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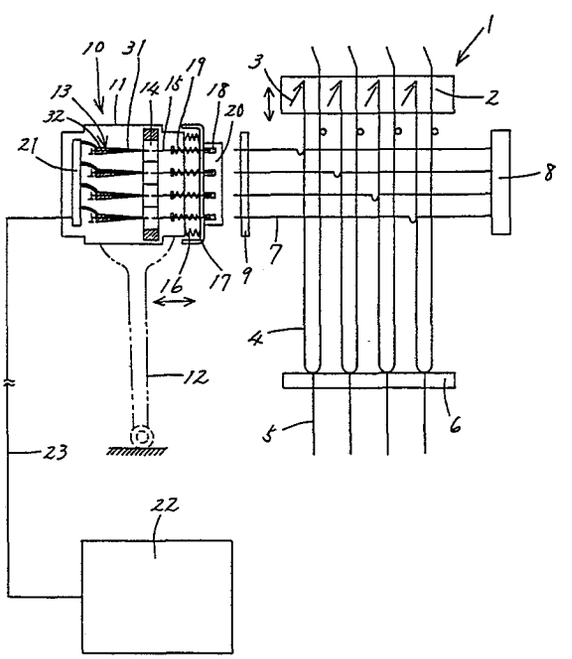
(54) DEVICE FOR TRANSLATING WOVEN PATTERN INTO MECHANICAL OPERATION.

(57) A device for translating woven pattern information into a mechanical operation, which has signal output means (22) for producing the woven pattern information as an electric signal, and a mechanism (10) for converting the output electric signal from said output means into a mechanical operation. The mechanism (10) has several actuators (13) cooperatively connected to several mechanical transmitting means (7) or (57) for warp operation information. The actuator (13) has a magnetic unit (31) and an excitor winding (32) for selectively exciting the magnetic unit (31) in accordance with the output electric signal. The mechanism (10) further has a structure disposed at a predetermined position (14) and is composed of a permanent magnet (34) in cooperation with the magnetic unit (31) of the actuator (13). Each actuator (13) may be positioned at two positions isolated from one pole of the permanent magnet (34) and attracted to one pole of the magnet, and selects the warp operation information by selection between the two positions.



EP 0 091 962 A1

SPECIFICATION

Apparatus for Translating Weaving Patterns into Mechanical Actions

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 ~~xxxxxx~~ 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 ~~in operation~~ 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.

Accordingly, an object of the ~~present~~ 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 an apparatus for translatin weaving pattern information into mechanical actions, comprising signal output means for deriving weaving pattern information as electric signals, ~~and~~ a mechanism for converting the output electric signals from said output means into mechanical actions, said converting mechanism including some actuators respectively operatively connected to some means for mechanically transferring warp yarn operation information, each actuator having a magnetic body and an excitation winding for selectively exciting said magnetic body by said output electric signal, a permanent magnet structure fixed in position for cooperating with said actuators, said actuator being adapted to assume two positions, one in which said magnetic body is attracted to one of the poles of ~~the~~ said permanent magnet and the other in which it is moved away from said pole, so that selection of ~~warp~~ warp yarn operation information is effected by selection of said two positions. 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 construction, 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 analizing 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 dirdctly as electric signals through a pattern analizaing device As for recording means, besides magnetic tapes, use may be made of floppy disks, punched tapes, punched disks, and conventional pattern cards.

In the preferable embodiment of the invention,

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the parmanent magnet structure cooperating with said magnetic body 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. In this case, 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 polarily 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 another embodiment of the invention, said means for mechanically transferring warp yarn operation information is the heald operating mechanism of a Jacquard machine. In this case, it is possible to product woven fabrics on the basic of weaving pattern information, without having to use pattern cards.

In a further 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.

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 magent 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 actuators 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.

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Fig. 14 is a sectional view partly showing a 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 prefereed 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 neeles being respectively connected to cords 5 which are respectively connected to the heald 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

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~~and~~ the upper end hook of the needle with the associated knife 3 are arranged and supported on ~~it~~ 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 as 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, the converting mechanism 10 is positioned in opposed relation with the horizontal needles 7. Therefore, the converting mechanism 10 is ~~disposed~~ 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 ~~mechanism~~ 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 excitatio winding (solenoid) for selectively ~~exciting~~ exciting said magnetic body. The end tips of the actuators 13 are respectively

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placed in the partitions in a permanent magnetiassembly 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. The 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

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recorded by a pattern analizer using a 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 phototransister 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 a 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 descirbed, 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 are 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 bamper member 20, and the distance between the frame 11 and the front plate 17 are suitably set cause to 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

bxxx 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 6). 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 xxxx 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 alternately 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 arrangment 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 rodinsertion 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 ~~xxxxxxxxxxxxxxx~~ to switch to S or N polariry. As a result of such magnetization for the switching of polariry, 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 ~~xx~~ switchingly against about the same. This action results

in the tips of magnetic bodies 31 being changed in position between the two positions of turing 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 ~~xxxxxxxxx~~ even if the electric signal is stopped ~~xx~~ so that it is demagnetized, so long as ~~xxxxxxxxxxxxxxxx~~ 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 ~~xx~~ 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 bamper memebers 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 conveting mechanism 10 are advanced, as shown in Fig. 12, the bamper 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 bamper 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 assocaited 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 assocaited 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 the two-position exciatation 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 bamper 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 ~~xxxixxxx~~ given S and N poles in horizontal arrangment, 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 fornt and rear plates 34b and 34c may be permanent magnets having S and N ~~xxx~~ poles.

