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(54) **KNITTING NEEDLE ASSEMBLY FOR ELECTROMAGNETIC NEEDLE SELECTOR**

(57) A knitting needle assembly for electromagnetic needle selector. The assembly consists of a needle jack (10) and a latch needle (30). The assembly has an electromagnetic attracting surface (25) provided on an upper side of a front end of a body (21) of the needle jack. A front needle butt (23) and a rear needle butt (24) are arranged in order on a rear side of the electromagnetic

attracting surface in a longitudinal direction of the body of the needle jack. The needle jack combines with the latch needle together by fitting the fitting portion (22) into the latch needle. A lower positioning surface is provided on a front end of the fitting portion on a lower side of the body of the needle jack, for positioning the needle jack on a needle body of the latch needle.

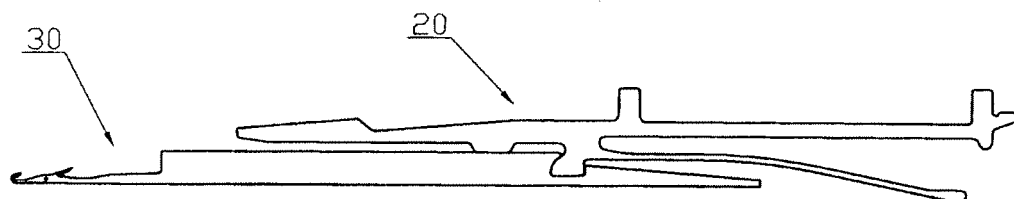


Fig. 3

Description

Technical Field

[0001] The present invention relates to a computerized flat knitting machine, in particular a knitting needle assembly for electromagnetic needle selector.

Description of the Related Art

[0002] Conventionally, every needle groove in a needle bed of a computerized flat knitting machine contains a latch needle and a group of auxiliary needles which work in cooperation with the latch needle, and a needle selector and a pressure plate act on the auxiliary needles so as to control the latch needle to perform various knitting actions. A needle selector is used for making a selection for the latch needles which do not participate in the knitting. Conventionally, there are two types of needle selector-mechanical type and electromagnetic type. In the mechanical needle selector, needle selecting tooth on the needle selector presses a needle selecting needle butt of the corresponding auxiliary needle, so that a needle butt of a needle jack which directly pushes the latch needle sinks into the needle groove and is free from the pushing of a knitting cam, thus the latch needle cannot perform a knitting action. In this way, the mechanical needle selector accomplishes the selection of a needle. In the electromagnetic needle selector, the needle jack is caused to move via electromagnetic attraction force, and a needle butt of the needle jack hereby sinks into the needle groove. In this way, the electromagnetic needle selector accomplishes the selection of a needle. When a latch needle needs to perform pattern knitting such as transfer knitting or tuck knitting, the latch needle has to work collaboratively with a corresponding pressure plate and a needle selection cam.

[0003] Fig. 16 shows a latch needle and a group of corresponding auxiliary needles of a computerized flat knitting machine manufactured by the Stoll Company of Germany, and this machine uses an electromagnetic needle selector. In this Figure, the auxiliary needles comprise a needle jack 10, an intermediate bit 11 and a selector bit 12. A latch needle 9 is disposed at the front end of a needle groove and a hook portion 9a is provided on the rear end of the body of the latch needle. The needle jack 10 is disposed on lower side of the rear part of the latch needle 9, and a groove 10a is provided in the body of the needle jack, a needle butt 10b is provided on upper side of the body. The latch needle 9 is attached to the needle jack by inserting its hook portion 9a into the groove 10a of the needle jack. The intermediate bit 11 with two needle butts 11a and 11b provided thereon is disposed at upper side of the rear part of the needle jack 10. The selector bit is disposed on upper side of an end of the needle jack 10 and the upper side of the front end of the selector bit is provided with an electromagnetic attracting surface 12a. There are two needle butts 12b and 12c on

the rear side of the electromagnetic attracting surface 12a and there is an elastic rod 12d on the lower side of the two needle butts 12b and 12c.

[0004] Before knitting each row, the electromagnetic needle selector selects needle withdrawal condition for all the knitting needles on the needle bed according to knitting requirement. First, a needle selection pressure plate 274 (or 275) presses down the rear needle butt 12c of the selector bit 12, and the front end of the selector bit is tilted upward. Then, the electromagnetic attracting surface 12a at the front end of the selector bit 12 is attracted by the electromagnetic needle selector, and the rear end of the selector bit 12 falls down. Accordingly, the rear needle butt 12c sinks into the needle groove (without exposing outside the needle groove). When the selector bit 12 relatively moves to a needle selection position of a needle selection cam 946 (or 944 or 947), a corresponding selector bit of the latch needle which does not participate in the knitting continues to be attracted by the electromagnetic needle selector, and the rear needle butt 12c does not move upward (moves towards the left in Fig. 15) as it sinks into the needle groove and thus is free from the pushing of the needle selection cam, and the intermediate bit 11 cannot be pushed upward and thus remains at the original position. However, at this position, the needle butts of the intermediate bit 11 are pressed by a fixed pressure plate 923 so that the intermediate bit 11 is pressed on the needle jack 10 at the lower side thereof and the thin elastic rod at the rear part of the needle jack 10 undergoes an elastic deformation and bends. As a result, the needle butt on the upper side of the needle jack sinks into the needle groove and thus is free from the pushing of the knitting cam and thus cannot push the latch needle to perform knitting actions. The corresponding selector bit of the latch needle which participates in the knitting disengages from the electromagnetic needle selector as it is not attracted by the electromagnetic needle selector at the above needle selection position, and the front end of the selector bit 12 falls back into the needle groove so that the needle butts 12b and 12c thereon expose from the needle groove and are to be pushed upward (moves toward the left in Fig. 15) by the needle selection cam and thus push the intermediate bit 11 to move upward. At this time, the needle butts of the intermediate bit 11 are not pressed by the fixed pressure plate 923 and the needle jack 10 is not pressed, so that the needle butt 10a on the upper side of the needle jack is exposed from the needle groove and pushed by a stitch cam 180 and thereby pushes the latch needle 9 to perform stitch knitting actions. If the selector bit 12 relatively moves to, for example, a second needle selection position of a needle selection cam 206 (207), and this movable needle selection cam moves to an upper side of the bottom plane of a triangle plate, and the upper needle butt 12c of the selector bit 12 continues to be pushed by the needle selection cam 206 (207), and thus the selector bit 12 further moves upward to push the needle jack 10 to move upward, and the upper needle butt

10a of the needle jack 10 finishes transfer knitting by being pushed by a transfer cam 870. When performing receiving knitting and tuck knitting, collaboration with movable pressure plates 261 and 572 is needed.

