(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 185 766**
A1

(12) # EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(21) Application number: **85902137.0**

(51) Int. Cl.⁴: **D 04 B 15/78**

(22) Date of filing: **20.04.85**

Data of the international application taken as a basis:

(86) International application number:
PCT/JP85/00222

(87) International publication number:
WO85/04910 (07.11.85 85/24)

(30) Priority: **21.04.84 JP 79347/84**

(43) Date of publication of application:
02.07.86 Bulletin 86/27

(84) Designated Contracting States:
IT

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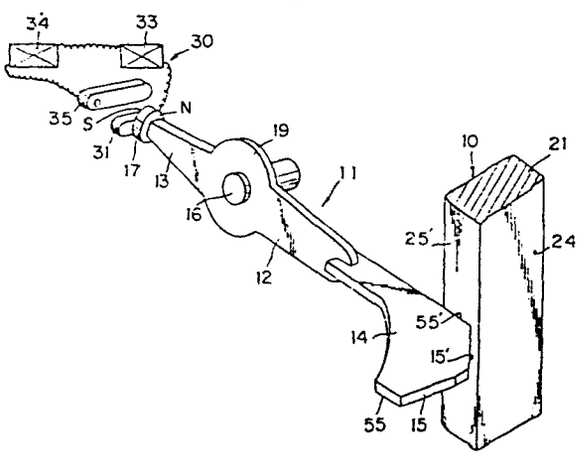
(54) **NEEDLE SELECTING DEVICE FOR CIRCULAR KNITTING MACHINES.**

(57) A needle selecting device for circular knitting machines, including a plurality of fingers each of which is supported pivotably nearly at its center position, and each of which is provided at its one end with a permanent magnet, and at the other end thereof with a pushing surface; and an U-shaped electromagnetic coil having S and N poles which are arranged vertically in opposition to the permanent magnet. When an electric current is applied to the electromagnetic coil selectively in the forward and backward directions in accordance with a certain plan, the fingers are moved pivotally, so that the pushing surfaces of the fingers and a finger-engageable butt of a jack engage each other selectively. That is, a lift cams in the circular knitting machine and a cam-engageable but of the jack engage each other selectively, thereby effecting knitting based on a predetermined pattern.

Fig.4



EP 0 185 766 A1

DESCRIPTION

TITLE OF THE INVENTION

Knitting Needle Driving Mechanism of Circular Knitting Machine

TECHNICAL FIELD

This invention relates to a knitting needle driving mechanism of a circular knitting machine.

More specifically, this invention relates to the knitting needle driving mechanism of a circular knitting machine capable of knitting a predetermined pattern by making or removing engagement between raising cams for applying vertical movement to a plurality of knitting needles on a circular cylinder of the circular knitting machine and cam butts of jacks engaging with lower ends of the knitting needles on the basis of a predetermined knitting plan.

PRIOR ART

As illustrated in Fig. 8, a jacquard circular knitting machine is comprised of a knitting cylinder 2 having a plurality of knitting needles 3, yarn feed devices 8, and a knitting needle driving mechanism 1 for transmitting a patterning procedure memorized in a patterning procedure memory 4 for vertical movement of the knitting needles. The knitting cylinder 2 is rotated through a transmitting mechanism 7 by a motor 6. The rotation of the knitting cylinder, more exactly, the rotational angle of the knitting cylinder, is detected by a decoder 5 and transmitted to the patterning procedure memory 4. A knitting procedure corresponding to the rotational angle of the knitting cylinder 2 is transferred from the patterning procedure memory 4 to the knitting needle driving mechanism 1. The patterning procedure memory 4 usually consists of a pin drum or a computer memory. A plurality of yarn 9 is fed through the yarn feed devices 8 to the knitting needles 3.

As a knitting needle driving mechanism now in wide

use, there is known the knitting needle driving mechanism as shown in Fig. 9, a main portion of which is comprised of a plurality of plates 60 arranged slidably in parallel to each other. In this mechanism, the plates 60 slide based on pins on the pin drum or signals emitted from the computer memory. When a plate 60 moves toward a center of the knitting cylinder 62, a jack 61 engaging the lower end of the knitting needle moves toward the center of the knitting cylinder, so that a cam butt provided on the lower portion of the jack 61 is disengaged from a rising cam 64. Accordingly, by controlling the sliding movement of the plate 60 by the pins or signals emitted from the memory, the vertical movement of the corresponding knitting needle is controlled and a knit cloth having the predetermined pattern can be made.

At the present, high speed drive of the jacquard circular knitting machine is desired. It is necessary to speed up the response of the knitting needle driving mechanism to achieve high speed drive of the circular knitting machine. However, there is a limit to increasing the response speed or the sliding speed of the plates in a knitting needle driving mechanism having the constitution where the plates are slid, such as the known knitting needle driving mechanism. It is possible to obtain a high speed circular knitting machine by increasing the number of the plates slid at the ordinary sliding speed, however, the knitting needle driving mechanism becomes too large due to the increased number of plates, so that it becomes difficult to arrange the knitting needle driving mechanism in a narrow space outside the circular knitting machine. Accordingly, a knitting needle driving mechanism having a small size and high response speed is strongly desired to enable a high speed jacquard circular knitting machine.

DISCLOSURE OF THE INVENTION

The object of the present invention is to provide a knitting needle driving mechanism having a small size

and high response speed for a circular knitting machine.