Fig. 16 shows a modification, wherein ~~xxxxxxxxxxxx~~ such intervening members as the front plate 9 and push rods 15 ~~xxxxxxxx~~ employed in the ~~xxx~~ 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 acquard 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 chisels 53. The table 52 has holes associated with the chisels 53 and is vertically moved by vertical moving means 54. The chisels 53 are vertically extending and are vertically movably supported. Pattern cards 55 to be punched are intermittenly 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 chisels 53 when the table 52 is upwardly moved.

The upper portions of the chisels 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

as viewed in the figure,
ends, 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 ~~xxxxxxxxxxxx~~ are successively punched in accordance with weaving pattern information. The ~~xxxxxxxxxxxxxxxxxxxxxxxx~~ 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 ~~xxx~~ this ~~xxxx~~ 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. An apparatus for translating weaving pattern information into mechanical actions, comprising signal output means for deriving weaving pattern information as electric signals, a mechanism for converting the output electric signals from said output means into mechanical actions, said converting mechanism including some actuators respectively operatively connected to some means for mechanically transferring warp yarn operation information, each actuator having a magnetic body and an excitation winding for selectively exciting said magnetic body by said output electric signal, a permanent magnet structure fixed in position for cooperating with said actuators, said actuator being adapted to assume two positions, one in which said magnetic body is attracted to one of the poles of said permanent magnet and the other in which it is spaced apart from said pole, so that selection of warp yarn operation information is effected by selection of said two positions.

2. An apparatus for translating weaving pattern information into mechanical actions as set forth in Claim 1, characterized in that the permanent magnet structure cooperating with said magnetic bodies has pairs of opposed magnetic poles of different polarities, and the magnetic body of each actuator is

selectively attracted to a magnetic pole of either polarity by excitation caused by said output electric signal.

3. An apparatus for translating weaving pattern information into mechanical actions as set forth in Claim 1 or 2, characterized in that said means for mechanically transferring warp yarn operation information is the headle operating mechanism of a Jacquard machine.

4. An apparatus for translating weaving pattern information into mechanical actions as set forth in Claim 1 or 2, characterized in that said means for mechanically transferring warp yarn operation information is a pattern card punching mechanism.

AMENDED CLAIMS

1. An apparatus for translating weaving pattern information into mechanical actions, comprising signal output means for deriving weaving pattern information as electric signals, a mechanism for converting the output electric signals from said output means into mechanical actions, said converting mechanism including a plurality of actuators respectively operatively connected to a plurality of input members of means for transferring said mechanical actions as warp yarn operation information, each of said actuators having a magnetic body and an excitation winding wound on said body for selectively exciting in an alternative polarity said magnetic body by said output electric signal, a permanent magnet structure fixed in position and provided with a plurality of pairs of opposed N- and S- magnetic pole surface partitions respectively associated with said plurality of actuators, each of said actuators being adapted to take two positions, one in which said magnetic body is attracted to one of the pole surfaces within the associated partition and the other in which it is attracted to the opposed surface, so that warp yarn operation information is formed by selection of said two positions.

2. An apparatus for translating weaving pattern information into mechanical actions as set forth in Claim 1 characterized in that

said means for transferring said mechanical actions as warp yarn operation information is the headle operating mechanism of a Jacquard machine.

3. An apparatus for translating weaving pattern information into mechanical actions 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.

