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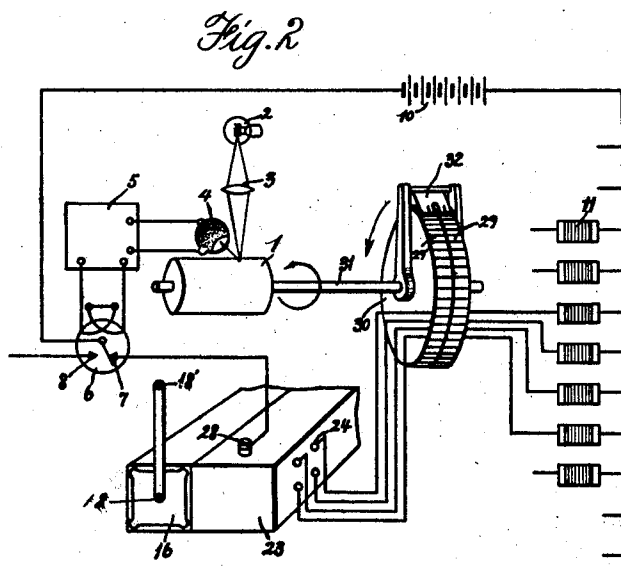
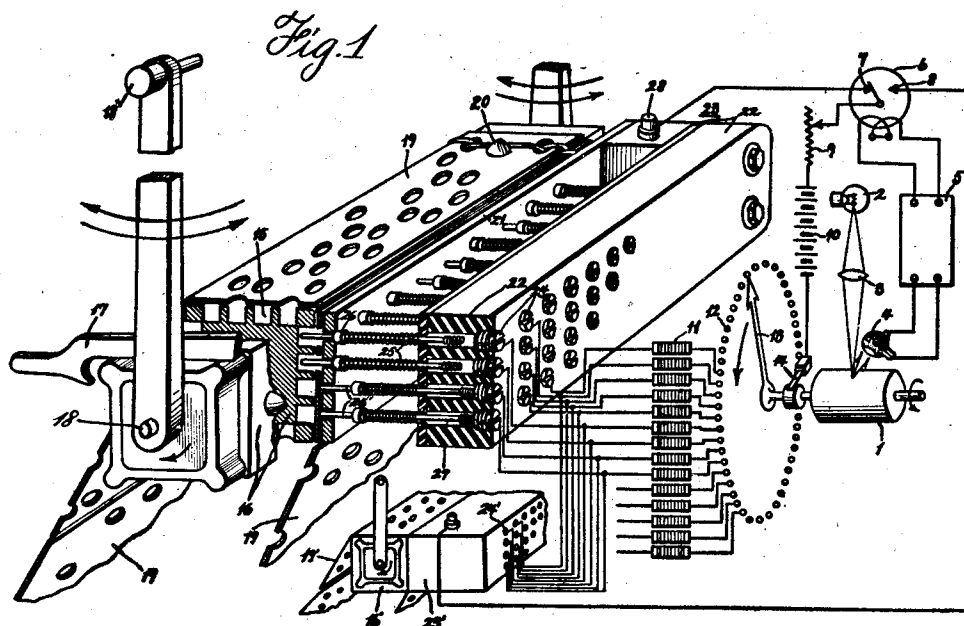
K. NAKANISHI

2,058,095

PATTERN MECHANISM FOR LOOMS

Filed Feb. 6, 1934

4 Sheets-Sheet 1



INVENTOR:
K. Nakanishi
BY: *Marks & Clark*
ATTORNEYS.

Oct. 20, 1936.