A knitting needle driving mechanism in accordance with the present invention is comprised of a plurality of fingers arranged substantially superimposed at intervals along the sliding direction of the knitting needles and capable of swinging in the sliding direction of the knitting needles by being pivoted at points near their central portions, an electromagnetic finger operating device arranged at a location behind the fingers for selectively swinging the corresponding fingers, and a housing for supporting the plurality of fingers and the electromagnetic finger operating device. Permanent magnets are provided on ends of the fingers remote from the knitting cylinder such that the lines connecting the two poles substantially correspond to the lengthwise directions of the fingers. The ends of the fingers near to the knitting cylinder have formed thereon pushing surfaces having a hill shape or a half hill shape in the horizontal plane and a predetermined thickness in the vertical direction. The electromagnetic finger operating device includes a plurality of electromagnetics, the S-poles and N-poles of which are attached on the housing. The S-pales and the N-pales of the electromagnets are positioned at intervals in the vertical direction so as to substantially face the end surfaces of the permanent magnets, of the fingers in the upper position and lower position of the swinging movement of the fingers. The housing includes a plurality of pivots supporting the fingers at the center portions thereof and a pair of finger guides slidably guiding in the vertical direction the two side faces, in the horizontal direction, of the plurality of fingers at the pushing side. The surfaces of the finger guides facing the knitting cylinder are parallel to the lengthwise direction of the knitting cylinder and extend in direction away from the fingers to form lead surfaces for finger butts of jacks abutting the lower ends of the

knitting needles. In the knitting needle driving mechanism in accordance with the present invention, the electromagnets of the electromagnetic finger operating device are supplied selectively with plus or minus currents in accordance with a predetermined plan, whereby the fingers swing and select the engagement between the pushing surfaces of the fingers and the finger butts of the jacks. The engagement between a raising cams and cam butts of the jacks is thereby selected and knitting of the predetermined pattern becomes possible.

Since the main portion of the knitting needle driving mechanism in accordance with the present invention is comprised of a plurality of swingable fingers as described hereinbefore and the swinging movement of the fingers is performed by an attractive force and a repelling force of electromagnets against the permanent magnets arranged on the ends of the fingers, the knitting needle driving mechanism can be operated at a high response speed compared with the conventional known knitting needle driving mechanism operated by the sliding movement of the fingers. Further, since the construction of the device of the present invention is simple, the device can be manufactured at low cost. Also, it is possible to save on electric power consumed in operating the device.

Still more, the finger guides of the knitting needle driving mechanism according to the present invention have formed thereon lead surfaces for the finger butts of the jacks engaging the lower ends of the knitting needles so that any butt protruding outward of the knitting cylinder for any reason is corrected in advance by the lead surfaces. Consequently, there is no chance that a finger butt of a jack will directly abut a finger, thus minimizing the chance of damage to the fingers.

In the knitting needle driving mechanism in

accordance with the present invention, it is preferable that the relative position between the fingers and the finger guides be determined such that, at the swinging position in which the pushing surfaces of the fingers engage with the finger butts of the jacks abutting the lower ends of the knitting needles, the two end edges of the pushing surfaces of the fingers, i.e., the hill shape portions, furthest from the knitting cylinder, or the end edge of half hill shaped portions remote from the knitting cylinder, be positioned in the same plane as the finger butt lead surfaces of the finger guides or move inward of the finger guides than the lead surfaces. The knitting needle driving mechanism having the aforesaid construction enables smooth contact of the finger butts positioned on the lead surfaces with the fingers, so the risk of damage to the fingers can be reduced and, as a result, the durability of the knitting needle driving mechanism can be significantly increased.

If the pushing surfaces are formed in a hill shape, the knitting needle driving mechanism in accordance with the present invention can be used when the circular knitting cylinder is rotated in the normal direction and the reverse direction. Incidentally, when the circular cylinder is rotated in one direction, pushing surfaces formed in a half hill shape may be used.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front elevation of a knitting needle driving mechanism illustrating an embodiment according to the present invention;

Fig. 2 is a side view along the line II to II of Fig. 1;

Fig. 3 is a side view along the line III to III of Fig. 1;

Fig. 4 is an enlarged perspective view illustrating a relative relation among a finger, an electromagnetic finger operating device and a housing in the knitting needle driving mechanism illustrated in Fig. 1;

Figs. 5 and 6 are front elevations illustrating a model relationship between an operative state of the knitting needle driving mechanism and a butt of a jack and a raising cam, Fig. 5 showing the case where the butt does not abut the raising cam and Fig. 6 showing the case where the butt abuts the raising cam;

Fig. 7 is a plan view illustrating a shape of a pushing member and a relative position between the pushing member and the housing;

Fig. 8 is a perspective view illustrating an example of a conventional known jacquard circular knitting machine; and

Fig. 9 is a partial cross-sectional side view illustrating a conventional known knitting needle driving mechanism.

BEST MODE FOR CARRYING OUT THE INVENTION

The present invention will be described hereinafter in connection with the accompanying drawings showing an embodiment of the present invention.

As illustrated in Fig. 1, the knitting needle driving mechanism of the embodiment is comprised of eight fingers 11, an electromagnetic finger operating device 30 arranged behind the fingers 11, and a housing 20 supporting the eight fingers 11 and the electromagnetic finger operating device 30. Though eight fingers are shown in the knitting needle driving mechanism according to the present embodiment, the number of fingers is not particularly limited. At least 16 fingers are used in conventional (sliding movement type) knitting needle driving mechanisms. A knitting needle driving mechanism with a small number of fingers is preferable, because it is possible to make the external dimensions smaller. Since, in the embodiment according to the present invention, the operation of the knitting needle driving mechanism can be made high speed, as described hereinafter, it is possible to form the knitting needle driving mechanism with eight fingers.

Incidentally, the ideal number of fingers in a knitting needle driving mechanism is just one.

As illustrated in the enlarged perspective view of Fig. 4, a finger 1 is comprised of a finger central portion 19 supported rotatively by a pivot 16, a first arm 12 and a second arm 13 extending from the finger central portion 19 to the two sides, a pushing member 14 attached to a top end of the first arm 12, and a permanent magnet 17 attached to a top end of the second arm 13. The top end of the pushing member 14 is substantially formed in a hill shape in the horizontal plane including the lengthwise axis of the finger 11 and inclined surfaces thereof form pushing surfaces 15, 15'. The permanent magnet 17 is formed such that the line connecting the two poles, i.e., S-pole and N-pole, corresponds to the lengthwise direction of the finger 11.