Fig. 1

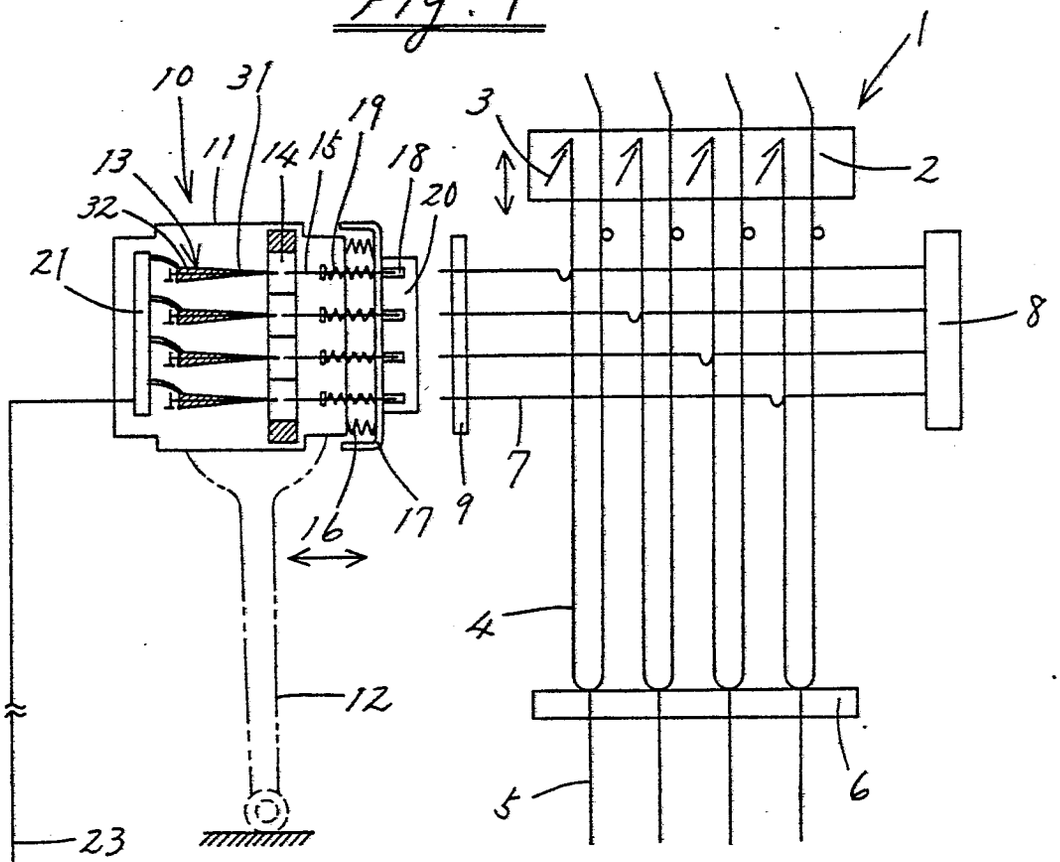

Fig. 16

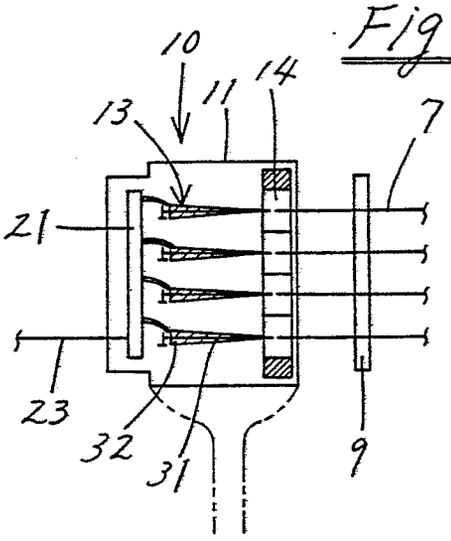

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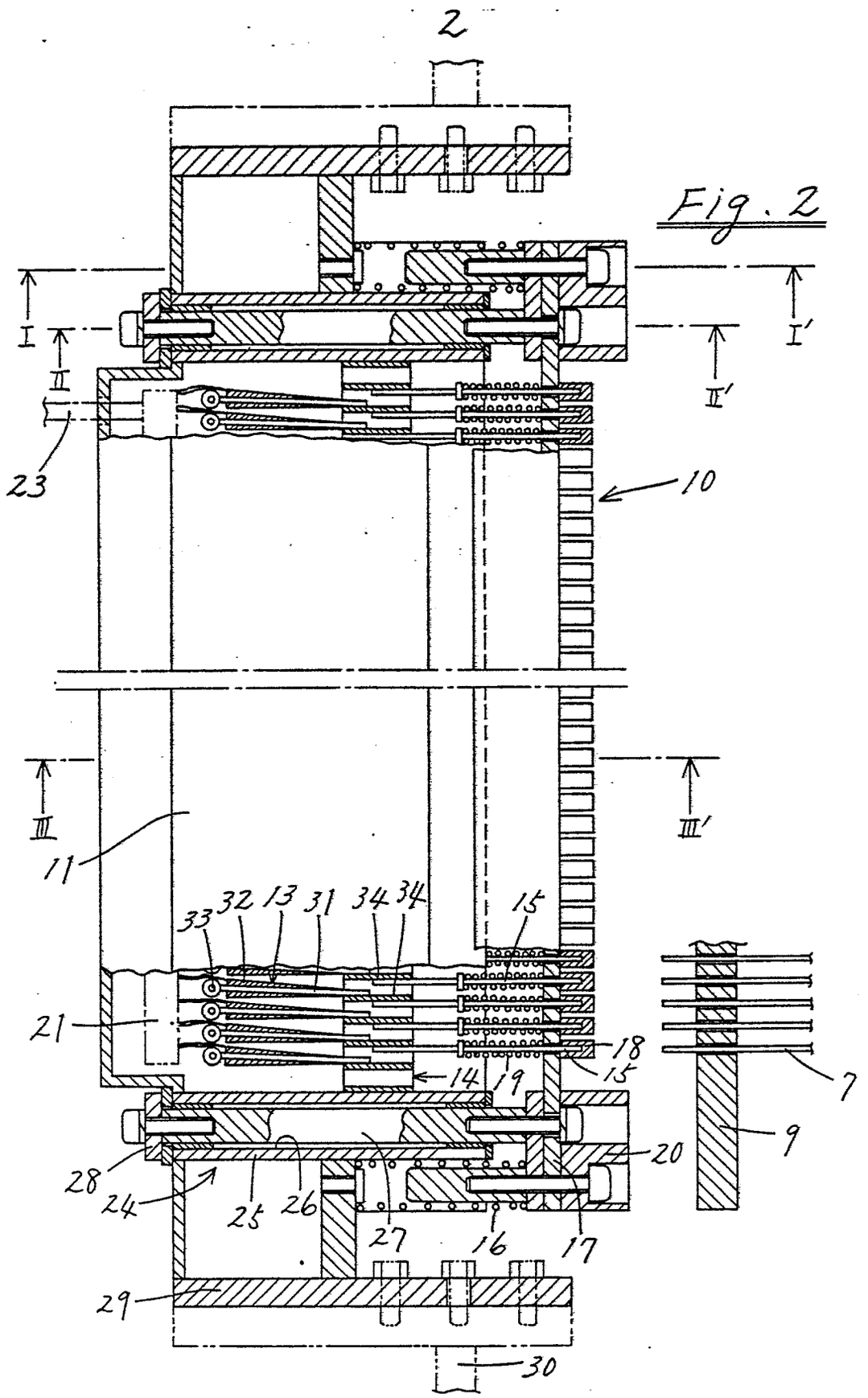
Fig. 2



