Jan. 23, 1934. A. F. SCHULER 1,944,815

JACQUARD MECHANISM

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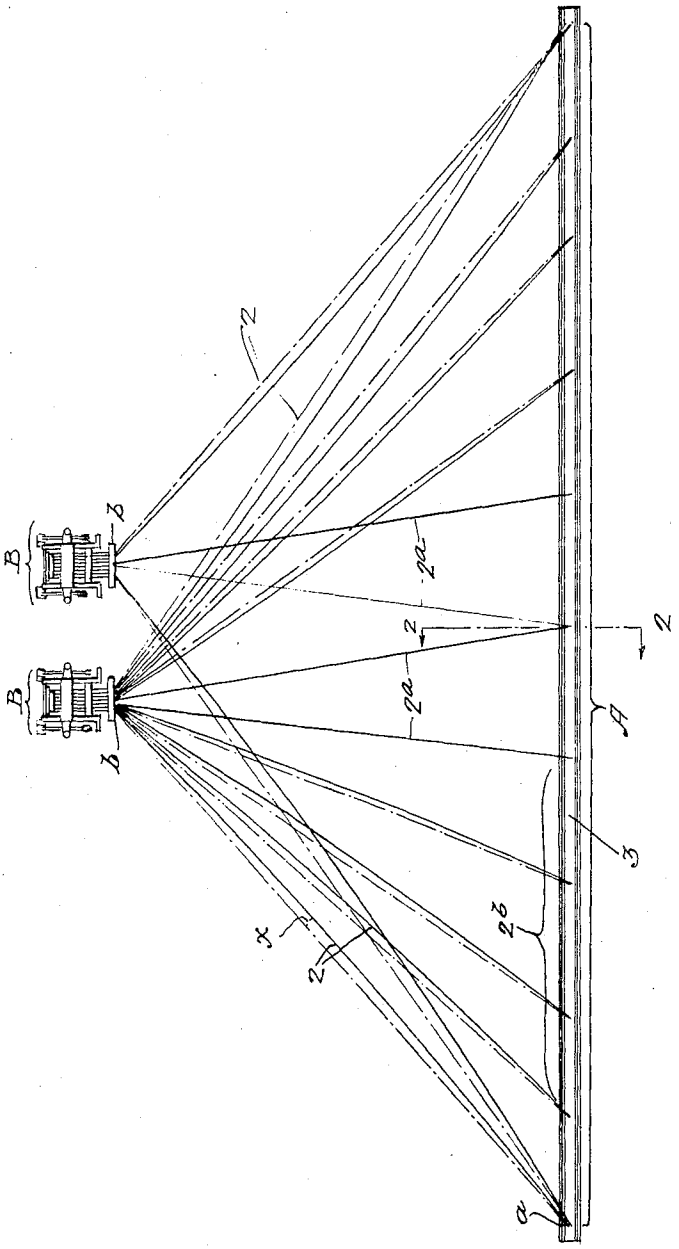
Fig. 1.



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JACQUARD MECHANISM

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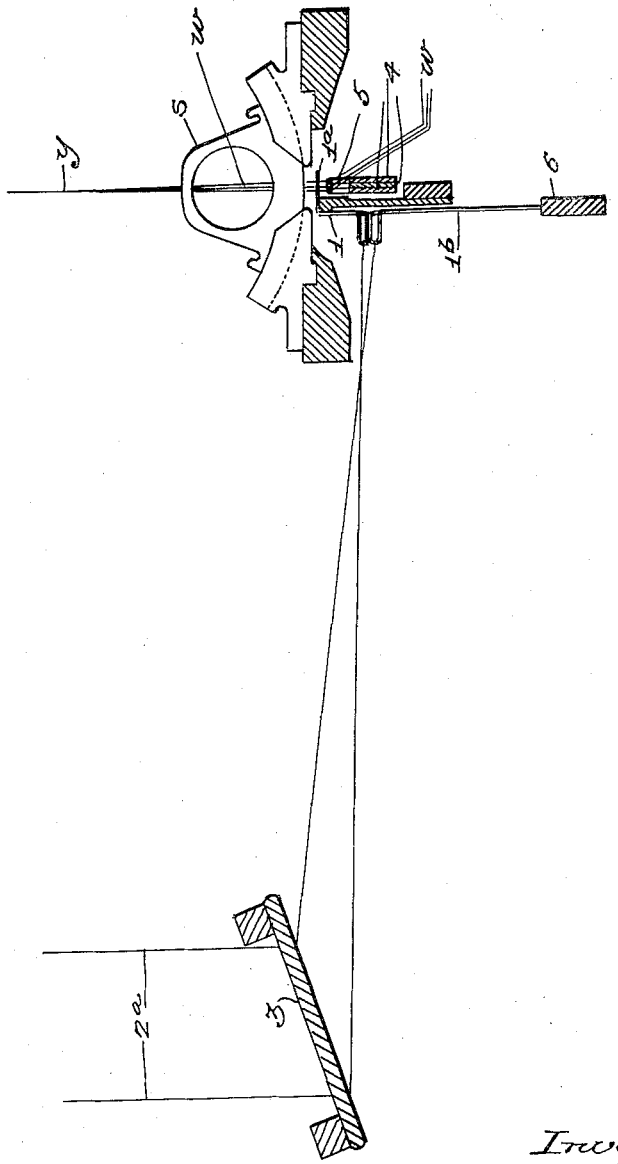

