

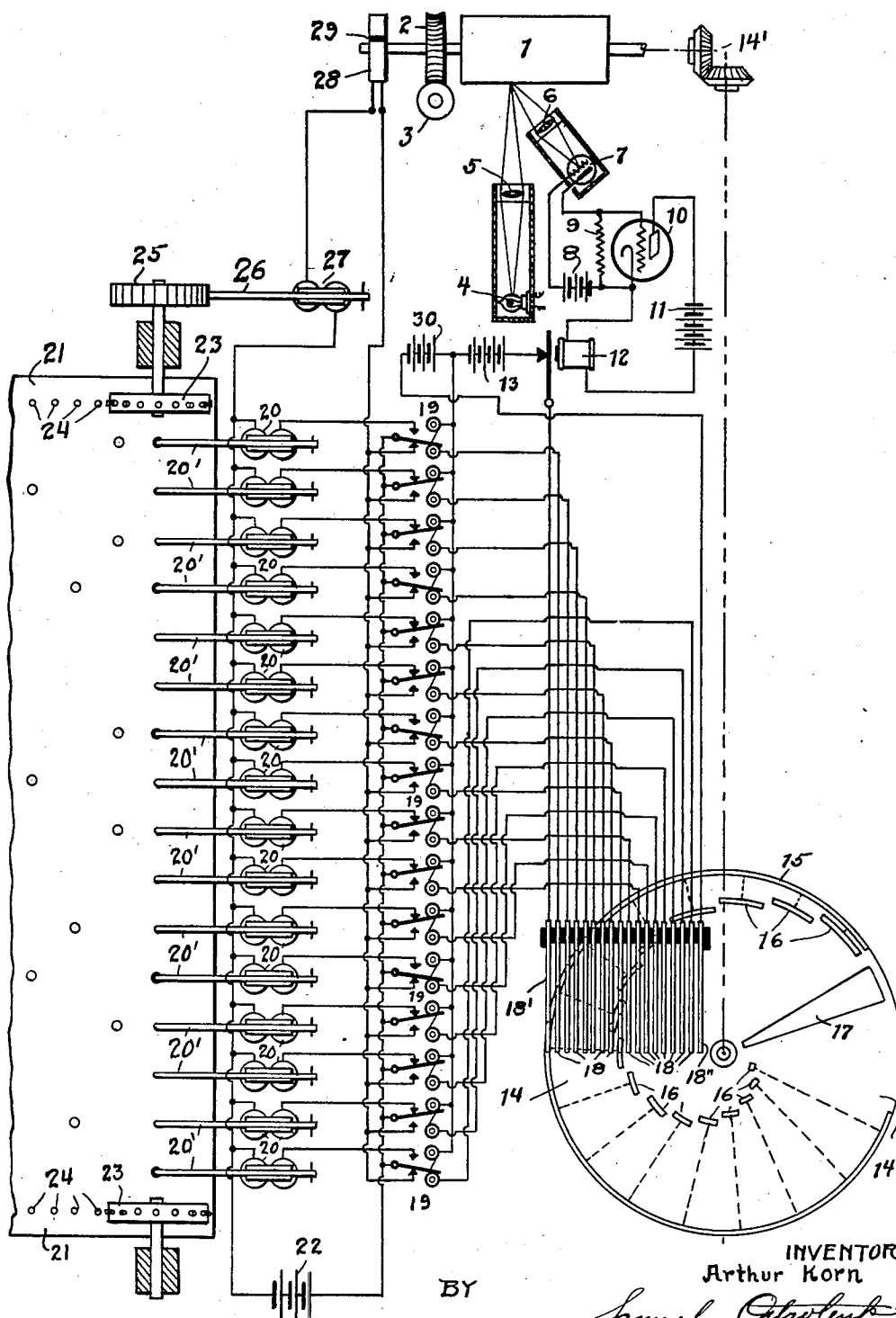
Jan. 28, 1930.

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1,745,019

APPARATUS FOR MAKING JACQUARD CARDS FOR TEXTILE MACHINERY

Filed June 7, 1928



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APPARATUS FOR MAKING JACQUARD CARDS FOR TEXTILE MACHINERY

Application filed June 7, 1928, Serial No. 283,722, and in Germany June 10, 1927.

This invention refers to apparatus for making so-called jacquard cards as used in connection with textile machinery.

One object of my invention is to provide means whereby a jacquard card may be cut automatically in accordance with a picture or design which it is desired to weave into a textile fabric.

Another object of my invention is to use a beam of light for scanning the individual elements of a design and for governing by electrical means the action of the card making mechanism in accordance with the brightness of the scanned elements.

A further object of my invention is to provide means whereby a design as originally drawn up may be used for the cutting of a corresponding jacquard card without the necessity of any special preparation to be made for such process.

