Aug. 4, 1964 A. W. STOUDENMIRE 3,143,149

OSCILLATABLE REED STRUCTURE

Filed Sept. 25, 1961 3 Sheets-Sheet 1

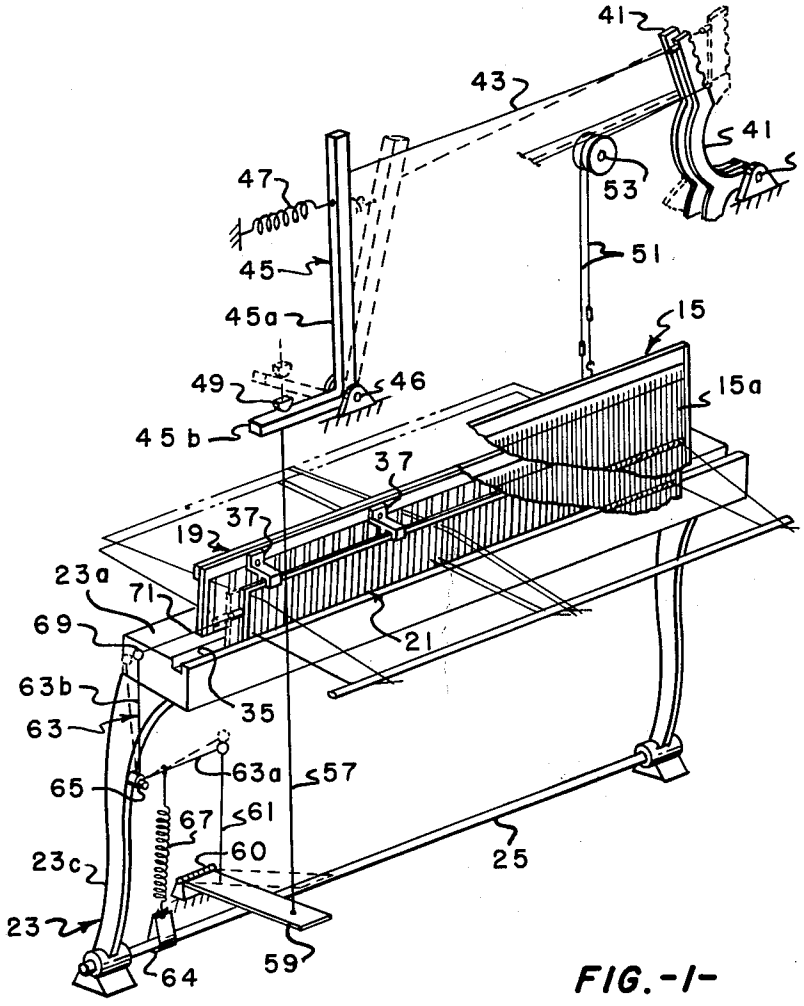

FIG.-1-

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Filed Sept. 25, 1961 3 Sheets-Sheet 2