Fig. 2.

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JACQUARD MECHANISM

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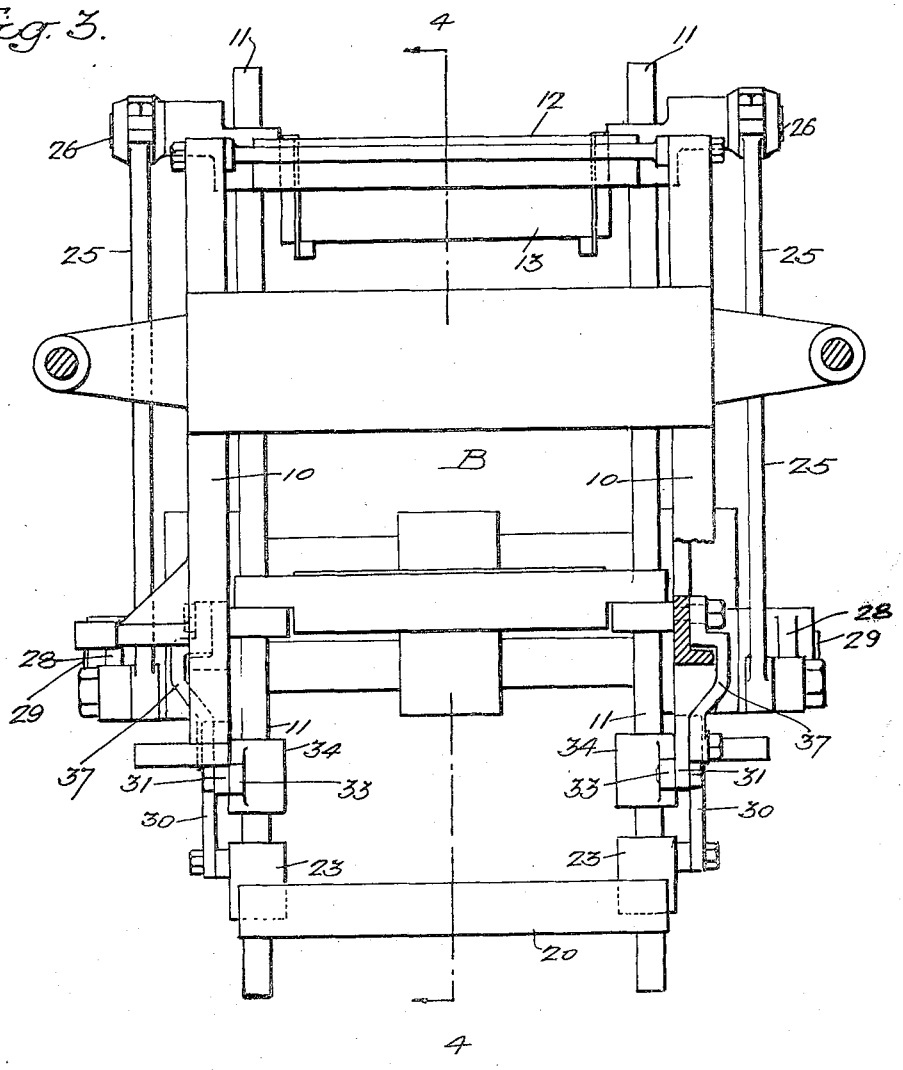
Fig. 3.