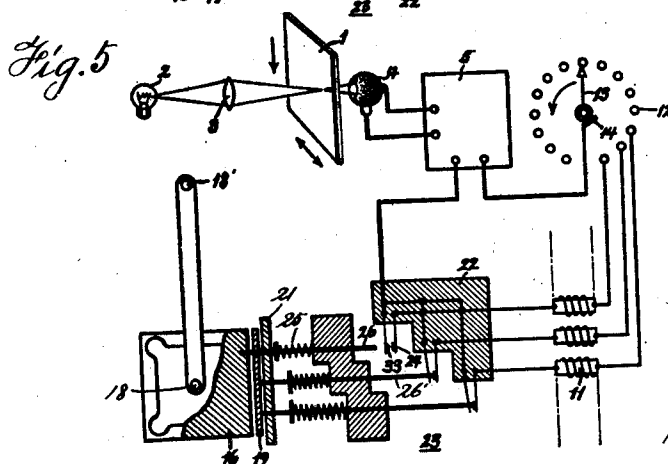
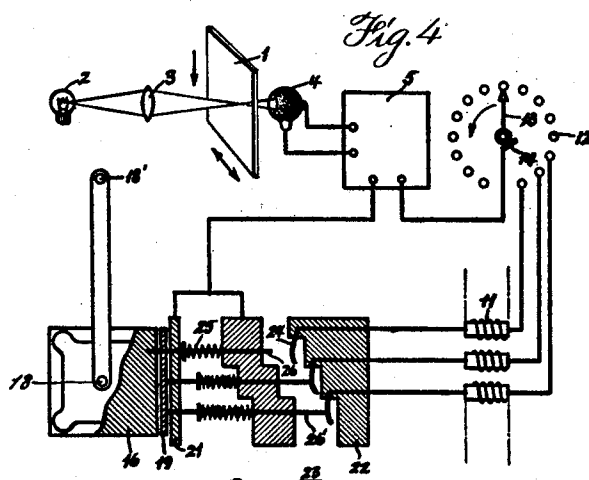
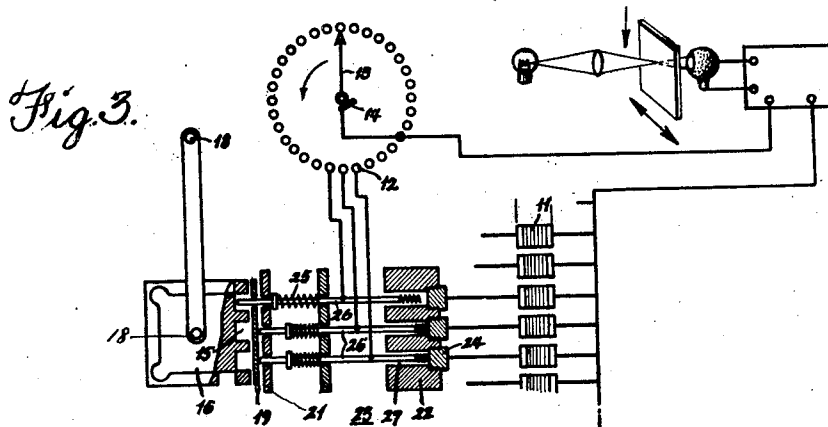
K. NAKANISHI

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PATTERN MECHANISM FOR LOOMS

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4 Sheets-Sheet 2



INVENTOR:
K. Nakanishi

BY: *Marks & Clerk*
ATTORNEYS.

Oct. 20, 1936.

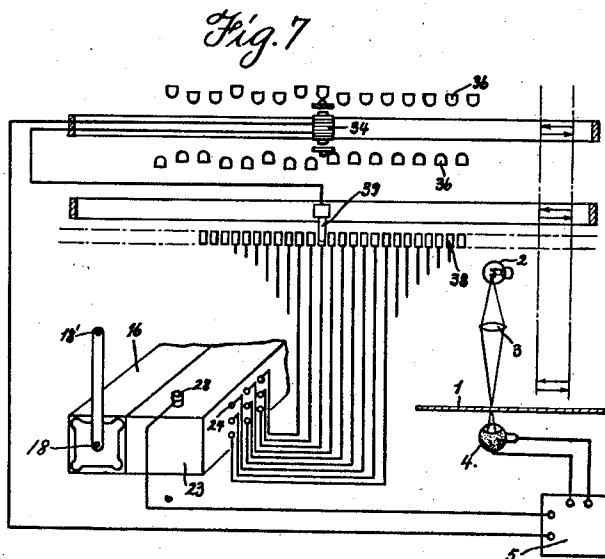
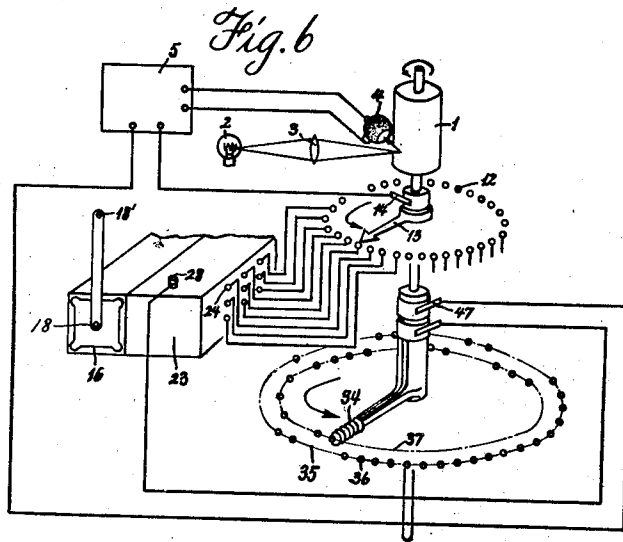
K. NAKANISHI

2,058,095

PATTERN MECHANISM FOR LOOMS

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4 Sheets-Sheet 3



INVENTOR:
K. Nakanishi
BY: *Mark I. Clark*
ATTORNEYS.