In the electromagnetic finger operating device, a pair of electromagnets is arranged for each finger 11. The pair of the electromagnets includes two electromagnetic coils 33 and 34 and electromagnet ends 31 and 35 provided on each electromagnetic coil 33 and 34 to form a U-shape electromagnetic coil, as illustrated in Fig. 4. Incidentally, though Fig. 4 shows that the two electromagnet ends 31 and 35 connected with the electromagnetic coils 33 and 34 by leading wires, this is for convenience in explanation. In actuality, as illustrated in Fig. 1, the electromagnet ends are the ends of the core of the electromagnetic coil. The electromagnet ends 31 and 35 are arranged in a rear vertical plate 22 of the housing 20, as illustrated in Fig. 3. Namely, the electromagnet ends 31a and 35a in Fig. 3 are ends of the core of the pair of electromagnetic coil 33a and 34a. When current flows to each electromagnetic coil to energize them, it is possible to reverse the states, e.g., change a plus state of the electromagnet end 35a and a minus state of the electromagnet end 31a to a minus state of the electromagnet end 35a and a plus state of the electro-

magnet end 31a, by changing the direction of the electric current. The change of the direction of the electric current is usually performed by means of transistors, so that the change between the plus state and the minus state of the electromagnet surface can be performed at an extreme high speed.

As described hereinbefore, eight fingers are arranged in the present embodiment. With regard to an arrangement of the fingers, the pushing surfaces 15 and 15' (for simplification, in Fig. 2, the reference numerals are given only to the pushing surfaces 15a, 15b ... and 15h on one side) are arranged at intervals in the vertical direction in Fig. 2 (which coincides with the sliding direction of the knitting needles). However, in the present embodiment, four fingers of the eight fingers are pivotably supported at a front side and the other four fingers (not shown in Fig. 1) at the back side by forming the pushing member 14 of the rear portion of the pushing surface 15 in a sickle-like shape as illustrated in Fig. 4. Therefore, the electromagnet surfaces corresponding to the permanent magnets 17 on the ends of the eight fingers are arranged such that four pairs are at the left and four pair are at the right. By arranging the eight fingers are described hereinbefore, the eight finger central portions 19 are separated into two groups; a left 19a, 19b, 19c, and 19d and a right 19e, 19f, 19g and 19h in Fig. 2. Consequently, the finger central portions 19 and the pivots 16 can be designed to dimensions sufficient to withstand the high speed sliding of the fingers 11 and, as a result the durability of the knitting needle driving mechanism according to the present invention can be increased. On the other hand, it is possible to make a knitting needle driving mechanism having the same strength with a smaller overall size.

Further, it is preferable that the space between the permanent magnets 17 and the electromagnetic ends 31

and 35 of the electromagnetic finger drawing mechanism 30 be such that the two approach each other without actual contact.

Next, the relationship between the housing 20 and the fingers 11 will be described. The housing 20 includes a pivot support member (not shown) extending in the vertical direction in the roughly central portion of the housing 20. The pivot support member supports four pivots 16 on both sides thereof. On the other hand, the housing includes a front vertical plate, i.e., a finger guide 21. The finger guide 21 is provided with an opening 23 having a substantially rectangular shape. The pushing surfaces 15 and 15' of the fingers 11 protrude into the opening 23. The opening 23 may be formed as a slit extending from a top end to a lower end of the housing 20. The relative position between the finger guide 21 and the pivots 16 supporting the fingers 11 is determined such that the space between the side walls 25 and 25' of the opening 23 (see Figs. 2 and 4) is set slightly larger than the distance between the side walls 55 and 55' of the pushing member 14 and such that at least one portion of the pushing surface 15 protrudes from the lead surface 24 of the finger guide 21.

An operation of the fingers 11 of the knitting needle driving device according to the present embodiment and the moving state of a cam butt (leveling butt) of the jack caused by the operation will be now described in connection with Figs. 5 and 6. In Figs. 5 and 6, 40 is a jack. The jack 40 is provided with a finger butt 41 and a cam butt 42. In Fig. 5, the S-pole at the end of the permanent magnet 17 of the finger 11 faces an electromagnet end 31, the end face of which is an N-pole, so that the finger 11 is kept in the horizontal plane in Fig. 5. Consequently, the finger butt 42 of the jack 40 on the knitting cylinder (not shown) abuts the pushing surface 15 of the finger 11, so that the jack 40 is

turned in the counterclockwise direction. Therefore, the cam butt 42 of the lower end of the jack 40 does not abut a raising cam 43 arranged on a machine frame of the circular knitting machine, so that the jack 40 and the knitting needle (not shown) engaging the jack 40 do not receive a raising movement caused by the raising cam 43.

Reversal of the direction of the electric current of the electromagnetic coil by the electromagnet ends 31 and 35 as shown in Fig. 6 results in the S-pole of the permanent magnet being attracted, from the position of Fig. 5, by the N-pole appearing at the electromagnet end 35 and repelled by the S-pole appearing at the electromagnet end 31, whereby the pushing surface of the end of the figure 11 is moved down. When the knitting cylinder rotates in this state, the finger butt 41 of the jack 40 on the knitting cylinder does not abut the pushing surface 15 and the jack 40 is maintained in roughly the vertical position in Fig. 6. The cam butt 42 of the jack 40 maintaining its vertical position and rotating with the knitting cylinder abuts the raising cam 43 and guided by the triangle shape side edge to rise, so that the knitting needle engaging with the top end of the jack is raised.

Incidentally, the relative position between the pushing surface 15 of the finger 11 and the finger butt 41 of the jack 40 may be constituted, conversely to Fig. 6, so that engagement between the finger butt 41 and the pushing surface 15 is released by upward movement of the pushing surface 15.

As described hereinbefore, the swinging movement of the finger 11 is performed by changing the direction of the electric current toward the electromagnetic coils 33 and 34. Since the change of the direction of the electric current is performed by a usual transistor, it can be effected at a high speed. Since the finger can change in position by a swinging movement about the pivot 16, the finger rapidly responds to the attraction

between different poles of the electromagnets and the repulsion between the same poles of the electromagnets to change in position. Consequently, the pushing surface of the finger can be inserted to or removed from a position engaging with the finger butt of the jack at a higher speed compared with any conventional known knitting needle driving mechanism.