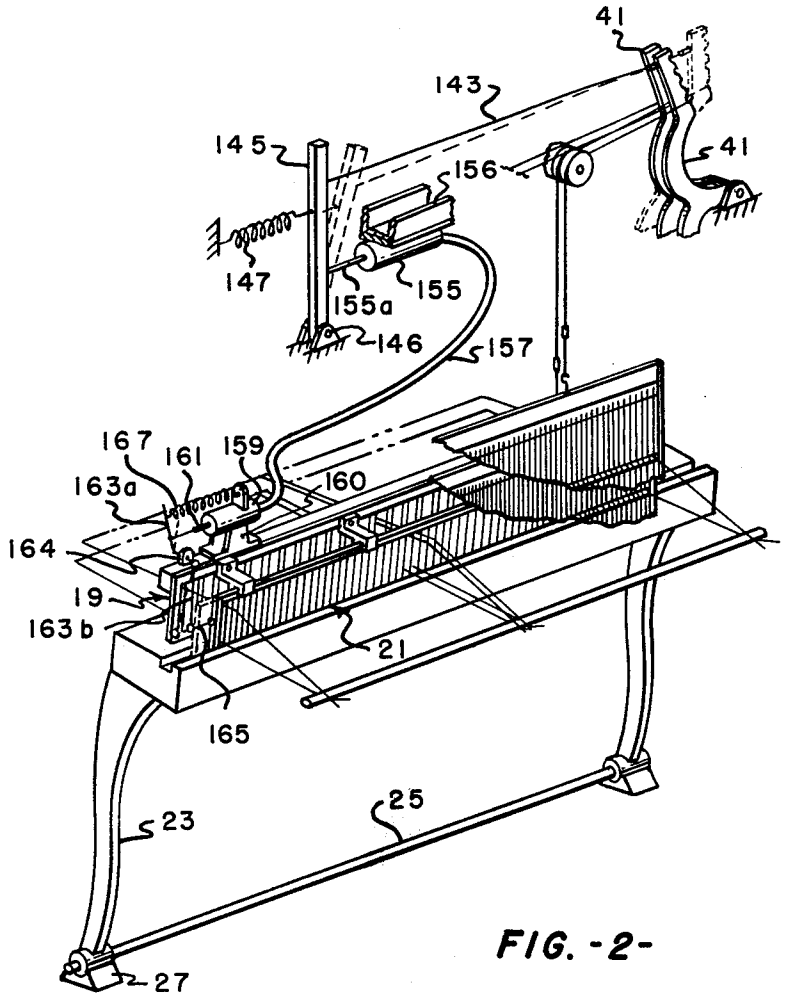

FIG. -2-

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OSCILLATABLE REED STRUCTURE

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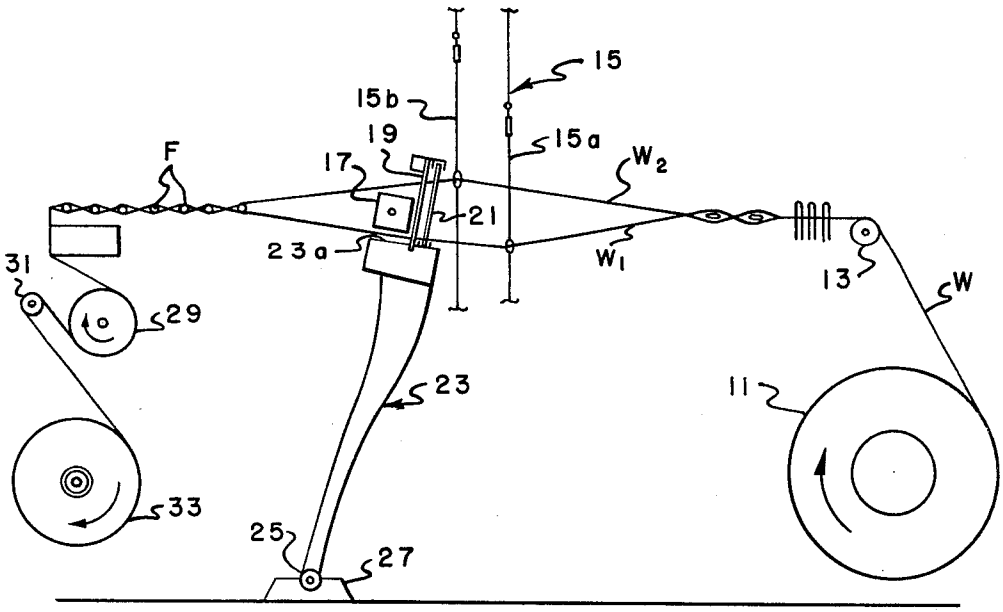