Another object of my invention is to combine a scanning mechanism with a mechanical distributing device operated synchronously therewith in such a manner that a row of magnets operating the cutting members and corresponding to a row on the design is successively influenced and the jacquard card cut line by line.

A final object of my invention is to operate a mechanism which will produce automatically a continuous card in the form of a strip so that a continuous pattern may be woven into the textile fabric without the necessity of repetition of design.

These, as well as other objects of my invention will become clearer by the following detailed description taken with reference to the accompanying drawing, which shows schematically one form of apparatus by means of which my invention may be carried out in practice and which is susceptible to numerous modifications by those skilled in the art, remaining, however, within the scope of my invention as defined in the appended claim.

It has been previously proposed in connection with jacquard card making machines for textile machinery, to use photo-electric cells which are influenced by the light or dark elements of a design, according to which a

jacquard card is to be cut and which act upon an electric circuit adapted for controlling the mechanism for cutting holes of the usual kind in these cards. In the simplest known form of such apparatus, the design or picture is specially prepared as a transparency, e. g., as a photographic film and the individual elements are scanned by a beam of light impinging upon a photo-electric cell after having passed through the picture elements. The apparatus as such is similar to the well-known apparatus for electric picture transmission. The chief disadvantage, however, of such apparatus which has prevented it from being introduced into actual practice is on the one hand the necessity of having a specially prepared design in the form of a transparency and on the other hand the fact that the mechanical apparatus for controlling the punching operation of the holes has been too complicated. According to my invention I provide suitable means whereby a design as originally drawn up may be used without any special preparation and I provide further a mechanism operated electrically, which is simple and which is simple and which secures the necessary reliability as is required in actual practical service.

I accomplish my invention by rendering it possible to use an original design without special preparation, by making use of the reflected light produced by a scanning beam incident upon the individual elements of the design. The amount of diffused light reflected is proportional to the brilliancy of the design element under exploration and is collected by means of a lens or system of lenses to act upon a photo-electric cell inserted in an electric circuit, in a well-known manner. As the current variations in an electric circuit in which the cell is included are of a very small order, I make use, furthermore, of an amplifying device, e. g., of a thermionic tube amplifier, in order to secure current variations strong enough for the actuation of the hole cutting mechanism.

Referring to the drawing, numeral 1 designates a cylinder upon which the sheet of the design as originally drawn up is applied.

The cylinder is rotated at a uniform speed by a suitable prime mover not shown in the drawing, by means of a worm gear 2 engaging a worm wheel 3. The scanning of the design is effected by a beam of light produced by a light source 4 and concentrated on a particular design element by means of a lens 5. The individual elements of one line of the design which may be considered as elemental squares are thus exposed successively to the action of the light beam within the period of one revolution of the cylinder. At the end of each revolution, the cylinder is moved sideways in the direction of its axis for a distance equal to the width of one line or else the cylinder may be progressed axially by a continuous movement to the same extent. Thus the entire design is scanned line by line within successive revolutions.

The light impinging upon the design element under exploration is reflected as diffused light. This diffused light is collected again by a lens arranged at the side of the main beam and is thrown upon the photo-electric cell 7 included in an electric circuit; 8 is a battery and 9 is a resistance forming part of the circuit. According to the brightness of the individual elements of the design the amount of reflected light is greater or smaller, whereby the electric resistance of the cell 7 is varied accordingly, as is well known. The result is a corresponding variation of the current in the electric circuits 7, 8, 9 and a variation of the potential on the resistance 9, which is applied to the grid of an amplifying tube 10. Included in the anode circuit of the tube is a high tension battery 11 and the winding of an electric relay 12. The arrangement is such that the difference between dark and bright elements of the design will cause current impulses in the anode circuit of the amplifying tube strong enough to operate the relay 12. The relay 12 controls a set of further relays 19 called selecting relays, which latter are co-ordinated each to one design element of each line. This is accomplished by means of a distributing device 14 operated synchronously with the cylinder 1 and connecting the selecting relays successively to the controlled circuit of relay 12. The selecting relays 19 are therefore actuated in accordance with the dark or white elements of the design and directly operate the cutting magnets 20 provided with levers 20' bearing suitable hole cutting members such as punches. In the example shown it is assumed that one line of the design is divided into sixteen elements, so that sixteen corresponding selecting relays 19 and sixteen cutting magnets 20 have to be provided for the cutting of one line of the Jacquard card 21. The distributor disc 14 is driven synchronously with the cylinder 1, as is indicated by dotted line connections to bevel gears 14'. It is made of insulating material and is provided with a number of contacts, viz, a contact 15 shaped as a broken ring and placed at its circumference, and a set of sixteen distributing contacts 16, all connected to 15, and an isolated reverse contact 17. The distributing contacts 16 are arranged in a spiral-like manner and are made of decreasing length with decreasing diameter of the spiral, as is readily seen from the drawing. Numeral 18 represents flat contact springs arranged in a radial line relative to disc 14. They are eighteen in number, sweep over the disc 14 and are so spaced as to engage each with one of the contacts 16. Thus, according to the position of the disc 14 the current from a battery 13 is applied to the windings of one of the polarized selecting relays 19, provided that relay 12 is in its working position, i. e., the design element under exploration is of the necessary brilliancy, in which case a current is established in the circuit 7, 8, 9, and the necessary potential applied to the grid of the tube 10.