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JACQUARD MECHANISM

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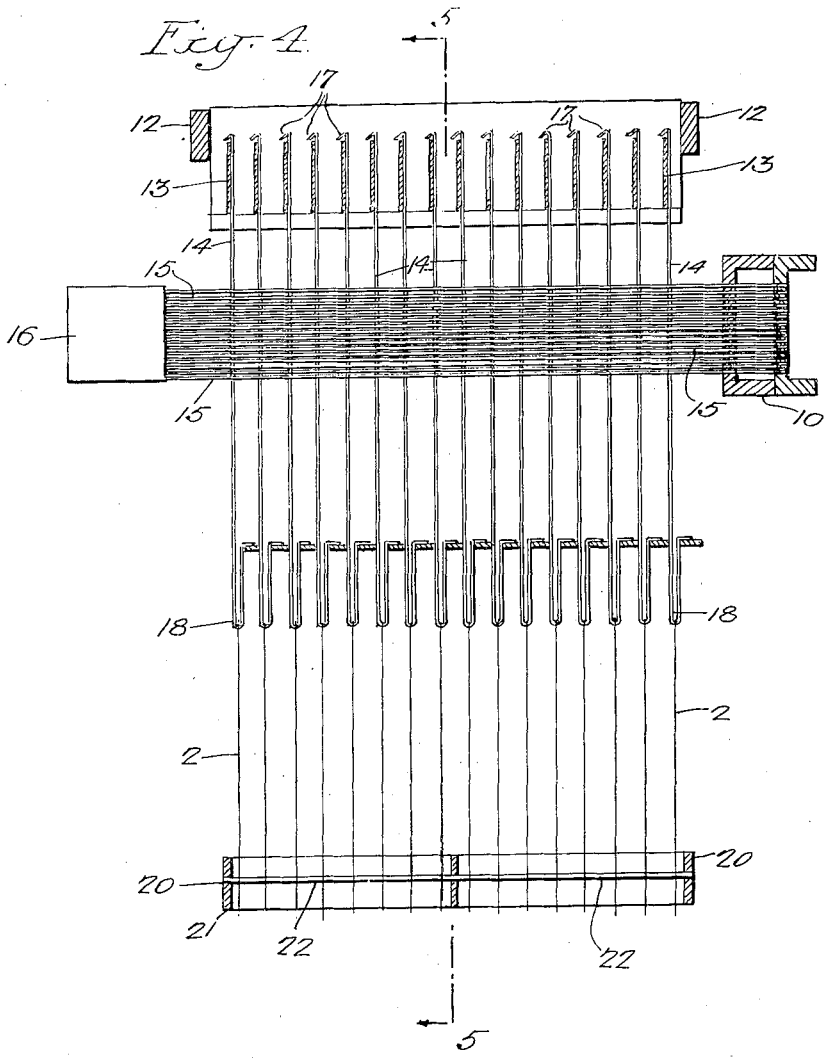
Fig. 4.



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JACQUARD MECHANISM

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Fig. 5.

