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PILE FABRIC LOOM.

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THE Norris Peters Co., Phoro-Litho, WASHINGTON, D.C.
To all whom it may concern:

Be it known that I, ALEXANDER TURRINGTON, a citizen of the United States, residing at Lafayette, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements In Pile-Fabric Looms, of which the following, in connection with the accompanying drawings, is a specification.

The invention to be hereinafter described relates to pile-fabric looms, and more particularly to that class of such looms whereby tufts of yarn are introduced and passed between the warp-threads with the ends of the tufts projecting upon the surface of the fabric to produce the pile effect. In looms of this general character as heretofore commonly employed the mechanical construction and operations have been such as to render the loom cumbersome and slow in its movements, and to introduce the tuft-yarns according to a preconceived pattern the plan commonly practiced was to wind the desired colored yarns on long spools or beams in the order in which they would appear in any row of tuft-yarns across the fabric, a number of such spools or beams being carried by a long and heavy chain, which was moved to present the spools or beams successively over the warp-threads, at which point the spool or beam was detached from the chain and carried by a transferer to pass the tuft-yarns through the warp. Such old form of construction necessitated a very long chain, and if the pattern formed by the tuft-yarns was extended beyond very simple patterns the length of tuft-yarn chains became so great as to present a serious problem in their handling, and, moreover, they occupied so much room and were so heavy as to be practically useless for the formation of intricate figures.

It is the object of my invention to simplify the construction of tuft-pile-fabric looms, to make them more compact, to provide means whereby the figure or pattern produced by the tuft-yarns may be varied as desired under the control of pattern mechanism without the employment of the cumbersome and heavy tuft-yarn-carrying chains, and to provide for the accomplishment of other results of an improved character over the prior devices, all as will hereinafter more fully appear.

The invention generally consists of means for carrying the tuft-yarns between the warp or filling threads to which they may be tied by passing around the said threads and presenting the tuft-yarns in any desired order for the formation of a pattern on the face of the fabric and also in the general combinations, parts, and devices, all as will be hereinafter fully described and then be definitely pointed out in the claims.

In the drawings, Figure 1 is a side view of a loom embodying my invention, some of the parts being omitted and a part of the frame being broken away to better disclose the pattern-controlled devices for determining the relative position of the tuft-yarn holders, a part of said devices being in section. Fig. 1 is a detail of the actuating means for the tuft-yarn carrier. Fig. 2 is a front view of the loom shown in Fig. 1. Fig. 3 is an enlarged sectional detail transversely of the tuft-yarn carrier, as on line x x, Fig. 2. Fig. 4 is a section on the line y y, Fig. 3, showing one of the tuft-yarn holders, some of the parts being omitted to better disclose the construction of the holder. Fig. 5 is an enlarged sectional detail similar to Fig. 3, showing the tuft-yarn-carrier shaft and the disposition of the paws for engaging the tuft-yarn holders with the shaft and disengaging them therefrom. Fig. 6 is a sectional detail, on an enlarged scale, of part of one of the tuft-yarn tubes and connected parts. Figs. 7, 8, and 9 are sectional details of different modifications of means for supporting the tuft-yarn in the holders. Figs. 10, 11, 12, 13, 14, and 15 are details, respectively, of the tuft-yarn carrier, showing it in the various positions it occupies during the operation of inserting the tuft-yarns around the threads of the fabric. Fig. 16 is a diagrammatic view of one of the tuft-yarn holders, showing its position with respect to the warp-threads when the tuft-yarn carrier has been shogged. Fig. 17 is a like diagrammatic view showing the relative positions of the end of a tuft-yarn tube and the lower comb during the insertion of the tuft-yarn around a warp-thread. Fig. 18 is a like diagrammatic view showing by full lines the position assumed by the tuft-yarn holder and its tuft-yarn tube with respect to the warp-threads after the return shogging movement of the
carrier. Fig. 19 is a section on line 2 z, Fig. 1, of one side of the loom. Fig. 20 is a sectional detail, on an enlarged scale, of the pattern-controlled devices for determining the positions of the tuft-yarn holders with respect to each other. Fig. 21 is a perspective view, on an enlarged scale, of one end of the gripper which holds the end of the tuft-yarn during the return movement of the tuft-yarn carrier. Fig. 22 is a sectional detail of the comb for giving a lateral movement to the warp-threads on the line 3 z', Fig. 1. Fig. 23 is a section on line 5 y' of Fig. 22. Figs. 24 to 31 are diagrammatic details showing the various movements that are imparted to the tuft-yarn-carrier arms during an entire cycle of movements for the insertion of a tuft-yarn and the withdrawal of the carrier to its normal position, a single cam being illustrated as the operating means to simplify the illustration. Fig. 32 is a detail view showing the divided holder and means for securing its parts together.

The loom-frame A, the warp-beams B A', the take-up roll A, and their adjunctive parts are and may be of any usual or preferred form and construction, and to more clearly disclose the present embodiment of my invention and to prevent unnecessary complication in the illustrations and descriptions I have purposely omitted the shedding mechanism, the lay, the shuttle-motions, the tuft-yarn-cutting mechanism, and their adjunctive parts, these forming no part of my present invention and may be of any usual or preferred type.