Oct. 20, 1936.

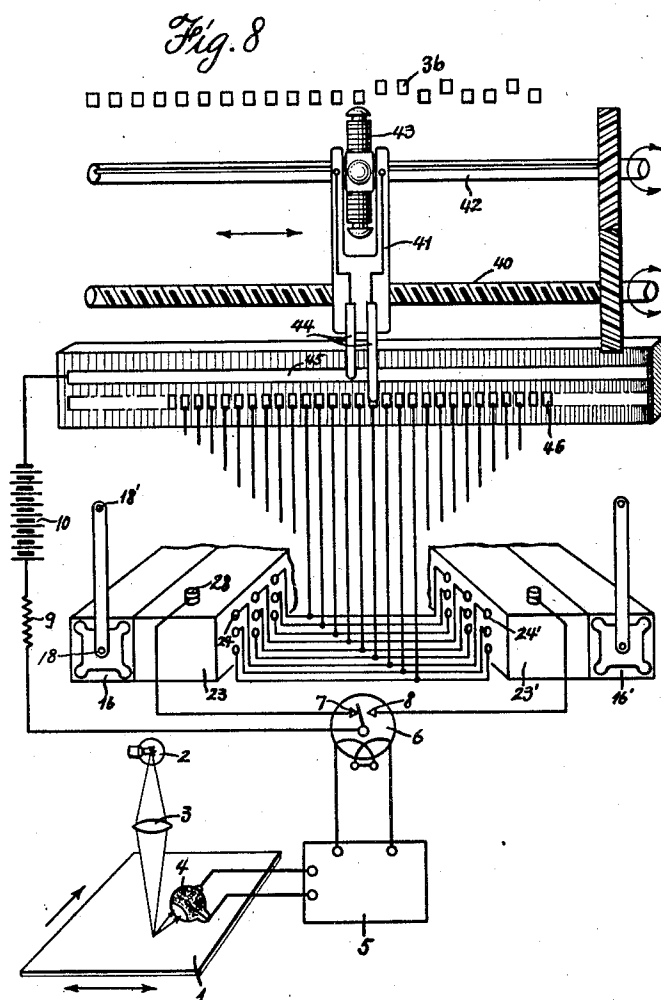
K. NAKANISHI

2,058,095

PATTERN MECHANISM FOR LOOMS

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4 Sheets-Sheet 4



INVENTOR:
K. Nakarishi
BY: *Marbo & Clark*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,058,095

PATTERN MECHANISM FOR LOOMS

Kinsaku Nakanishi, Hakata, Fukuoka, Japan

Application February 6, 1934, Serial No. 710,000

In Japan February 13, 1933

2 Claims. (Cl. 139—319)

This invention relates to improvements in pattern selecting devices to be associated with photo-electric brocade looms and the like for giving one or more weaves to fabric and has for its principal object to provide a pattern selecting device whereby patterns may be given to the fabric all electrically.

For a better understanding of my invention reference is had to the following description taken in connection with the accompanying drawings, in which Fig. 1 is a perspective view illustrating a pattern selecting device embodying this invention;

Fig. 2 illustrates a system for weaving fabric under control of the pattern selecting device of Fig. 1;

Fig. 3 illustrates a modification of a pattern selecting device shown in Fig. 1;

Fig. 4 illustrates another modification of the pattern selecting device;

Fig. 5 is a diagrammatic view illustrating a further modification of the pattern selecting device;

Fig. 6 illustrates another system using a single rotary selective electro-magnet and the pattern selecting device of this invention;

Fig. 7 illustrates a similar system using a single shifting selective electromagnet and the pattern selecting device of this invention; and

Fig. 8 illustrates another modification of the similar system using a shifting type rotary electromagnet and the pattern selecting device of this invention.