[0005] The above-described auxiliary needle assembly uses so many auxiliary needles that the control thereof is rather complex. Fig. 15 shows the structure of a knitting control system which corresponds to the latch needle and auxiliary needles as shown in Fig. 16. The knitting control system comprises two knitting units each of which consists of a knitting area I, a pressure plate area II and a needle selection area III distributed on upper side, middle portion and lower side of a triangular bottom plate, respectively. Different types of knitting cams are disposed in the knitting areas, such as depressing cam 870, returning needle-after-stitch cam 178, and stitch cam 372. Movable pressure plates 261 and 572 and fixed pressure plate 923 are provided in the pressure plate area. The electromagnetic needle selector 100, different types of needle selection cams such as 206, 207 and 944-947, and needle selection pressure plates 274, 275 are provided in the needle selection area. The triangular bottom plate has a complex structure and a large size. The knitting control system is mounted on the head of the computerized flat knitting machine, and the size of the head is correspondingly large. Since the head works on the needle bed, it is inevitable that the needle bed also has a large size; and since the needle bed is a casting, a large size means more material will be consumed. Therefore, the complex structure of the triangular bottom plate and the large size of the needle bed incur a high manufacturing cost of the computerized flat knitting machine.

[0006] The applicant of the present invention previously introduced a knitting needle assembly (Chinese application number: 200810122648.0) which is composed of a latch needle and a needle jack. The needle jack integrates the functions of a traditional needle jack and a selector bit, so that the number of auxiliary needles in the needle groove decreases and the length of the corresponding needle groove is largely shortened and thereby the needle bed and the knitting machine are downsized remarkably. However, this knitting needle assembly and its corresponding knitting machine cannot perform complex front-rear transfer knitting, so that their knitting functions are not complete.

Summary of the Invention

[0007] The object of the present invention is to overcome the above-mentioned shortcomings in the prior art and to provide a knitting needle assembly for electromagnetic needle selector, which is capable of largely reducing the whole sizes of the corresponding knitting control system and the flat knitting machine, remarkably simplifying the knitting control system and dramatically reducing the manufacturing costs of the whole machine.

[0008] The above object of the present invention is ac-

complished by the following technical solutions:

A knitting needle assembly for electromagnetic needle selector consists of a needle jack and a latch needle, wherein an electromagnetic attracting surface is provided on an upper side of the front end of the needle jack body; a front needle butt and a rear needle butt are arranged in order on a rear side of the electromagnetic attracting surface in a longitudinal direction of the needle jack body; a fitting portion and an elastic rod are arranged in order on a lower side of the needle jack body in the longitudinal direction; and the needle jack combines with the latch needle together by fitting the fitting portion into the latch needle.

[0009] The electromagnetic attracting surface can also be arranged on a lower side of the rear end of the needle jack body.

[0010] A lower positioning surface for positioning the needle jack on a needle body of the latch needle is provided on the front end of the fitting portion on a lower side of the needle jack body.

[0011] An upper positioning surface for positioning the needle jack on a knitting cam when the jack being pushed by the knitting cam is provided on the upper side of the electromagnetic attracting surface.

[0012] An upper positioning surface for positioning the needle jack on a knitting cam when the jack being pushed by the knitting cam is also provided on the upper side of the rear end of the needle jack body.

[0013] In the present invention, only one auxiliary needle, i.e. the needle jack, is required to assist the actions of the latch needle. The needle jack of the present invention combines a needle jack's function of pushing the latch needle to move, a selector bit's function of determining whether the latch needle participates in the knitting with a pattern bit's (intermediate bit) function of determining what kind of knitting the latch needle performs in the prior art. Therefore, the length of a whole knitting needle is largely shortened, which remarkably reduces the size of the triangular bottom plate. The size of the needle bed which works cooperatively with the triangular bottom plate is also dramatically reduced, so that less material is consumed. At the same time, there is neither a pressure plate area nor an independent needle selection area in the corresponding knitting control system, and the structure of the system is very simple while has a complete knitting function; that is, the system can perform all the knitting functions of an existing complex computerized flat knitting machine, such as front-rear transfer knitting and the like, which lays a solid foundation for largely reducing the manufacturing costs of a computerized flat knitting machine.

Brief Description of the Drawings

[0014]

Fig. 1 is a schematic diagram showing the structure of the needle jack of the present invention.

Fig. 2 is a schematic diagram showing the structure of the latch needle of the present invention.

Fig. 3 is a schematic diagram showing the structure of the knitting needle assembly of the present invention.

Fig. 4 is a schematic diagram showing the position of the needle jack on the knitting cam when it is being pushed by the knitting cam.

Fig. 5 is a schematic diagram showing the structure of the knitting control system corresponding to the knitting needle assembly as shown in Fig. 3.

Fig. 6 is an enlarged view of the portion M in the knitting control system as shown in Fig. 5.

Fig. 7 is a schematic diagram showing the structure of the knitting needle assembly in a non-knitting state.

Fig. 8 is a schematic diagram showing the track of the front and rear needle butts of the needle jack in the knitting area when performing stitch knitting.

Fig. 9 is a schematic diagram showing the track of the front and rear needle butts of the needle jack in the knitting area when performing transfer knitting.

Fig. 10 is a schematic diagram showing the track of the front and rear needle butts of the needle jack in the knitting area when the knitting needle assembly does not participate in the knitting.

Fig. 11 is a schematic diagram showing the track of the front and rear needle butts of the needle jack in the knitting area when performing receiving knitting.

Fig. 12 is a schematic diagram showing the track of the front and rear needle butts of the needle jack in the knitting area when performing tuck knitting.

Fig. 13 is a schematic diagram showing another structure of the needle jack of the present invention.

Fig. 14 is a schematic diagram showing the installation arrangement of another structure of the knitting needle assembly and the electromagnetic needle selector in the corresponding knitting control system.

Fig. 15 is a schematic diagram showing the structures of a latch needle and a group of corresponding auxiliary needles of a computerized flat knitting machine manufactured by the Stoll Company.

Fig. 16 is a schematic diagram showing the structure of a knitting control system corresponding to the existing latch needle and auxiliary needles shown in Fig. 15.

[0015] In the drawings, 1 denotes a needle bed; 9 denotes a latch needle on the Stoll's computerized flat knitting machine; 9a denotes a groove portion of the latch needle; 10 denotes a needle jack on the Stoll's computerized flat knitting machine; 10a denotes a groove of the needle jack 10; 10b denotes a needle butt of the needle jack 10; 11 denotes an intermediate bit; 11a and 11b are needle butts of the intermediate bit; 12 denotes a selector bit on the Stoll's computerized flat knitting machine; 12a

denotes an attracting surface of the selector bit; 12b and 12c denote needle butts of the selector bit 12; 12d denotes an elastic rod of the selector bit 12; 20 denotes a needle jack; 21 denotes the needle jack body; 22 denotes a fitting portion; 23 denotes a rear needle butt; 24 denotes a front needle butt; 25 denotes an attracting surface; 26 denotes an elastic rod; 27 denotes a lower positioning surface; 28 denotes an upper positioning surface; 30 denotes the latch needle of the present invention; 31 denotes a needle body of the latch needle 30; 32 denotes a fitting groove of the latch needle 30; 40 denotes a triangular bottom plate; 41 denotes a depressing cam; 42 denotes a returning needle-after-stitch cam; 43 denotes a transfer cam; 44 denotes a transfer needle retracting cam; 45 denotes a needle lifting cam; 46 denotes a tuck cam; 47 denotes a stitch cam; 48 denotes a receiving cam; 49 denotes a reset cam; 50 denotes a needle selection pressure plate; 60 denotes an electromagnetic needle selector; 61 denotes a magnetic conductive plate; 62 denotes an electromagnetic coil; 70 denotes a knitting cam; 80 denotes a needle bed; 81 denotes a needle groove; 82 denotes a notch in the needle groove; 90 denotes the head of the computerized flat knitting machine; 100 denotes an electromagnetic needle selector; 178 denotes a returning needle-after-stitch cam; 261 and 572 denote movable pressure plates; 274 and 275 denote needle selection pressure plates; 372 denotes a stitch cam; 870 denotes a depressing cam; 923 denotes a fixed pressure plate; and 206, 207 and 944-947 denote needle selection cams.