Mounted on each side of the loom-frame in appropriate position to give the necessary movements to the tuft-yarn carrier for the insertion of the tuft-yarns are the tuft-yarn-carrier arms A, which at their ends loosely carry, so as to be rotated therein, the tuft-yarn carrier, (designated as a whole by A') the said tuft-yarn-arms being each connected, in the present embodiment of my invention, are designated to have a rising, falling, and endwise movement, and as one of the many supporting means for said arms to permit such movements I have shown pins or rollers A' projecting from the loom-frame, which engage slots A in said arms, the end walls of the slots A serving as stops for the endwise movement of said arms; but it is to be distinctly understood that I do not regard my invention as limited in this respect, as any means may be employed for the support of said arms so long as they are permitted to have the described movements. As one of the means for imparting the described movements to the arms A, and consequently the desired movement to the tuft-yarn carrier A' for the insertion of the tuft-yarns and the withdrawal of the carrier from the inserting position, I have provided the free end of the arms with oppositely-projecting pins A" A', which bear upon the two cams A" A', mounted upon the cross-shaft A", which is given appropriate rotary motion from any moving part of the loom, as through the shaft A, connected to the cross-shaft A' by the bevel-gears A A and driven from the cam-shaft A. The said cams A' and A" are so shaped that they impart to the carrier-arms A, and consequently the tuft-yarn carrier, movement to lower the carrier to place the tuft-yarn tubes between the warp-threads, then give to the carrier a shogging movement to carry the end of the tubes across the warp-threads, then a rising and forward movement to carry the end of the tuft-yarns above the plane of the warp and close to the fell, and then reverse the movement of the tuft-yarn carrier to return it to its original position above the warp-threads and out of the path of the lay as the latter beats up, all as will be hereinafter more fully described; but while I have shown cams for securing this cycle of movements it is to be understood that my invention is not limited in this respect, and any form of mechanical devices that will impart the necessary movements may be employed.

Mounted in the ends of the carrier-arms A' A" is the carrier-shaft B, which is free to rotate in said arms, said shaft having connected thereto a pinion B', adapted to engage a rack B' carried by an actuator B", the said actuator deriving the requisite motion to give rotation to the shaft B in one direction by virtue of the ratchet-and-pawl connection n n' between the pinion and shaft through a lever B', pivoted at B' and having a roll B engaging the cam B', carried by the cam-shaft A'. While I deem this a desirable form of actuating mechanism for the carrier-shaft B, it is only one of the many forms of such devices that will suggest themselves to one skilled in the art, and my invention is not limited thereto, as any of the desired forms of such mechanism may be employed so long as they give to the shaft B two rotations on each because A' in the present embodiment.

The carrier-shaft B has formed therein longitudinally thereof a series of grooves B, (see Figs. 3, 4, and 5) and loosely mounted on said shaft are a series of tuft-yarn holders C, the number of said holders being dependent upon the number of tuft-yarns desired to be placed in the fabric in the transverse rows of tufts, and each of said holders is provided with means for supporting a series of tuft-yarn spools, five of such tuft-yarns being shown in each holder in the present illustration of my invention; but any desired number may be employed, and each of the tuft-yarns carried by the holders may differ in color or quality, or both, from the other yarns, as desired. The various tuft-yarns carried by the tuft-yarn holders may be supported in any desired manner—as, for instance, such yarn may be wound upon small spools c, Figs. 3, 7, and 9, and carried by a removable frame c', Fig. 3, which when desired may be removed from the holder and replenished, or such spools c may be carried by arms c", Fig. 7, having one
end pivoted to the holder, and when replenishment is necessary said arms may be swung outward and full spools placed therein, or such spools may be supported on a series of bars or rods, which yield sufficiently to permit the insertion and removal of the spools, as shown by Fig. 9, two of said bars or rods being preferably carried by a hinged cover on the holder, as will be more fully explained, so that upon turning back the cover the spool may be readily removed and replaced, or the tuft-yarns may be simply coiled outward and full spools placed therein, or such spools may be supported on a series of bars or rods, which yield sufficiently to permit the insertion and removal of the spools, as shown by Fig. 8. In any event I preferably divide the holder into a number of supporting sections or chambers, as C, each for the reception and support of one character or color of tuft-yarn, and while I have shown the holder in its present form as a closed casing it is evident, of course, that the character of the holder may be varied and, indeed, be a skeleton frame, which is sufficiently obvious without multiplying the illustrations. Preferably I provide a cover C for each of the sections or chambers in the holder and hinged said cover, as at C, so as to turn outward, a spring C being provided to cause the cover to turn outward, as shown by dotted lines, Fig. 9, on its hinge when a trip or lock C is released from its holding-catch C, Figs. 3, 6, 7, 8, and 9, and projecting outward from each of the sections or chambers C of the holder is a tuft-yarn tube C. One side of each of the tuft-yarn tubes is provided with a slot C, Figs. 6, and pivoted on the tuft-yarn holder at C, Fig. 6, is a trip-arm C, normally resting against the tuft-yarn within the tube, but which when said tuft-yarn breaks becomes exhausted turns outward through the slot C and by its shorter end C disengages the trip C from the holding-catch C, thereby permitting the cover C to swing outward and indicate either that the tuft-yarn in that particular section or chamber is exhausted or broken and needs replacing or repairs. Thus the cover which I preferably employ for each section or chamber acts as an indicator as to the condition of the tuft-yarn carried by the holder, and although this constitutes one simple and effective form of indicator it is evident that any device that will notify the attendant when a tuft-yarn has become exhausted or broken might be employed.