Referring now to the drawings, 1 represents a drum carrying an original design picture; 2 is a light source for projecting a spot light on the original picture through a lens 3; 4 is a photo-electric cell adapted to receive the reflected light from the original picture for transforming same into a photo-electric current; 5 is an amplifier for the photo-electric current; 6 designates a relay inserted in its output circuit having two contacts 7 and 8. The contactor of the relay 6 is connected to the source such as a battery 10, through an adjustable resistance 9. 11 designates selecting electromagnets in number corresponding to the picture elements on one scanning line of the original picture, each electromagnet being connected to the corresponding contact 12 of a distributor. The contacts 12 are connected to one side of the source 10 through a rotary contactor 13 and a collecting brush 14.

According to this invention, instead of leading the current which varies responsively to the shading of the elements of the original picture on the

drum 1 to the selecting electromagnets 11 directly, the picture current is further interrupted through a pattern selecting device having contacts controlled by a series of standard pattern cards connected together. A pattern cylinder 16 having as many holes on its surfaces as the number of the picture elements on one scanning line of the original picture, similar to a pattern cylinder of a Jacquard machine is mounted to be revolved around the pivot 18 by means of a handle 17 at each scanning operation of the original picture so that the standard pattern cards 19 connected together may be passed one by one. Each of the standard pattern cards 19 as for instance a satin card is caught by the projections 20 to be secured onto the pattern cylinder 16 which is carried by arms rocked about the pivot 18'. The casing of a switch comprising a conductor plate 21 and an insulating plate 22 is arranged to face the cylinder 16. Fixed contacts 24, corresponding in number to the picture elements on one scanning line of the original picture are attached to the insulating plate 22 so as to be insulated from one another. Movable contactors 26, which always make contact with the conductor plate 21, but are normally spaced apart from the fixed contact 24 by means of a bias spring 25, are arranged between the conductor plate 21 and the insulating plate 22 in number equal to the number of the picture elements on one scanning line of the original picture in such a manner that one end of a movable contactor 26 is normally pressed into a cavity on the column 16 by means of a spring 25 to be insulated from the fixed contact 24. If the contactor is prevented from projecting into the cavity 15 by the blank surface of the standard pattern card 19 it moves through the slot 27 in the insulating plate 22 to make contact with the fixed contact 24. The contact 7 of the relay 6 is connected to the terminal 28 of the conductor plate 21 and each of the fixed contacts 24 is connected to a respective selecting magnet 11. Similarly another pattern selecting device 16' and 23', controlled by another series of standard pattern cards, is provided and its fixed contacts 24' are connected to the corresponding selecting electromagnet 11 respectively in a similar manner as the fixed contacts 24 of the above mentioned pattern selecting device 16 and 23. The terminal of the conductor plate 23' is connected to the other contact 8 of the relay 6.

The operation of the above mentioned device is as follows: Assume that it is intended to weave the design of bright colour into crepe and that of dark colour into twill and also that the relay

6 closes its contact 8 with current corresponding to the bright elements of the picture and closes its contact 7 with current corresponding to dark elements of the picture. Now, if a desired original design is attached onto the drum 1 and the rotary contactor 13 is driven in synchronism with the drum and the spot light from the light source 2 is projected on the original picture on the drum 1 to scan the same, the light reflected from the picture will be led into the photo-electric cell 4 and the current varying with the brightness of the scanned elements is magnified by means of the amplifier 5 and is led into the operating coil of the relay 6.

The pattern cylinders 16 and 16' are interconnected with the shaft of the drum 1 through any suitable mechanism so that after one line on the original picture is scanned the pattern cylinders 16 and 16' may swing to the left around the pivot 18' and simultaneously the pattern cylinders 16 and 16' are revolved around the shaft 18 through the handle 17 or any other automatic mechanism to bring the succeeding pattern card to face with the switch 23. By the time the scanning of next line on the original picture is commenced, the pattern cylinders 16 and 16' swing back to the position urging the respective pattern card against the movable contactors 26. Thus conductive connection between the fixed contacts 24 and terminal 28 of the selecting switch 23 are selectively interrupted at the movable contactors 26 in accordance with the pattern card before the scanning operation of the one line of the original picture is commenced. The pattern cylinder 16 carries a series of the standard pattern cards 19 for twill and the pattern cylinder 17 carries a series of the standard pattern cards 19' for crepe. The scanning operation of one line on the original picture is started under the conditions as shown in the drawings. If the scanned element is dark color, the relay contact 7 will be closed as shown in the drawings. The rotary contactor 13 revolves in synchronism with the rotation of the drum 1. Since a standard pattern card 19 for weaving twill is previously put on the pattern cylinder 16 and the contacts 24 and 26 of the switch 23 are previously opened or closed in response to the standard pattern card 19, with the current corresponding to the dark element the electromagnet 11 corresponding to the elements now being scanned only will be energized through a circuit extending from the source 10 through the resistance 9, the contact 7 of the relay 6, the terminal 28 of the switch 23, the contacts 26' and 24 corresponding to the picture elements which are closed by the blank part of the card 19, the electromagnet 11 corresponding to that picture element now being scanned, the contact 12, the rotary contactor 13 and the brush 14 back to the source 10. All the fixed contacts 24 other than that corresponding to the element now being scanned are inoperative since their circuits are all interrupted at the rotary contactor 13 which is revolved in synchronism with the scanning operation or revolution of the drum 1 and connects a single electromagnet 11 corresponding to the element now being scanned only in circuit with the source 10. All the contacts 24' of the other pattern selecting device 23' are interrupted from the source 10 at the relay contact 8.