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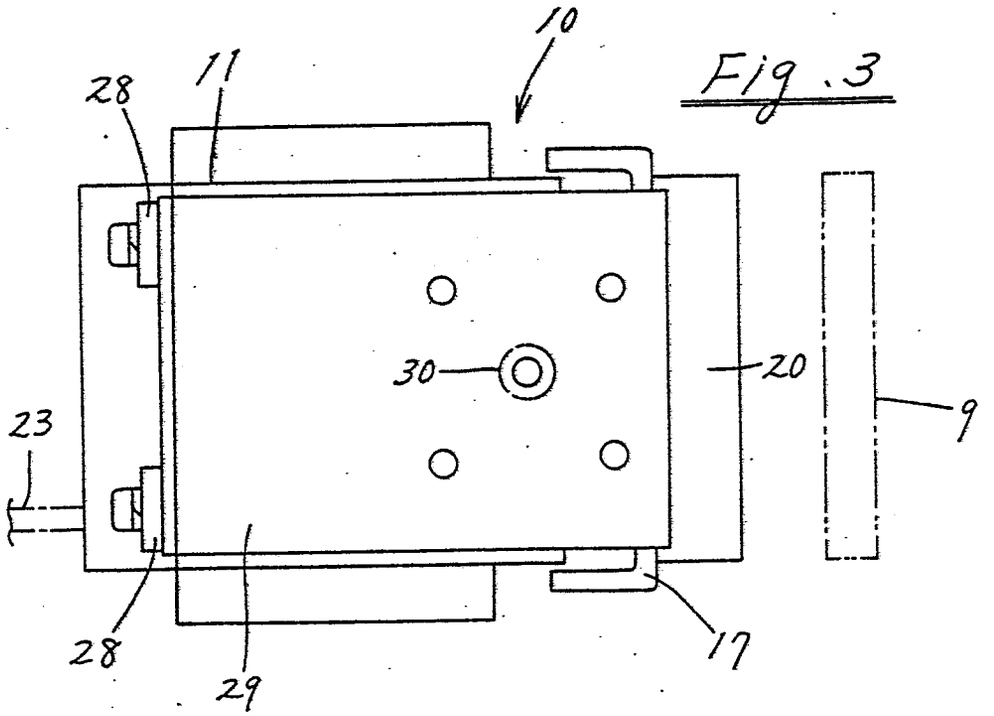