As before described, the tuft-yarn carrier is composed of a plurality of tuft-yarn holders, each separate from the other and independently mounted upon the carrier-shaft B, and each tuft-yarn holder is adapted to carry a series of different kinds, characters, or colors of tuft-yarns, each of which presses from a suitable section or chamber in the holder through a tuft-yarn tube projecting beyond the circumferential outline of the holder, and the ends of said yarn-tubes are bent at their ends in the plane of the holder into substantially U shape, with the end of the tube. In the production of tuft-yarn fabrics it is desirable that the tuft-yarns be introduced in such transverse manner of the warp, in varying combinations in order to produce a figure effect upon the face of the resultant fabric, and I have therefore provided means which, under the control of any desirable pattern mechanism, may produce any combination in qualities, characters, or colors of tuft-yarn supported in the series of tuft-yarn holders, said means in general statement within the scope of my invention comprising detachable connections between the tuft-yarn holders and the carrier-shaft, said connections permitting the tuft-yarn holders to move with the said shaft, or remain at rest to present the proper tuft-yarn between the warps, as called for by the pattern mechanism, and I have arranged devices to cause said tuft-yarn holders to assume a predetermined or normal position on said shaft after each insertion of a tuft-yarn, as will now be described.

Mounted on each of the tuft-yarn holders so as to be capable of movement to engage with or disengage from the longitudinal grooves B in the carrier-shaft B are a series of connecting devices or pawls b, Figs. 3 and 5, each having an operating projection b, by which the connecting device or pawls b may be moved to withdraw them from engagement with the longitudinal slots in the carrier-shaft, B, said pawls being normally held in engagement with said slots by spring-fingers b, pivotable at b, Figs. 3 and 5, the free end b of each of the fingers b being extended to underlie the next adjacent finger at a point beyond its pivot b, from which construction it will be seen that should any one of the projections b be moved to disengage its pawl from the longitudinal slot in the carrier-shaft B its connected fingers b will also be moved on its pivot b, thereby lifting by its free end the next adjacent finger and connected pawl, and so on around the entire series of pawls, so that a disengaging movement of any one of the projections b will cause all the pawls to be disengaged from the carrier-shaft, and the tuft-yarn holder on which these pawls are mounted will then be disconnected from the carrier-shaft and remain at rest. In order to provide against too-free movement of the holders on the shaft, as by sliding thereon, I have found it desirable to provide each tuft-yarn holder with a light tension-spring b and adjusting-screw b, Fig. 3. Each of the operating arms or projections b has a turned or bent end b, and the said operating arms or projections b on any one carrier are of different lengths, so that in the rotation of the carrier with the shaft the longest operating-arm would meet with and be arrested by a projection that the next shorter and remaining arms would pass, and the next shorter operating arm or projection would meet and be arrested by a projection that all the other shorter arms would pass, and so on around the series, and on the
arrest of any one of the arms of the series all the pawls or connecting devices would be disengaged from the carrier-shaft B and the holder carrying said arm would remain at rest.

5 It will be evident from the above-described construction that if while all the tuft-yarn holders are revolving with the shaft an abutment or projection be moved into position to engage all the longest operating-arms b' throughout the series of tuft-yarn holders then all of said holders will be disconnected from the shaft and be held at rest, with their longest arm against such projection or abutment and in no other position, and such position I will hereinafter designate as the "pre-determined" or "normal" position, it being the position to which all of the holders are returned after having inserted tufts of yarn. It will also be evident that if said abutment or projection above referred to be removed from engagement with the longest arms of the holders the holders will become connected to the shaft and revolve with it, and if while revolving a series of pins be projected into the path of movement of any of the arms or projections then such arms or projections will engage such pins and the corresponding holders be arrested in position according to the particular arm or projection engaged, as will now be described.

Mounted on and extended across the loom-frame in proximity to the path of movement of the operating arms or projections b' are a pair of guide-bars D, Figs. 1, 9, and 20, provided with perforations for a series of pins d d', said pins being connected by a rocking link d², having a pin-and-slot connection, as shown, with said pins d d', whereby as the pattern-pins d' are projected the pins d are retracted, and vice versa. The series of pins d', extending across the loom-frame, are connected by bell-crane links d² with the tail cords or connections d³ of any desired form of pattern mechanism, as a jacquard, and said connectors or tail-cords are joined to the bell-crane links d² at different points in the length of the arm of said bell-crane, whereby upward movement of the tail-cords or connectors will serve to move the bell-crane through a greater or less angle, according to the distance of its connection from the end pivot d' of the bell-crane, and consequently the pins d' will be projected more or less, according to the tail-cord that may be lifted.