The shape of the pushing member 14 and the relative position between the finger guide 21 and the pushing member 14 in the housing 20 are now described in connection with Fig. 7.

The pushing member 14 may be formed in a hill shape having inclined pushing surfaces 15 and 15' on its two sides, as illustrated in Fig. 7 (a), (b), (c), (d), and (e), or in a half hill shape having an inclined pushing surface 15' on only one side, as illustrated in Fig. 7(f). In the former case, when the knitting cylinder can rotate in two directions, i.e., the normal direction and the reverse direction, rotation in the two directions of th knitting cylinder can be handled by a single knitting needle driving mechanism. The latter pushing member can be used only for rotation in one direction of the knitting cylinder.

The relative position between the finger guide 21 and the pushing member 14 may be determined such that the pushing surfaces 15 and 15' of the pushing member 14 are completely exposed from the lead surface 24 and 24' and further portions of side walls 55 and 55' of the pushing member 14 are exposed from the lead surface 24 and 24' as illustrated in Fig. (e). However, it is preferable that the relative position between the finger guide 21 and the pushing member 14 be determined such that points 56 and 56', at which the pushing surfaces 15 and 15' meet the side walls 55 and 55', are arranged within the lead surfaces 24 and 24' as illustrated in Fig. 7(a); or the points 56 and 56' coincide with the lead surfaces 24 and 24', as illustrated in Fig. 7(b).

When the relative position between them is determined as illustrated in Fig. 7(a) or Fig. 7(b), the jack butt 41 advancing toward the pushing surfaces 15 and 15' under the guide of the lead surface 24 or 24' can ride on the pushing surface 15 or 15' without receiving any resistance and can move by being pushed by the pushing surface 15 or 15', more concretely, by the jack butt being pushed toward an axis of the knitting cylinder.

Since the lead surfaces 24 and 24' serve to push the jack to a suitable level when the jack jumps out in the radial direction of the knitting cylinder by centrifugal force itself or damage itself, the lead surface can prevent the finger butt from damaging the finger of the knitting needle driving mechanism. Further, the angle of inclination of the lead surfaces 24 and 24' may be such that the lead surfaces 24 and 24' are in the horizontal plane in Fig. 7, as illustrated in Fig. 7(a) and Fig. 7(b) are inclined outward as illustrated in Fig. 7(c), or inclined inward as illustrated in Fig. 7(d). The position of Fig. 7(c) helps to slowly push in a protruding jack, and the position of Fig. (d) helps to push in an abnormally protruding jack.

Though the leads surfaces 24 and 24' of the finger guide 21 are formed as flat planes, the shape of the lead surfaces is not limited to a flat plane and may be formed as an arc-like shape.

CAPABILITY OF EXPLOITATION IN INDUSTRY

Since the knitting needle driving device according to the present invention is constituted as described hereinbefore, the movement of the pushing surface of a finger for selecting a needle is very speedy. Therefore, it is possible to make the knitting needle driving mechanism small by decreasing the number of fingers compared with the conventional knitting needle driving mechanism. Further since the construction of the device is simple, the device according to the present invention has advantages of low cost manufacture of the device and

significant savings in power consumption.

Further, when the two edges of the pushing surface of the pushing member are arranged within the lead surface of the housing, as indicated in the preferred embodiment of the present invention, it is possible to prevent fingers in the knitting needle driving mechanism from being damaged by the butt on the rotating knitting cylinder.

CLAIMS

1. A knitting needle driving mechanism of a circular knitting machine able to knit a predetermined pattern by making or removing engagement between raising cams for applying vertical movement to a plurality of knitting needles on a circular cylinder of the circular knitting machine and cam butts of jacks engaging with lower ends of the knitting needles on the basis of a predetermined knitting plan: characterized in that said knitting needle driving mechanism is comprised of a plurality of fingers arranged substantially superimposed at intervals along a sliding direction of the knitting needles and capable of swinging in the sliding direction of the knitting needles by being pivoted at points near their central portions, an electromagnetic finger operating device arranged at a location behind the fingers for selectively swinging the corresponding fingers, and a housing for supporting the plurality of fingers and the electromagnetic finger operating device; permanent magnets being provided on ends of the fingers remote from the knitting cylinder such that the lines connecting the two poles substantially correspond to the lengthwise directions of the fingers; the ends near to the knitting cylinder fingers having formed thereon pushing surfaces having a hill shape or a half hill shape in the horizontal plane and a predetermined thickness in the vertical direction; said electromagnetic finger operating device including a plurality of electromagnets, S-poles and N-poles of which are attached on the housing, the S-poles and the N-poles of the electromagnets positioned at intervals in the vertical direction so as to substantially face the end surface of the permanent magnets of the fingers in the upper position and lower position of the swinging movement of the fingers; said housing including a plurality of pivots supporting the fingers at the center portions thereof and a pair of finger

guides slidably guiding in the vertical direction the two side faces, in the horizontal direction, of the plurality of fingers at the pushing side; the surfaces of the finger guides facing the knitting cylinder being parallel to the lengthwise direction of the knitting cylinder and extending in direction away from the fingers to form lead surfaces for finger butts of jack abutting the lower ends of the knitting needles; the electromagnets of the electromagnetic finger operating device being supplied selectively with plus or minus currents in accordance with a predetermined plan, whereby the fingers swing and select the engagement between the pushing surfaces of the fingers and the finger butts of the jacks; whereby the engagement between raising cams and cam butts of the jacks is thereby selected and knitting of the predetermined pattern becomes possible.

2. A knitting needle driving mechanism according to claim 1, characterized in that relative positions between said fingers and said finger guides are determined such that, in the swinging position in which the pushing surfaces of the fingers engage with the finger butts of the jacks engaging the lower ends of the knitting needles, both edges of the hill shape portions remote from the knitting cylinder or an edge of the half hill shape portions, forming the pushing surfaces of the fingers, remote from the knitting cylinder are positioned in the same plane as the finger butt lead surfaces of the finger guides or an inward position of the finger guides compared with said finger butt lead surfaces.

3. A knitting needle driving mechanism according to claim 1 or claim 2, characterized in that said ends of the fingers near to the knitting cylinder are formed in a hill shape in the horizontal plane to constitute said pushing surfaces.

