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(54) **DEVICE FOR TRANSLATING WOVEN PATTERN INTO MECHANICAL OPERATION.**

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Description

Technical Field

The present invention relates to an apparatus for translating weaving patterns into mechanical actions, adapted for use with a machine which controls the operation of warp yarns on the basis of predetermined information on weaving patterns, typically a Jacquard machine or a machine for punching pattern cards for Jacquard machines, said apparatus imparting weaving information in the form of electric signals to such machines to control their operation controlling the handling of warp yarns.

Background Art

A pattern analizer for coding weaving information concerning warp yarn operation for weaving has already been developed and put into practical use. Attempts have also been made to impart such coded weaving pattern information in the form of electric signals to a Jacquard machine or the like so as to directly control the operation thereof, in which case an apparatus is required which translates weaving pattern information provided in the form of electric signals into mechanical actions. To put this apparatus into practical use, it is the most common method to use an actuator operable by excitation of an excitation winding (solenoid) as an element of a mechanism for converting electric signals into mechanical actions, and conventional attempts have been mainly by such method. However, conventional apparatuses of this type have been very bulky, complicated in construction, very expensive, not smooth or reliable in operation, slow in response, incapable of high speed operation or otherwise unsatisfactory, thus not yet reaching the substantial level of practical use.

DE-A-2 809 248 discloses apparatus for translating woven pattern information into a mechanical operation, comprising signal output means for producing the woven pattern information as electric signals and a mechanism for converting the output electric signals from said output means into a mechanical operation, the mechanism comprising a plurality of actuators cooperatively associated with a plurality of mechanical transmitting means for warp operation information, each of the actuators being pivoted at one end thereof and having a magnetic body and being associated with an excitor winding for selectively exciting the magnetic body in accordance with the output electric signals from said signal output means, the mechanism further including a permanent magnet assembly disposed at a predetermined position and composed of a plurality of permanent magnet structures cooperative with said actuators, respectively, so that each actuator may be positioned at two positions repelled from one pole of one of the permanent magnet structures and attracted to the other pole of the permanent magnet structure, the position of the actuator determining the warp operation information. The excitor winding associated with each actuator is fixed in position relative to the permanent magnet structures and a separate permanent magnetic structure is provided for each actuator. The apparatus consequently requires a large space for installation and has a complicated construction.

DE-A-2 938 851 discloses apparatus according to the pre-characterizing portion of claim 1 below. In the apparatus a prermanent magnet structure provides a permanent magnet yoke and comprises two polar plates, between one pair only of facing edge portions thereof are disposed magnetic strips. The whole length of each of the actuators is disposed between the polar plates. A plurality of the actuators are arranged in a line extending parallel to the lengthwise direction of the permanent magnet strips. A large space is necessary for the installation of the permanent magnet assembly, together with the actuators and the windings. The construction is therefore complicated.

Accordingly, an object of the invention is to provide an apparatus for translating weaving pattern information into mechanical actions, which is designed to minimize said drawbacks.

Disclosure of the Invention

The present invention provides apparatus for translating woven pattern information into a mechanical operation, which comprises signal output means for producing the woven pattern information as electric signals, and a mechanism for converting the output electric signals from said output means into a mechanical operation, said mechanism comprising a plurality of actuators cooperatively associated with a plurality of mechanical transmitting means for wry operation information, each of said actuators being pivoted at one end thereof and having a magnetic body and an excitor winding for selectively exciting the magnetic body in accordance with the output electric signals from said signal output means, said mechanism further including a permanent magnet assembly disposed at a predetermined position and comprising a plurality of permanent magnet structures cooperative with said actuators, respectively, so that each actuator may be selectively positioned at two positions repelled from one pole of one of the permanent magnet structures and attracted to another pole of the magnet structure, the position of the actuator being in accordance with wry operation information to be transmitted by the respective mechanical transmitting means, the plurality of permanent magnet structures being assembled laterally relative to each other and each of said magnet structures being provided by a pair of spaced elongate polar plates arranged at

opposite sides of the structure and facing each other,

characterized in that:

said excitor winding is wound on said magnetic body of each of said actuators,

each of the permanent magnet structures further comprises a pair of permanent magnet pieces disposed between the pair of polar plates of the structure at their opposite terminal portions, respectively to magnetize said pair of polar plates with different polarities and together with said pair of polar plates to define an elongate opening, said one end of a plurality of the actuators being disposed outside of the elongate opening and the other ends of the plurality of said actuators being accommodated within said elongate opening at different spots or zones therein for selective attraction to either of said polar plates, and said plurality of actuators are disposed in a line and are pivoted, at said one ends thereof, about an axis extending in the lengthwise direction of said elongate opening.

Therefore, in this apparatus, the mechanism for converting electric signals into mechanical actions is composed simply of actuators each having a magnetic body and an excitation winding and movable between two positions, and a permanent magnet structure fixed in position, thus achieving a simple and small-sized construc tion, which ensures that the entire apparatus is compact and relatively inexpensive. Further, the operation of the converting mechanism is such that the magnetic body is selectively excited by an electric signal through the excitation winding and moved between two positions in cooperation with the poles of the permanent magnet fixed in position, so that the operation is smooth and reliable, and the response is high, enabling high speed operation.

In addition, the output means for deriving weaving pattern information in the form of electric signals is generally composed of weaving pattern information recording means wherein weaving information is once coded and recorded in a magnetic tape or other suitable medium from a weaving pattern by a pattern analyzing device or the like through a computer, and means for reading information from said recording means to produce electric signals. Further, without intervention of such recording means, it is possible to derive weaving pattern information from a pattern directly as electric signals through a pattern analyzing device. As for recording means, besides magnetic tapes, use may be made of floppy disks, punched tapes, punched disks, and conventional pattern cards.

Each permanent magnet structure has a pair of opposed magnetic poles of different polarities and the magnetic body of said actuator is selectively attracted to a magnetic pole of either polarity by excitation caused by said output electric signal. The action by the movement of the actuator between the two positions is smooth and reliable and the response is high, so that the merit of enabling high speed operation is further enhanced. More advantageously, in that action after the magnetic body of each actuator has been attracted to a magnetic pole of either polarity in accordance with an output electric signal, said magnetic body will remain attracted to the selected magnetic pole even if the output electric signal is stopped, so long as it is not attracted to the pole of the opposite polarity by the next output electric signal. Therefore, by dividing all actuators into two or more groups, it is possible to perform instruction treatment of a series of actions by such pulse drive as to shift them with a slight time lag for each cycle of operation of the apparatus, whereby the mechanism for deriving weaving pattern information in the form of electric signals can be made simple and compact.

In an embodiment of the invention, said means for mechanically transferring warp yarn operation information is the heddle operating mechanism of a Jacquard machine. In this case, it is possible to produce woven fabrics on the basic of weaving pattern information, without having to use pattern cards.

In another embodiment of the invention, said means for mechanically transferring warp yarn operation information is a pattern card punching mechanism. In this case, conventional pattern cards for Jacquard machines can be produced by punching.

Preferably the excitor windings of said plurality of said actuators are disposed outside of the elongate opening.

Brief Description of the Drawings

Fig. 1 is a diagrammatic setup view showing an embodiment of the present apparatus applied to a Jacquard machine;

Fig. 2 is a plan view, partly broken away, showing in detail a mechanical portion for converting electric signals into mechanical actions in the apparatus of Fig. 1, with the intermediate portion being omitted;

Fig. 3 is a side view of the mechanical portion of Fig. 2;

Fig. 4 is a cross-sectional view of the mechanical portion of Fig. 2 taken along the line I—I';

Fig. 5 is a cross-sectional view taken along the line II—II' in Fig. 2;

Fig. 6 is a cross-sectional view taken along the line III—III' in Fig. 2;

Fig. 7 is a fragmentary enlarged perspective view of a permanent magnet assembly in the mechanism portion of Fig. 2;

Fig. 8 is a front view of a part of the permanent magnet assembly of Fig. 7, further enlarged, as seen from the front, showing the details thereof;

Fig. 9 is a front view of the permanent magnet assembly of Fig. 7, as seen from the back;

Fig. 10 is a cross-sectional view of the permanent magnet assembly taken along the line IV-IV' in Fig. 8;

Fig. 11 is a fragmentary side view, in section, showing the pivotal construction of actuator in the mechanism portion of Fig. 2;

Figs. 12 and 13 are views for an explanation of the function of the mechanical portion of Fig. 2.