When the parts are in position as indicated in Fig. 20, with the pins d' unacted upon by the jacquard or other pattern device, they are retracted, so that the ends of all the operating arms or projections b' will pass the ends of said pins d' without engagement, and at this time the pins d are fully projected, so that the ends thereof are in position to be struck by the longest of the operating-arms b' to thereby stop all of the tuft-yarn holders in a predetermined or normal position. With the tuft-yarn holders thus in predetermined or normal position, it being desired to change the relation of the sections or chambers of the holders to bring different tuft-yarns into position to be inserted between the warp-threads, the pattern-pins d' are moved into a forward position, the extent of movement being dependent upon which of the tuft-yarns in any holder is to form the tuft. Thus if the shortest operating-arm b' is to be engaged by the pattern-pin d' corresponding to any holder the pin is projected to its extreme forward position, and if the longest arm of any holder is to be engaged by the pattern-pin corresponding to that holder said pin d is projected to its shortest forward position, and so on for all the pins and holders across the loom, and the pins d' being all simultaneously withdrawn from engagement with the longest operating-arms b' by movement of the pattern-pins d' the whole series of holders on the carrier-shaft will turn with said shaft until any holder having turned sufficiently to bring the proper tuft-yarn in position next to the warp-threads the operating-arm of said holder will engage its pattern-pin d' and arrest further movement of the holder.

The shaft B thus makes a complete revolution in direction of the arrow, Fig. 1, on the indication for a pattern of tuft-yarns being formed by the jacquard, the timing for such movement of the shaft being produced by the actuator B² from the necessary shape of cam B². This complete revolution of the shaft B is necessary on the formation of each combination or row of tufts to be inserted, because the call of the pattern may require a holder to stop with the longest arm b against a pattern-pin, and since the normal or predetermined position of all the holders is with the longest arms b' in engagement with the pins d the particular holder referred to may have to make almost a complete rotation with the shaft prior to meeting its pattern-pin, the direction of movement being as indicated by arrow in Fig. 1. It will be understood, of course, that there will be as many pattern-pins d as there are tuft-yarn holders C on the carrier-shaft B, one pin controlling the movement of one holder through the pattern or jacquard. The tuft-yarn holders being thus arrested in their movement with the shaft and having the proper pattern or combination of tuft-yarns formed next the warp and ready to be inserted between the same, the actuator B² ceases to act to further turn the shaft B in the direction of the arrow, Fig. 1, and both the shaft and the holders remain for the time relatively fixed, while the actuator B² descends, merely turning the pinion B' on the shaft by virtue of the ratchet-and-pawl engagement therebetween. The tuft-yarns are now ready to be placed between the warp, as will presently appear, and the carrier is thereafter returned to its proper position above the warp to permit the beat-up, at which time the pattern-pins d' are retracted under the action of the jacquard and the positioning-pins d are projected, ready to engage the long-
by virtue of the revolution of the carrier-shaft, to which the holders are rotatively connected by the pawls \(b\), are carried around until such engagement takes place, whereupon the holders become rotatably detached from the carrier-shaft and remain at rest in their predetermined or normal position, as before.

While I have thus described one of the preferred embodiments of my invention as the pattern-pins \(d\) and positioning-pins \(d\), together with the operating-arms \(b\) to be engaged as stated, I do not wish to be understood as limiting my invention in this respect, as the number, character, and disposition of these parts may be varied.

The tuft-yarns having been disposed on the carrier in desired relation for the formation of a row of tufts, it now becomes necessary to give to the carrier the desired movements for the insertion of the tufts, say, around the warp-threads, although, as will be evident, they might, if desired, be passed around the warp or filling threads.

