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(54) Improvements introduced in rectilineal knitting machines.

(57) The invention refers to a series of improvements introduced in rectilineal knitting machines, having as purpose the obtention of a full automatization in the attaining of patterns of mesh transfers, concretely over one same knitting line and with selective side movement.

In accordance with said improvements, the machine incorporates, besides the classical knitting lines (2A, 5A), respective auxiliary knitting lines (2B, 5B), mounted with possibility of slide on the former and which in turn constitute the physical support for a plurality of side transfer punches, numerically and positionally coincident with the needles of the corresponding knitting line, being these auxiliary knitting lines movable longitudinally with the concourse of step by step motors (9A, 9B) and through adequate transmissions (10, 11), so that each side transfer punch is susceptible of changing its position, passing from a situation of opposition to a certain needle, to the situation of opposition to an adjacent needle or to a needle separated two, three or more spaces from the primitive one, so that one needle assigns the mesh to a punch and through the programmed movement of the auxiliary knitting line which corresponds, said punch assigns the same mesh to a different needle of the same knitting line.

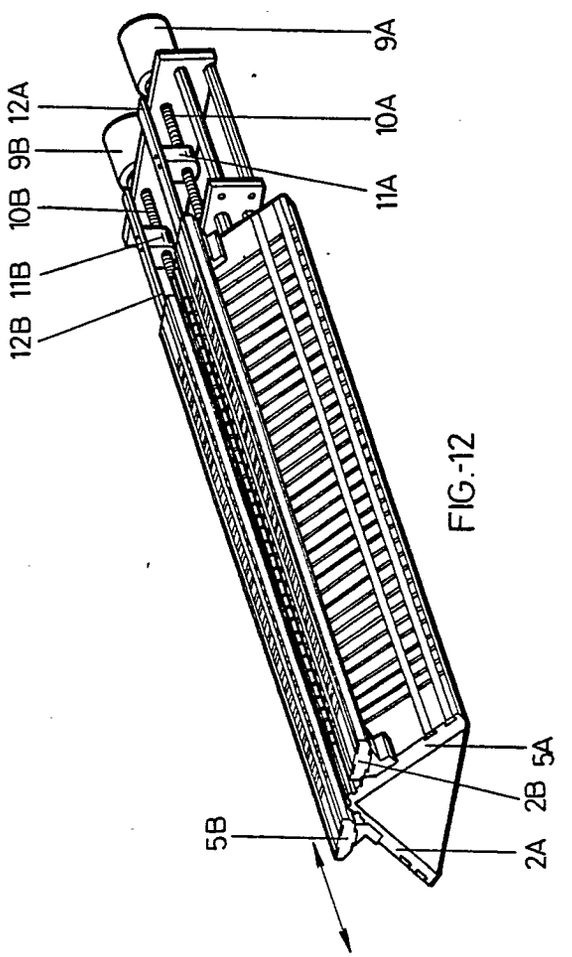

FIG.-12

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IMPROVEMENTS INTRODUCED IN RECTILINEAL KNITTING MACHINES

OBJECT OF THE INVENTION

The present invention refers to a series of improvements introduced in rectilineal knitting machines, concretely orientated towards the consecution of a full automatization in the obtention of the samples of mesh transfer over one same knitting line and with selective side movement.

ANTECEDENTS OF THE INVENTION

The present transfer rectilineal knitting machines are basically equipped with two knitting lines in which are housed the special needles for transfer, together with the tacks and other elements of selection and weaving necessary for the obtention of Links-Links samples, braids and other linkings of transfer.

It must be highlighted that in this type of ligatures, the basic structure is that of a fabric at only one knitting line, which is obtained through the transfer of mesh from the previous knitting line to the latter and viceversa; therefore it is impossible to obtain, in these conventional machines, the transfer of mesh of a knitting line in itself. For the obtention of this type of samples one appeals, at present, to semi-automatic machines in which, in an artisan mode, that is, with manual participation, this type of weaving is made possible.

It is not necessary to highlight the problem derived from this need of manual participation in the process, and which is fundamentally centered in the cost aspect.