Description of the Embodiments

[0016] The present invention and its advantages will now be described in detail below with reference to the drawings and embodiments.

[0017] The knitting needle assembly of the present invention is composed of a latch needle and a needle jack. The structures of the needle jack 20 and the latch needle 30 are shown in Figs. 1 and 2.

[0018] As shown in Fig. 1, an electromagnetic attracting surface 25, a front needle butt 24 and a rear needle butt 23 are arranged in order on an upper side of a body 21 of the needle jack 20 in its longitudinal direction. A fitting portion 22 and an elastic rod 26 are arranged in order on a lower side of the body in the longitudinal direction. A lower positioning surface 27 is provided at the front end of the fitting portion 22 and an upper positioning surface 28 is provided on an upper side of the rear end of the body.

[0019] As shown in Fig. 2, a fitting groove 32 corresponding to the fitting portion 22 is provided in a needle body 31 of the latch needle. The needle body located behind the rear end of the fitting groove narrows gradually, obliquely and downwardly in its longitudinal direction.

[0020] As shown in Fig. 3, the fitting portion 22 of the needle jack 20 is fitted into the fitting groove 32 in the

needle body 31 of the latch needle 30 and the needle jack 20 is positioned on the upper side of the needle body of the knitting needle via the lower positioning surface 27. Accordingly, the needle jack 20 is fitted into and combined with the latch needle 30 together to form an assembly which is to be placed in each needle groove on the needle bed.

[0021] The knitting needle assembly formed by combining the latch needle 30 with the needle jack 20 is controlled by the knitting control system shown in Fig. 5. The knitting control system mainly consists of a triangular bottom plate 40, an electromagnetic needle selector 60 disposed at an upper end of the triangular bottom plate and two groups of knitting cams disposed on the triangular bottom plate. Each group of knitting cams forms a knitting area on the triangular bottom plate 40. A transfer needle retracting cam 44, a transfer cam 43, a returning needle-after-stitch cam 42, a stitch cam 47, a receiving cam 48, a needle lifting cam 45, a tuck cam 46 and a depressing cam 41 are mainly provided in each knitting area. The electromagnetic needle selector 60 composed of electromagnetic coils 62 and magnetic conductive plates 61 is disposed at the upper end of the triangular bottom plate 40 and forms two pairs of symmetrical needle selection positions in each knitting area, i.e., a needle selection position I which is relatively far from a center of the knitting area and a needle selection position II which is relatively close to the center of the knitting area. A needle selection pressure plate 50 is provided in such a manner that it is close immediately to the outer side of the needle selection position I.

[0022] The whole knitting control system is much simpler than the control mechanism shown in Fig. 15. In the knitting control system of the present invention, the needle selection area coincides with the knitting area and there is no pressure plate area nor independent needle selection area, so that the longitudinal size of the triangular bottom plate is largely reduced and the size of the needle bed is accordingly reduced and materials are saved dramatically, thereby reducing the manufacturing costs of the whole knitting machine.

[0023] The knitting action of the latch needle 30 is controlled by the knitting cam. The knitting cam pushes the rear needle butt 23 or the front needle butt 24 of the needle jack 20 corresponding to the latch needle to make the corresponding latch needle 20 move upward to perform a knitting action. After the knitting is finished, a related knitting cam pushes the rear needle butt 23 or the front needle butt 24 of the jack 20 to reset the corresponding latch needle. When the needle jack 20 is pushed by the related knitting cam, the upper positioning surface 28 of the needle jack contact an upper side surface of a corresponding knitting cam 70, i.e., positioning on the corresponding knitting cam 70, so that the movement of the needle jack 20 is smoother and more reliable (see Fig. 4).

[0024] Before the knitting, the states of the latch needle and the needle jack are shown in Fig. 6, i.e., the rear

needle butt of the needle jack is exposed from the needle groove. When performing the knitting actions, the knitting control system shown in Fig. 5 reciprocates on a needle bed 80 along with a head 90 of the knitting machine, and a corresponding notch 82 for letting the needle selection pressure plate 50 pass through is provided in a groove wall of a needle groove 81 on the needle bed. When the needle selection pressure plate 50 passes over the needle groove, it will presses the body 21 of the needle jack in the needle groove so that the needle jack rotates with the rear end of the elastic rod 26 functioning as a fulcrum. The electromagnetic attracting surface 25 at the front end of the needle jack rotates upward and is attracted by the magnetic conductive plate 61 of the selector. The elastic rod 26 of the needle jack is pressed and deformed, and the rear end of the needle jack rotates downward and thus the rear needle butt 23 sinks into the needle groove. The needle body, which is narrowed obliquely and downwardly behind the rear end of the fitting groove 32 in the latch needle, provides room for the above rotation.

[0025] When knitting pattern, the knitting states of a number of latch needles 30 on the needle bed are different-some of which participate in the knitting while some do not. The needle selector 60 performs a needle selection for the latch needles in all the needle grooves on the needle bed in accordance with the need of the pattern to be knitted.

[0026] When the needle selection position I on the needle selector 60 moves to a position above the needle groove, if the latch needle 30 in the needle groove does not participate in knitting, the magnetic conductive plate 61 will continue attracting the corresponding needle jack 20, so that the rear needle butt 23 of the needle jack 20 will not be exposed from the needle groove 81 and will not be pushed by the knitting cam 70, and thereby the latch needle 30 is in a non-knitting state (see Fig. 7). If the latch needle 30 in the needle groove participates in knitting, the needle selector 60 makes the magnetic conductive plate 61 stop attracting the electromagnetic attracting surface 25 of the needle jack, so that the needle jack 20 disengage from the magnetic conductive plate 61 and the rear part of the needle jack 20 pops upward under the action of an elastic force of the elastic rod 26, thus both the front and rear needle butts expose from the needle groove 81. If the stitch cam 47 is on an upper side of the triangular bottom plate (while the transfer cam 43 is on a lower side of the triangular bottom plate and is indicated by dashed lines), the rear needle butt 23 will be pushed by the stitch cam 47 to perform stitch knitting. The tracks of the front and rear needle butts of the needle jack 20 are shown in Fig. 8. If the transfer cam 43 is on an upper side of the triangular bottom plate, the front needle butt 24 will be pushed by the transfer cam 43 to perform transfer knitting. The tracks of the front and rear needle butts of the needle jack 20 are shown in Fig. 9.