Fig. 14 is a sectional view partly showing b modification of the construction of the tip of an actuator;

Fig. 15 is a front view partly showing a modification of the permanent magnet assembly;

Fig. 16 is a schematic diagram showing a modification of the mechanical portion for converting electric signals into mechanical actions;

Fig. 17 is a diagrammatic setup view showing an embodiment of the apparatus of the present invention applied to a pattern card punching machine.

Best Mode of Carrying out the Invention

Referring to Fig. 1, the arrangement of a preferred embodiment of the apparatus of the invention applied to a Jacquard machine is diagrammatically shown. The main component of a known Jacquard machine is generally designated by the reference numeral 1, and signal output means for deriving weaving pattern information in the form of electric signals is designated by the reference numeral 22.

In the Jacquard machine 1, a plurality of vertical needles adapted to be vertically moved with their upper end hooks suitably catching the knives 3 of a vertically movable knife box 2 are arranged and supported on a bottom plate 6, the lower ends of said vertical needles being respectively con nected to cords 5 which are respectively connected to the heddle for controlling the shedding motion of warp yarns, and a plurality of horizontal needles 7 each adapted to engage and push the associated vertical needle 4 and movable lengthwise to establish and cancel engagement of the upper end hook of the needle with the associated knife 3 are arranged and supported on a rear mouth plate 8 and a front auxiliary mouth plate 9. Therefore, each horizontal needle 7 constitutes means for mechanically transferring warp yarn operation information to a heddle operating mechanism.

Adjacent the front ends of the horizontal needles 7 extended immediately before the auxiliary mouth plate 9 disposed forwardly of the Jacquard machine 1, this converting mechanism 10 is positioned in opposed relation with the horizontal needles 7. Therefore, the converting mechanism 10 is provided at the position where originally the pattern card cylinder would be mounted, in lieu of the pattern card cylinder.

The converting mechanism 10 is equipped with a box-like frame 11 of substantially the same size as the pattern card cylinder. The frame 11 is adapted to be mechanically reciprocated in the lengthwise direction of the horizontal needles 7 for pushing the latter by an illustrated batten 12 or other suitable drive means driven by rod drive, shaft drive, chain drive or any other method from the crank shaft or the like of the weaving machine, as in the case of the pattern card cylinder.

Disposed in the internal rear region of the frame 11 and in opposed relation with the respective horizontal needles 7 with the same pitch as that of the latter in accordance with the arrangement of the horizontal needles 7, are a plurality of movable actuators 13 each having a magnetic body and an excitation winding (solenoid) for selectively exciting said magnetic body. The end tips of the actuators 13 are respectively placed in the partitions in a permanent magnetic assembly 14 formed like shelving in accordance with the arrangement thereof. The end tips of the actuators 13 are disposed in adjacent opposed relation with the rear ends of push rods 15 disposed further forwardly in accordance with the arrangement thereof, said push rods serving as intermediaries for pushing the horizontal needles 7. The push rods 15 are slidably inserted in a front plate 17 which is resiliently supported by springs 16 forwardly of the frame 11 at a suitable distance from the latter so as to be movable toward the frame. Me tips of the push rods 15 projecting slightly beyond the front plate 17 are respectively formed with heads 18 which are opposed to the tips of the associated horizontal needles 7. Each push rod 15 is rearwardly urged by a spring 19 installed thereon so that the heads 18 are in contact with the front plate 17, and damper members 20 projecting a predetermined distance forwardly of the heads 18 for abutment against the auxiliary mouth plate 9 are mounted on the front plate 17 on both sides.

The excitation windings of the actuators 13 are coupled to terminals on a terminal board 21 disposed at the rear of the frame 11, said terminals on terminal board 21 being electrically connected to signal output means 22 installed at a suitable position, as adjacent to the weaving machine, separate from the converting mechanism 10, so that in accordance with the instruction of electric signals from the output means 22 the actuators 13 will be actuated by individual excitation of the magnetic bodies by the excitation windings.

As for the signal output means 22, a magnetic tape or floppy disk in which pattern information has been magnetically recorded by a pattern analizer using is computer as selective control signals for desired pushing and non-pushing of horizontal needles for operation on warp yarns, or a punched tape or punched disk having selective control signals recorded therein by punching are used as recording means. In the case of a magnetic tape or floppy disk, a magnetic head is used as read means, while a phototransistor or a laser beam device is used as read means in the

case of a punched tape or punched disk. Electric signals in forward or reverse direction are fed from said read means to the solenoids of the actuators 13 through a memory device and is power source device. In addition, the position where said memory device and power device are installed is not limited to the signal output means 22 but may be at the converting mechanism 10.

The details of the converting mechanism 10 will now be described with reference to Figs. 2 through 6 and further to Figs. 7 through 11.

As previously described, the front plate 17 is resiliently supported at a suitable distance from the frame 11 by the springs 16 so as to be movable toward the frame. Such resilient-support springs 16 are installed at total of 4 places, namely, two places, upper and lower, on each of the right and left sides (see Figs. 2 and 4). The front plate 17 is guided by guide means 24 installed at four places as in the case of the resilient-support springs 16 so that it can be moved toward the frame 11 against the forces of the springs 16 (see Figs. 2 and 5). Each guide means 24 comprises slide pins 27 slidably fitted in through-holes 26 formed in a guide member 25 attached to the end of the frame 11, the front ends of said pins 27 being fixedly connected to the front plate 17 as by bolts, and stopper members 28 against the back of the frame 11 attached to the rear ends of the pins 27. As a result, the front plate 17 is urged by the springs 16 to be positioned at a predetermined distance forwardly of the frame 11 and can be moved toward the frame 11 against the forces of the springs 16 by guidance established by the slide movement of the guide pins 27 along the through-holes 26 in the guide means 24.

Brackets 29 are attached to the frame 11 on both right and left sides. By suitably fixing to said brackets 29 attachment members having shafts 30 corresponding to the right and left projecting center shafts of a pattern card cylinder, the entire mechanism 10 can be simply installed in place of the pattern card cylinder of the Jacquard machine which would otherwise be installed therein (see Figs. 2 and 3).

The head 18 of each push rod 15 is made of synthetic resin or the like and is thicker than the horizontal needles 7, and its length of projection forwardly from the front plate 17 between the head 18 and the damper member 20, and the distance between the frame 11 and the front plate 17 are suitably set to cause the horizontal needles 7 to be pushed at a desired distance e.g., at about 9 mm.

Each actuator 13 comprises an excitation winding 32 wound in taper form on a bar-like magnetic body 31 of iron or the like, the rear ends of said magnetic bodies 31 being pivotally connected to the frame 11 by a vertical pivot pin 33, thereby allowing the end tips of the magnetic bodies 31 to turn clockwise and counterclockwise around the rear end pivot pin 33 (see Figs. 2 and 61. In such pivotal mounting of the magnetic bodies 31 for the actuators 13, for example, flange-like ring spacers 40 and bushings 41 are alternately fitted on the vertical pivot pin 33 installed between the top and bottom of the frame 11, with the boss portions 42 provided on the rear ends of the magnetic bodies 31 being rotatably mounted on said bushings 41 between adjoining spacers 40 (see Figs. 6 and 11). With this design, arrangement of the magnetic bodies 31 with accurate pitch conforming to the pitch of the horizontal needles 7 can be easily realized. In this case, the pivot pin 33, spacers 40 and bushings 41 as well as the frame 11 are made of non-magnetic material.