FIG. -3-

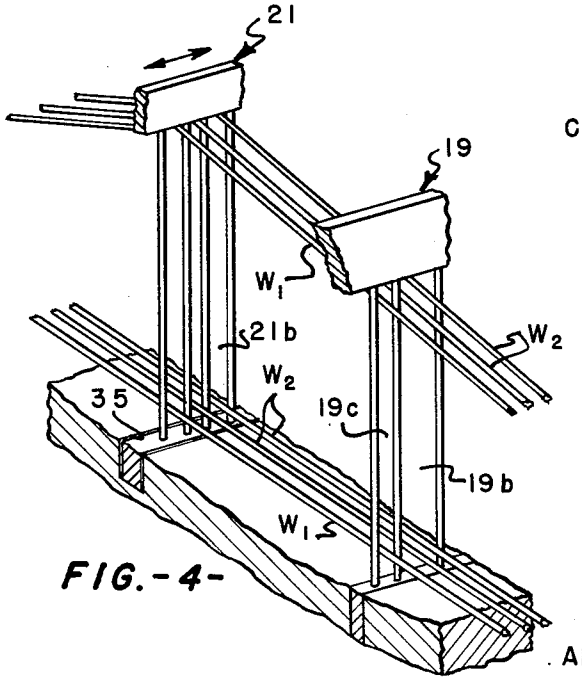

FIG. -4-

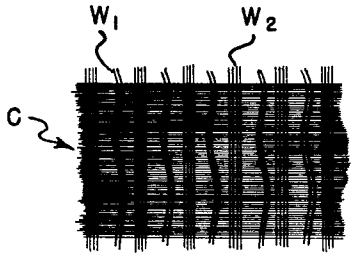

FIG. -5-

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OSCILLATABLE REED STRUCTURE

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6 Claims. (Cl. 139—48)

This invention relates to a method and aparatus for forming textile fabric, and more particularly to a novel method and loom arrangement for forming a novelty weave fabric.

Briefly, according to the invention, one or more selected ends of a warp sheet of filaments is laid in an undulating path with respect to other ends of the warp sheet, and this undulating path is maintained at least in part in the finished fabric. This undulating movement of the selected warp end or ends is effected through the medium of a novel loom arrangement including two reeds, one of which is movable with respect to the other, and one of which has dents of different size with respect to the dent size of the other reed. Preferably, the dents in one reed are of varying size at spaced intervals along the width of the reed, while the dents of the other reed may be of constant size. In the preferred embodiment, the movable reed has constant sized dents and is between the varying sized dent reed and the warp supply means, whereby variations in lateral movements of the warp filaments in the variable size dents (as effected by the movable reed) will be reflected in the fabric on the beat up side of the reeds. This method and apparatus yields a novelty fabric which may have undulations in one or more of the filaments, and preferably in spaced groupings of filaments across the width of the fabric.

Various other features and attendant advantages will become apparent to those skilled in the art from a reading of the following detailed description of several modes of practicing the invention, including several physical embodiments for the practice thereof, taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a schematic illustration in perspective of a portion of a loom embodying the present invention.

FIGURE 2 is a view similar to FIGURE 1 of a modified embodiment according to the invention.

FIGURE 3 is a schematic line drawing in side elevation of a loom embodying the present invention according to both FIGURES 1 and 2.

FIGURE 4 is an enlarged view in perspective illustrating the passage of warp ends through the reed portion of the loom of FIGURES 1 and 2.

FIGURE 5 is a schematic plan view of a novelty fabric formed by utilizing the method and apparatus according to the invention.

Referring now in detail to the figures of the drawings, FIGURE 3 illustrates schematically a loom embodying the present invention, in which a sheet of warp filament ends W (composed of warp ends W_1 and W_2) is fed in a conventional manner from a supply roll **11** over a guide roll **13** to a shed zone where the filaments are formed into a suitable shed as by a harness arrangement **15**, including heddles **15***a*, **15***b*. In the shed zone one or more weft or filling filaments F is intermittently fed, as by a shuttle **17**, between the filaments of the warp sheet and is beat up into the warp sheet to form a fabric through the medium of a novel reed arrangement **19**, **21** carried by an oscillating lay **23** which moves on a rocker shaft **25** mounted in the conventional form on bearings **27** carried by the loom frame. The fabric is then carried around suitable guide rolls **29**, **31**, in the conventional manner to a take-up roll **33** onto which it is wound in the conventional or desired manner.

