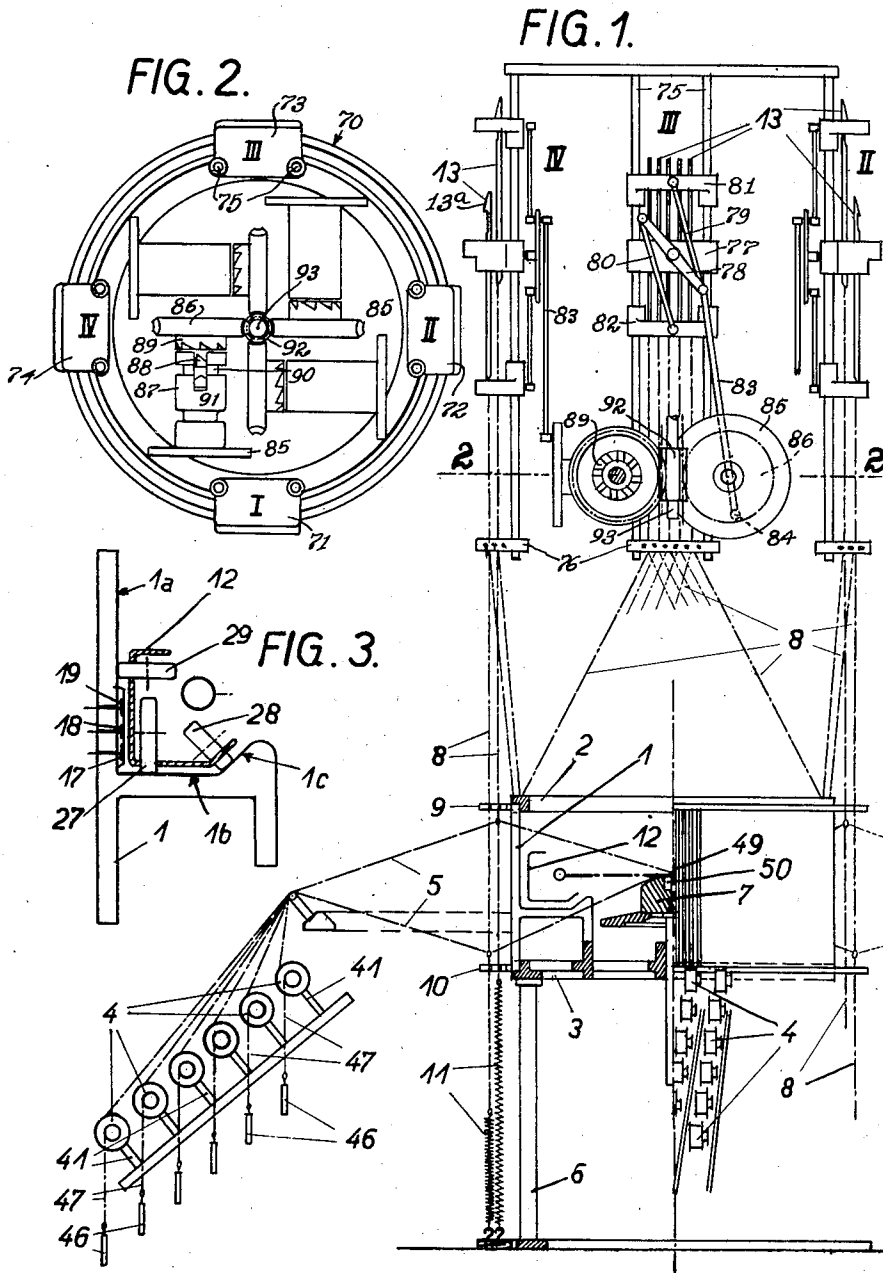
I. BAUMGARTEN

2,255,608

CIRCULAR LOOM

Filed Sept. 19, 1939

4 Sheets-Sheet 1



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