The cutting of the holes in the card 21 may also be effected mechanically instead of electrically, as shown in the drawing. In this case the magnets 20 may serve to remove a blocking member and allowing the cutting to be effected by some mechanical force. The current flow through the relays 19 may be traced as follows:

Whenever relay 12 is energized in accordance with a bright element of the design and closes its contacts, the current of battery 13 will be conducted over the extreme left hand spring 18' to the circumferential contact ring 15 of the disc 14, depending on the position of disc 14 to one of the contacts 16 in contact at that instant with one of the springs 18 (the particular spring sweeping over this contact) further to the winding of a corresponding relay 19 and back again to the battery 13.

In order to secure this action, the following electrical connections are made:—

The armature of the relay 12 is connected electrically to the extreme left hand spring 18' which sweeps continuously over the contact 15; the fixed contact of relay 12 leads to one terminal of the battery 13. Furthermore, the contacts 16 are each in electric connection with the circumferential contact 15. The springs 18 with the exception of the one at the extreme left 18', and the one at the extreme right 18'' are connected each to one of the terminals of one of the relays 19, the remaining terminals of the relays being connected by a common lead to the other terminal of the battery 13. The relays 19 operate the punching magnets 20 by applying the current from a battery 22. The magnets actuate the levers 20' disposed to cut the holes in the card 21. The card is advanced step by step at the end of each revolution of the cylinder 1, i. e., after each individual line of the design has been scanned and the corresponding holes

have been cut in the card. This is effected by means of cog wheels 23 engaging with perforations 24 arranged at opposite sides of the card. The ratchet wheel 25 is coupled mechanically to the wheels 23 and is moved forward by means of a pawl or rod 26 actuated by an electro-magnet 27. This magnet is included in a separate circuit of battery 22 in series with a rotating interrupter 28 consisting of insulating material and provided with a conducting segment 29. This interrupter is operated synchronously with the cylinder 1 as shown, and is so designed and adjusted that only at the end of each revolution when one line of the card has been cut the circuit through magnet 27 is closed and the card 21 advanced and brought into position for the cutting of the following line. This same advancing mechanism may also be employed to displace axially the cylinder 1 (as mentioned above) or the beam of light after successive lines of the design have been scanned. However, the cylinder 1 may also be moved continuously in its lengthwise direction and the scanning may be carried out in a spiral-like manner as is customary in picture transmission apparatus. Furthermore, instead of punching the holes in succession in accordance with the actuation of the relays 19, the punching operation may at first be only predetermined and set, and the cutting of the holes to be carried out simultaneously at the end of the revolution, i. e., within the interval between the operation of the last contact 16 on disc 14 and the operation of release contact 17. This may be effected by a means such as a cam suitably connected with the driving mechanism of the device. At the end of the revolution and after the cutting operation has been carried out, all of the springs 18, with the exception of the extreme left hand one (18') are sweeping over contact 17; an impulse from a release battery 30 is then sent over the right hand spring 18'' which carry a current only at this moment; this current passes to all of the relays in the opposite direction to the operating impulse, so that these relays are moved back from the operating position into their position of rest and ready for the scanning and cutting of the next line of the picture or design.

It is understood that in place of a contact disc as shown in the drawing a contact cylinder or the like may be employed as I do not intend to limit myself to the specific modification as shown by the drawing.

The apparatus according to my invention may, of course, also be employed for the scanning of colored designs in connection with corresponding light filters and the cutting of corresponding combinations of holes, e. g., with a separate card for each color.

Having described my invention, what I believe to be new and desire to secure and pro-

tect by Letters Patent of the United States is:—

In a jacquard card cutting machine, a rotatable drum carrying a sheet having a design thereon, said drum rotating at a uniform speed and being advanced longitudinally at a uniform rate, means for projecting a beam of light upon said sheet for scanning one line of said design during one revolution of said drum, a photo-electric cell arranged at the side of said beam to be influenced by the light reflected from an element of said design, an electric circuit including said photo-electric cell and an amplifying device, a control relay in the output circuit of said amplifying device, a rotary distributor having a plurality of contact segments electrically connected with the armature of said control relay, a plurality of selecting relays having electrical connection with brushes on said distributor, said brushes being adapted to co-operate with said contact segments, and a plurality of perforating magnets, each magnet being controlled by one of the selecting relays, and a perforating punch operatively associated with each perforating magnet.

In testimony whereof I have affixed my signature.

ARTHUR KORN.