4. A knitting needle driving mechanism according to claim 1 or claim 2, characterized in that said ends

of the fingers near to the knitting cylinder are formed in a half hill shape in the horizontal plane to constitute said pushing surfaces.

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Fig. 1

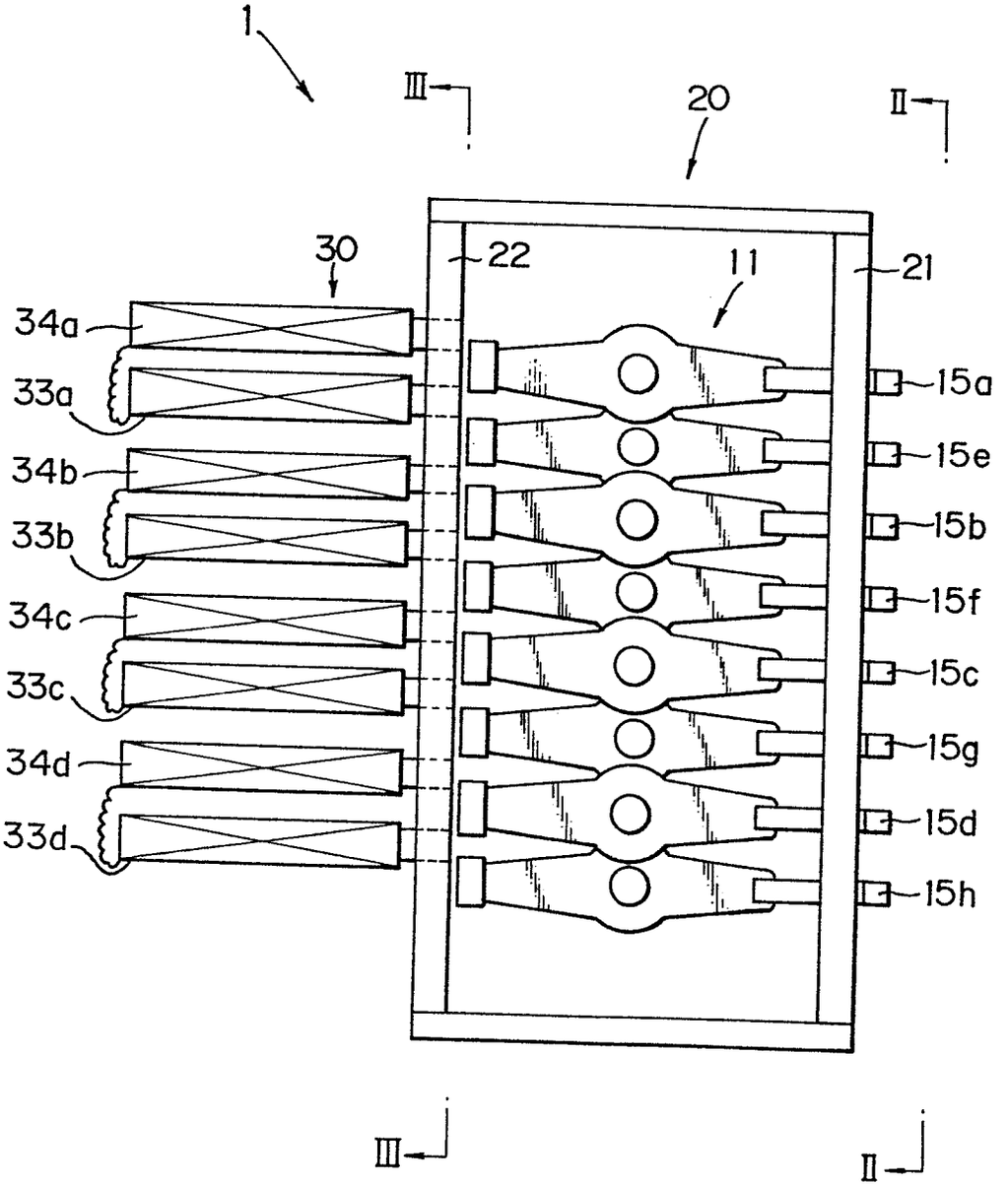

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Fig.2

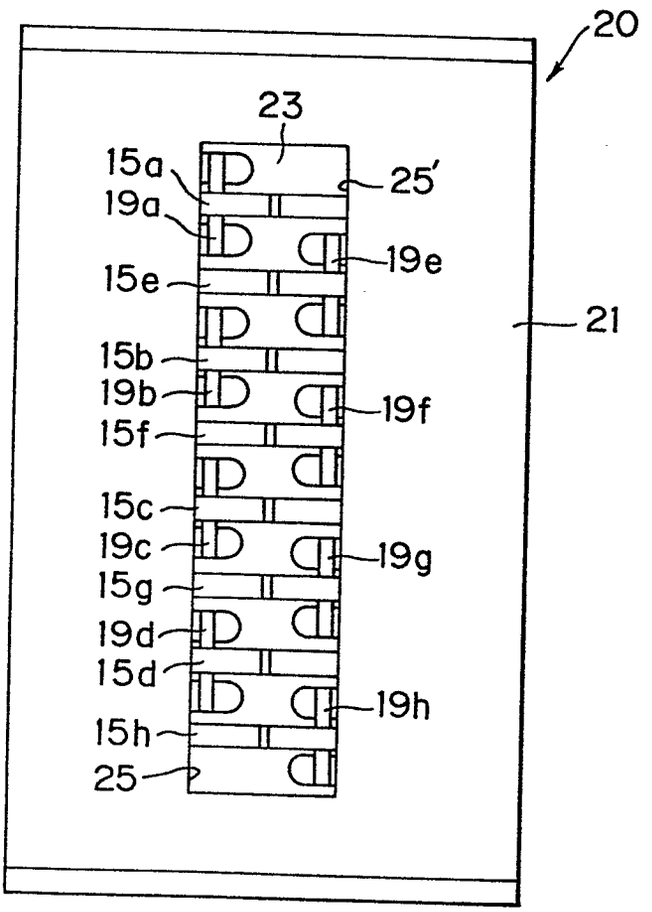

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Fig.3

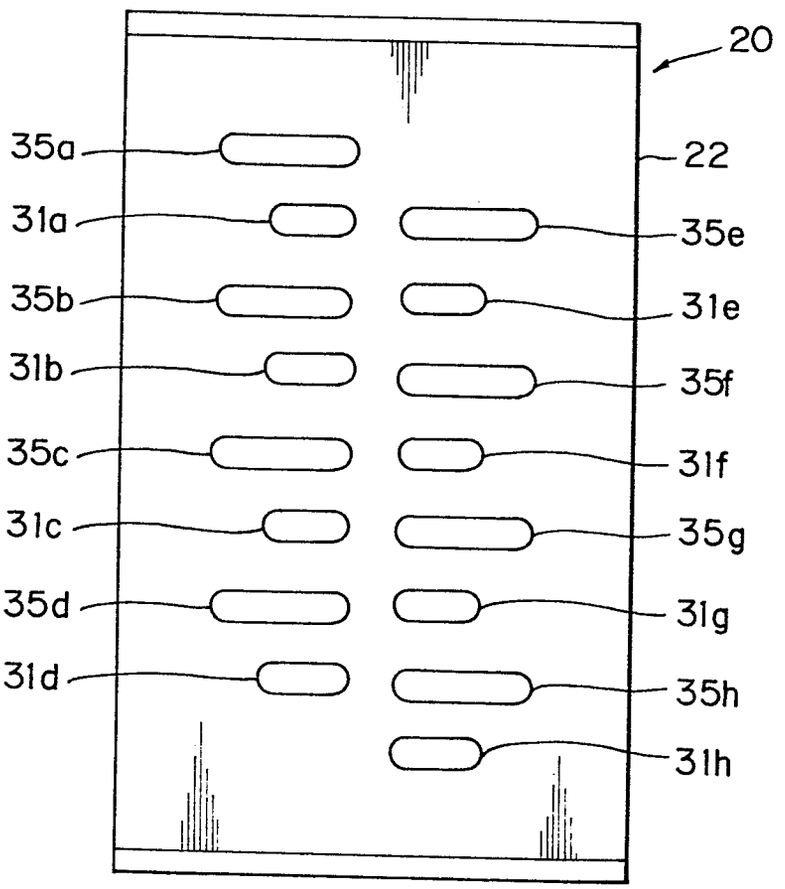

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Fig.4