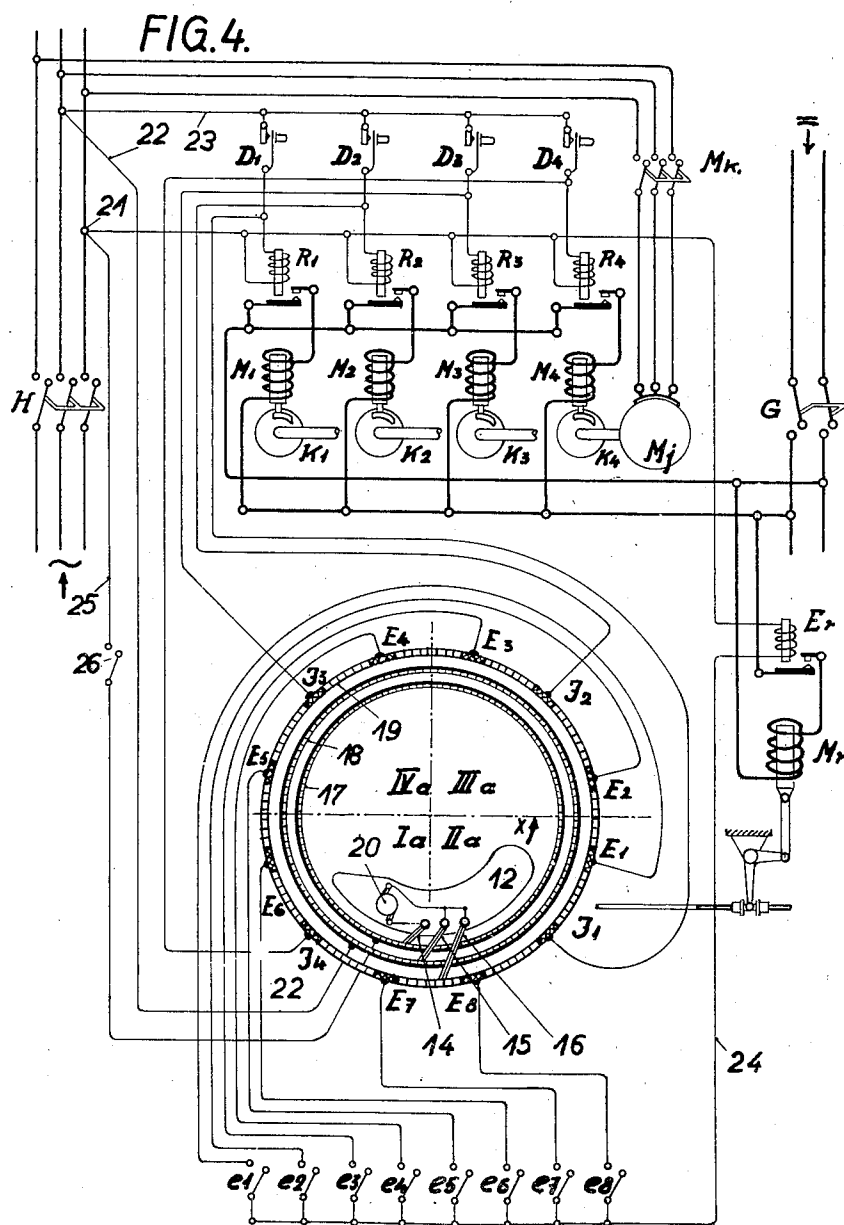
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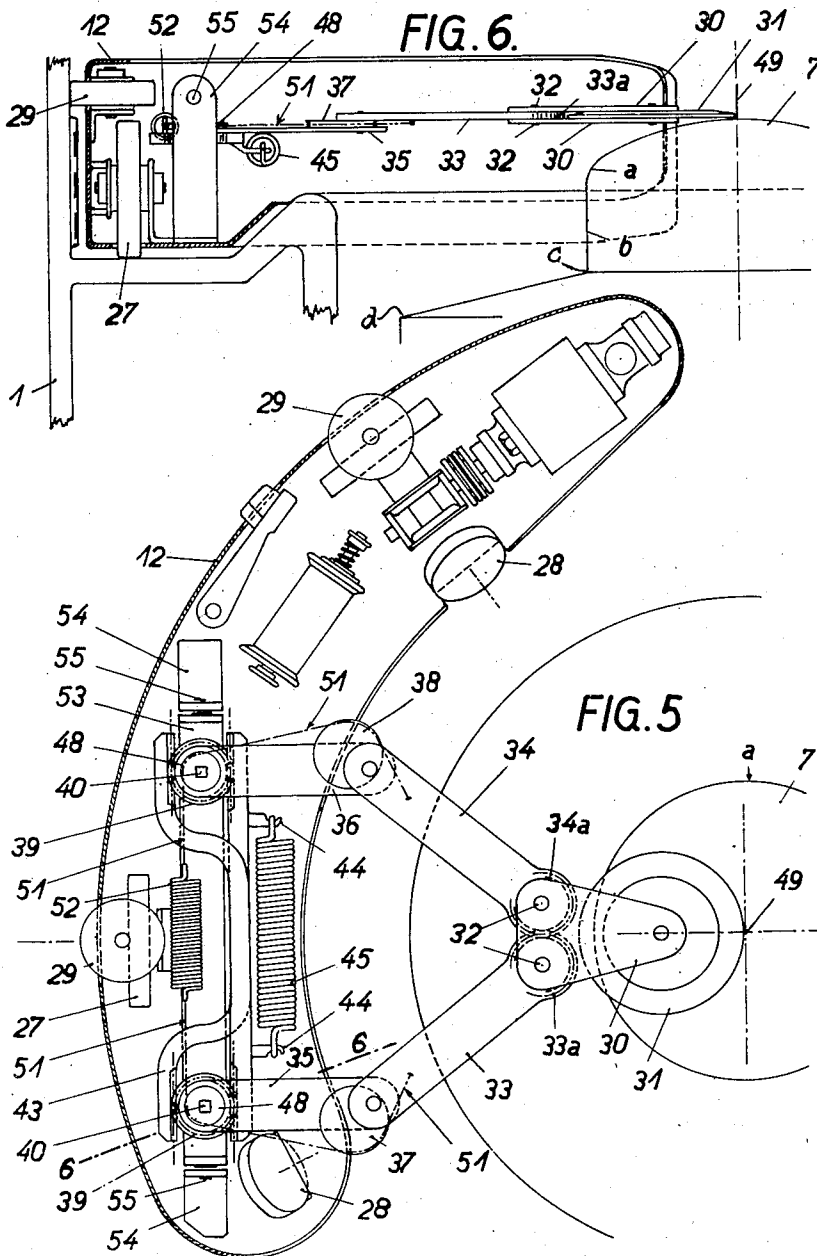