Fig. 3

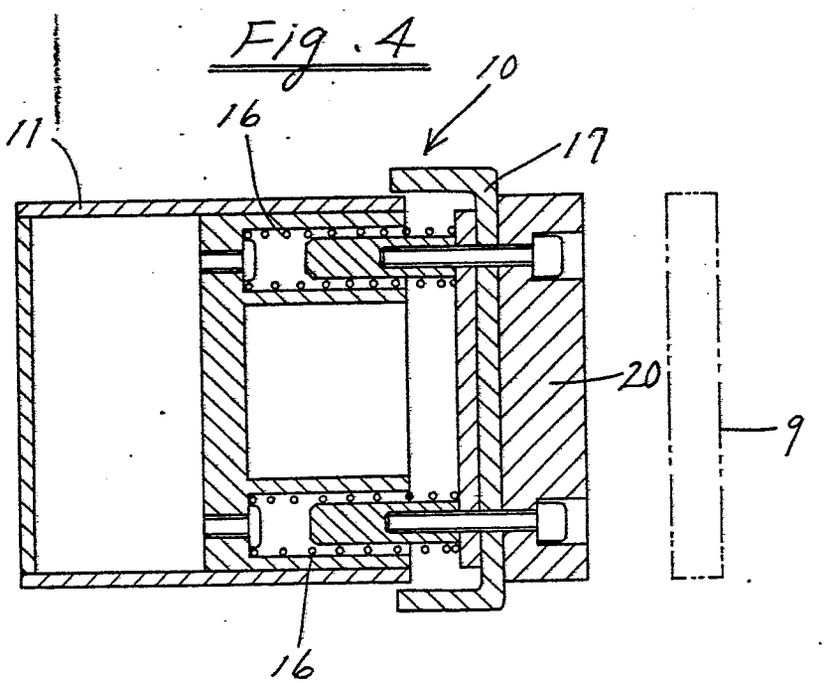

Fig. 4

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Fig. 5

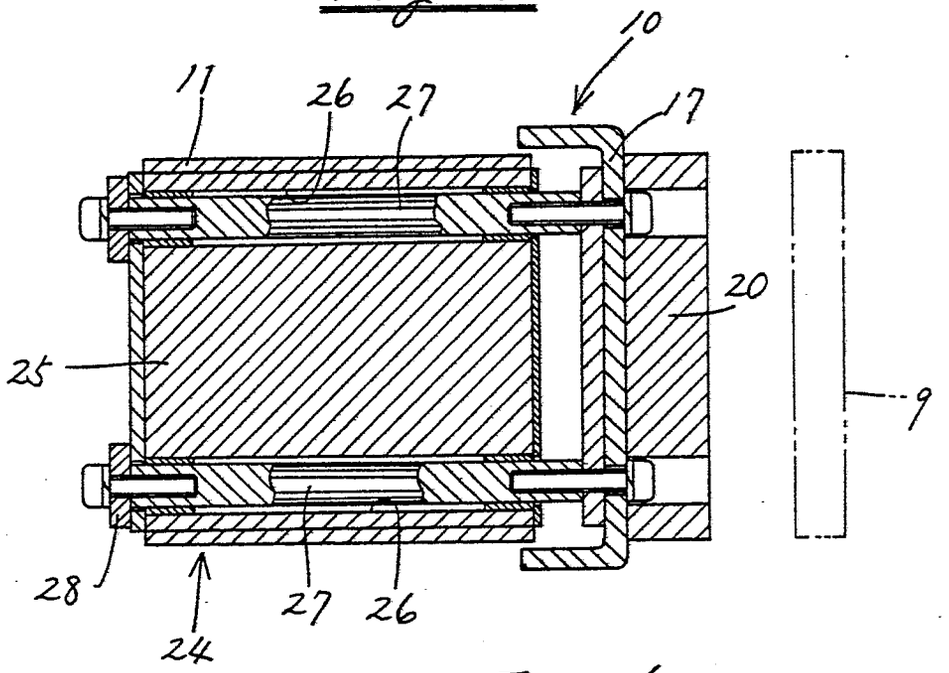

Fig. 6

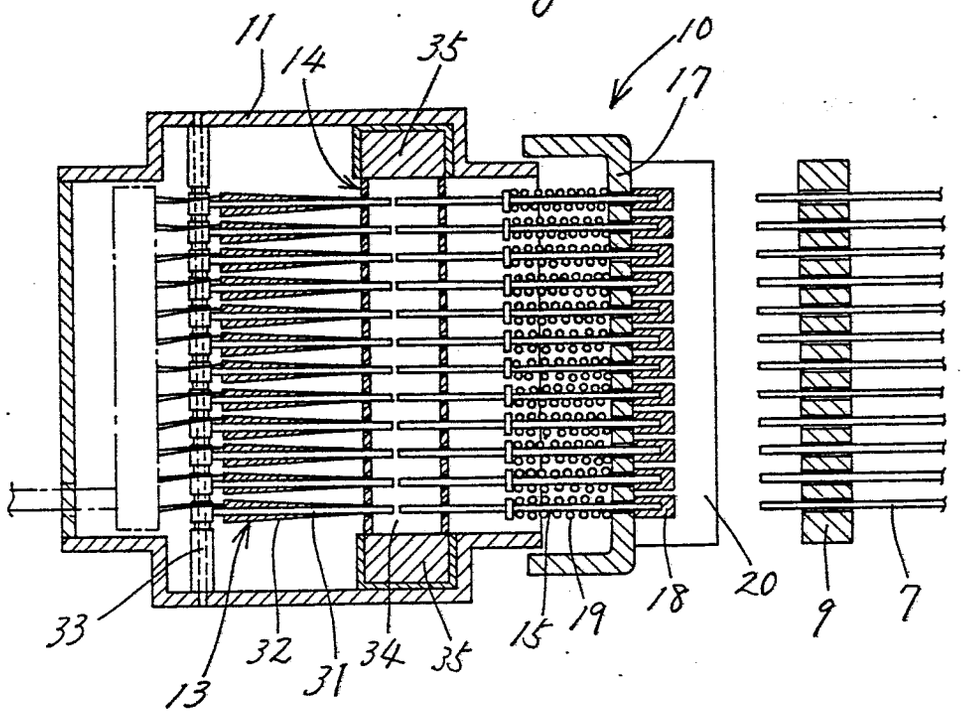

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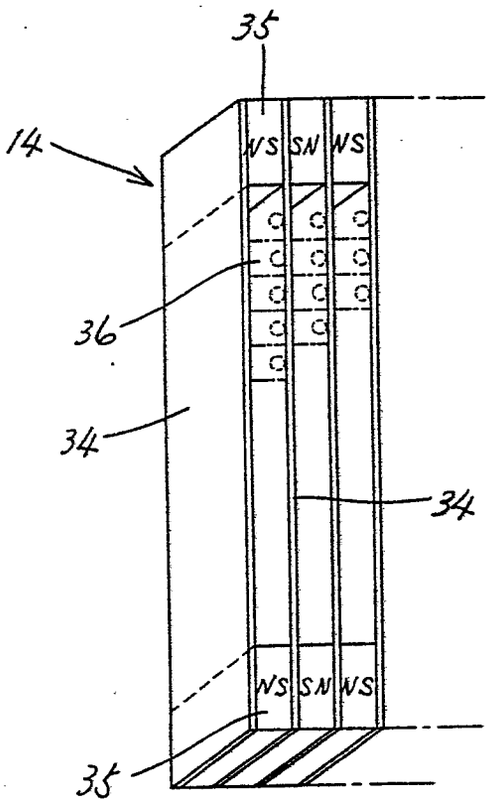
Fig. 7