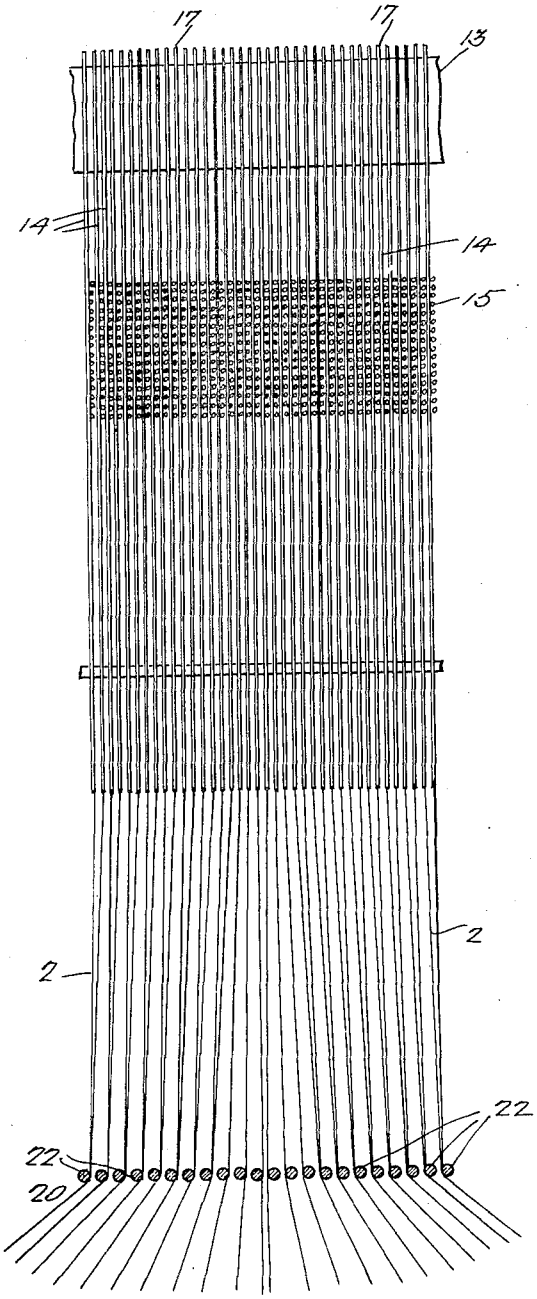

Fig. 6

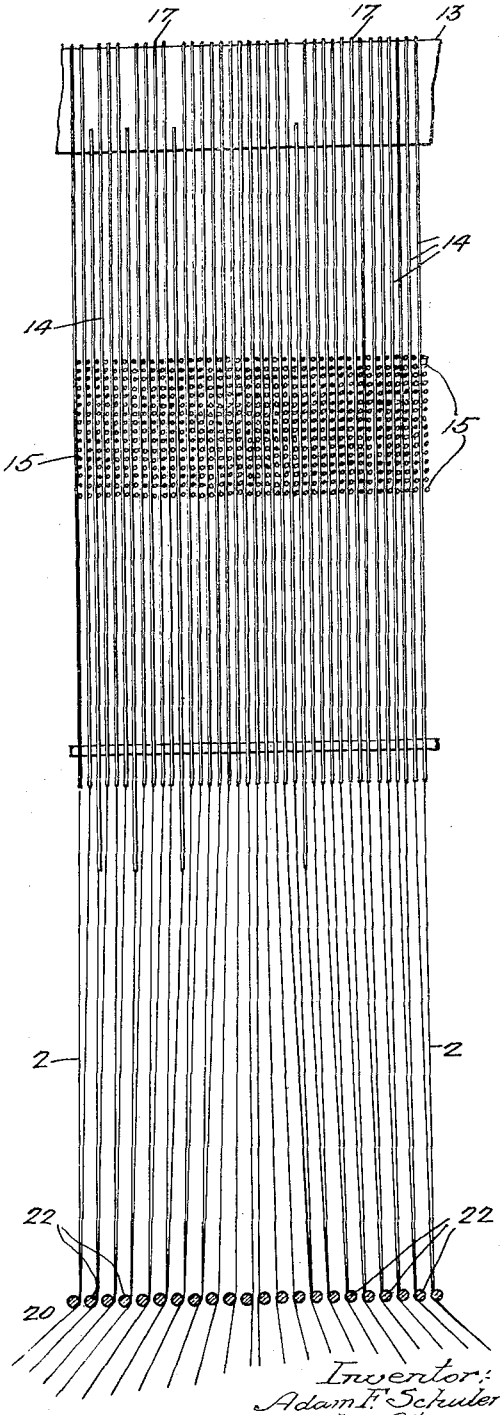

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Fig. 7.