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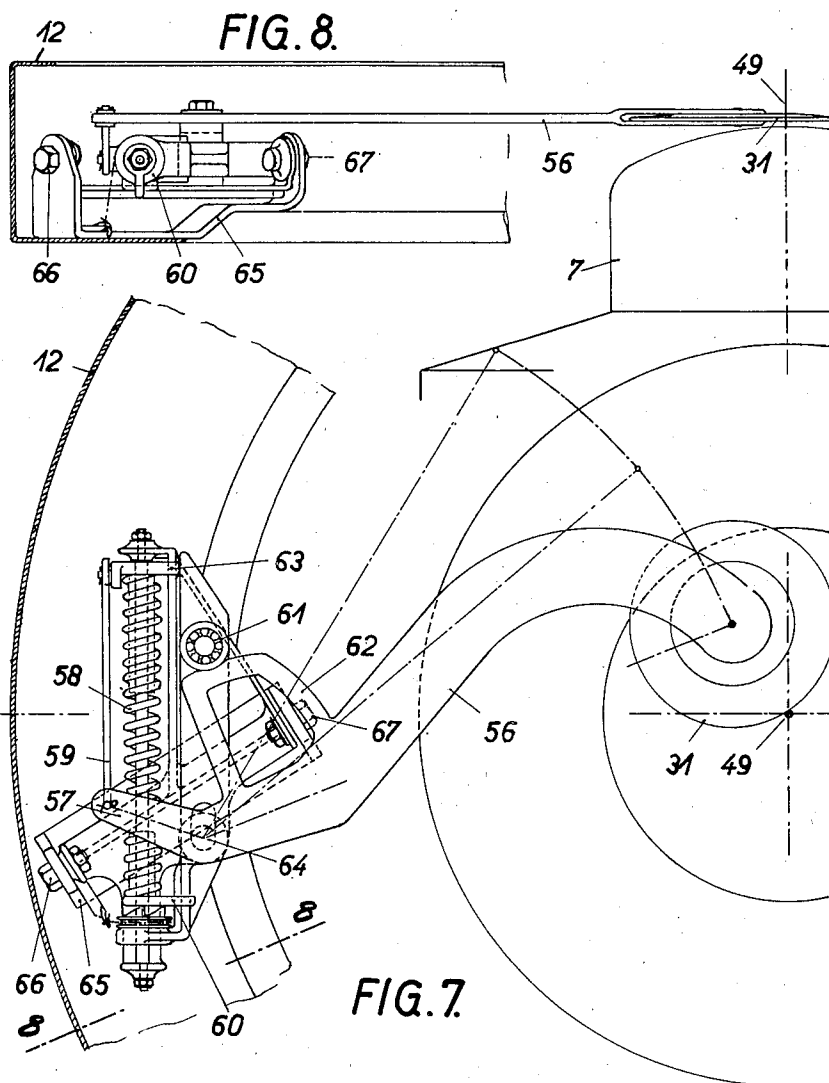
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CIRCULAR LOOM