The permanent magnet assembly 14, as shown in Fig. 7, comprises equispaced plates 34 in the form of long strips of magnetic material each interposed between adjacent horizontally spaced arrays of the magnetic bodies 31 of the actuators and the push rods 15, with the distance between adjacent plate 34 being about 2—3 times the thickness of the magnetic bodies 31 and push rods 15, and permanent magnets 35 held between adjacent plate 34 and at the upper and lower ends of the space therebetween. In this case, the permanent magnets 35 held between the plates have horizontally spaced S and N poles, with the S and N poles being alernately reversed in the horizontal arrangement. As a result, the horizontally spaced plates 34 have different polarities such that alternating plates have an S pole and the others an N pole. The plates 34 having poles of alternately different polarities are used as partition walls so that spots 36 in which the tips of the magnetic bodies 31 are received are formed like shelving between adjacent opposed plates 34 of different polarities, thereby completing the permanent magnet assembly 14. Further, in the arrangement of this permanent magnet assembly 14, as shown in Figs. 8—10, it is preferable to provide insert members 39 of non-magnetic material each held between adjacent plates 34, said insert member having on its front side a push rod insertion hole 37 at a position biased to one plate and on its rear side a slit 38 extending between the two plates for horizontally movably receiving the magnetic bodies 31, thereby forming the individual spots 36. Thus, the tips of the magnetic bodies 31 are inserted from the slits 38 into the spots 36, while the rear ends of the push rods 15 are inserted thereinto from the insertion holes 37 in adjacent opposed relation with said tips.

In operation, the actuators 13 individually have electric signals of weaving pattern information from the signal output means 22 imparted to their excitation windings 32 as forward and reverse selective electric currents, whereby the tips of the magnetic bodies 31 are selectively magnetized to switch to S or N polarity. As a result of such magnetization for the switching of polarity, the end tips of the magnetic bodies 31, in the spots 36 of the permanent magnet assembly 14, are each selectively attracted to either of the mating pole

surfaces of different polarities of the plates 34 forming the partition walls of the assembly to switchingly abut against the same. This action results in the tips of magnetic bodies 31 being changed in position between the two positions of turning around the axis of the pivot pin 33 at their rear ends within the spots 36. In this two-position operation, if the tip of a magnetic body 31 is in one position, said tip is not in axial alignment with the rear end of the associated push rod 15 and cannot engage the same, whereas if the tip of said magnetic body 31 is in the other position, said tip is in axial alignment with the rear end of the push rod 15 and can engage the same. The two-position operation of the actuators 13 can be smoothly effected with small electric power load on the excitation windings 32 or by instantaneous pulse. Once the magnetic body 31 is attracted to the magnetic pole of one polarity in the permanent magnet assembly, it will remain attracted to this position even if the electric signal is stopped so that it is demagnetized, so long as the next electric signal for switching to the opposite side is not provided.

Thus, such switching actions by electric signals from the signal output means 22 between the two positions of the actuators 13 are effected for each cycle of the reciprocating motion of the frame 11, whereby the selective push action control of the horizontal needles 7 is achieved in the following manner.

If the frame 11 and hence the entire converting mechanism 10 are in the retracted position in their reciprocating motion, the damper members 20 are separated from the auxiliary mouth plate 9, with the heads 18 of the push rods 15 being separated from the tips of the associated horizontal needles 7 projecting through the auxiliary mouth plate 9, which condition is shown in Fig. 2. When the frame 11 and hence the entire converting mechanism 10 are advanced, as shown in Fig. 12, the damper members 20 abut against the the auxiliary mouth plate 9, in which condition the heads 18 of the push rods 15 substantially abut against the tips of the corresponding horizontal needles 7, and in this condition or the previous condition, the above-mentioned selective operation between the two positions of the actuators 13 is effected in accordance with the current direction of electric signals from the signal output means 22. Subsequently, the frame 11 and hence the entire converting mechanism 10 are further advanced to the most advanced position, where, as shown in Fig. 13, the abutment of the damper members 20 against the auxiliary mouth plate 9 causes the front plate 17 to be relatively brought close to the frame 11 against the forces of the springs 16. At this time, some push rods 15 abut against the tips of the associated magnetic bodies but the others do not, depending upon the selective positions of the actuators 13. As a result, those push rods 15 whose rear ends are not aligned with and hence do not abut against the tips of the associated magnetic bodies 31 are moved backwardly within the associated spots 36 of the permanent magnet assembly 14 while passing the tips of the associated magnetic bodies 31, so that their heads 18 do not project forwardly from the front plate 17 and do not push the associated horizontal needles 7, whereas those push rods whose rear ends are aligned with and hence abut against the tips of the associated magnetic bodies 31 are pushed by said tips, with their heads 18 projecting forwardly from the front plate 17 against the forces of the springs 19, as the frame 11 and hence the entire converting mechanism 10 are advanced, thereby pushing the associated horizontal needles 7. In this way, with this apparatus, the selective push control of the horizontal needles is achieved by the mechanical reciprocating motion of the converting mechanism 10 and by the two-position excitation of the actuators 13, and the shedding of the warp yarns in the Jacquard machine can be performed in accordance with weaving pattern information, without having to use pattern cards, to produce a woven fabric. It is also possible to arrange the apparatus such that when the frame 11 is in the retracted position in its reciprocating motion, the damper members 20 have already abutted against the auxiliary mouth plate 9, as shown in Fig. 12, that is, the members 20 are always abutting against the plate 9.

In addition, in the apparatus described above, as shown in Fig. 14, the tip of the magnetic body 31 of the actuator 13 may be covered with a covering member 45, such as a cap, made of non-magnetic material so that the contact of the tip of the magnetic body 31 of the actuator 13 with the polar plates 34 of the permanent magnet assembly 14 on the basis of magnetization of said tip may be made through the covering member 45.

This arrangement provides a high merit of preventing damage in connection with the abutment of the tip of the magnetic body 31 against the rear end of the push rod 15 and another merit that the two-position switching operation of the front end of the magnetic body 31 by excitation can be smoothly performed with less electric power consumption.

Further, in the arrangement of the permanent magnet assembly 14 shown in Figs. 7—10 described previously, since the magnetic plates 34 are alternately given S and N poles in horizontal arrangement, it is necessary that for each horizontal pitch, the relation between the forward and reverse currents to the excitation windings 32 of the actuators 31 and the engaging and non-engaging positions thereof relative to the push rods 15 be reversed by signal instructions. This requirement may be eliminated by adopting an arrangement, as exemplified in Fig. 15, wherein in the permanent magnet assembly 14, the plates 34 are of laminar construction comprising a non-magnetic intermediate plate 34a sandwiched between magnetic plates 34b and 34c, whereby the S and N poles

of the sandwiched permanent magnets 35 can be respectively oriented in the same direction, with each plate 34 having S and N poles in the magnetic plates 34b and 34c. If possible, without using permanent magnets 35, the front and rear plates 34b and 34c may be permanent magnets having S and N poles.

Fig. 16 shows a modification, wherein such intervening members as the front plate 9 and push rods 15 employed in the embodiment shown in Fig. 1 are omitted and instead the tips of the horizontal needles 7 as means mechanically transferring warp yarn operation information are directly associated with the magnetic bodies 31 of the actuators 13, thereby further simplifying the construction.

Though not shown, in this invention, as a further modification, instead of mechanically reciprocating the converting mechanism 10 to push the horizontal needles 7 serving as mechanical-transfer means of warp yarn operation as in the embodiment shown in Fig. 1, it is possible to fixedly install the converting mechanism 10 on the rear side of the Jacquard machine 1 in such a manner as to be associated with the rear ends of the horizontal needles and provide means on the front side of the Jacquard machine 1 for resiliently pushing the horizontal needles 7 through springs or the like.