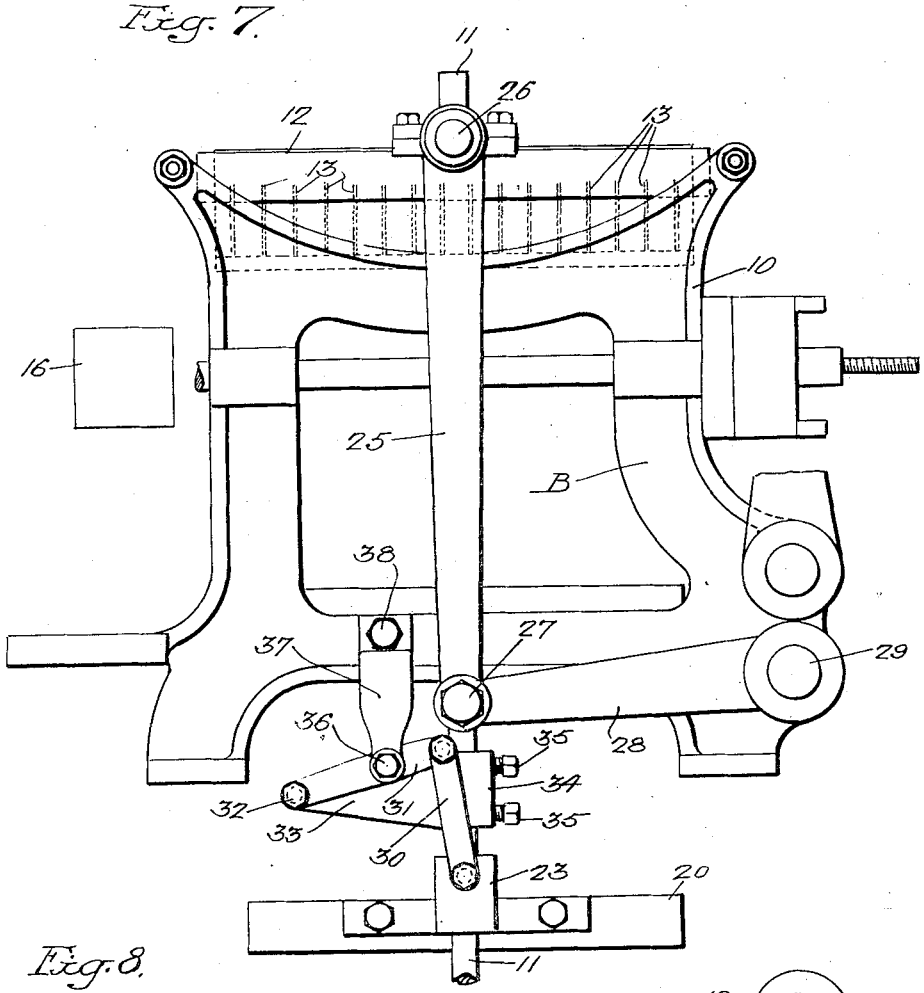
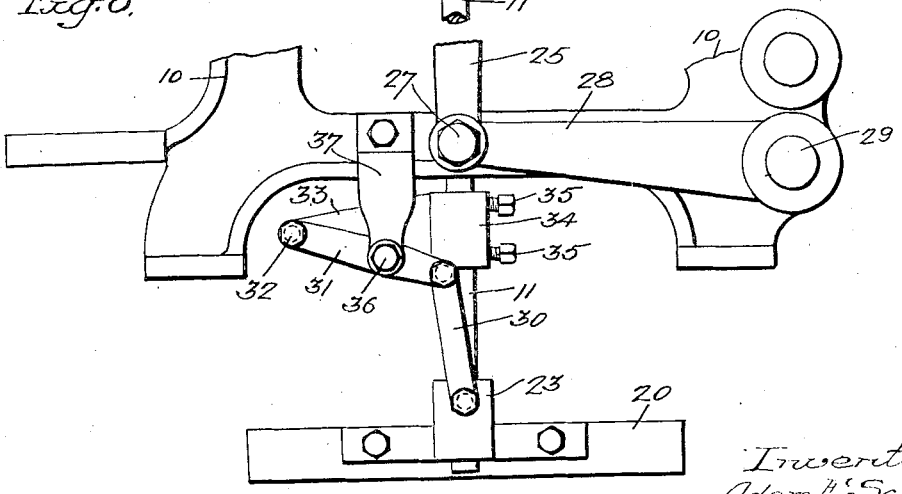


Fig. 8.



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Patented Jan. 23, 1934 1,944,815

UNITED STATES PATENT OFFICE

1,944,815

JACQUARD MECHANISM

Adam F. Schuler, Philadelphia, Pa.

Application July 29, 1932. Serial No. 626,154

4 Claims. (Cl. 96—20)

This invention relates to jacquard mechanisms, and particularly to those employed with wide lace-making machines of the type generally known as the "Nottingham" lace machine, which is capable of producing a single extremely wide piece of lace, but which is commonly used for simultaneously producing a plurality of relatively narrower strips of lace fabric, such as lace curtains, under control of a single or double jacquard mechanism located above the center of the breadth of the lacing portion of the machine which frequently attains thirty feet or more.

These machines are provided with a control jack adjacent each of the vertically disposed warp and bobbin threads at intervals of, for example one-eighth of an inch across the entire width of the lacing space of the machine. These jacks are respectively connected to and controlled by harness cords which in turn are connected to the selector wires of the jacquard mechanism, either singly or in groups as desired. The harness cords radiate in a fan-like manner from the bottom guide of the jacquard mechanism and are respectively connected at their remotely situated ends to the relatively spaced jacks of the machine.

In instances, for example where a machine is adapted to produce eight strips of fabric simultaneously, each selector wire of the jacquard mechanism will have connected thereto a series of eight harness cords, which extend from that particular wire to eight jacks at separated points across the lacing space of the machine for controlling corresponding parts of each of the eight strips of lace being manufactured.

The longest of the harness cords, that is, those extending at the more acute angles from the jacquard mechanism to the outermost jacks, sag considerably intermediate the jacks and the jacquard mechanism, due to the weight of the suspended portions thereof between the points of contact with the bottom guide of the jacquard mechanism and the points of contact with perforated guide plate of the machine adjacent the jacks. This sag diminishes proportionately in those harness cords that control the jacks lying intermediate the outermost jacks and the jacks lying directly below the jacquard mechanism, wherein the sag would normally be nil.

The sag in the said outermost and intermediate cords must be taken up before the jacks controlled thereby become operative, which necessitates the grid that raises the selector wires to which the harness cords are connected having a considerable amount of movement preliminary to and in addition to that required for actually operating the jacks.