[0027] When the needle selection position II on the needle selector 60 moves to a position above a needle groove where the needle jack 20 is located, if the needle

jack 20 attracted at the needle selection position □ is still attracted, the latch needle to which the needle jack 20 corresponds will not participate in the knitting of a row performed by the head of the knitting machine. The front and rear needle butts 23 and 24 of the needle jack are not pushed by the knitting cam, and the knitting needle assembly substantially horizontally moves out of the knitting area (see Fig. 10 which shows its track). If the needle jack 20 is not attracted, for the same reason as described above, both the front and rear needle butts of the needle jack 20 expose from the needle groove 81; at this time, if the tuck cam 46 is at the lower side of the triangular bottom plate, the rear needle butt 23 of the needle jack is first pushed by the tuck cam 46 and then pushed by the receiving cam 48 to perform receiving knitting. The tracks of the front and rear needle butts of the needle jack 20 are shown in Fig. 11. If the tuck cam 46 is at the upper side of the triangular bottom plate, the rear needle butt 23 of the needle jack is pushed by the tuck cam 46 to perform tuck knitting. The tracks of the front and rear needle butts of the needle jack 20 are shown in Fig. 12.

[0028] As described above, the knitting needle assembly of the present invention cooperates with the corresponding knitting control system to make the latch needle perform different kinds of knitting under the action of one auxiliary needle of the needle jack.

[0029] The electromagnetic attracting surface 25 of the needle jack of the present invention can be arranged reversely; that is, it can be arranged on a lower side of the rear end of the jack body 21 (see Fig. 13). The knitting needle assembly composed of the latch needle 30 and the needle jack 20' is placed in a needle groove while the electromagnetic needle selector 60 in the corresponding knitting control system is placed on a rear side of the lower end of the triangular bottom plate 40 (see Fig. 14). Such a knitting needle assembly and the corresponding knitting control system are totally the same as the knitting needle assembly and the corresponding knitting control system shown in Figs. 3 and 5 in terms of working principle, working processes and beneficial effects, and the explanation thereof is omitted.

Claims

1. A knitting needle assembly for electromagnetic needle selector, consisting of a needle jack and a latch needle, wherein an electromagnetic attracting surface is provided on an upper side of a front end or a lower side of a rear end of a body of the needle jack; a front needle butt and a rear needle butt are arranged in order on a rear side of the electromagnetic attracting surface in a longitudinal direction of the body of the needle jack; a fitting portion and an elastic rod are arranged in order on a lower side of the body of the needle jack in the longitudinal direction; and the needle jack combines with the latch needle together by fitting the fitting portion into the latch nee-

dle.

2. The knitting needle assembly for electromagnetic needle selector according to claim 1, wherein the electromagnetic attracting surface is provided on the lower side of the rear end of the body of the needle jack, and a lower positioning surface is provided at a front end of the fitting portion on the lower side of the body of the needle jack, for positioning the needle jack on a needle body of the latch needle.
3. The knitting needle assembly for electromagnetic needle selector according to claim 1 or 2, wherein the electromagnetic attracting surface is provided on the lower side of the rear end of the body of the needle jack, and an upper positioning surface is provided on an upper side of the electromagnetic attracting surface of the needle jack, for positioning the needle jack on a knitting cam which pushes the needle jack to move.
4. The knitting needle assembly for electromagnetic needle selector according to claim 1, wherein the electromagnetic attracting surface is provided on the upper side of the front end of the body of the needle jack, and a lower positioning surface is provided at the front end of the fitting portion on the lower side of the body of the needle jack, for positioning the needle jack on a needle body of the latch needle.
5. The knitting needle assembly for electromagnetic needle selector according to claim 1 or 4, wherein the electromagnetic attracting surface is provided on the upper side of the front end of the body of the needle jack, and an upper positioning surface is provided on the upper side of the rear end of the body of the needle jack, for positioning the needle jack on a knitting cam which pushes the needle jack to move.