Fig. 17 shows an embodiment wherein the apparatus of the present invention is applied to a pattern card punching machine. In this figure, the principal component section of a known pattern card punching machine is collectively indicated by 50. The pattern card punching machine 50 has a machine frame 51 provided with a table 52 for punching pattern cards and a plurality of punches 53. The table 52 has holes associated with the punches 53 and is vertically moved by vertical moving means 54. The punches 53 are vertically extending and are vertically movably supported. Pattern cards 55 to be punched are intermittently fed one by one on the table 52 in synchronism with the vertical movement of the table 52, so that necessary holes are formed therein by the punches 53 when the table 52 is upwardly moved.

The upper portions of the punches 53 are engaged with a plurality of associated control horizontal rods 56. The control horizontal rods 56 are reciprocable transversely (lengthwise) and have their right-hand side ends, as viewed in the figure, connected with a plurality of flexible wires or horizontal bars 57 having tube covers for push operation, so that they are selectively pushed by the selective pushing of the wires or horizontal bars 57. Punching actions of the chisels 53 are selected by selective push movement of the horizontal bars 56, and the pattern cards 55 are successively punched in accordance with weaving pattern information. The horizontal bars 56 are pushed in unison at their left-hand ends by a reset push plate 58 which reciprocates in each punching operation, whereby they are moved back to their original position. In this pattern card punching machine 50, therefore, the wires or horizontal bars 57 for push operation correspond to means for mechanically transferring warp yarn operation information as a pattern card punching drive mechanism, and a converting mechanism 10 which is mechanically reciprocated as in the case of the Jacquard machine shown in Fig. 1 is installed in opposed relation with the actuating ends of the wires or horizontal bars 57.

Therefore, in this apparatus, the punching of pattern cards for use with conventional Jacquard machines can be effected by electric signals for weaving pattern information from the signal output means 22.

Industrial Applicability

As has been described so far, the apparatus for translating weaving pattern information into mechanical actions according to the present invention is very useful, in weaving, for operation control of treatment concerning warp yarn operation by imparting weaving pattern information to such a machine as a Jacquard machine: or pattern card punching machine for Jacquard machines through the intermediary of electric signals.

Claims

1. Apparatus for translating woven pattern information into a mechanical operation, which comprises signal output means (22) for producing the woven pattern information as electric signals, and a mechanism (10) for converting the output electric signals from said output means into a mechanical operation, said mechanism (10) comprising a plurality of actuators (13) cooperatively associated with a plurality of mechanical transmitting means (7 or 57) for warp operation information, each of said actuators (13) being pivoted at one end thereof and having a magnetic body (31) and an excitor winding (32) for selectively exciting the magnetic body (31) in accordance with the output electric signals from said signal output means (22), said mechanism (10) further including a permanent magnet assembly (14) disposed at a predetermined position and comprising a plurality of permanent magnet structures cooperative with said actuators (13), respectively, so that each actuator (13) may be selectively positioned at two positions repelled from one pole of one of the permanent magnet structures and attracted to another pole of the magnet structure, the position of the actuator being in accordance with warp operation information to be transmitted by the respective mechanical transmitting means, the plurality of permanent magnet structures being assembled laterally relative to each other and each of said magnet structures being provided by a

pair of spaced elongate polar plates (34) arranged at opposite sides of the structure and facing each other,

characterized in that:

said excitor winding (32) is wound on said magnetic body (31) of each of said actuators (13),

each of the permanent magnet structures further comprises a pair of permanent magnet pieces (35) disposed between the pair of polar plates (34) of the structure at their opposite terminal portions, respectively to magnetize said pair of polar plates (34) with different polarities and together with said pair of polar plates (34) to define an elongate opening, said one ends of a plurality of the actuators (13) being disposed outside of the elongate opening and the other ends of the plurality of said actuators (13) being accommodated within said elongate opening at different spots or zones (36) therein for selective attraction to either of said polar plates (34), and said plurality of actuators (13) are disposed in a line and are pivoted, at said one ends thereof, about an axis extending in the lengthwise direction of said elongate openiing.

2. An apparatus as set forth in claim 1, characterized in that said means for transferring said mechanical actions as warp yarn operation information is the heddle operating mechanism of a Jacquard machine.

3. An apparatus as set forth in claim 1, characterized in that said means for transferring mechanical actions as warp yarn operation information is a pattern card punching mechanism.

4. An apparatus as set forth in any preceding claim, characterized in that the excitor windings (32) of said plurality of said actuators (13) are disposed outside of the elongate opening.

Patentansprüche

1. Vorrichtung zum Übersetzen von Webmusterinformationen in mechanische Funktionen, welche ein Signalausgabemittel (22) zum Erzeugen der Webmusterinformationen als elektrische Signale und einen Mechanismus (10) zur Umwandlung der elektrischen Ausgabesignale aus dem Ausgabemittel in mechanische Funktionen umfaßt, wobei der Mechanismus (10) eine Vielzahl von Betätigern (13) aufweist, die jeweils mit einer Vielzahl von mechanischen Übertragungsmitteln (7 oder 57) für die Kettenbetätigungsinformationen zusammenwirken, wobei jeder der Betätiger (13) an einem Ende schwenkbar gelagert ist und einen Magnetkörper (31) und eine Erregerwicklung (32) zur selektiven Erregung des Magnetkörpers (31) entsprechend den elektrischen Ausgabesignalen vom Signalausgabemittel (22) aufweist und wobei der Mechanismus (10) ferner eine Permanentmagnetanordnung (14) enthält, die an einer festgelegten Stelle angeordnet ist und eine Vielzahl von Permanentmagnetbaugruppen umfaßt, die jeweils mit den. Betätigern (13) derart zusammenwirken, daß jeder Betätiger (13) wahlweise in zwei Stellungen positioniert werden kann, abgestoßen von einem Pol einer der Permanentmagnetbaugruppen und angezogen von einem anderen Pol der Magnetbaugruppe, wobei die Position des Betätigers mit den Kettenbetätigungsinformationen übereinstimmt, die von dem jeweiligen mechanischen Übertragungsmittel zu übertragen sind, wobei die Vielzahl von Permanentmagnetbaugruppen nebeneinanderliegend zusammengesetzt sind und wobei jede dieser Permanentmagnetbaugruppen mit einem Paar von im Abstand angeordneten, länglichen Polplatten (34) versehen ist, die an entgegengesetzten Seiten der Baugruppe angebracht und einander zugekehrt sind, dadurch gekennzeichnet, daß die Erregerwicklung (32) auf den Magnetkörper (31) jedes Betätigers (13) gewickelt ist, daß jede Permanentmagnetbaugruppe ferner ein Paar von Permanentmagnetstücken (35) umfaßt, die zwischen dem Paar von Polplatten der Baugruppe an deren entgegengesetzten Endpartien angeordnet sind, um das Polplattenpaar (34) mit unterschiedlichen Polaritäten zu magnetisieren, und zum Ausbilden einer länglichen Öffnung zusammen mit dem Polplattenpaar, wobei die besagten einen Enden einer Vielzahl von Betätigern außerhalb der länglichen Öffnung angeordnet sind und wobei die anderen Enden der Vielzahl von Betätigern (13) in der länglichen Öffnung an verschiedenen Stellen oder Bereichen (36) zur wahlweisen Anziehung an je eine der Polplatten (34) aufgenommen werden und wobei die Vielzahl von Betätigern (13) in einer Linie angeordnet und an ihren besagten einen Enden um eine Achse verschwenkbar sind, die sich in Längsrichtung der besagten länglichen Öfnung erstreckt.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Mittel zum Übertragen der mechanischen Funktionen als Kettenfaden-Betätigungsinformationen der Litzen-Betätigungsmechanismus einer Jacquard-Maschine ist.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Mittel zum Übertragen der mechanischen Funktionen als Kettenfaden-Betätigungsinformationen ein Musterkarten-Lochmechanismus ist.

4. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Erregerwicklungen (32) der Vielzahl von Betätigern (13) außerhalb der länglichen Öffnung angeordnet sind.

Revendications

1. Appareil de traduction en opération mécanique des informations sur un modèle de tissage, comportant des moyens de sortie de signal (22) pour produire les informations sur le modèle de tissage sous forme de signaux électriques et un mécanisme (10) pour

convertir les signaux électriques de sortie en provenance desdits moyens de sortie en une série d'organes de commande (13) associés en coopération à une série de moyens de transmission (7) ou (57) pour l'information sur l'ourdissage, chacun desdits organes de commande (13) étant articulé à une de ses extrémités et comportant un corps magnétique (31) et un bobinage d'excitation (32) pour exciter sélectivement le corps magnétique (31) en fonction des signaux électriques de sortie en provenance desdits moyens de sortie de signaux (22), ledit mécanisme (10) comprenant un ensemble d'aimants permanents (14) disposés en des positions prédéterminées et constitués d'une série de structure d'aimants permaments coopérant respectivement avec lesdits organes de commande (13), de telle façon que chaque organe de commande (13) puisse être positionné de façon sélective en deux positions et repoussé par l'un des pôles de l'une des structures d'aimants permanents et attiré par l'autre pôle de la strurure d'aimants permanents, la position de l'organe de commande étant en fonction des informations sur l'ourdissage à transmettre au moyen respectif de transmission mécanique, la série de structures d'aimants permanents étant assemblés latéralement les uns par rapport aux autres et chacune desdites structures d'aimants étant munie d'une paire de plaques polaires (34) allongées et espacées l'une par rapport à l'autre et disposées sur des faces opposées de la structure en face l'une de l'autre, caractérisé par le fait que

– ledit bobinage d'excitation (32) est bobiné sur ledit corps magnétique (31) de chacun desdits organes de commande (13);

– chacune desdites structures comprend en plus deux pièces (35) d'aimants permaments disposées entre lesdites deux plaques polaires (34) de la structure à leur partie terminale opposée pour aimanter respectivement lesdites deux plaques polaires (34) avec des polarités différentes et définir avec lesdites deux plaques polaires (34) une ouverture allongée, l'une desdites extrémités d'une série d'organes de commande (13) étant disposée à l'extérieur de ladite ouverture allongée et les autres extrémités de la série desdits organes de commande (31) étant disposées à l'intérieur de ladite ouverture allongée à différentes places ou zones (36) à son intérieur pour attirer sélectivement l'une ou l'autre desdites plaques polaires (34) et ladite série d'organes de commande (13) sont disposées en ligne et sont pivotées à l'une de leurs extrémités, autour d'un axe s'étendant dans la direction longitudinale de ladite ouverture allongée.

2. Appareil selon la revendication 1, carartérisé en ce que lesdits moyens transformant ladite action mécanique concernant les informations sur l'ourdissage sont constitués par le mécanisme à aiguille d'un métier Jacquard.

3. Appareil selon la revendication 1, caractérisé en ce que lesdits moyens pour transformer en action mécanique les informations sur l'ourdissage sont constitués par un mécanisme de réseau à cartes perforées.

4. Appareil selon l'une des revendications précédentes, caractérisé par le fait que lesdits bobinages d'excitation (32) de ladite série d'organes de commande (13) sont disposés à l'extérieur de l'ouverture allongée.

Fig. 1

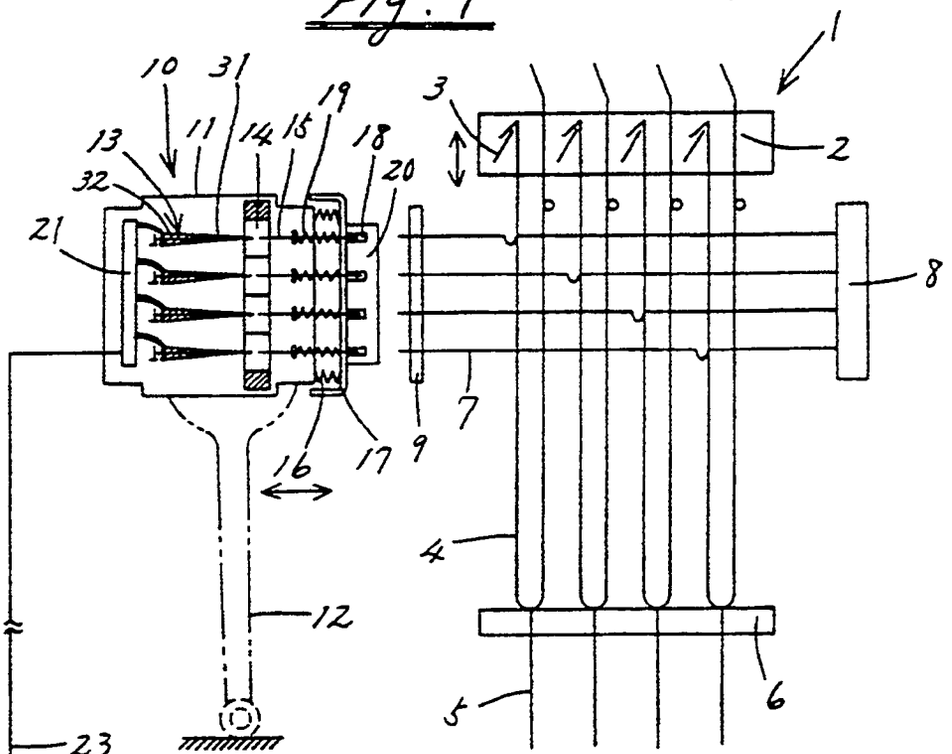
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Fig. 1b