Mounted on the shaft \(A\) are the two cams \(A^0\) and \(A\) on each side of the loom-frame, which bear upon the pins \(A\) projecting from the sides of the arms \(A\) and drawing the tuft-yarns, as before described, and although one cam might be employed for giving the entire series of movements, as I have indicated diagrammatically in Figs. 24 to 31 for the sake of clearness and simplicity, yet in practice I have found it desirable to employ the two cams, one on each side of each of the arms \(A\), as indicated in Figs. 2 and 19, one of said cams, as \(A^0\) being designed to give the rising-and-falling movement to the carrier \(A\) and take the weight thereof, while the cam \(A\) is designed with a contour or cam surface to give an upward or backward movement to the arms and carrier in the direction of the length of said arms. The starting or normal position of the actuating-cams \(A\) while the carrier is in its upper position, at which time the pattern-pins \(d\) and positioning-pins \(d\) act upon the operating-arms \(b\), is represented in Fig. 24, wherein the high part of the cam bear upon the pin or roll \(A\) and by depressing and holding this end of the arms \(A^0\) depressed raises and maintains the carrier \(A\). As the cams move in the direction of the arrow the carrier \(A^0\) is gradually lowered, with the tuft-yarn tubes, into the warps, as represented in Fig. 10, which shows the carrier to have been moved from its dotted to its full line position. The tuft-yarn being now between the warp-threads, it is desirable to give a shogging movement to the carrier \(A\), that is, to pull back on one of the arms \(A\), which latter arm \(A\) moves slightly forward—and this I accomplish by providing the cams on opposite sides of the loom with shogging depressions \(m^\prime\) and disposing one cam slightly in advance of the other with respect to the shogging depressions, which serve to permit the arms \(A^0\) to move different distances forward in the direction of the arrow, as shown in Fig. 25, the result being that the various tuft-yarn holders and the tuft-yarn tubes below the warp-threads take a slightly-diagonal position with respect thereto, as indicated in Fig. 16, so that as the carrier rises slightly under the action of a riser \(m\) of the ends of the tuft-yarn tubes will be carried above the warp-threads on the side thereof opposite to which they entered the warp, as indicated in Fig. 11. A continuation of the surface \(m\) then permits the arms \(A^0\) to slide forward from their position indicated in Figs. 11 and 26, so as to carry the ends of the tuft-yarn tubes close to the fell of the cloth, as indicated in Fig. 12, at which point the grippers, to be hereinafter described, operate to engage the end of the tuft-yarn. The tuft-yarns having thus been entered between the warps and held by the grippers, to be described, the carrier \(A\) is to be returned to its normal upper position, or that position from which it is started, the first movement to secure this return being indicated in Figs. 13 and 28, wherein by the latter is shown the cam-surface \(m\) engaging the forward end of the roll or pin on the end of the arm \(A\) and drawing said arms backward the extent of the slots \(A\) in said arms, and by virtue of the disposition of the gams and cam-surface \(m\) at opposite sides of the loom the carrier \(A\) is given its return shogging movement and lowered slightly by the cam surface \(m\), as indicated in Fig. 29, so as to carry the end of the tuft-yarn tubes below the warp-threads and in a position, as indicated in Fig. 18 by full lines, so that the tuft-yarn tubes will not engage the warp-threads as the carrier is raised, which raising movement takes place gradually, as shown in Figs. 30 and 31 and indicated from the dotted to the full line position of the carrier \(a\) in Fig. 18. In this raised or normal position the arms \(A\) which support the tuft-yarn carrier \(A\) will be in the position again indicated in Fig. 14, the disposition of the cam-surfaces on the operating-cams for the arms \(A\) being such as to maintain said arms in the position indicated, with the carrier raised and with the arms retracted, with the pins or rolls \(A\) at the forward end of the slot \(A\), as indicated in Fig. 24, and when the carrier \(A\) is lowered into the warp at its forward position it will be noticed that the pin \(A\) is at the upper end of the slot \(A\) and these slots \(A\) in the opposite arms may be so disposed as to maintain the carrier \(A\) in its shogged position while introducing tufts of yarn.

While I have thus described with reference to Figs. 24 to 31, inclusive, a single cam on each side of the loom-frame for operating the carrier-arms \(A\) for the sake of simplicity and clearness, it is to be understood, of course, that I may form this cam in two parts, as I have above indicated and shown in Fig. 2, for instance, wherein part \(A^0\) serves to hold the arms with the carrier in raised position, while...
the other part of the cam, as $A^1$, serves to impart to the arms, and consequently the carrier, backward-and-forward movement lengthwise of the arms; but in either event the movement imparted by the cams will be simply dependent, of course, upon the contour of said cams, and whether one or several are employed the contour to effect the movement will be substantially the same as that indicated in Figs. 24 and 31.

While I have found cams desirable to perform the movement hereinbefore described to the tuft-yarn carrier $A^2$, it is to be understood that other means may be employed within the scope of my invention.

In order to insure the proper crossing of the tuft-yarn tubes around the warp-thread, which may be secured solely by the shogging movement given to the tuft-yarn carrier, I have provided a comb below the warp-threads which will serve to move the warp-threads slightly to one side as the tuft-yarn tubes are shogged and rise from under the said warp-threads, and as one embodiment of the construction of said comb I mount upon a cross-bar $F$, beneath the warp-threads, a series of pins $j$, projecting upward therefrom, said cross-bar preferably traveling in guides, as $F'$, secured to the sides of the loom-frame, as more clearly indicated in Figs. 22 and 23. Mounted on a shaft $F''$, which derives motion from the cam-shaft $A^4$ through any suitable operating connections, is a cam $F^3$, upon which a projecting toe $F^4$ of the comb rests, as clearly indicated in Fig. 1, whereby the comb may be given a rising-and-falling movement as the said cam $F^3$ is turned by the shaft. Secured upon the guides $F'$ are cam-shoes $F^4$, which after the pins $j$ of the comb have engaged the warp-threads $w$, as indicated in Fig. 22, move the said comb endwise, thereby carrying the warp-threads in front of the tuft-yarn tubes slightly to one side, as indicated by the diagram in Fig. 17, to thereby further insure that the tuft-yarns as they rise between the threads will be laid across the same on the upward movement.