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UNITED STATES PATENT OFFICE

2,255,608

CIRCULAR LOOM

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In Germany July 20, 1938

3 Claims. (Cl. 139—13)

The invention relates to a circular loom for the manufacture of hats and hat-shaped structures, having an electrically driven shuttle which carries means for pressing the weft threads into position as well as having one or more jacquard machines arranged above the loom and controlled by the shuttle for the purpose of forming the shed and for the periodical multiplication of the weft, especially for the manufacture of hats and hat-shaped structures.

In order to prevent all contact between the shuttle and the layer of warp-thread and thus all deleterious friction and mechanical strain upon the warp threads, the loom in each case consists of sections having approximately the shape of the letter h and being arranged vertically side by side in a circle with interstices, and which constitutes the shuttle race, is so designed that the shuttle with its weft bobbin, driving motor, run wheels and guide rollers, is positively guided on the race, so that it remains within the section of the particular shed.

In addition to having the jacquard machine which is electrically driven by means of relays and solenoids, and which controls the warp threads, arranged above the loom, the individual bobbins carrying the warp threads are arranged about the loom in such a manner that the loom is easily accessible from all sides. For this purpose there is provided merely an electric connection between the loom trough and jacquard machine and the control is effected by means of the revolving shuttle.

Said shuttle is according to the invention provided with a means for exerting pressure, for example a rotatable pressure disk which is movable radially with respect to the work-piece and vertically, acting within the shed for the purpose of pressing the inserted weft thread into position in the finished fabric and for manufacturing uniformly tight cones, said disk undergoing during the individual stages of the course of hat manufacture, pressures of differing magnitude which may however be determined in advance.

The invention is described in detail with reference to the accompanying drawings which illustrate one constructional form thereof by way of example. In the drawings:

Figure 1 illustrates one half of a circular loom in vertical section, the other half being in side elevation.

Figure 2 is a horizontal section of the jacquard machine on the line 2—2 of the Figure 1.

Figure 3 illustrates on a larger scale one of

the castings of which the loom trough is constituted, also the shuttle which revolves therein, with its wheels shown diagrammatically.

Figure 4 illustrates, also diagrammatically the electric arrangement.

Figure 5 illustrates on a larger scale the shuttle having a weft thread beating up device, as seen from above.

Figure 6 is a vertical cross-section on the line 6—6 of Figure 5.

Figure 7 illustrates a further constructional form of the weft thread beating up device with a portion of the shuttle on a larger scale, seen from above, and

Figure 8 is a vertical cross-section on the line 8—8 in Figure 7.

In the case of the circular loom illustrated in Figure 1 the loom trough is constituted by approximately h-shaped castings 1 arranged radially in a circle, and held together by upper and lower rings 2 and 3. Gaps are provided between the castings for the warp threads 5 coming from the bobbins 4 which are rotatably mounted and together form a truncated conical surface, only the warp threads actually in the plane of the drawings being shown on the left hand side.

The loom trough is attached to a supporting frame 6. In the vertical centre axis of the loom there is disposed the hat shape 7 which moves vertically during the weaving process, and at the apex of which the warp threads to be used at the beginning of the weaving process are attached in a depression 50.

The shafts 8 which raise and lower the warp threads are passed through and guided in the bores provided in the upper and lower ring portions 9 and 10 of the weaving basket. The lower ends of the shafts 8 are connected in known manner to coil springs 11.

The castings 1 constitute a triple roller guide for the revolving shuttle 12, namely by means of the vertical edge 1a, the horizontal edge 1b and also the inclined extension 1c, of the casting 1. The run wheels and guide rollers of the shuttle are arranged so as to correspond with these three guide surfaces.