In order that the jacks at and adjacent the center of the lacing portion of the machine will be operated at substantially the same time as the outermost jacks and intermediate jacks, it is necessary that the substantially straight hanging harness cords controlling the jacks at and adjacent the center of the lacing space be provided with an amount of slack substantially equal to the amount of sag in the more angularly disposed cords, so that the first portion of the upward movement of the grid will first take up the slack and sag in all the cords alike while the remaining portion of the upward movement of the grid is devoted to the actual operation of the jacks. Therefore, the grid of the jacquard mechanism must be raised a considerably greater distance than would be necessary for proper operation of the jacks if it were possible to eliminate the sag in the harness cords running to the outer and intermediate jacks.

The slack necessitated in the centrally disposed cords tends to cause these cords to lash back and forth as the grid rises and falls. Such lashing causes the cords to wear rapidly by constant rubbing action one with the other and furthermore causes the cords to become entangled one with another, resulting in the operation of jacks that have not been selected by the pattern card for withdrawal and which normally should remain in a fixed position while the selected jacks are being withdrawn in order to produce a predetermined pattern in the fabric being produced. Such improper operation of jacks causes imperfections in the fabric which must be corrected by hand and which in many instances necessitates the sale of such fabric as seconds at a considerably reduced price.

The object of the present invention is to counteract the sag in the harness cords running to the outermost and intermediate jacks and thereby entirely eliminate the necessity for slack in the cords running to the more centrally disposed jacks, whereby lashing and entangling of the centrally disposed cords will be eliminated and whereby the grid will be raised only a sufficient distance to actually operate the jacks, no preliminary movement of the grid being necessary for taking up sag or slack in the cords.

The shorter rise and fall of the grid, which according to the principles of the present invention is substantially half the rise and fall normally required in these machines, enables the machine

to be operated at a higher rate of speed, thereby increasing the production of the machine.

The construction and operation of the mechanism forming the subject of the present invention will be fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Fig. 1 diagrammatically illustrates sufficient of a wide lace-making machine provided with a double jacquard mechanism to disclose the principles of the present invention as applied thereto;

Fig. 2 is a transverse sectional elevation taken on the line 2—2, Fig. 1;

Fig. 3 is an enlarged front elevation of one of the jacquard mechanisms illustrated in Fig. 1;

Fig. 4 is a sectional elevation taken on the line 4—4, Fig. 3;

Fig. 5 is a sectional elevation taken on the line 5—5, Fig. 4, with the wire-controlling grid in normal low position preliminary to the selection of harness pull wires to be raised thereby;

Fig. 6 is a view similar to Fig. 5 subsequent to the selection of pull wires and illustrating the grid and the selected wires in a raised position;

Fig. 7 is a side elevation of the jacquard mechanism shown in Fig. 3 with the grid in the lowered position; and

Fig. 8 is a view of the lower portion of the mechanism shown in Fig. 7, in a slack-rectifying position.

As an example of the breadth of machines of the type noted the lacing space A of the machine shown in Fig. 1 is substantially thirty-six feet in width, in which is disposed a plurality of jacks 1 at spaced intervals of approximately one-eighth of an inch from end to end of the lacing space A. The machine is provided with two jacquard mechanisms B, B, which, as illustrated in Fig. 1, are disposed substantially fifteen feet above the plane of the jacks 1 at the center of the lacing space A, consequently the longest of the harness cords 2 attain a length of substantially twenty-four feet and these cords are disposed at an angle and suspended between a point of contact *b* at the jacquard mechanisms B, B and a point of contact *a* in the perforated guide board 3 which extends the full length of the lacing space A in substantially parallel relation to the bank of jacks 1. Obviously, suspension of such a great length of cord between two points will cause a certain amount of sag to develop in the cord, said sag being illustrated at *x* in Fig. 1, wherein the normal positions of the harness cords 2 are illustrated in full lines while the positions of the cord after the sag is removed are illustrated in broken lines.

In accordance with the principles of the present invention, the more centrally disposed cords 2*a* hang substantially straight and without slack from the jacquard mechanisms B, B to the guide board 3, while the sag in the intermediate cords 2*b* diminishes proportionately from the maximum *x* in the outermost cords 2 to nought at the more centrally disposed cords 2*a*.

As illustrated in Fig. 2, each jack 1 is composed of a spring wire having an end 1*a* extending in a horizontal plane between adjacent vertically disposed warp and bobbin threads *w* which are adapted to be shogged laterally in the usual manner by a plurality of horizontally extending bars 4 having thread guides 5 through which the vertical threads *w* pass in traveling from the bobbins or spools (not shown) to the lacing point *y* disposed above the jacks 1, and between which the shuttles *s* oscillate horizontally back and forth through the threads *w* for producing lace fabric in the usual manner.