The manner in which a particular electromagnet 11 once energized picks up the warp is the subject matter of my copending U. S. patent ap-

plication No. 710,002 and is fully explained and claimed in that specification.

The manner in which the electro-magnets 11 operate the loom is well known to those skilled in the art and accordingly I have omitted these operating members from the drawings, the operating coils of the electro-magnets 11 only being shown in the drawings. Briefly speaking, each electromagnet has an armature normally engaging with a pivoted selecting element which, in turn, pushes a selecting rod for a harness hook against the bias of the spring so that the hook may normally be out of the moving path of the knife edge of the loom. If the electromagnet is energized and the armature is attracted, then the selecting element will be released so that the selecting rod moves the harness hook to the position to be engaged with the knife-edge with the aid of the bias spring associated with the selecting rod. Thus, by lifting the knife edge the harness hooks and hence the warps belonging to the electromagnets energized only may be lifted and a weft is threaded therethrough. After a weft is threaded all the selecting elements are restored to their normal position through restoring mechanism. Similarly, the bright portion of the design may be woven into crepe by using a series of standard crepe cards attached onto another pattern cylinder 16, automatically on one piece of fabric.

Fig. 2 illustrates a modification of a distributor shown in Fig. 1 in which two rows of contact members 29 and 29' insulated from each other are arranged on the cylindrical surface of an insulating drum 30 and the contacts 29 are connected to the fixed selective electromagnets respectively and the other contacts 29' arranged side by side with the former contacts are respectively connected to the corresponding fixed contacts 24 of the pattern selecting device 23. A synchronous rotating brush 32 is mounted on the driving shaft 31 of the drum 1 to bridge a pair of parallel contacts 29 and 29'. In other respects the arrangement is quite similar to that shown in Fig. 1.

In Fig. 3, instead of connecting the contacts 12 to the fixed electromagnets 11 the contacts are connected to the movable contacts 26 of the switch 23 directly. The photo-cell is operated by penetrated light. The relay 8 and the battery 10 of Fig. 1 are omitted. The arrangement may also be used to weave various patterns on one piece of fabric.

The arrangement shown in Fig. 4 is similar to that shown in Fig. 1 except that the fixed contacts 24 of the pattern selecting device 23 are composed of resilient contacts, the relay 8 and the battery 10 of Fig. 1 being also dispensed with in this embodiment.

Fig. 5 illustrates a method of accomplishing the same object as of Fig. 1, in which the selecting rods 26 controlled by standard pattern cards attached onto the column 16 open or close the movable contacts 33 of a jack type.

Fig. 6 illustrates an embodiment of this invention in which elements 36 to be selected which are arranged on an outer circle 35 are selectively attracted onto the inner circle 37 by means of the synchronous operation between the scanning of the original picture 1 and the movements of the rotary brush 13 for making contact with the distributor contacts 12 and of the rotary selective electromagnet 34 so that the harness hooks may be brought to positions ready to be engaged with a lifting knife edge. The selective electromagnet

34 is energized with the current corresponding to the design and pattern to be woven, through the pattern selecting device 23, the distributor brush 13 and the collecting brush 47. The element 36 is an armature as, for instance, shown and explained in the copending U. S. patent application No. 710,002. This arrangement may be used to give a particular weave to the dark or light portion of the design.