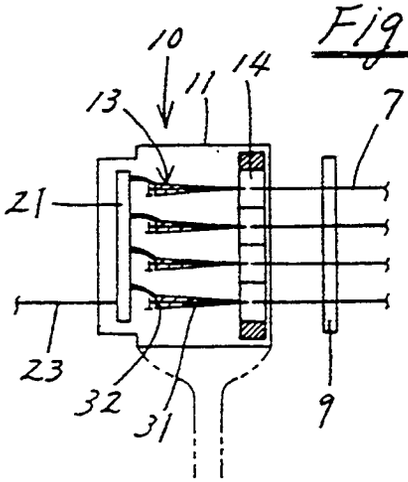
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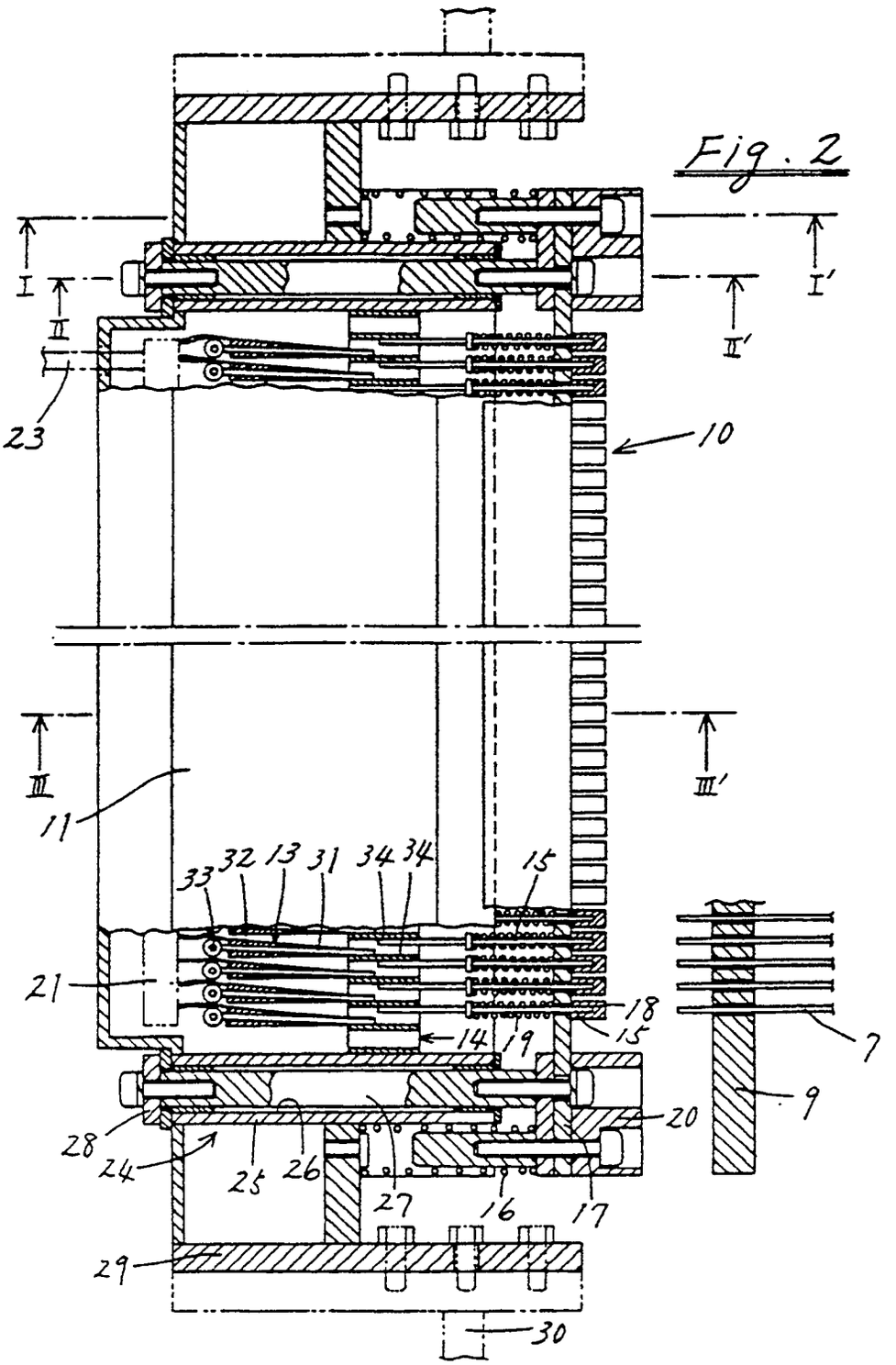
Fig. 2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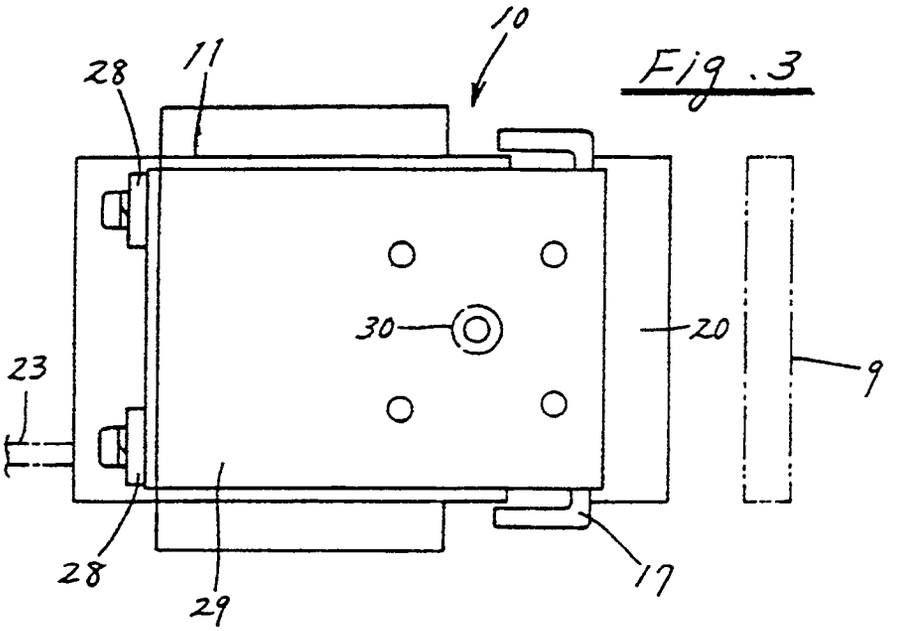

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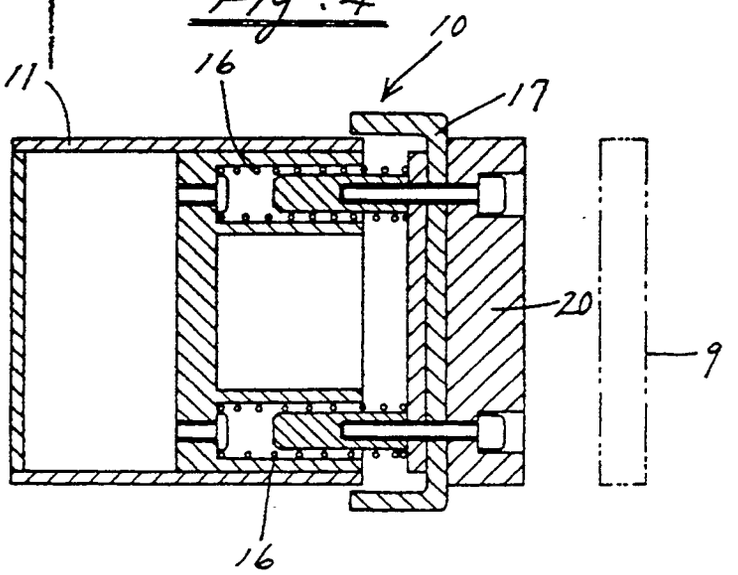

Fig. 4

Fig. 5

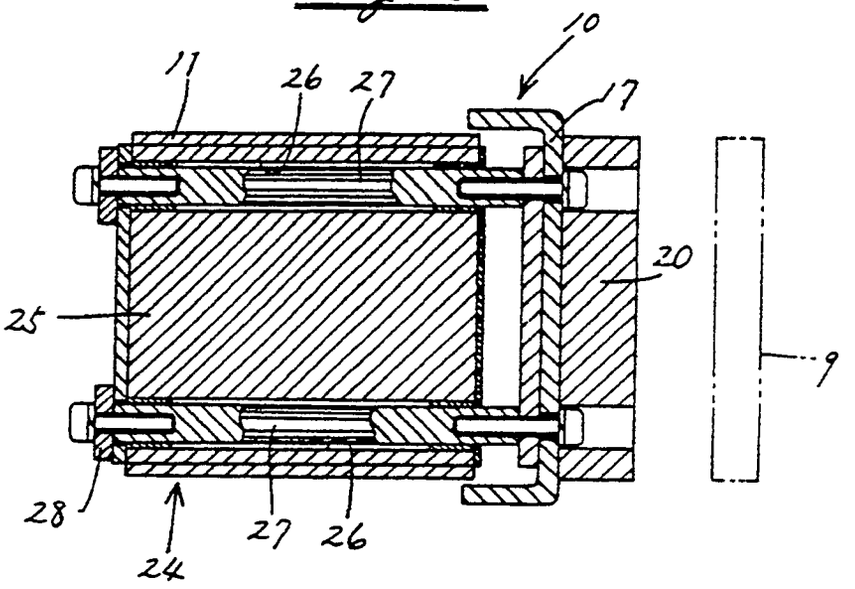
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Fig. 6