The jacks 1 are provided with a vertically extending portion 1*b*, each of which is anchored in a rigid horizontally extending bar 6, as illustrated in Fig. 2.

Each of the jacquard mechanisms B comprises the usual side frames 10, 10 in which are vertically and slidably mounted a pair of bars 11, 11, to the upper ends of which is secured a frame 12 that supports a plurality of horizontally extending blades 13 constituting the lifting grid for the selector or pull wires 14, 14. The pull wires 14 are arranged vertically in the frame of the jacquard mechanisms B, in the usual manner, passing through eyes formed in horizontally disposed selector needles 15 which are arranged to be selectively operated by cards (not shown), which pass over the intermittently rotatable card cylinder 16 which is also adapted to be reciprocated in the direction of the length of the needles 15 for selectively moving the hooks 17 of the wires 14 from above the upper edges of the blades 13 of the raising grid 12. The selector wires 14 are provided with the usual loops or eyes 18 at their lower ends in which are secured the upper ends of the harness cords 2, 2*a* and 2*b*.

The harness cords drop vertically from the eyes 18 of the wires 14 through a rectifying grid 20 which consists of a frame 21 having a series of transversely extending bars 22 secured therein and between which the harness cords pass, as illustrated in Figs. 5 and 6.

The rectifying grid 20 is provided with bearings 23, 23 at the opposite sides thereof and which are slidably mounted on the lower ends of the vertically movable guide bars 11, 11 at the opposite sides respectively of the jacquard mechanisms B.

The lifting grid 12 and consequently the guide bars 11, 11 thereof are raised with respect to the frame 10 of the jacquard mechanism B by means of links 25, 25 pivotally connected at 26 to the opposite sides of the lifting grid 12, 12 and pivotally connected at their lower ends at 27, 27 to arms 28, 28 which are secured to a horizontal shaft 29 that is adapted to be rocked by the regular cam motion of the machine (not shown), and which in turn effects raising of the lifting grid 12 subsequent to movement of the card cylinder 16 inwardly for selecting those of the wires 14 which are to be raised by the upward movement of the lifting grid 12, the unselected wires 14 remaining in the normally low position as usual in the production of patterned lace fabric on this type of machine.

The bearings 23 of the rectifying grid 20 are freely slidably mounted on the lower ends of the guide bars 11 and are connected by links 30, 30 at each side of the jacquard mechanism to one end of a lever 31, the opposite end of which is pivotally mounted at 32 on a bracket 33 extending laterally from a boss or collar 34 secured to and movable with the bar 11 by means of set screws 35, 35. Intermediate its ends, each of the levers 31 is pivotally connected at 36 to one end of a link 37, the opposite end of which is pivotally connected at 38 to the frame 10 of the jacquard mechanism B.

After the card cylinder 16 has moved inwardly and made the selection of the wires to be raised by the raising grid 12 the shaft 29 is rocked by the cam motion above mentioned to raise the grid 12 and the

selected wires 14, and this vertical movement of the selected wires 14 is transmitted to the harness cords 2, 2*a* and 2*b* which in turn pull the jacks 1 connected thereto, flexing the same in such a manner that their horizontally extending ends 1*a* are drawn out of the mass of warp threads *w* permitting predetermined warp threads to be shogged by longitudinal movement of the bars 4 into contact with the projecting ends 1*a* of those jacks which have been permitted to remain in normal position for producing predetermined design effects in the fabric being made.

The raising of the grid 12 causes immediate operation of the more centrally disposed jacks 1, because of the absence of slack in the cords 2*a* by which these more centrally disposed jacks are connected to the pull wires 14 of the jacquard mechanism. Under ordinary conditions operation of the outermost jacks, controlled by the outermost cords 2 and the intermediate jacks, controlled by the cords 2*b*, would be subsequent to the operation of the central jacks due to the necessity for taking up the slack *x* in the cords 2, 2*b*, but under the principles of the present invention all the jacks operate in unison.

As the grid 12 rises the rectifying grid 20 descends, for example, from the position shown in Fig. 5 to that shown in Fig. 6. The descent of the rectifying grid 20 is such that the sag in the cords 2 and 2*b* is taken up and the jacks controlled thereby operated at the same time as the operation of the more centrally disposed jacks controlled by the cords 2*a* in which no slack or sag is present.