Referring now more particularly to FIGURES 1 and 4,

reed **19** is fixed in the conventional manner on the lay adjacent the bed **23***a* on which the shuttle rides. The reed **21** is disposed on the back or heddle side of the reed **19**, and is mounted in a suitable guide arrangement for reciprocating or oscillating movement to-and-fro widthwise of the warp sheet of filaments. This guide arrangement may suitably take the form of a guide slot **35** formed in the upper surface of the lay **23** and guide elements **37** suitably secured as by screws at intervals on the upper framework of the reed **19**.

The movable or auxiliary reed **21** preferably has dents of equal size along its entire width, while the fixed reed preferably has dents of unequal size disposed at intervals along its width. As seen more particualrly in FIGURE 4, in the illustrated arrangement the dents **19***b*, **19***c* of the fixed reed are alternately large and small in size, the large size dents **19***b* being twice as large as the small size dents **19***c*, and the smaller size dents **19***c* being equal is size to the dents **21***b* of the reciprocating reed. Other dent size relationships may of course be employed for different effects, as for instance the dents **19***b* may be equal to three, or alternately two, three, etc., times the width of dents **21***b*.

Also, as seen in FIGURE 4, according to one mode of practicing the invention two warp filament ends W_1 are passed through each dent **21***b* of the reciprocating reed **21**, with two warp ends being passed through corresponding ones of each of the small dents **19***c* in the fixed reed **19**. Four warp ends W_2 are passed through each of the double size dents **19***b* of the reed **19**. This same pattern may be repeated across the width of the warp sheet, or, as will be apparent to those skilled in the art, one may suitably vary this pattern as may be desired as by varying the dent spacing or number of ends passed through each dent in one or both of the reeds **19**, **21** to achieve a desired variation in fabric design.

In FIGURE 1 the invention is illustrated as applied to a dobby loom, in which one of the dobby jacks **41** is employed to impart reciprocating or oscillating motion to the movable reed **21**. In this embodiment, a dobby jack **41** is connected through a cable **43** to one arm **45***a* of a bell crank **45** which may be suitably pivotally mounted on the framework of the loom as indicated generally at **46**. The normal position of the dobby jack **41** is illustrated in solid lines in this figure, while the harness lifting position of the dobby jack is illustrated in broken lines, it being of course understood that the actual degree of movement is not precisely shown as such would be on a loom, but is only shown schematically for purposes of illustrating movement. The bell crank **45** is normally biased to the left as shown in this figure through the medium of a spring **47**. Connected to the other arm **45***b* of the bell crank **45** is a rigid rod **57**, the connection between the rod **57** and the arm **45***b* being suitably a swivel connection as formed by a rocker element **49** which may be adjustably secured to the rod, with the rod passing through an oversized bore suitably formed in the arm **45***b*. The lower end of the rod **57** is also swivel connected to an oscillating foot **59** adjacent the outboard end of the foot, which forms in effect a lever arm. The oscillating foot or lever arm **59** is pivotally mounted at its other end on the framework of the loom, as indicated generally at **60**.

Connected between the pivot mounting **60** of the foot **59** and the connection between the foot and the rod **57** is a rigid rod **61** which is swivel connected both to the oscillating foot and to one arm **63***a* of a bell crank **63** which is pivotally mounted as indicated **65** on the sword **23***c* of the lay **23**. The bell crank **63** is normally biased in a clockwise direction as viewed in FIG. 1, as through the medium of a return spring **67** connected between the arm **63***a* and an anchor **64**, which may suitably be a leather thong wrapped about the rock shaft **25**.

The other arm 63*b* of the bell crank 63 is connected as through a swivel connection 69 to a push rod 71 which is in turn connected through a swivel connection to the frame of the reciprocating reed 21.

In order to prevent any excess undesirable movement of the reciprocating reed 21 as a result of mere oscillating movement of the lay 23 between the harness and the fell of the cloth, it is desirable that the connection between the rigid rod 61 and the oscillating foot or lever arm 59 be disposed as close as practically possible to the rocker shaft 25. This will result in a minimum of movement of the reed 21 as a function of normal oscillating movement of the lay 23. This may be accomplished from a practical standpoint as by disposing the oscillating foot 59 so that its lower position will be very close to the rocker shaft at the point of connection between the rigid rod 61 and the foot 59 and approximately vertically aligned with the rocker shaft axis.