The shafts 8 which are located in a cylindrical plane are in manner known per se connected to the individual lifters 13 of the jacquards, Figures 1 and 2, comprising four single jacquards I, II, III and IV arranged above the loom and controlled by solenoids M₁—M₄ (Figure 4), as will be explained more in detail hereinafter.

Mounting the apparatus is a frame generally indicated at 10 (Figs. 1 and 2) having four plate

portions 71, 72, 73, and 74 to which are attached in each case a pair of upright guide bars or shafts 75 which are secured at their lower ends to plates 76. Upon each pair of shafts 75 is fixed a pivot mounting block 77 upon which is pivoted a lever 78 connected at the ends thereof to a pair of opposite links 79, 80 which in turn are connected at their upper and lower ends respectively to a pair of sliding blocks 81, 82 slidably mounted upon said two shafts. The links and intermediate lever virtually form a sort of two-way toggle which operates to raise block 81 when block 82 is lowered along shafts 75 and vice versa. The upper block 81 is adapted to support the lifters 13 when the same has been sufficiently lowered to catch the upper edges thereof beneath the hook portions 13a of apertures in said block through which the lifters pass.

To the lower right end of 78 is pivotally connected a driving link 83, which at its lower end is connected to an eccentric portion 84 of a wheel 85 concentrically mounted with a worm gear 86. The wheel 85 in each of the four jacquards has a clutch portion 87 containing clutch member 88 adapted to engage with the teeth of a clutch 89 upon the worm gear 86, while operable means (not shown) actuated by the respective solenoid associated with the jacquard mechanism involved engages in a slot 90 upon the drum 91 of wheel 85 so that if the worm gear 86 is rotated continuously by a worm 92 upon shaft 93 the shifting of the clutch member 88 will thus control operation or idling of the jacquard involved. The drums of the other jacquards preferably are of similar construction, but the details have been omitted therefrom to simplify the drawings (Fig. 2).

The electric control of the loom is effected according to the invention by means of the shuttle 12. Figure 4 illustrates by way of example a constructional form of electric arrangement and wiring diagram which solves this problem.

Upon the shuttle 12 there are arranged three current collecting brushes 14, 15, 16, by means of which the current may be picked up with the aid of the three superposed contact rings 17, 18, 19 consisting of metal disks attached to and insulated from the castings 1. The electric motor 20 which drives the shuttle 12 is thus for example fed by the rings 17 and 18 by means of the sliding brushes 14, 15. The solenoid switches K₁—K₄ for the individual drives of the jacquards I—IV, and the lifting magnet are controlled respectively by the sliding brushes 15 and 16, and rings 18 and 19.

In the case of circular looms the warp thread layer is of course divided into two or more groups because the revolving shuttle is always located in the circular shed, so that a simultaneous changing of all the warp threads cannot take place, but in successive sections, because the raising and lowering of the lifters 13 can never extend to more than an arc of the circle, preferably at the moment when the shuttle has already left the old portion of the shed and entered an already prepared new shed. In the example of constructional form illustrated the shedding always extends over a quarter of a circle Ia—IVa, Figure 4, to which the jacquards I—IV individually appertain. The shuttle thus always switches on the jacquard, the shed of which the shuttle has just left.

When the sliding brushes 15, 16 of the shuttle 12, which revolves in the direction of the arrow, 75

reach the contact J₁ a new shed must be formed in the quarter circle or section Ia by means of the appropriate jacquard. For this purpose the circuit of the relay R₁ of the appertaining solenoid M₁, and through the relay R₁ also the circuit of the direct current winding of the solenoid M₁, are closed, so that the switch mechanism K₁ is engaged by means of the commutator of the solenoid M₁.

There are four such contacts J₁—J₄ on the upper contact ring 19 one for each of the four jacquards. Between these contacts there are inserted in several places, in eight places in the wiring diagram illustrated, further contacts E₁—E₈ in the circuit of the relay E_r of the solenoid M_r which effects the raising of the shape 7.

From the alternating current main supply line, leads are taken from the connector 21 to connect the windings of the relays R₁—R₄ and E_r in parallel. The lead 22 is taken from the main lead 23 to the centre ring 18 which provides full contact and is arranged within the loom trough. The leads of the contacts J₁—J₄ inserted upon the upper contact ring 19 are taken to the other ends of the windings of the relays R₁—R₄. Between those leads and the lead 23 there are inserted in parallel the push-button instantaneous switches D₁—D₄ by means of which the circuit of the individual relays R₁—R₄ and thus the alternating motion of the jacquards may be engaged and disengaged independently of one another by means of the shuttle as well as manually.