The descent of the rectifying grid 20 simultaneous with the rise of the lifting grid 12 is effected through the linkage illustrated in Figs. 7 and 8, from which it will be seen that when the bars 11 rise with the grid 12 the brackets 33 also ascend and due to the connection of the brackets 33 with the levers 31 said levers will rock about their pivots 36, causing the ends of the levers 31 to which the links 30 are connected to drop, which, through the links 30, causes a corresponding lowering of the rectifying grid 20 at the same time as the raising grid 12 is rising.

The action between the two grids is such that there is no apparent time lapse between the operation of the outermost and intermediate jacks controlled by the harness cords in which the sag is removed by the downward movement of the rectifying grid 20, and the more centrally disposed jacks controlled by the cords 2*a* in which there is no sag or slack at any time.

As a result of the simultaneous movement of the two grids 12 and 20 in opposite directions movement of the grid 12 is reduced to about one-half that ordinarily required in machines of this type, wherein the grid 20 merely acts as a guide for the harness cords in order that they may spread in the fan-like manner above noted and wherein the said grid 20 is rigidly secured to the lower bars 11 and rises with and at the same time as the raising grid 12. With such an arrangement the more centrally disposed harness cords are necessarily provided with slack corresponding to the sag in the angularly disposed harness cords which produces the undesirable results above noted.

The simultaneous movement of the grids 12 and 20 in opposite directions reduces by approximately fifty per cent the movement generally required for the grid 12 to operate the jacks 1; it entirely eliminates the necessity for slack in the more centrally disposed harness cords; it takes up the sag in the angularly disposed harness cords; and permits the machine to be operated at a higher rate of speed, as a result of the smaller lift required and the quicker action of the jacks in accordance therewith.

In machines of the prior art, the jacquard mechanisms have been positioned at a high elevation, approximately fifteen feet above the jacks, in order to reduce the angles of cords running to the outer and intermediate jacks. With the present invention the jacquard mechanism may be positioned at an elevation considerably lower than heretofore, for example not exceeding ten feet above the jacks which, together with the elimination of slack in the more centrally disposed cords, results in a considerable saving in the amount of harness cord necessary in tying up the harness in a new installation or in reharnessing an old installation.

I claim:

1. The combination of a pair of horizontally vertically spaced substantially parallel grids, a plurality of individual jacks in horizontal plane below said grids, a plurality of control cords connected to the upper grid and dropping vertically through the lower grid from which said cords radiate to and connect with said jacks respectively, means for raising the upper grid to pull said cords for operating said jacks, and means for lowering said lower grid simultaneously with the raising of the upper grid for removing slack from the control cords to effect operation of the jacks in unison.

2. The combination of a pair of horizontally vertically spaced substantially parallel grids, a plurality of individual jacks in horizontal plane below said grids, a plurality of control cords connected to the upper grid and dropping vertically through the lower grid from which said cords radiate to and connect with said jacks respectively, means for raising the upper grid to pull said cords for operating said jacks, a lever interposed between said grids and pivotally mounted intermediate its opposite ends in a relatively fixed position, means for connecting one end of said lever to said upper grid, and means for connecting the opposite end of said lever to the lower grid, whereby said raising movement of the upper grid will be transmitted in reverse order to said lower grid for removing slack from the radiating cords to effect operation of the jacks in unison.

3. The combination of a pair of horizontally vertically spaced substantially parallel grids, a plurality of individual jacks in horizontal plane below said grids, a plurality of control cords connected to the upper grid and dropping vertically through the lower grid from which said cords radiate to and connect with said jacks respectively, means for raising the upper grid to pull said cords for operating said jacks, a link pivoted at one end in a fixed position, a lever pivoted intermediate its ends to the free end of said link, means for connecting one end of said lever to said upper grid, and means for connecting the opposite end of said lever to the lower grid, whereby said raising movement of the upper grid will be transmitted in reverse order to said lower grid for removing slack from the radiating cords to effect operation of the jacks in unison.

4. The combination of a frame, a vertically disposed guide bar slidably mounted in said frame, a horizontally disposed lift grid secured to the upper end of the guide bar, a horizontally disposed rectifying grid slidably mounted on the lower end of said guide bar, a plurality of jacks

operatively mounted below said rectifying grid, a plurality of control cords connected to the lift grid and dropping vertically through the rectifying grid from which said cords radiate to and connect with said jacks respectively, means for raising said lift grid and the guide bar secured thereto, a link pivoted at one end to said frame, a lever pivoted intermediate its ends to the free end of said link, a bracket rigidly secured to the guide bar and pivotally connected to one end of said lever, and a link pivotally connected at one end to the opposite end of said lever and at its opposite end to said rectifying grid.

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