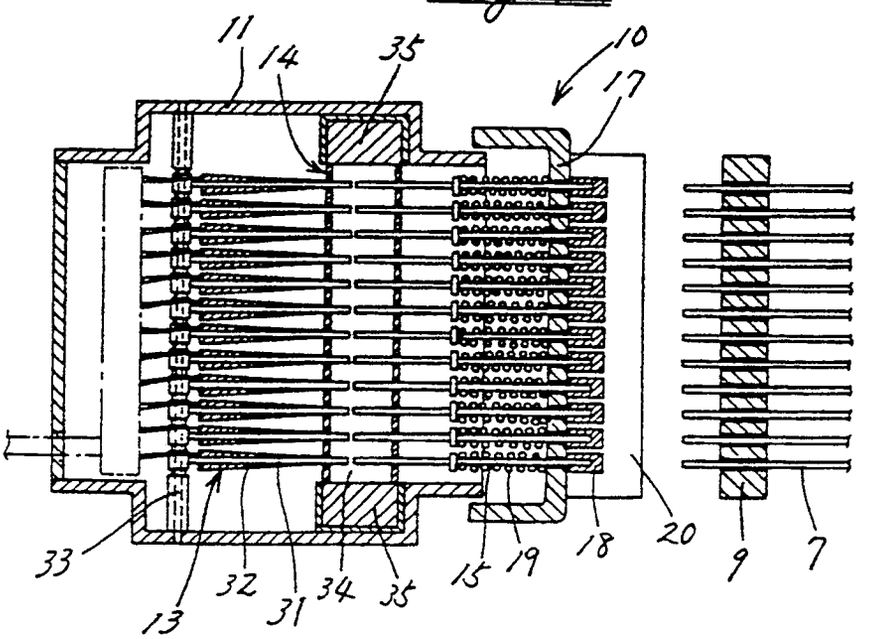
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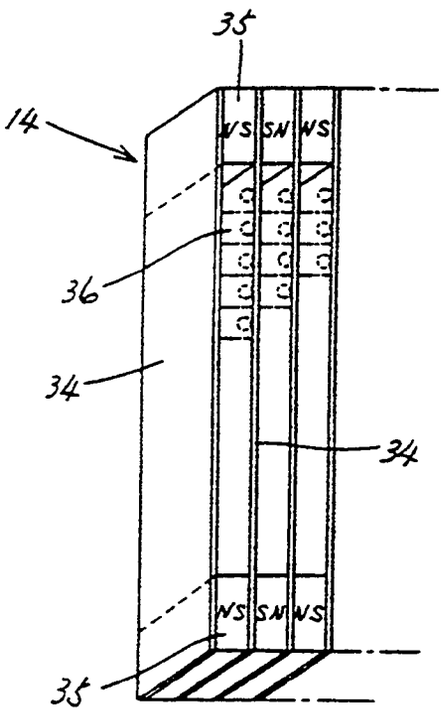
Fig. 7



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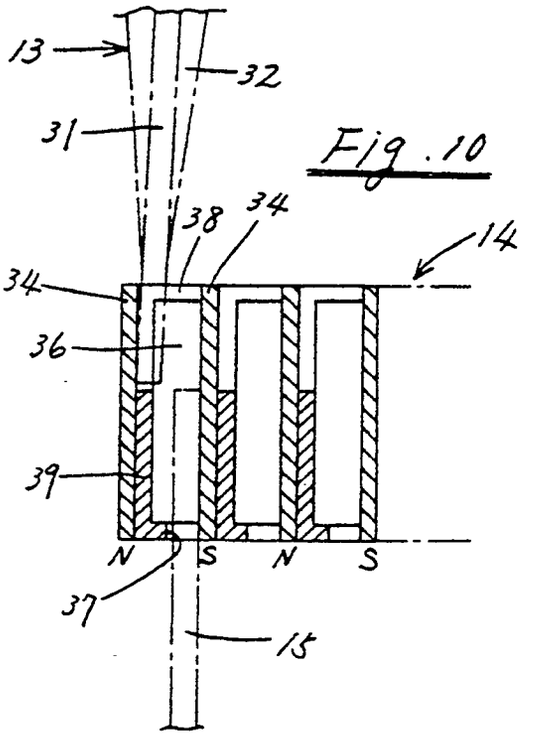


Fig. 9

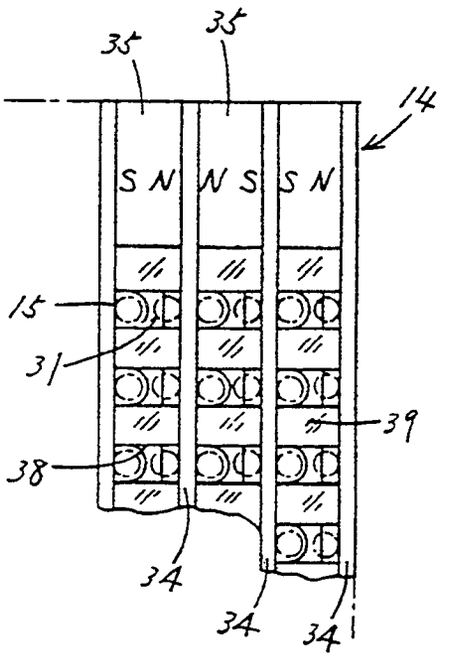
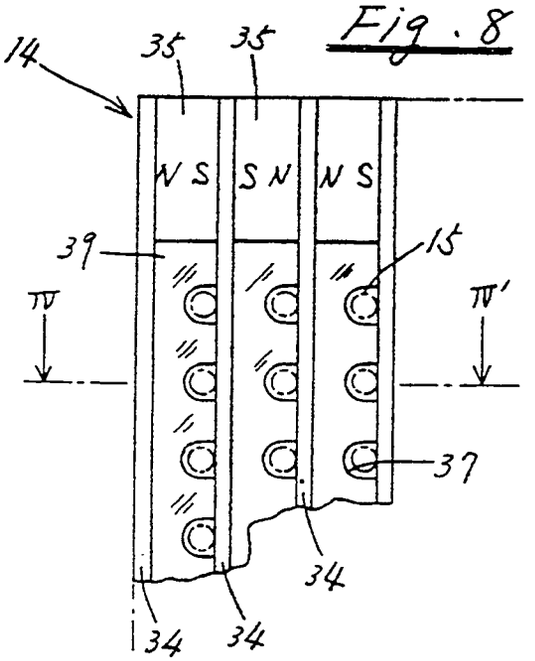