Pivotally mounted on the cross-shaft $G$, journaled in the loom-frame, are a pair of rocker-arms $G'$, one end of which, as $G^2$, bears upon the periphery of a cam $G^3$, secured on the shafts $F''$, whereby the rocker-arms $G'$ are given rocking movement as the cams $G^3$ are actuated by the shafts $F''$.

Mounted upon the ends of the rocker-arms $G'$ and extending therebetween is a gripper $g$, preferably consisting of a continuous strip having teeth $g'$, said gripper being disposed above the warp-threads, as indicated in Fig. 60. 1, a spring $g^2$ normally causing the rocker-arms $G'$ to bear upon the periphery of the cams $G^3$. Mounted upon the loom-frame, as indicated in Fig. 2, is a cam $G^3$, which, bearing against the side of the rocker-arms $G'$, causes said rocker-arms and the gripper carried thereby to be moved slightly crosswise of the loom after the teeth of the gripper have engaged the warp-threads in a manner similar to the movement of the comb $F$, so that said gripper then moves to further impede the lateral movement of the warp-threads to secure certainty in the placement of the tuft-yarns around said threads. When the tuft-yarns have been carried into the position as indicated in Fig. 12, with the ends of the tuft-yarns close to the fell, the gripper is given a further forward movement to engage the end of the tuft-yarns projecting from the tuft-yarn tubes, such movement being permitted by reason of the change in the shedding of the warp, which occurs about this time. If found desirable, the cam $G^2$ may be provided with a contour which will permit a slight raising of the gripper from engagement with the warp-threads after the tuft-yarns have assumed the position of Fig. 12 and to once return the gripper to engage such tuft-yarns and hold them as the tuft-yarn carrier $A^2$ is returned to its normal position.

I do not wish to be understood, of course, as limiting my invention by the necessary employment of the comb $F$ and the laterally-moving grippers for supporting the warp-threads to enable the tuft-yarns to be properly inserted, as these may be dispensed with under some conditions; but I have found such devices to be desirable in this connection. Nor do I intend to limit my invention to the particular construction and operation of the comb and grippers, as they might be modified.

I have indicated in the drawings by the lines $w$ the condition of the warp-threads when the shed is open for the reception of the weft or filling, and I have indicated also by $w'$ the completed fabric as it is wound upon the cloth-beam $A^2$; but the details of the shedding mechanism and other parts not forming essential features of my invention have, as hereinbefore stated, been omitted for the sake of clearness.

It may sometimes happen that the tuft-yarn holder $C$ may become injured or some of its parts become inoperative or defective, in which event it is desirable that such tuft-yarn holder may be readily removed from the carrier-shaft and replaced by a new holder without disturbing the relation of the remaining holders on the carrier-shaft, and to this end I form each of the holders $C$ in two parts, as indicated in Fig. 32, the said parts of the holder being detachably joined together by spring-clips $k$, secured to one part of the holder and engaging suitable projections $E'$ on the other part of the holder, as will be obvious. Of course any form of detachable connecting means for the two parts of the holder might be employed, and I do not restrict myself in this respect, but merely show the above-described construction of one means for securing the parts of the holder together upon the shaft.

By the mechanism hereinbefore described, it will be noticed that I have provided a tuft-
pile-fabric loom in which the tuft-yarns are all carried by a suitable carrier, and which tuft-yarns may, under the call of pattern mechanism, have their position changed with relation to each other, so as to vary the pattern of the tuft-yarns in any row of tufts, and it will also be noticed that after each insertion of a row of tufts the tuft-yarn holders are all returned to a predetermined or normal position with respect to each other—as, for instance, that all of the sections or chambers throughout the series of holders containing a white yarn shall be in line with each other across the loom—so that when the pattern or jacquard mechanism operates to indicate a pattern for tuft-yarns all of the tuft-yarn holders will start to move from the same predetermed or normal position.

I believe myself to be the first to provide in a tuft-pile-fabric loom a carrier for the tuft-yarns, said tuft-yarns being controlled as to their relation with each other on the carrier by a pattern or jacquard mechanism, and I desire to claim such construction broadly.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a pile-fabric loom, the combination of means for carrying the whole of the tuft-yarns, and actuating devices for said means to move the same and all of the tuft-yarns carried thereby for the presentation of the desired tuft-yarn between and through the warp-threads.

2. In a pile-fabric loom, the combination of means for carrying the whole of the tuft-yarns, actuating devices for said means to move the same and all of the tuft-yarns for the presentation of the desired yarns between the warp-threads and withdrawal therefrom, and means for holding the end of the tuft-yarns as the carrying means is withdrawn from between the warp-threads.

3. In a pile-fabric loom, a tuft-yarn carrier for supporting the tuft-yarns, actuating devices for moving said carrier and the whole of the tuft-yarns to introduce the desired tuft-yarns between and withdraw them from the warp-threads and pattern-controlled devices for determining the order of introduction of said tuft-yarns between the warp-threads.