As in conventional practice, the dobby jacks 41 are connected to the heddle harnesses 15 having heddles 15*a* therein, as through the medium of lifting cables 51 passing over pulleys 53. These dobby jacks may be suitably pivotally mounted on the frame of the loom as indicated at 55, and may be suitably intermittenly pivoted about this axis 55 through any conventional or desired mechanism (not shown).

The extent of movement of the reed 21 in its guides 35, 37 may be adjusted to the desired amount by adjustment of the position of connection of the cable 43 to the arm 45*a*, or by adjustment of the position of connection of the rod 57 to the arm 45*b*, or by adjustment of the connections between 57 and 59, the desirable connection change being made on one or both of the arms 45*a*, 45*b* of the bell crank 45. I have found that a suitable extent of movement for the illustrated embodiment may be of the order of ⅛–½ inch. The exact extent of reciprocating motion will, of course, vary with the particular pattern which may be being formed, and the width of the dents in the reeds.

In operation, the loom is operated in the normal manner, with the dobby jacks 41 being periodically moved about their pivot mounting 55 to lift and lower selected ones of the heddle harnesses 15. Thus, periodically the particularly one of the dobby jacks 41 which is connected to the cable 43 will be moved to effect sidewise movement of the reed 21 first in one direction through the positive motion of the dobby jack 41 and then in the opposite direction under the return springs 47 and 67. For the illustrated embodiment, the extent of movement of the auxiliary or movable reed 21 corresponds to approximately two dent widths 21*b* in order to carry the four filaments W_2 from one side to the other of the respective large dent 19*b* for each grouping thereof and to effect the desired extent of undulation of filaments W_1 in the fabric C. The length of time which the dobby jack remains in one position or the other may be varied by selecting a dobby jack which has the desired period, or by employing a single dobby jack 41 for this purpose alone and so arranging the motion imparted thereto as to obtain the desired periodicity of motion. For instance, the dobby jack may be gradually moved back and forth about its pivot axis 55, or may be abruptly moved back and forth, or combined abrupt and slow in opposite directions, and the extent of time may vary over one or two picks of the shuttle or may extend for a number of picks, e.g. 15–20 picks. The periodicity or length of periodicity will, of course, vary the formation of the pattern. As shown in the example of FIGURE 5, a fabric C is formed in which the periodicity of movement of the dobby jack is relatively slow, being of the order of one complete back and forth movement of the dobby jack for each 25–30 or so weft picks of the loom. Referring to this fabric formed in FIGURE 5, it will be noted that the groupings of weft filaments W_1 have been set closely together to form an undulating line varying as a function of the movement of the dobby jack back and forth

and giving the visual effect of a single comparatively large sized filament, while the groupings of weft filaments W_2 have each been moved closer together to form a substantially straight filament formation which on casual examination appears in the filament cloth as substantially one extra large size filament. As mentioned above, variations of pattern may be formed as may be desired, utilizing the teachings of the present invention.

FIGURE 2 illustrates a modified arrangement constructed acording to the invention, in which the oscillating or reciprocating reed 21 has its motion imparted therethrough through the medium of a flexible fluid pressure conduit connecting between a source of selectively variable fluid pressure and a fluid-pressure-to-mechanical-movement transducer carried by the lay 23. Otherwise, the loom arrangement, including the lay and its two associated transversely fixed and oscillatable reeds 19, 21, is substantially identical to that of the FIGURES 1, 3 and 4, and the fabric which may be made thereon is also substantially the same.