Fig. 8



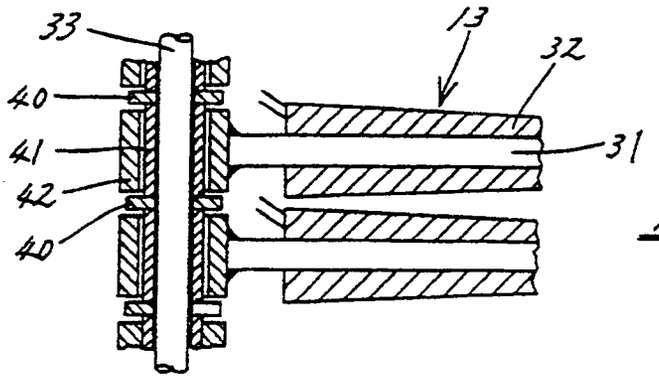


Fig. 11

Fig. 14

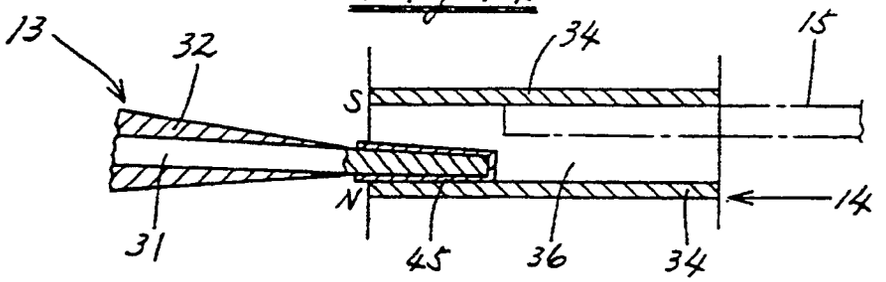


Fig. 15

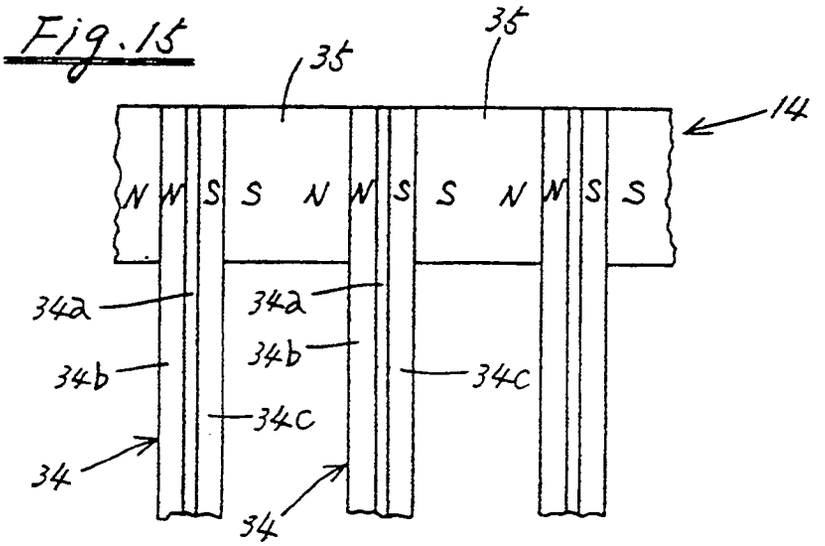


Fig. 12

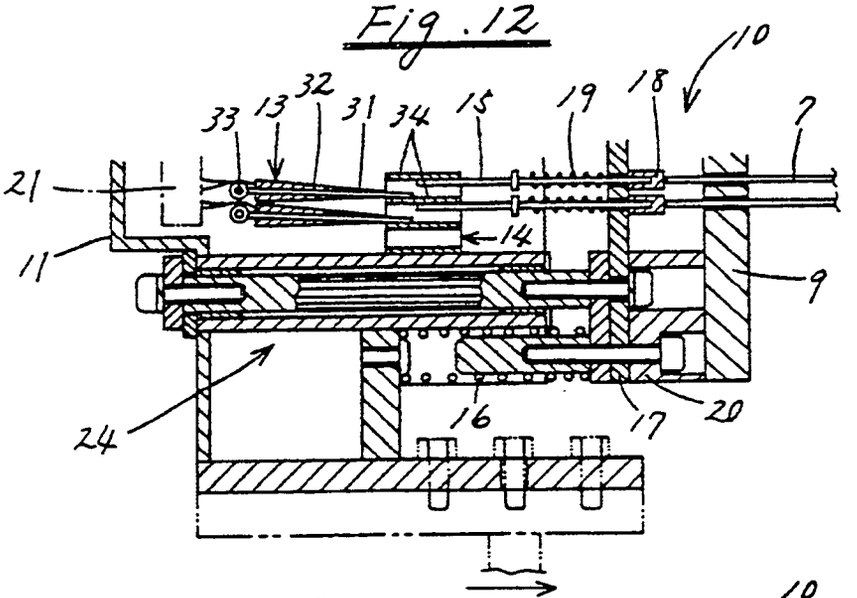

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Fig. 13

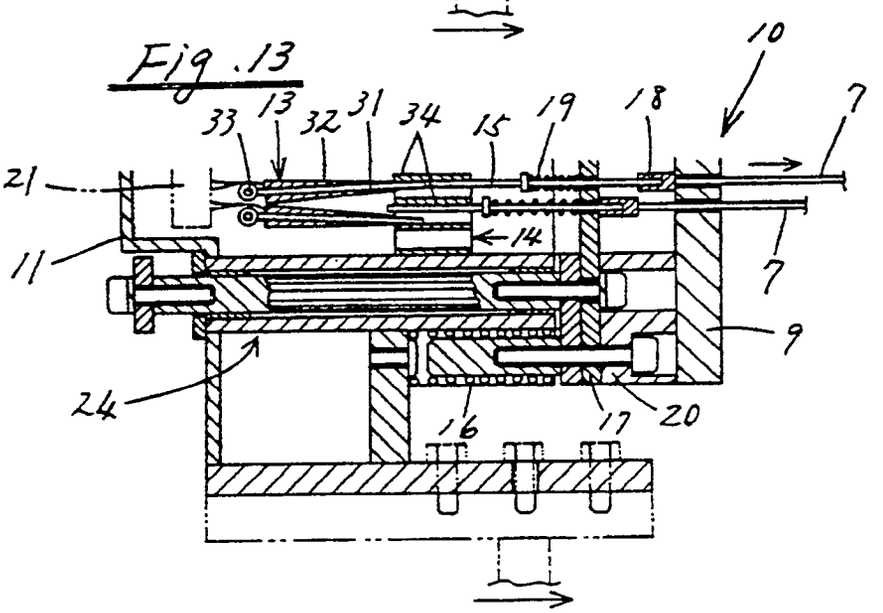
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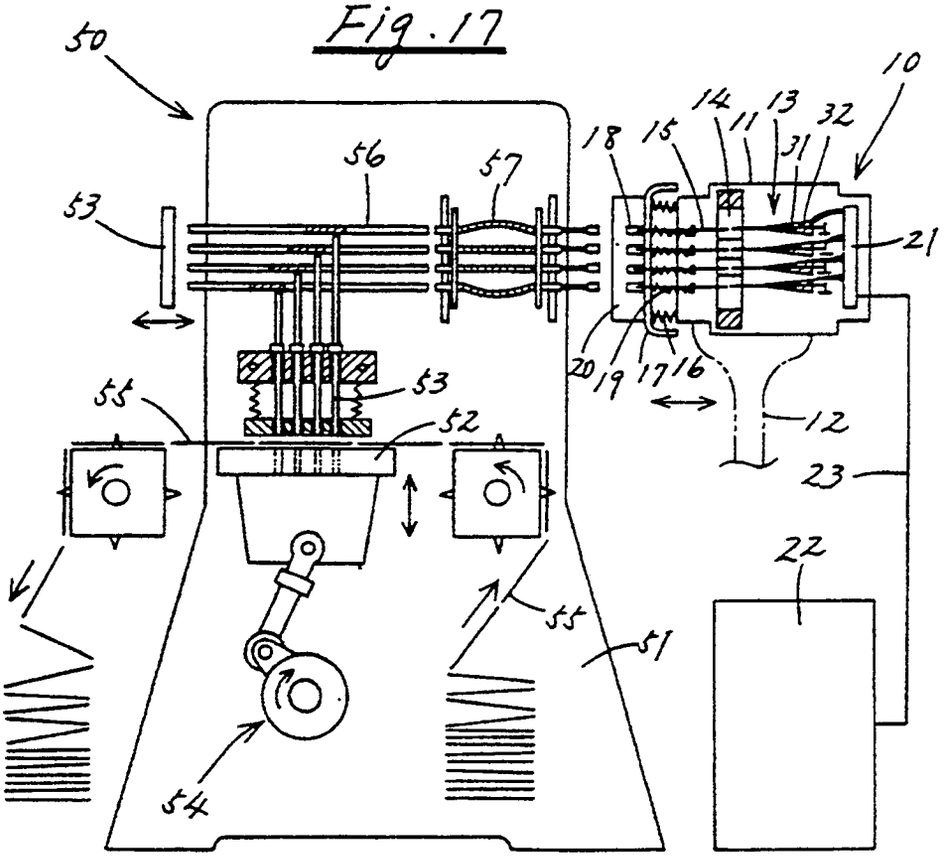
Fig. 17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