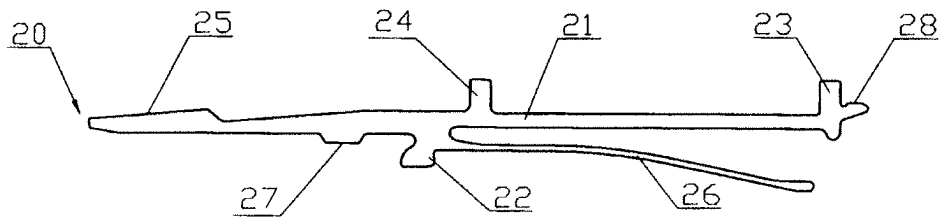


Fig. 1

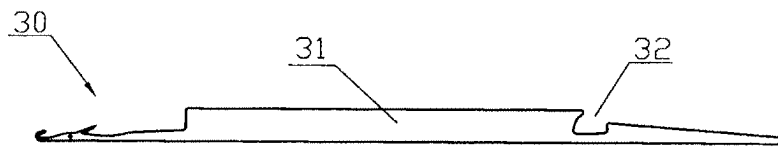


Fig. 2

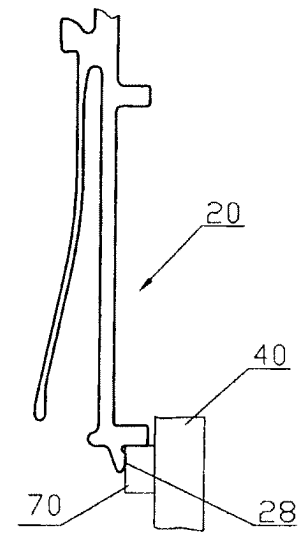


Fig. 4

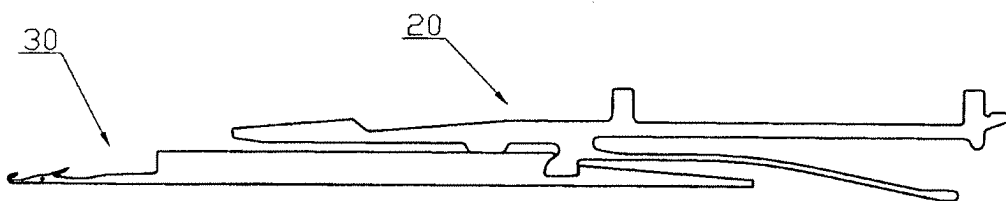


Fig. 3

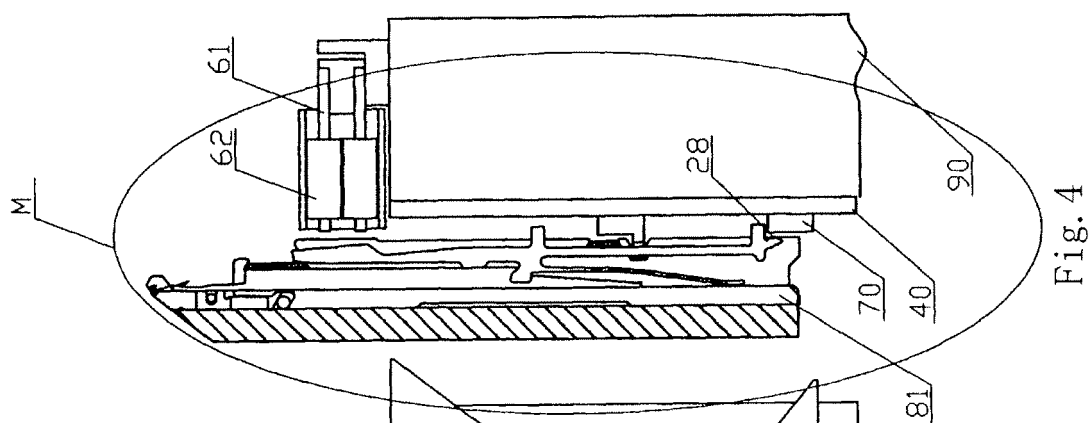


Fig. 4

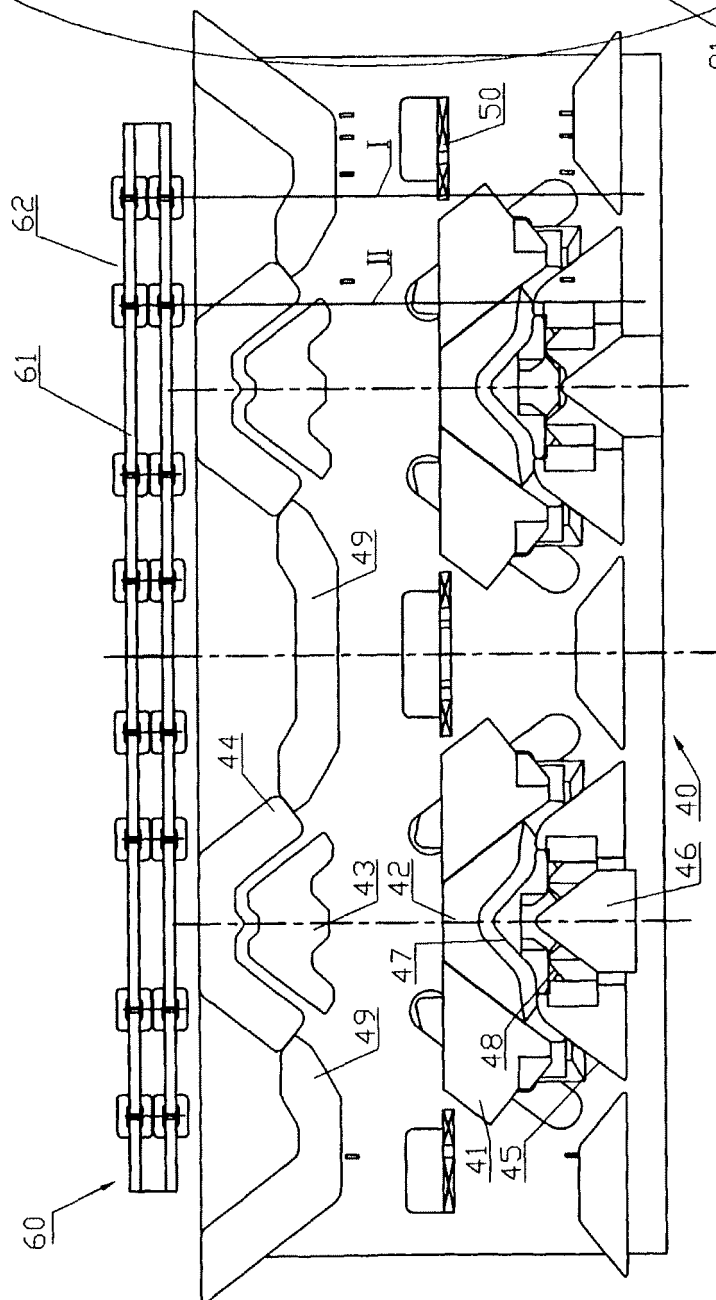


Fig. 5

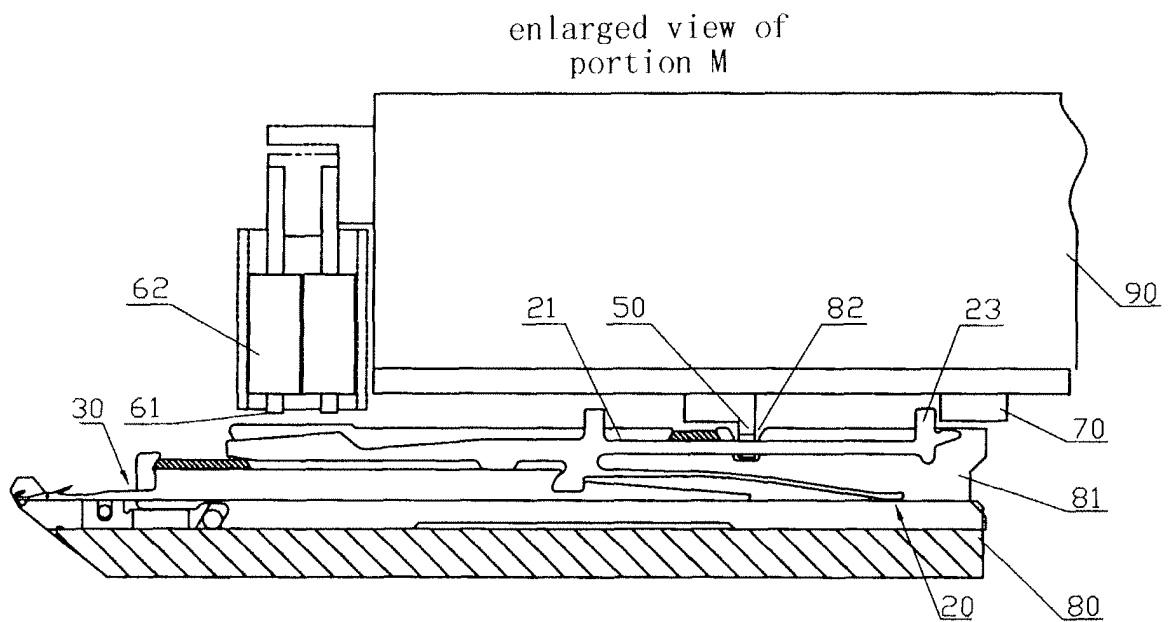


Fig. 6

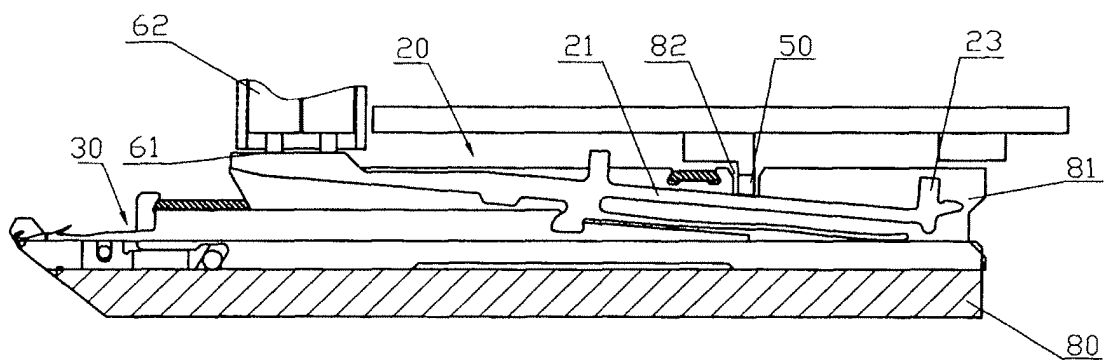


Fig. 7

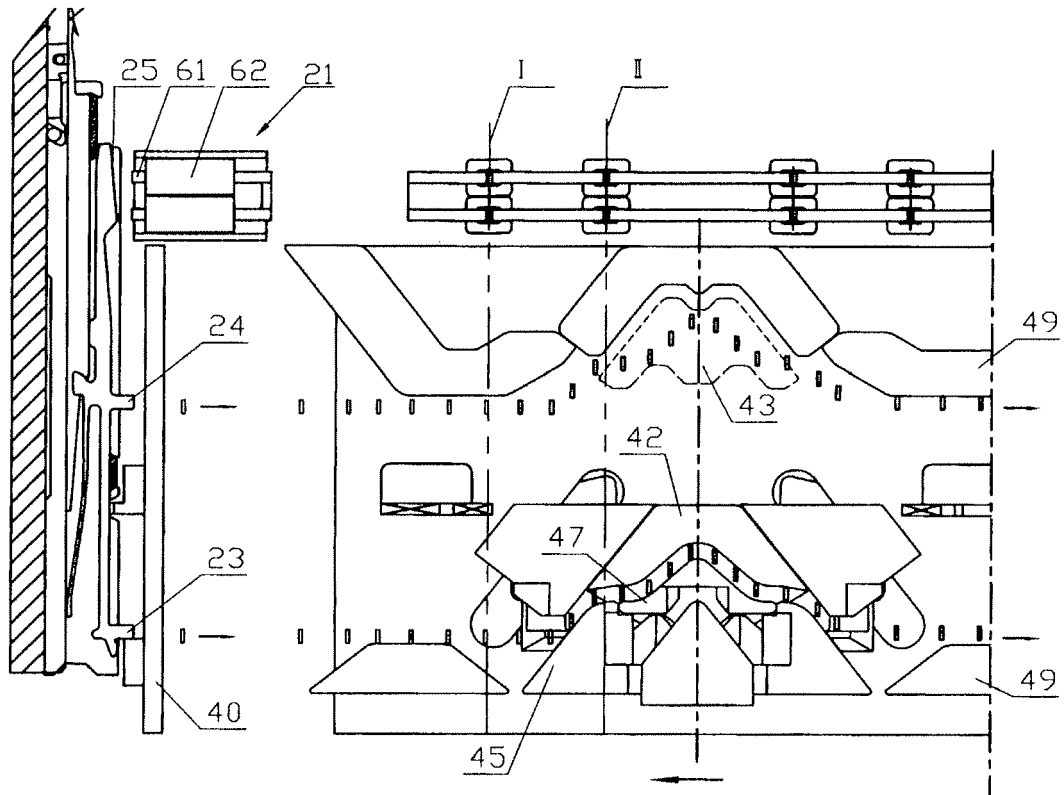


Fig. 8

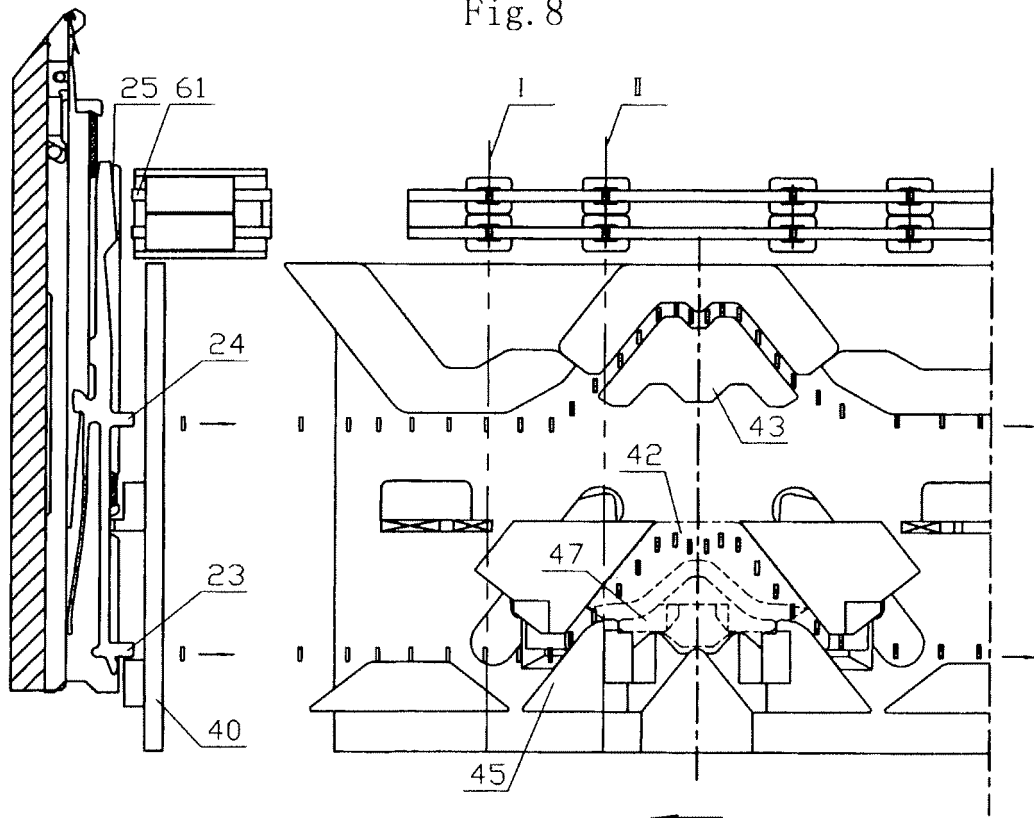


Fig. 9

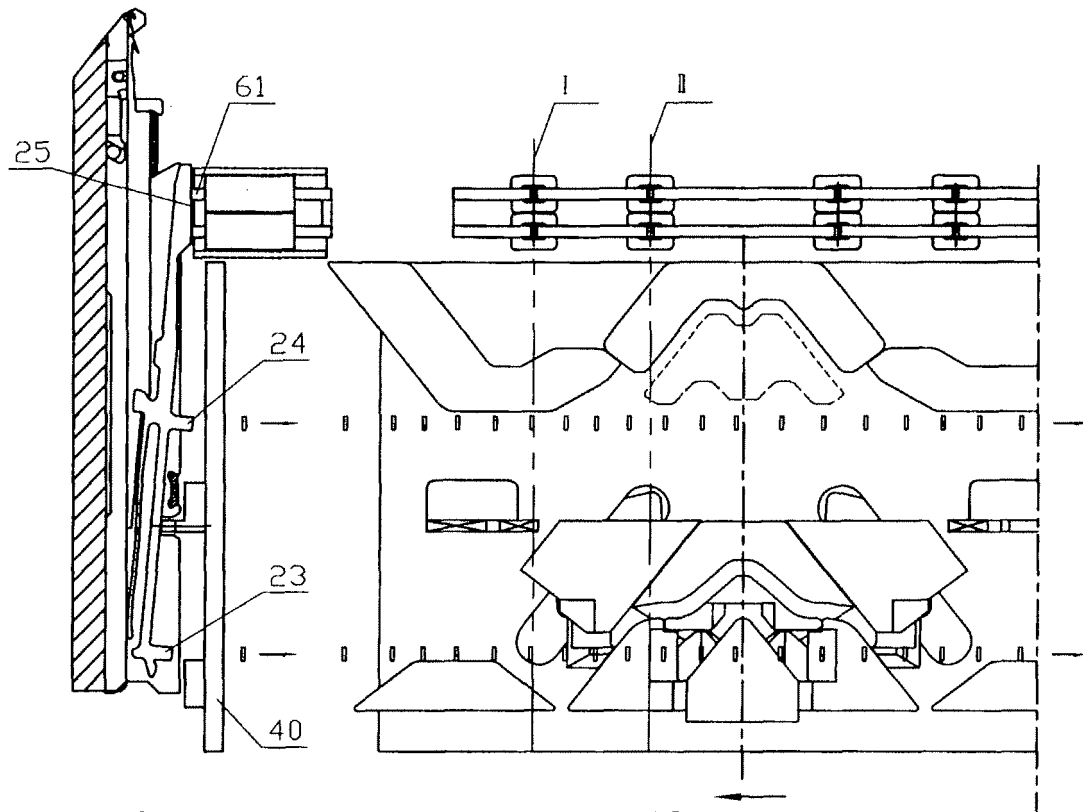


Fig. 10

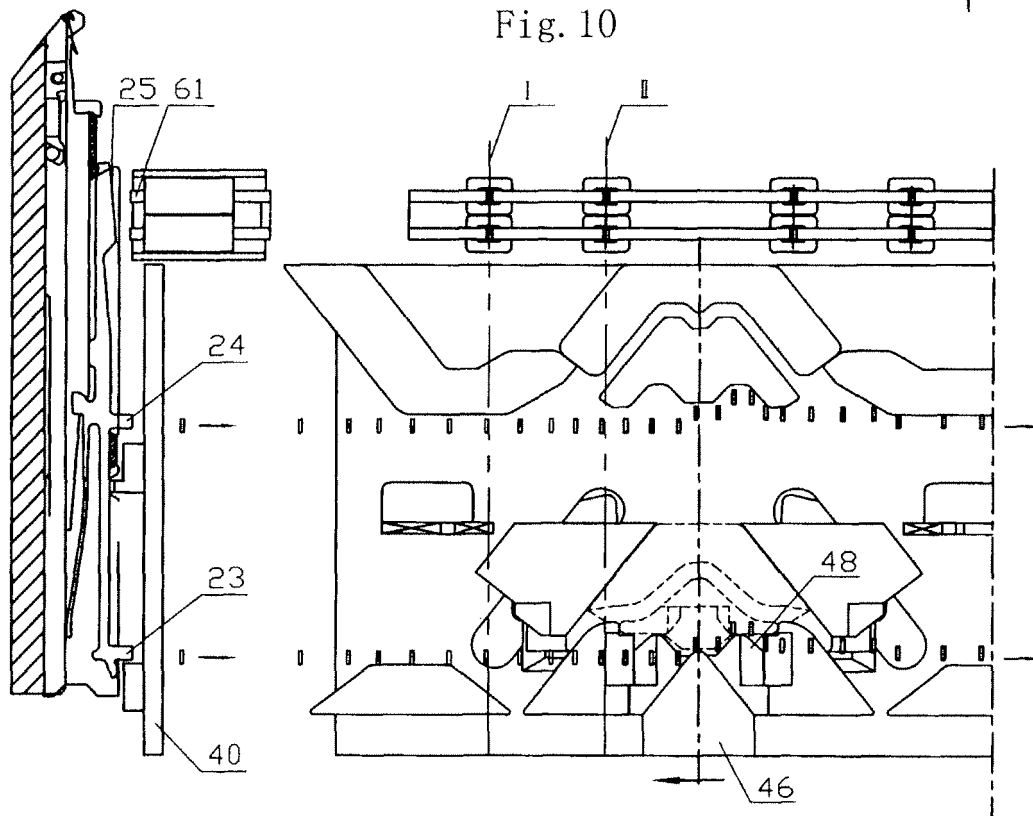