In Fig. 7, the elements 36 to be selected are arranged alternately on two lines and a single selective electromagnet 34 is synchronized with the scanning operation of the original picture so as to pull in or push out the elements 36 to be selected. The contacts 38 connected respectively to the fixed contacts 24 of the pattern selecting device 23 are arranged on a straight line so as to control the energization of the selective electromagnet 34 by co-operating with a sliding brush 39 moving in synchronism with the selective electromagnet 34. This arrangement may also be used to give a particular weave to the dark or light portion of the design.

In Fig. 8, a plurality (four, for instance) of selective electromagnets 43, which are keyed onto a side shaft 42 to be revolved thereby, are mounted on a bracket 41 threaded onto a screw shaft 40 driven in synchronism with the scanning of the original picture so that elements 36 to be selected arranged on a straight line extending along its moving path may be selectively operated. The selective electromagnets 43 are energized through the brush 44, the bus-bar 45 and one of the contacts 46 which are arranged on a line parallel to the bus-bar and connected to the fixed contacts 24 and 24' of the pattern selecting devices 23 and 23' respectively so as to weave a brocade having several kinds of patterns.

By rotating a plurality of electromagnets the moving path of the selector magnets 43 may be greatly reduced in length. The manner in which the moving magnets 43 are revolved is disclosed and claimed in my copending U. S. patent application No. 710,002.

The operation of the modifications shown in Figs. 2 to 8 are similar to that described in reference to Fig. 1 and same reference characters are used to designate similar parts in these drawings so that the detailed explanation may be dispensed with.

In short, according to this invention, instead of leading the photo-electric current corresponding to the colouring or shading of the original picture directly to the coil of the selective electromagnet, the selective electromagnet is energized through a pattern selecting device having contacts previously opened or closed in response to a series of standard pattern cards desired. Thus, one or more kinds of patterns may be woven into a cloth in a simple, positive and quick manner by using a single original picture and one or several kinds of patterns may be woven by threading a weft of a certain colour, thereby weaving a brocade of higher grade quickly. In the foregoing, the reflected light from the original picture is projected into a photo-electric cell, but the penetrated light may be used if desired as shown in Figs. 3, 4, 5 and 7. Further, the amplifier for the photo-electric current and the relay are not always necessary and may sometimes be omitted. This invention may equally be applicable to any well known electrically controlled bro-

cade loom irrespective to whether it uses a photo-electric control or a conductivity control having conductive and non-conductive sections as in an electric brocade loom using photogravure, accomplishing the object with the same principle.

The standard pattern card is not always limited to the cardboard and may be made of any suitable material, conductor or non-conductor and it may also be of a board having concave or convex portions produced by pattern nails. In scanning the original picture any scanning system used in television may be adopted. In the foregoing, several embodiments of this invention as applied to a brocade loom are shown, but the principle of this invention may also be applicable to a card cutting machine and other similar machinery. In the latter case, it is only necessary to combine the elements to be selected with the needles for punching the pattern cards, the explanation of the other features being omitted.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In combination, a design picture, photo-electric means for scanning said design picture, selecting electro-magnets for looms controlled by said photo-electric means equal in number to the number of elements on one scanning line of said design picture, and a pattern mechanism for looms comprising a switch having fixed contacts mutually insulated and each connected to one of said electro-magnets and movable contacts one for each of said fixed contacts, a pattern cylinder having cavities on one surface thereof equal in number to that of said fixed contacts, a series of pattern cards attached onto said pattern cylinder, means for urging said pattern card together with said pattern cylinder against said movable contacts of said switch, and means for revolving said pattern cylinder to pass the next pattern card in position to control said movable contacts once for every one line scanning operation of said design picture whereby conjoint control of said electro-magnets is effected through the pattern mechanism and said photo-electric means.

2. A loom controlling device, in combination, a design picture, photo-electric means for scanning said design picture, a relay having contacts equal in number to the number of kinds of color on said design picture, said relay being energized from said photo-electric means, selecting electro-magnets for operating heddles of a loom, an electric source, switching means for connecting said selecting electro-magnets successively to said electric source in synchronism with the scanning operation of said design picture, and pattern mechanisms for giving bindings, corresponding in number to the number of contacts of said relay, each of which has a number of fixed contacts each connected to one of said selecting electro-magnets and corresponding movable contacts connected to one contact of said relay and controlled by a series of pattern cards, said pattern mechanisms being connected in the energizing circuit of said selecting electro-magnets in parallel with each other, but in series with said switching means and the corresponding contact of the said relay whereby conjoint control of said electro-magnets is effected through the pattern mechanism and said photo-electric means.

KINSAKU NAKANISHI.