The contacts E₁—E₈ arranged on the upper contact ring 19, are connected via switches e₁—e₈ to one end of the winding of the relay E_r by means of the common lead 24. Owing to this connection the circuit of the relay E_r is closed during the revolution of the shuttle only at the contacts at which also the appertaining switch is closed. In this manner it is possible to adjust at will the extent to which the hat shape is raised. The lead 25 is taken via the switch 26 to the lower contact ring 17 which is arranged within the loom trough, and through which current is fed to the motor 20 which is built into the shuttle 12. The motor M₁ which drives the jacquards I—IV is fed from the alternating current supply line through the switch M_k, a main switch H being provided for switching the mains on and off.

The solenoids M₁—M₄ of the jacquards and the solenoid M_r for raising the hat shape 7 are fed from the direct current supply line which is shown in heavy lines in the drawings, said supply being switched on by means of the hand operated switch G.

The bobbins which carry the individual warp threads 5 are arranged so as to be easily accessible about the loom in such a manner as to constitute a conical surface. Flat rods 41 are provided for mounting the bobbins 4, horizontal pins 42 being attached to said rods. At each bobbin there is a cord 47 leaded by means of a weight 46, so that the warp threads 5 are kept under constant uniform tension.

In order to ensure steady travel and to prevent contact between shuttle and warp threads, the shuttle is provided with run wheels 27 on the underside, running upon a horizontal annular track, obliquely mounted wheels 27 running on an internal inclined guide surface, and external supporting rollers 29 running upon an external cylindrical supporting surface.

At the front portion of the shuttle 12 there is

arranged the device for beating up the inserted weft thread in the fabric, said device possessing a pressure disk 31 which is rotatably mounted between two flat jaws 30. The pins 32 of the pivotably mounted arms 33 and 34 are attached to the jaws 30. The ends of the arms 33 and 34 are designed in the manner of toothed segments 33a and 34a and intermesh. Arms 35, 36 are hingedly connected respectively to the arms 23 and 34. A cord pulley 37, 38 is excentrically attached to the resultant hinges. The inner ends of the arms 35, 36 and the gear wheels 39 are attached to pins 40, the gear wheels meshing with racks 43 in such a manner that the left hand end of the upper rack meshes from the outside with the left gearwheel and the right hand end meshes with the right hand gearwheel from the inside. The left hand end of the lower rack meshes with the left hand gearwheel from the inside and the right hand end of said lower rack meshes in the right hand gearwheel from the outside. At the inner ends of the two racks are attached the hooks 44, between which a coil spring 45 is mounted. Cord pulleys 48 are rotatably mounted on the pins 40. Above the arms 35, 36, there are rotatably arranged upon the pins 40 further cord pulleys. One end of the pull cords 51 is attached to the arms 33, 34, and the other end is connected to the upper and lower end respectively of the coil spring 52. The pins 40 are pivotably mounted in a bow 53 and the latter may be pivoted upon the brackets 54 and pins 55.

The method of working of the above described device is as follows:

At the commencement of the weaving process the pressure disk 31 assumes a horizontal position, Figure 6, and rests upon the needle 49 inserted in the apex of the hat shape 7, the hat shape having been raised to the appropriate position. In this position of the pressure disk 31 the coil springs 43 and 52 are only very moderately tensioned and consequently the weft thread which is inserted in wavy line is pressed only with moderate pressure into position in the already finished fabric in order to obtain the desired uniform close weave of the individual courses of the weft thread. As the diameter of the fabric thus produced increases, the pressure disk 31 is gradually moving away from the apex of the shape 7, and this gradually tensions the coil spring 52 by means of the arms 33, 34, with the aid of the cord pulleys 37, 38, which are excentrically attached to the hinges, and of the pull cords 51 which pass over said pulleys. At the same time the coil spring 45 is also gradually tensioned due to the fact that the arms 33, 34 cause the arms 35, 36 which are hingedly connected thereto, to pivot outwardly about the pins 40, to displace the racks 43, which engage the gearwheels 39 cross-wise with respect to one another, in such a manner as to tension the differential coil spring 45 which is mounted between the hooks 44. However, this tensioning action continues only until the pressure disk 31 reaches the rounded portion a of the hat shape 7 where the crown commences to extend into the cylindrical portion b thereof. During the continuation of the weaving of the trunk, i. e. the cylindrical portion, the further tensioning of the differential coil spring 45 ceases, because during this stage of the manufacture of the trunk the tensioning device is in its centre position, in which the lower arms 35, 36 extend perpendicular to the bow 53, whilst the upper arms 33, 34