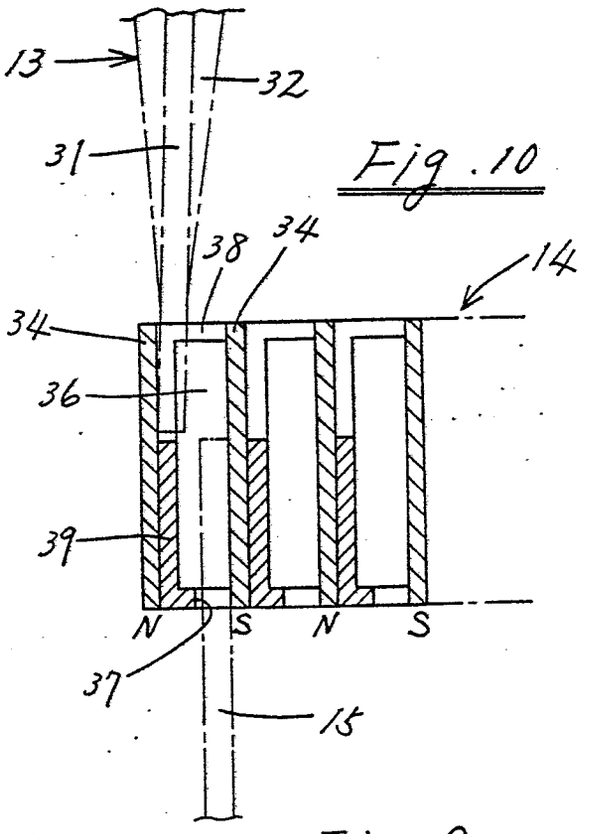
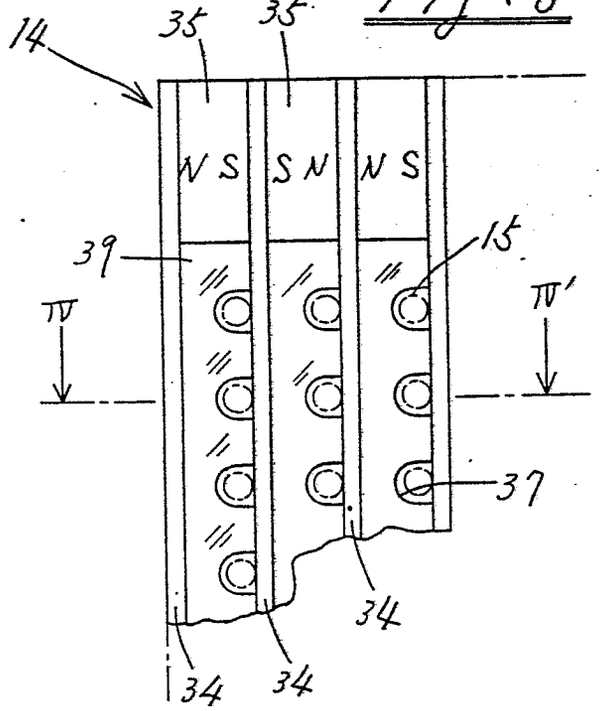
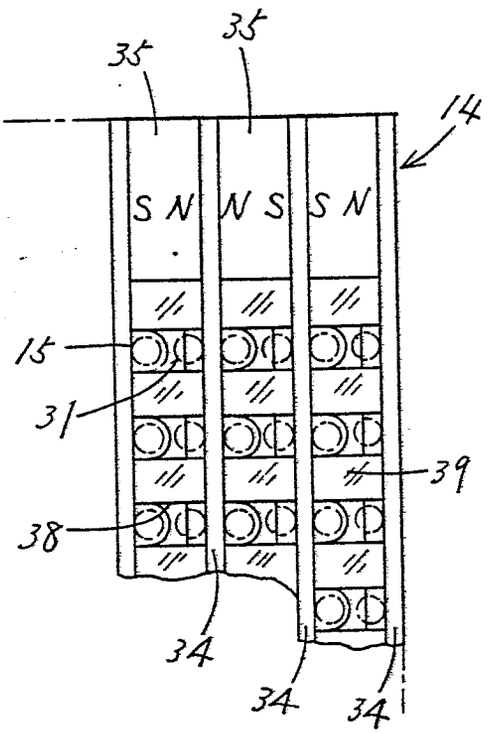


Fig. 10

Fig. 9

Fig. 8





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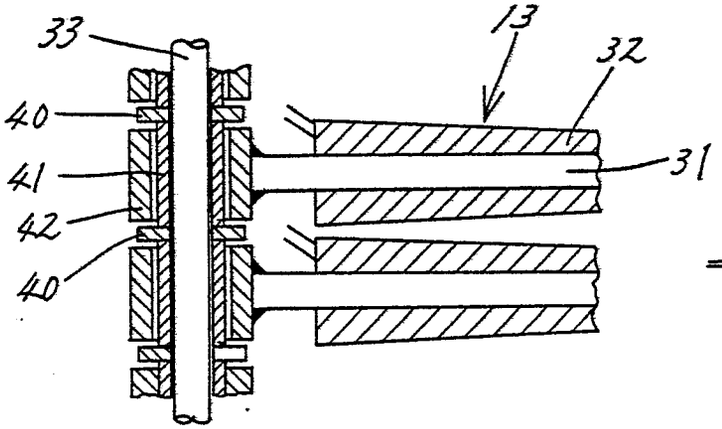