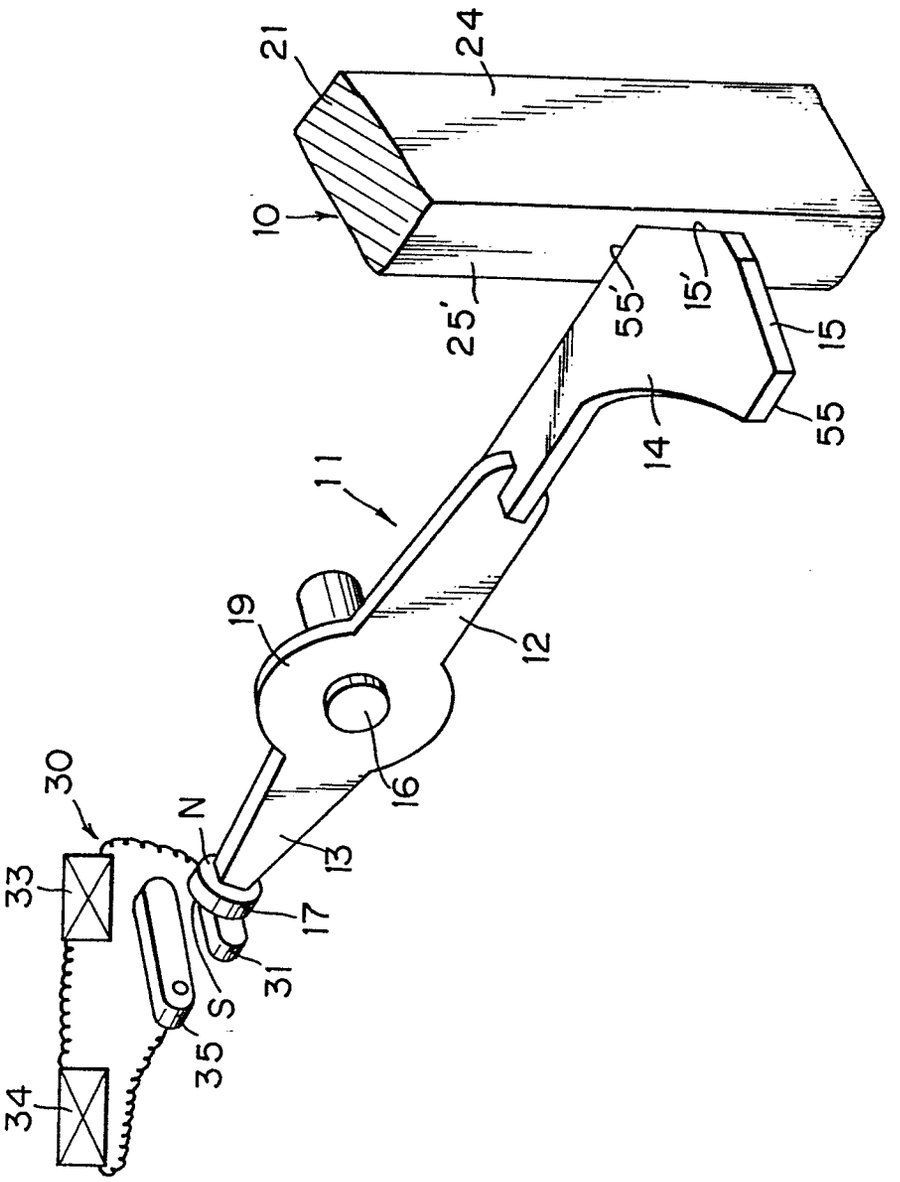

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Fig.5

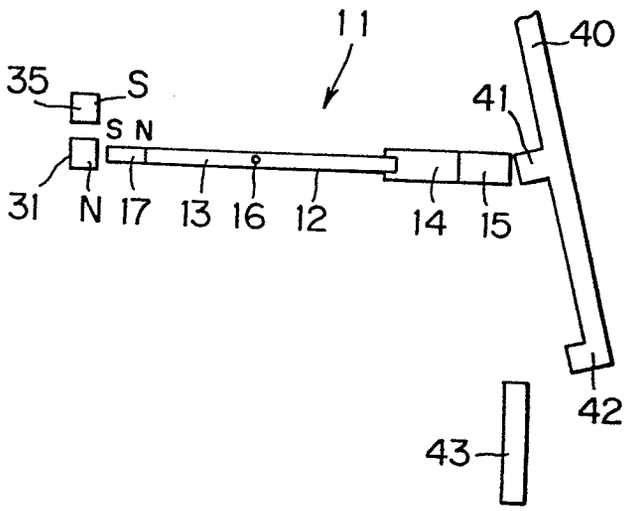


Fig.9

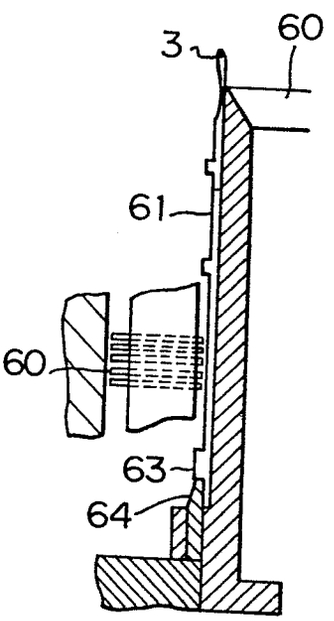


Fig.6

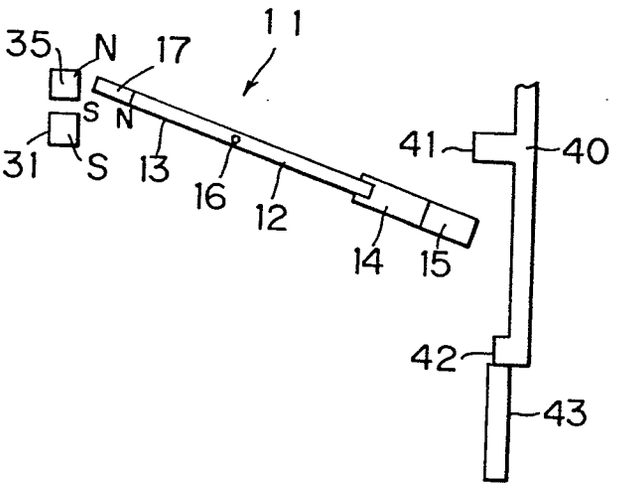
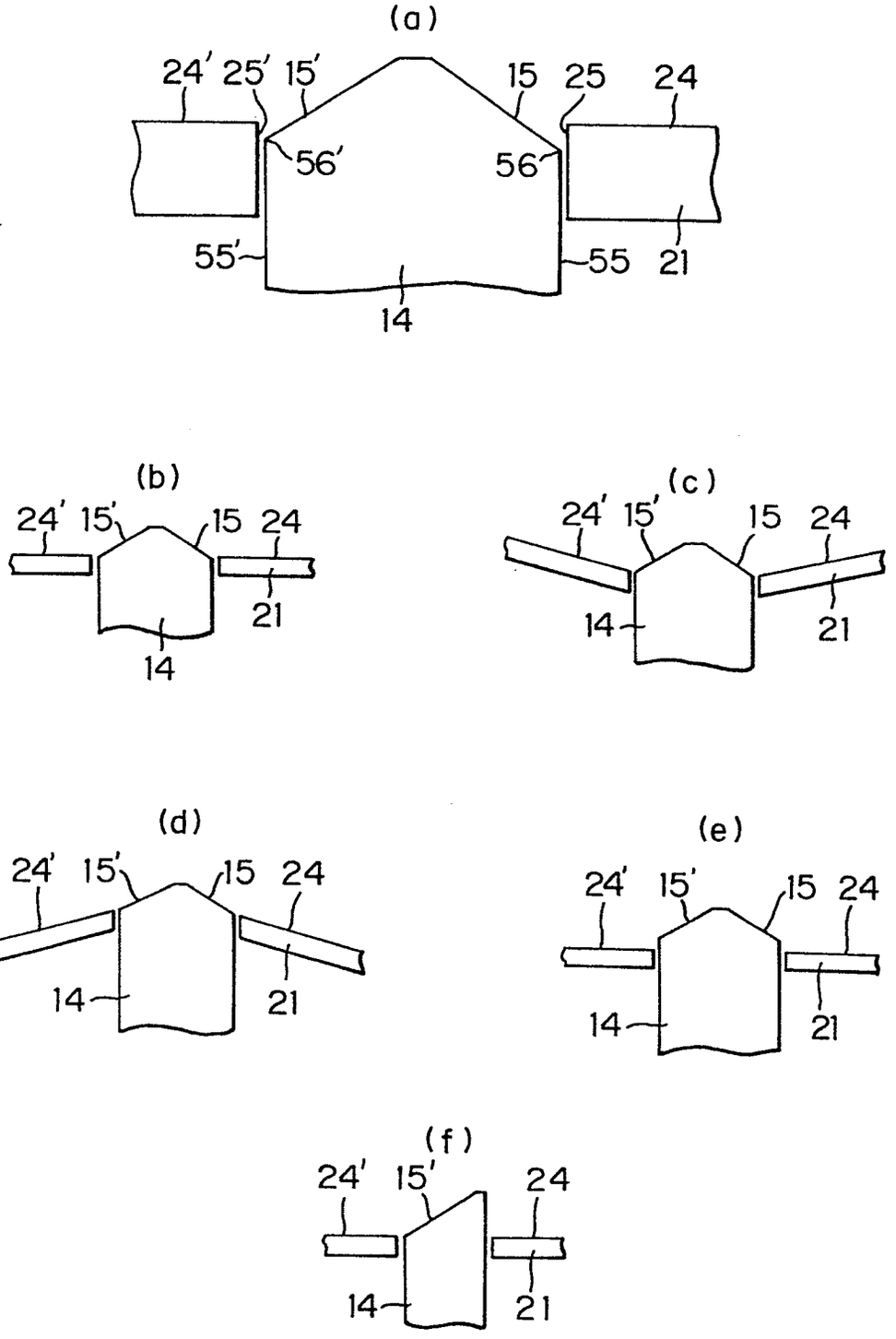