assume their extreme position. In this centre position of the tensioning device the pressure disk 31 exerts its greatest pressure. The manufacture of the cylindrical portion of the trunk must from this point onward be effected with uniform, that is to say unvarying beating up in order to obtain a uniformly close weave. When the cylindrical portion of the trunk has been woven, that is to say when proceeding the weave the piece of fabric corresponding to the brim portion of the hat from point c to point d the two lower arms 35, 36 are pivoted further inwardly, so that the two upper arms 33, 34 are turned back i. e. pivoted outwardly. The result of this is that the racks 43 allow the hooks 44 to approach one another thus gradually detensioning the differential coil spring 45.

The coil spring 52 is gradually tensioned from the commencement to the end of the manufacture of the trunk, by means of the pull cords 51 passing over the cord pulleys 37, 38 attached to the lower arms 35, 36 respectively. During the first stage of the weaving the total pressure exerted by the coil spring 52 and the differential coil spring 45 increases from zero to maximum, whilst during the second stage of the weaving i. e. during the manufacture of the brim portion, the combined pressure of the two coil springs gradually diminishes because the tension of the differential coil spring 45 gradually decreases.

The arrangement of the rotatable pressure disk 31 possessing the advantage of substantially reducing the friction upon the warp threads, but the substitution of the pressure disk 31 by a suitably shaped sliding pressure member in no way alters the nature of the invention.

In the constructional form illustrated in Figures 7 and 8, the pressure disk 31 produces the same effect as in the case of the aforesaid double-armed device for beating up the filling thread, the only difference being that in the modified constructional form only one coil spring is used for this purpose.

In this constructional form the pressure disk 31 is rotatably mounted in the free slotted end of the bent pressure arm 56, said arm being properly speaking designed in the form of a double armed lever. By means of the short extension 57 of said lever the coil spring 58 is compressed with the aid of the pull rod 59 and the coil spring retainer 60. At the same time the coil spring 58 is however further compressed, owing to the roller 61 rolling over the rising portion of the arcuate track 62 attached to the pressure arm 56 and with the aid of the two coil spring retainers 60, 63. The pressure arm 56 is rotatable about the pin 64 and said pin at the same time engages the longitudinal slots of the two coil spring retainers 60 and 63, which may thus be displaced to a certain extent with respect to one another. The two coil spring retainers 60, 63 are further pivotably mounted in a cross-member 65 about horizontal pins 66, 67. The cross-member itself is attached to the bottom of the shuttle.

The pressure which may be exerted upon the fabric by the pressure disk 31 is in this constructional form varied according to requirements with the aid of one single coil spring during the various stage of manufacture of the trunk merely by means of the different inclination of the curved track 62 which is attached to the pressure arm 56 and influences a pressure roller 61,

so that also with the aid of this constructional form a uniformly close weave may be produced.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. In a circular loom having an electrically driven rotating shuttle and at least one Jacquard loom controlled by the latter for making hats and hat-shaped structures, the combination of a pressure applicator comprising a rotatable pressing disc arranged to act within the shed in order to press the weft thread which has been passed in, against the finished fabric and produce uniform dense stumps, rotatably mounted arms allowing said pressing disc to be moved radially in relation to the workpiece and also in the upward direction, and coil springs capable of adjustment and advance for causing said disc to be subjected to a variable compressing pressure at the various progressive stages of manufacturing the hats.

2. A circular loom according to claim 1, including a plurality of arms arranged in pairs and articulated to each other and serving to carry the pressure disc, a pair of helical springs of variable tension acting upon said arms in order to move the same and a draw bar and rack gears operated by said pressure disc upon moving radially inwards or outwards and effective to increase or decrease the tension of said springs according to the direction of movement of said disc.

3. A circular loom according to claim 1, including a pressure arm which is rotatable in all directions, a shoulder upon said rotatable pressure arm capable of influencing one helical spring causing the pressure disc to be pressed against the finished fabric, and a cam disc arranged on said pressure arm for altering the pressure effect at various stages of the manufacture of the hats, said cam disc having a plurality of inclined portions.

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