4. In a pile-fabric loom, a rotatable tuft-yarn carrier for supporting the tuft-yarns, a pattern-controlled means for determining the rotative position of the tuft-yarns on said carrier, and means for moving said carrier and all of the tuft-yarns to introduce the desired tuft-yarns between and withdraw them from the warp-threads.

5. In a pile-fabric loom, the combination of a rotative tuft-yarn carrier for supporting tuft-yarns, pattern-controlled means for determining the relative rotative position of the tuft-yarns on the carrier, and means for introducing the tuft-yarns between the warp-threads and withdrawing them therefrom, and devices for holding the end of the tuft-yarns as the yarns are withdrawn from between the warp-threads.

6. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting tuft-yarns, pattern-controlled means for determining the relative position of the tuft-yarns on the carrier, means for moving the carrier for the introduction of the tuft-yarns between the warp-threads and withdrawing them therefrom, and for giving said carrier a shogging movement when a tuft-yarn is introduced between the warp-threads.

7. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting the tuft-yarns, pattern-controlled means for determining the position of the yarns on the carrier, means for moving the carrier to introduce the yarns between the warp-threads, then raising and giving a shogging movement to said carrier and thereafter returning said carrier to its original position.

8. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting tuft-yarns, pattern-controlled means for determining the position of the yarns on the carrier, means for moving the carrier to introduce the yarns between the warp-threads, then giving a shogging and rising movement to said carrier and thereafter returning said carrier to its original position, a comb, and means for moving said comb to move the warp-threads laterally.

9. In a pile-fabric loom, the combination of a tuft-yarn carrier, pattern-controlled means for determining the position of the tuft-yarns on said carrier, means for moving the carrier for the introduction of the tuft-yarns between the warp-threads, a comb, means to introduce the comb between the warp-threads and move the same to carry the warp-threads laterally, the means for moving the carrier thereafter acting to return the carrier to its original position.

10. In a pile-fabric loom, the combination of a tuft-yarn carrier, pattern-controlled means for determining the position of the tuft-yarns on said carrier, means for moving the carrier for the introduction of the tuft-yarns between the warp-threads then shogging said carrier, a comb, means to introduce the comb between the warp-threads and move the same to carry the warp-threads laterally, the means for moving the carrier thereafter acting to return the carrier to its original position.

11. In a pile-fabric loom, the combination of a tuft-yarn carrier having a series of tuft-yarns normally sustained thereby in a determined rotation, pattern-controlled means for moving the tuft-yarns on said carrier into different relation, means for introducing the tuft-yarns between and withdrawing them from the warp and means to thereafter return the tuft-yarns to their predetermined or normal position on the carrier.

12. In a pile-fabric loom, the combination of a tuft-yarn carrier having a series of sepa-
rate tuft-yarn holders normally sustained by said carrier in determined relation, pattern-controlled means for moving the tuft-yarn holders into different relations, means for introducing the tuft-yarns between and withdrawing them from the warps, and means to return the tuft-yarns to their original predetermined or normal position after the carrier has been withdrawn from the warp.

13. In a pile-fabric loom, the combination of a shaft, a series of tuft-yarn holders each provided with means for supporting a plurality of tuft-yarns of different kinds or colors, said holders being arranged in a predetermined or normal relation, pattern-controlled means for determining the movement of the holders into a different relation, means for introducing the tuft-yarn between the warp-threads and withdrawing them therefrom, and means for returning the tuft-yarn holders to the said predetermined or normal relation.

14. In a pile-fabric loom, the combination of means for carrying the tuft-yarns in a predetermined or normal relation, devices for moving the tuft-yarns into different relations to form a row of tufts, mechanism for moving said means and the whole of the tuft-yarns for inserting the desired tuft-yarns between the warp-threads, and means for returning the tuft-yarns into their predetermined or normal relation after the insertion of a row of tufts.

15. In a pile-fabric loom, the combination of means for carrying tuft-yarns comprising a series of tuft-yarn holders each carrying a plurality of tuft-yarns and normally maintained in a predetermined or normal position, devices for moving the tuft-yarn holders to carry their tuft-yarns into a different relation for the formation of a row of tufts, and means for returning the tuft-yarn holders to their predetermined or normal position after the insertion of a row of tufts.

16. In a pile-fabric loom, the combination of a shaft, a series of tuft-yarn holders carried by said shaft and each provided with a plurality of supporting devices for tuft-yarns, means for rotating said shaft, and devices for rotatively connecting said holders to and disconnecting them from said shaft so that they may either rotate with said shaft or remain fixed with relation thereto.

17. In a pile-fabric loom, the combination of a shaft, a series of tuft-yarn holders carried by said shaft and each provided with a plurality of supporting devices for tuft-yarns, means for rotating said shaft, and devices for rotatively connecting said holders to and disconnecting them from said shaft so that they may either rotate with said shaft or remain fixed with relation thereto, and pattern-operative means for controlling said devices.

18. In a pile-fabric loom, the combination of a shaft, a series of tuft-yarn holders carried by said shaft and each provided with a plurality of supporting devices for tuft-yarns, means for rotating said shaft, a plurality of devices for rotatively connecting said holders with and disconnecting it from the shaft, the movement of any one of said plurality of devices serving to give corresponding movement to the others whereby they simultaneously act under the control of any one of them to connect or disconnect a holder with or from the shaft.