Fig. 11

Fig. 14

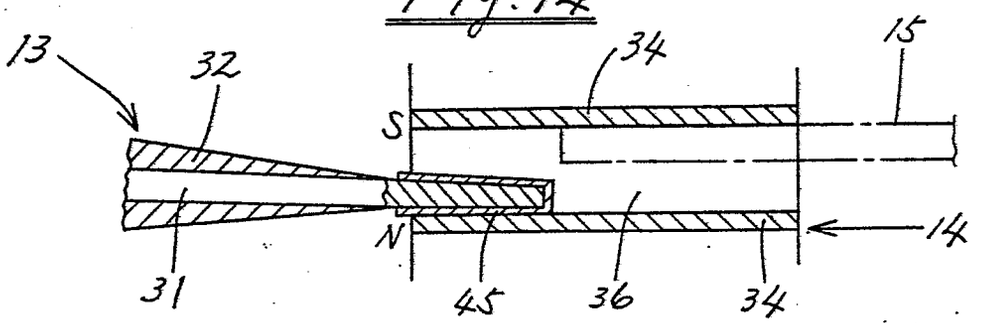

Fig. 15

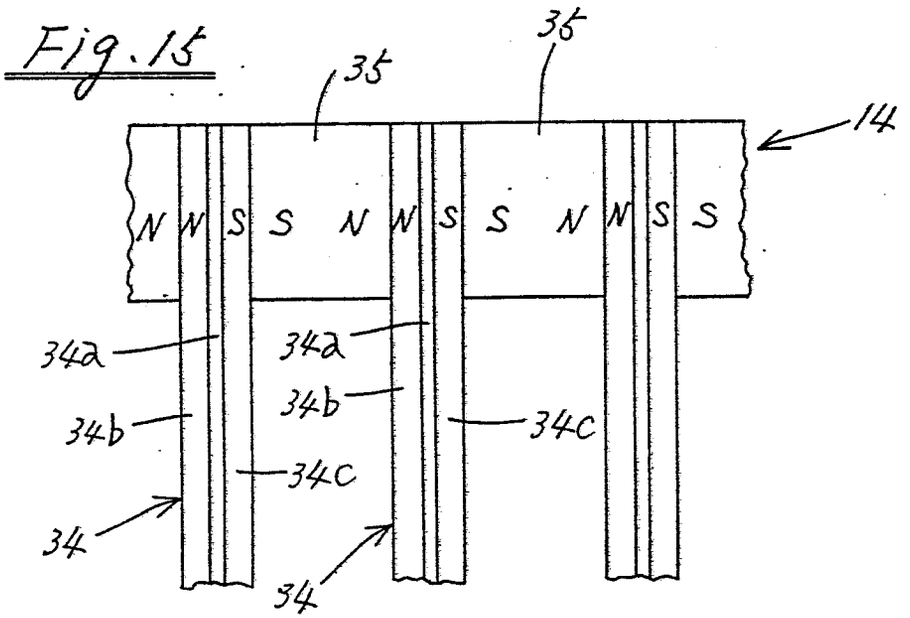

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Fig. 12

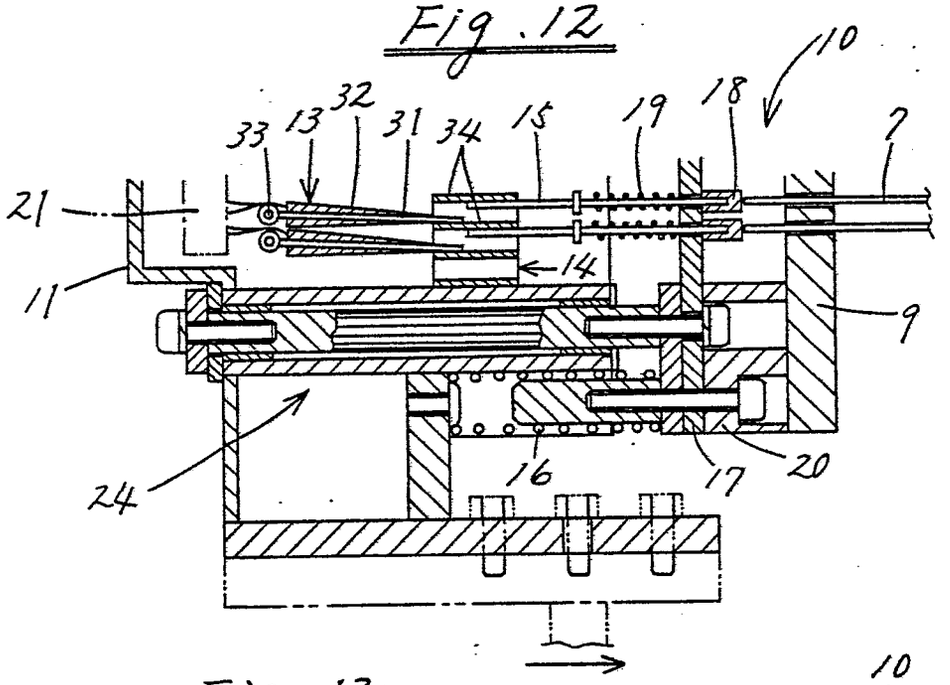

Fig. 13

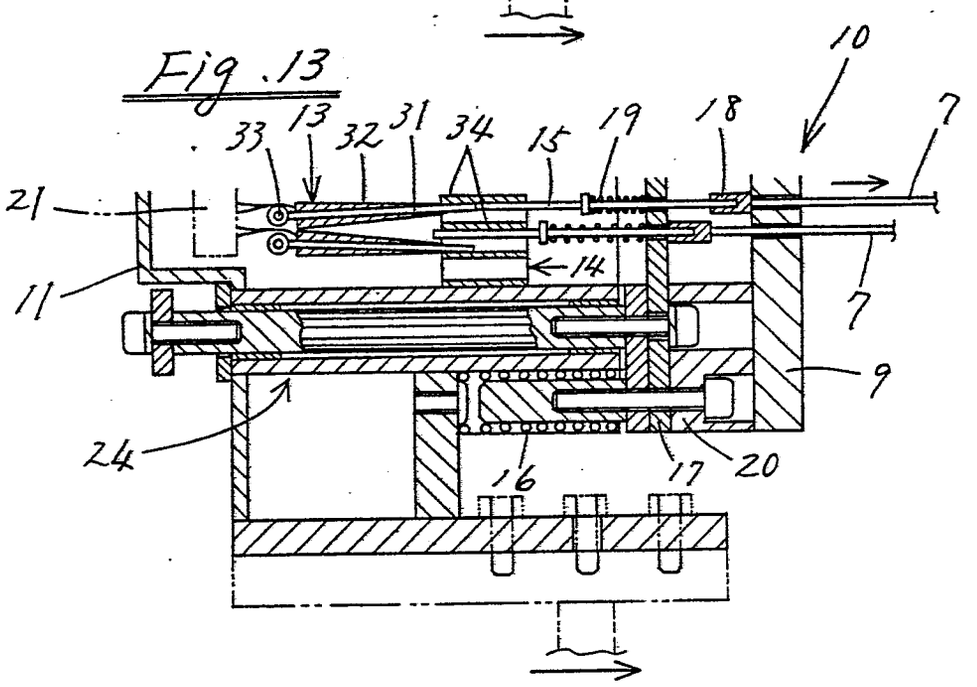

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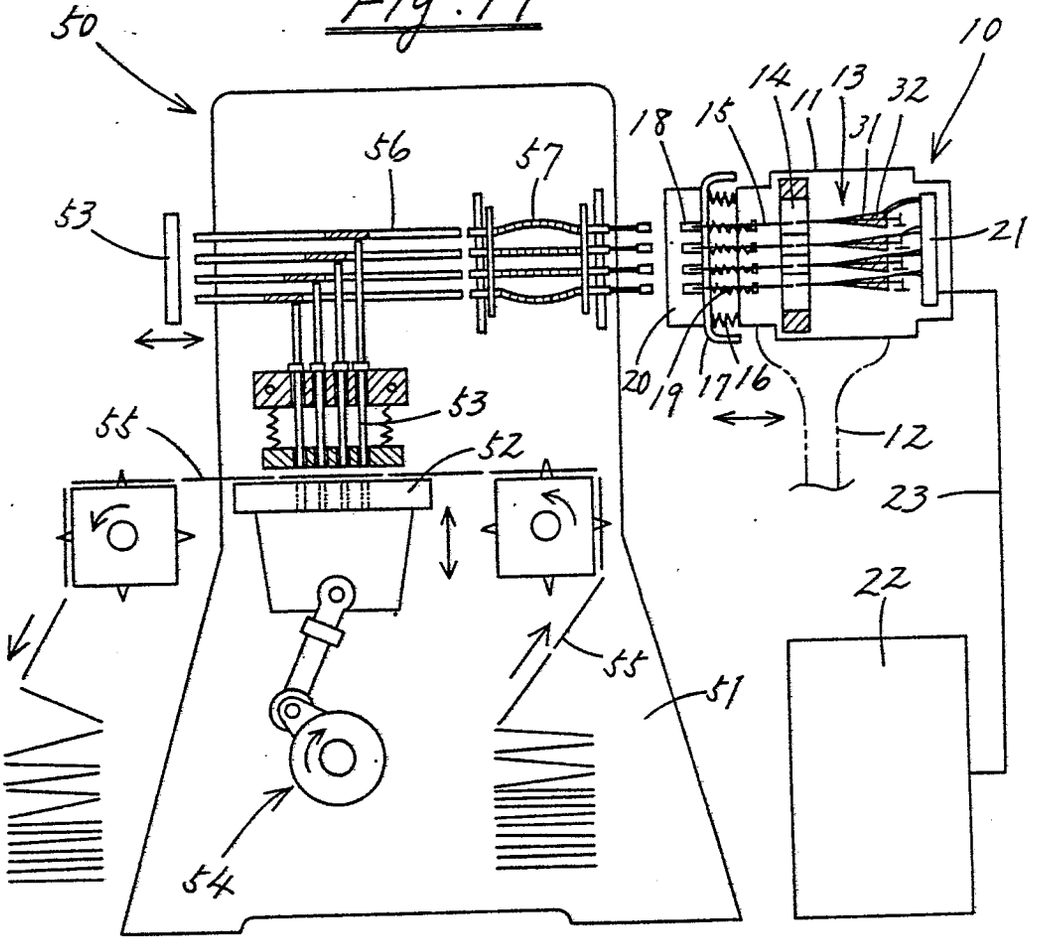
Fig. 17



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INTERNATIONAL SEARCH REPORT

International Application No PCT/JP81/00302

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.[3] D03C3/20 D03C17/06

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
Int.Cl.[3]	D03C3/20, D03C17/06

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho 1926 - 1981

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US,A, 4,139,027, 1979-02-13 Figs 1 to 10, Gebrüder Sulzer AG. "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step.	1 - 3

* Special categories of cited documents: [15]

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"L" document cited for special reason other than those referred to in the other categories

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"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention

"X" document of particular relevance

IV. CERTIFICATION

Date of the Actual Completion of the International Search [1]	Date of Mailing of this International Search Report [2]
January 18, 1982 (18.01.82)	January 25, 1982 (25.01.82)
International Searching Authority [1]	Signature of Authorized Officer [20]
Japanese Patent Office	