According to this modification, the dobby jack 41 which is to be employed for effecting reciprocating or oscillating motion of the movable reed 21 is connected through the medium of a cable 143 to a lever 145 which may be pivotally mounted on the frame of the loom as indicated generally at 146. The lever 145 is normally biased in the counterclockwise direction as viewed in FIGURE 2 as through the medium of a spring 147, and is connected through a swivel connection to the piston 155*a* of a cylinder and piston arrangement 155, 155*a*. The cylinder 155 may be suitably mounted on the upper cross beam 156 of the loom frame. A flexible fluid conduit 157 connects from the interior of the cylinder 155 to a fluid-pressure-to-mechanical motion transducer in the form of a cylinder 159 which is mounted as through the medium of a bracket 160 on the upper framework of the transversely fixed reed 19. The two cylinders 155 and 159 are in fluid connection with one another so that inward movement of the piston 155*a* will effect corresponding outward movement of the piston 161 associated with the cylinder 159. The piston 161 is in turn connected through a suitable swivel connection to a double-armed lever 163*a*, 163*b* which is pivotally mounted as indicated at 164 on the transversely fixed reed 19. A push rod 165 is connected through two swivel connections to the arm 163*b* and one end of the frame of the movable reed 21.

The operation of this arrangement to achieve the desired novelty fabric configuration is similar to that of the embodiment of FIGURE 1, in that the dobby jack 41 is intermittently moved to impart reciprocating or oscillating motion to the reed 21 relative to the reed 19. This motion in this instance is effected by the action of the plunger or piston 155*a* being moved as a function of the movement of the dobby jack 41 to in turn cause a fluid pressure change in the cylinder 159 effecting a corresponding movement of the piston 161 and lever 163*a*, 163*b*, and thereby effecting the desired movement of the reed 21. The return movement of the reed 21 is assisted through the medium of spring 167 which acts to return the plunger or piston 161 to its innermost position. Variation in the extent of movement of the reed 21 may be effected by variation of the point of connection of the cable 143 to the lever 145, or by variation of the length of the effective lever arm 163*a*, 163*b*, as well as by variation of the point at which the cable 143 is connected to the respective dobby jack 41. If desired, in either of the embodiments illustrated in FIGURES 1 and 2, governing of the extent of movement may also be assisted by employment of end stops on the lay adjacent each end of the movable reed 21.

While the invention has been described and illustrated with respect to two physical embodiments constructed in accordance therewith, it will be apparent that various modifications and improvements may be made without

departing from the scope and spirit of the invention. Accordingly, it will be understood that the invention is not to be limited by the specific illustrative embodiments, but only by the scope of the appended claims.

That which is claimed is:

1. A loom having two reeds, one of said reeds being movable relative to the other of said reed in a direction transverse to the path of warp filaments therethrough, means for imparting back-and-forth motion to said one reed transverse to the normal path of movement of warp filaments therethrough, said motion-imparting means including a variable source of fluid pressure, a fluid-pressure-to-mechanical-movement transducer mechanically connected in motion-imparting relation to said one reed, and a fluid conduit connecting between said variable source of fluid pressure and said transducer.

2. A loom according to claim 1 including an oscillatable lay, said reeds being carried by oscillatable said lay, said variable source of fluid pressure being mounted on a part of said loom remote from said lay, said transducer being mounted on said lay, and said fluid conduit being flexible to permit free movement between said lay and said variable source of fluid pressure.

3. A loom according to claim 1 wherein said transducer is a cylinder and piston and said variable source of pressure is a cylinder and piston.

4. A loom having an oscillatable lay, at least two reeds mounted on said lay, one of said reeds being movable in said lay in a direction transverse to the other of said reeds, said movable reed being substantially coextensive with said other reed, both of said reeds having dents therein, one of said reeds having less dents than the other of said

reeds, said reed having less dents having a plurality of dents of varying size across the width of said reed, said movable reed having dents of substantially equal size, means supplying warp filaments through the dents in both of said reeds, and means operably assocated with said movable reed to periodically cause sliding movement of said movable reed whereby undulations will be formed in a portion of said warp filaments passing therethrough.

5. The structure of claim 4 wherein said plurality of varying size dents are regular in variation, varying alternately large and small in size with respect to one another.

6. The structure of claim 5 wherein a portion of said varying sized dents are substantially equal in size to the dents in the other of said reeds, and a portion thereof are larger than the dents of the other of said reeds.

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