19. In a pile-fabric loom, the combination of a shaft, a series of tuft-yarn holders carried by said shaft and each provided with a plurality of supporting devices for tuft-yarns, means for rotating said shaft, a plurality of devices for rotatively connecting said holder with and disconnecting it from the shaft, the movement of any one of said plurality of devices serving to give corresponding movement to the others whereby they simultaneously act under the control of any one of them to connect or disconnect a holder with or from the shaft, and pattern-controlled means for causing any one of said devices to become operative to disconnect the holders from the shaft.

20. In a pile-fabric loom, the combination of a tuft-yarn carrier comprising a shaft, means to rotate said shaft, a series of tuft-yarn holders carried by said shaft and each provided with a plurality of tuft-yarn supports, tuft-yarn tubes for guiding the tuft-yarns from the supports, and pattern-controlled devices for disconnecting each holder rotatably from said shaft.

21. In a pile-fabric loom, a tuft-yarn carrier comprising a series of tuft-yarn holders each having supporting means for tuft-yarns, a lid or cover to inclose said tuft-yarns, and means to cause the lid or cover to open when a tuft-yarn breaks or becomes exhausted.

22. In a pile-fabric loom, a tuft-yarn carrier comprising a shaft, a series of divided holders supported on said shaft and means to detachably connect the parts of the divided holders whereby any one of them may be readily placed upon or taken from said shaft without disturbing the remaining holders.

23. In a pile-fabric loom, a tuft-yarn holder having provisions for supporting a plurality of tuft-yarns, a series of pawls or connecting devices carried by said holder, movement of any one of the pawls or connecting devices causing a corresponding movement of the others.

24. In a pile-fabric loom, the combination of a shaft, means for rotating said shaft, a series of tuft-yarn holders carried by said shaft, a series of operating-arms, for each of said holders whereby said holders may be rotatively connected to and disconnected from said shaft, and means for actuating said operating-arms.

25. In a pile-fabric loom, the combination of a shaft, means for rotating said shaft, a se-
ries of tuft-yarn holders carried by said shaft, a series of operating-arms of different lengths for each of said holders whereby said holders may be rotatively connected to and disconnected from said shaft, and means for acting upon said operating-arms.

26. In a pile-fabric loom, the combination of a shaft, means for rotating said shaft, a series of tuft-yarn holders carried by said shaft, a series of operating-arms for each of said holders whereby said holders may be rotatively connected from said shaft, pattern-controlled means for acting upon said operating-arms.

27. In a pile-fabric loom, a tuft-yarn carrier comprising a shaft, means for rotating said shaft, a series of tuft-yarn holders for rotatively connecting them with and disconnecting them from the shaft, positioning-pins for engaging an operating-arm on each holder to cause the holders to assume their normal or predetermined position with relation to each other, and pattern-pins under control of a pattern mechanism for engaging any of the operating-arms on the holders under the call of the pattern to position the holders for forming a row of tufts.

28. In a pile-fabric loom, a tuft-yarn carrier, means for rotating said shaft, a series of tuft-yarn holders, a series of operating-arms for each of said holders whereby said holders may be rotatively connected to and disconnected from said shaft, and means for acting upon said operating-arms.

29. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting the tuft-yarns, mechanism for lowering the tuft-yarn carrier to enter the tuft-yarns between the warp-threads and near the fell and for thereafter shogging, raising and moving forward the tuft-yarn carrier to place the ends of the tuft-yarns above the warp-threads and near the fell.

30. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting the tuft-yarns, mechanism for lowering the tuft-yarn carrier to enter the tuft-yarns between the warp-threads, a comb, means to raise said comb between the warp-threads and give lateral movement thereto, said mechanism then acting to shog, raise and move forward the carrier to place the ends of the tuft-yarns above the warp-threads and near the fell, and a gripper disposed with its gripping edge above the warp-threads to engage and hold the ends of the tuft-yarns as the carrier returns to its normal position.

31. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting the tuft-yarns, mechanism for moving the tuft-yarn carrier to enter the tuft-yarns between the warp-threads, a comb disposed beneath and a gripper disposed above the warp-threads, means to cause the comb and gripper to engage the warp-threads and give lateral movement thereto, the said mechanism then acting to move the carrier to place the tuft-yarns above the warp-threads and then return it to its normal position.

32. In a pile-fabric loom, the combination of a tuft-yarn carrier for supporting the tuft-yarns, mechanism for moving the tuft-yarn carrier to enter the tuft-yarns between the warp-threads, a comb disposed beneath and a gripper disposed above the warp-threads, means to cause the comb and gripper to engage the warp-threads and give lateral movement thereto, the said mechanism then acting to move the carrier to place the tuft-yarns above the warp-threads and then return it to its normal position, the gripper acting on the return movement of the carrier to engage and hold the end of the tuft-yarns.

ALEXANDER TURKINGTON.

In presence of—
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