Fig. 11

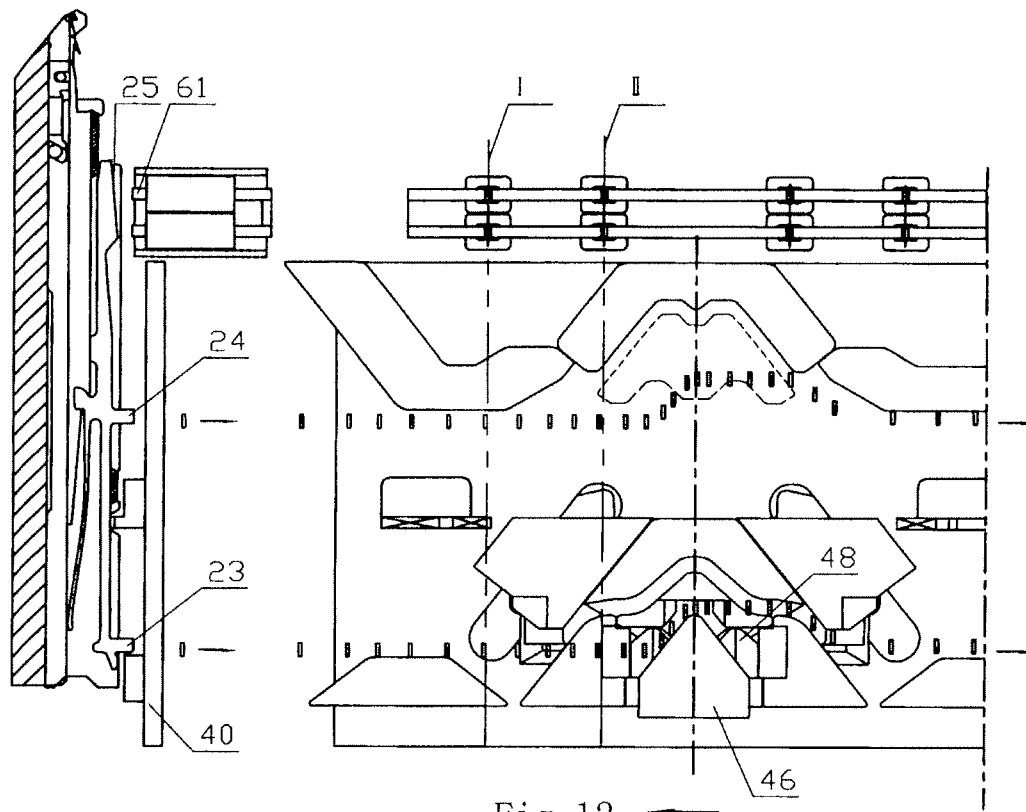


Fig. 12

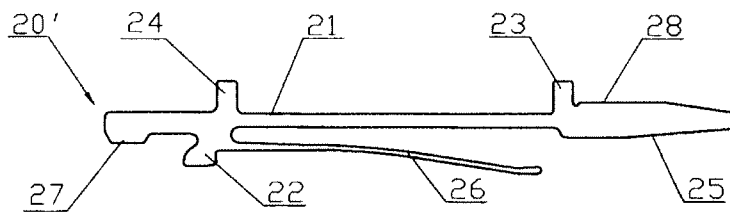


Fig. 13

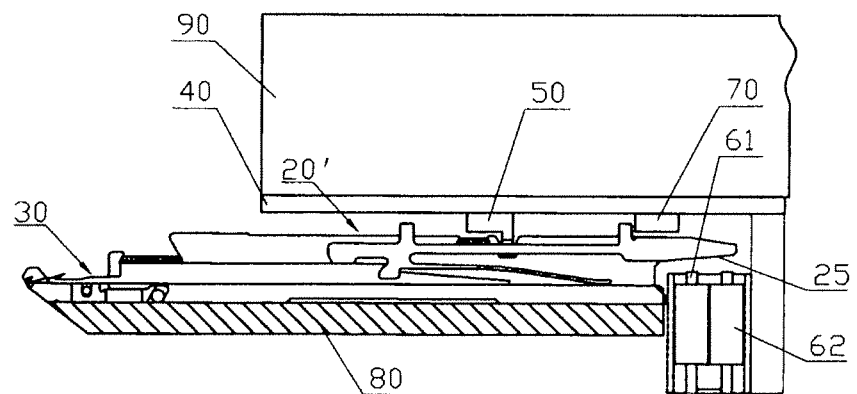


Fig. 14

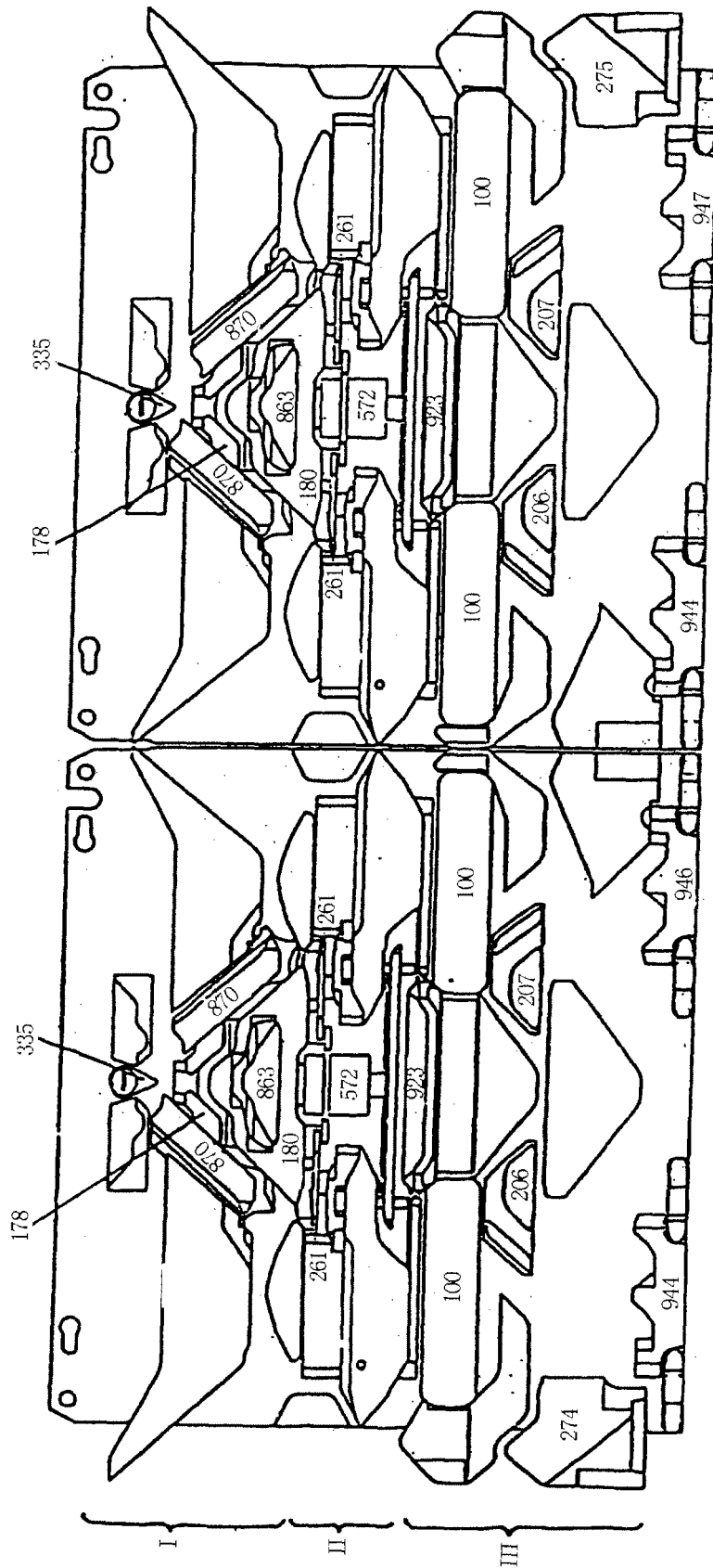


Fig. 15

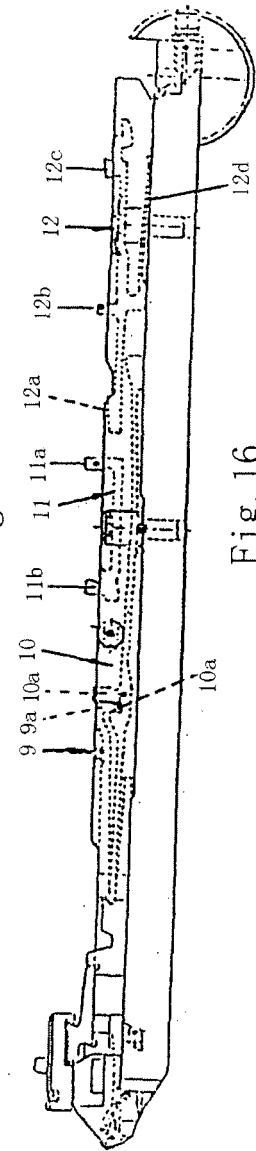


Fig. 16

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2009/000688

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI,CNPAT,WPI,EPODOC,PAJ: jack?, butt?, select???, electromagnet+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to
Y	CN 1218118 A(SIPRA PATENTENTWICKLUNGS & BET-GMBH) 02 June1999 (02.06.1999) figures 1,3 and page 5, line 27-page 7, line 23	1
Y	CN 1718893 A(FENG, Jialin) 11 Jan.2006 (11.01.2006) figure 12	1
P,X	CN 101314887 A(FENG, Jialin) 03 Dec. 2008 (03.12.2008) the whole document	1—5
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A	CN 1313417 A(SHIMA SEIKI MFG LTD) 19 Sep. 2001 (19.09.2001) the whole document	1—5
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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“O” document referring to an oral disclosure, use, exhibition or other means	“&”document member of the same patent family
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
25 August 2009 (25.08.2009)Date of mailing of the international search report
10 Sep. 2009 (10.09.2009)Name and mailing address of the ISA/CN
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INTERNATIONAL SEARCH REPORT
 Information on patent family members

International application No.

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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

D04B15/66(2006.01)i

D04B35/04(2006.01)i

REFERENCES CITED IN THE DESCRIPTION

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