Fig.7


(a)
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56'
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55'
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(b)
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(c)
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(e)
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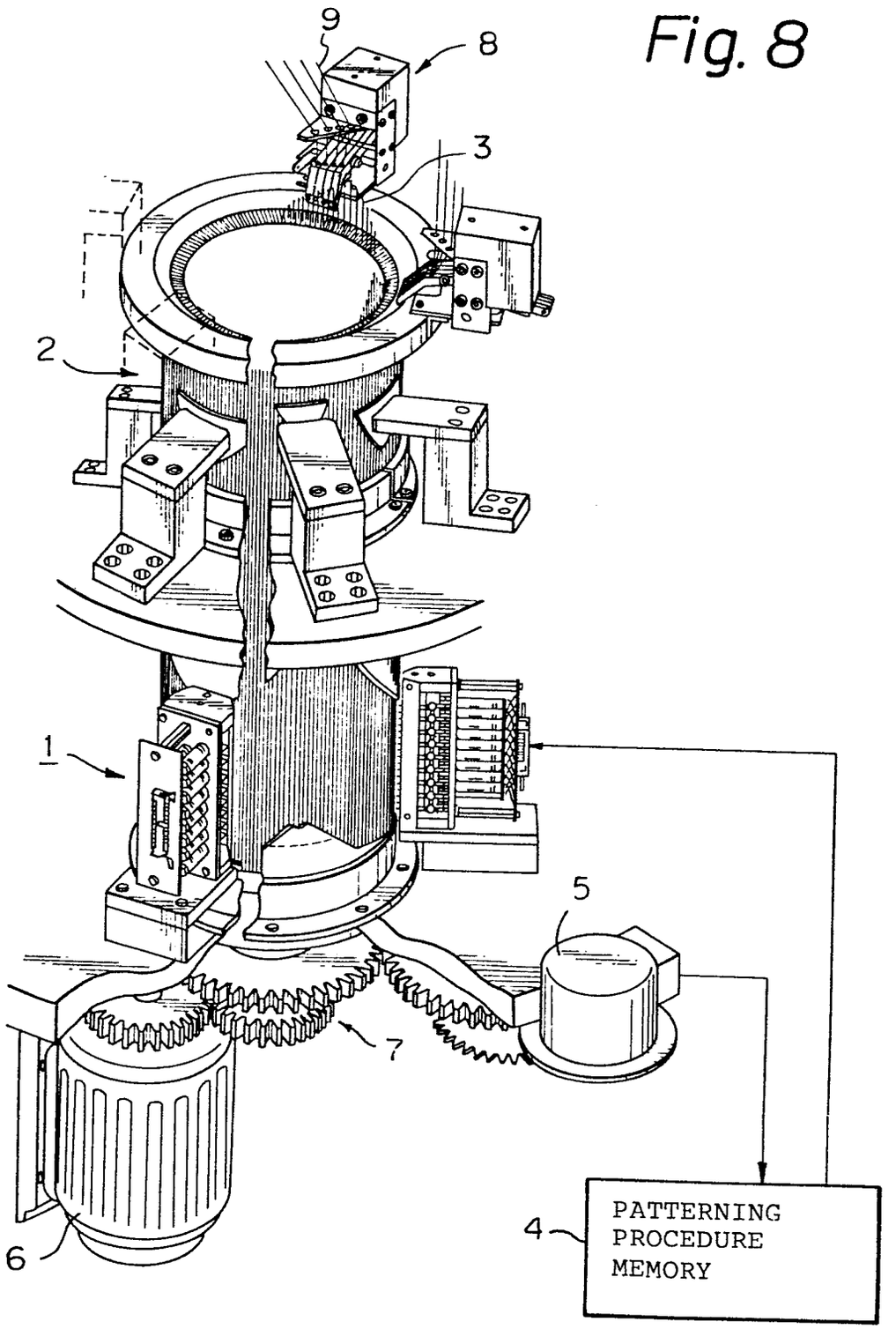
(f)
24' 15'
24
14
21

Fig. 8



LIST OF REFERENCE NUMBERS AND ITEMS

1	knitting needle driving mechanism
11	finger
12	first arm
13	second arm
14	pushing member
15, 15'	pushing surface
16	pivot
17	permanent magnet
19	finger central portion
20	housing
21	finger guide
22	vertical plate
23	opening
24, 24'	lead surface
25, 25'	side wall
30	electromagnetic finger operating device
31, 35	electromagnet end
33. 34	electromagnetic coil
40, 61	jack
41	finger butt
42	cam butt
43	raising cam
55, 55'	side wall
56, 56'	point

INTERNATIONAL SEARCH REPORT

0185766

International Application No. PCT/JP85/00222

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[4] D04B 15/78

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC	D04B 15/78

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

Jitsuyo Shinan Koho 1975 - 1985
Kokai Jitsuyo Shinan Koho 1975 - 1985

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	JP, B2, 54-21465 (Fukuhara Sheiki Seisakusho Kabushiki Kaisha) 31 July 1979 (31. 07. 79) & US, A, 3855819 & GB, A, 1436607	1 - 4
X	JP, B2, 58-31421 (Macchine Tessili Circolari Matec S.p.A.) 6 July 1983 (06. 07. 83) & US, A, 3998073 & DE, A1, 2537118 & IT, A, 1018222 & FR, B1, 2282495	1 - 4

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published 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; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
July 10, 1985 (10. 07. 85)	July 22, 1985 (22. 07. 85)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
Japanese Patent Office	