DESCRIPTION OF THE INVENTION

With the improvements which the invention proposes one attains, in a rational and productive mode, a full automatization of the manufacturing process of fabrics with side transfer of mesh, being able to attain patterns with drawing effects not only on the inside or medium area of the fabric, no matter if on one and one knit, channeled, etc. but also on the rims of same (drop stitches) working at one or two knitting lines.

In accordance with the fundamental objective of the invention, which is centered on the move of mesh of a knitting line in itself or side transfer, that is attained through some auxiliary mechanisms which are materialized, in essence, in some punches with transfer incorporated to same, set forth within some auxiliary knitting lines that have a selective side movement corresponding to one, two, three.... needles, at the same time, independently from the movement of the knitting lines of needles or of weaving.

Each of the needles corresponds with a punch or tack of side transfer.

If needle and punch have been selected through the corresponding work program, both elements advance in synchronization; the needle delivers the mesh to the punch and it transfer same to another needle of the same knitting line, after transmitting through a step by step motor, to the auxiliary punch knitting line, the selective side movement necessary for such change.

DESCRIPTION OF THE DRAWINGS

To complement the description which is being made and in order to aid to a better understanding of the characteristics of the invention, we enclose to the present specification, as an integral part of same, a set of drawings in which illustratively and not limitatively, the following has been represented:

Figures 1, 2, 3, 4 and 5.- Show different manual processes for the obtention of the side transfer in conventional semi-automatic machines.

Figures 6, 7, 8, 9, 10 and 11.- Represent different types of samples of side transfer, which may be obtained in a classical mode, that is, in an artisan mode, or industrially, through the use of rectilineal knitting machines with the improvements object to the present invention.

Figure 12.- Shows a schematic perspective representation of the head of a rectilineal knitting machine made in accordance with the improvements of the invention.

Figures 13, 14, 15, 16, 17, 18 and 19.- Schematicaally represent, transversally, respective portions corresponding to the sequence of work of the principal elements which participate in the side transfer pursued.

Figures 20 and 21.- Schematically show two relative positions between needles and punches in their stage of transfer.

Figure 22.- Shows, finally, two views of one of the mentioned punches of side transfer, in which it is observed that structure of such punches and in which it is seen the transfer incorporated to same.

PREFERENT EMBODIMENT OF THE INVENTION

Before getting into the development of the improvements of the invention and for a better understanding of same, it is necessary to explain the manual process followed for the obtention of the side transfer of mesh in the conventional semi-automatic machines, as starting from this process it will be easier to understand the latter explanations relative to the different operational sequences of the automatic process which is attained with the new improvements.

In this sense, in figures 1 to 3 it can be seen the side transfer of a mesh using only one punch. For the move of two, three, four and up to eight meshes, it is frequent to use a tool, represented in figure 4. For a multiple move, of more than eight meshes, much more sophisticated tools are usually utilized, of the type represented in figure 5.

In figures 1 to 3 is expressed, graphically, the simplest process, that is, that of moveing the mesh from one needle to its closest one, and that is located in the same knitting line. This move is made with the concourse of the punch P which is introduced from the hook of needle A through the eyepiece OJ represented in the punches of figure 4. Afterwards, making a manual movement of ascent and descent of the group formed by needle and punch (see arrow of figure 1) one attains to pass the mesh M (figure 2) to the body of the punch, which is liberated from the head of the needle A. The punch O and the mesh N to be transferred, follow the traject indicated by the arrow and go to look for the neighbour needle B, to which body is moved by the mesh M, followig the oscilating movement indicated by the arrow of figure 3.

In the graphic of figure 5 is represented the position of the utmost ascent of the group formed by needles and punches, in a multiple side translation of meshes which process has the same basic movements stated previously.

As previously stated, figures 6 to 11 are different patterns, quite representative, of the cited side transfer. The samples 6 and 7 correspond to two classical drop stitches obtained at two knitting lines and of a different knit structure, whilst in figures 8 and 9 there appear two types of open work obtained inside a garment. In the sample of figure 10 are observed continuous side transfers, with the crossings making rhombuses over a knit bottom that has been weaved with all the needles of the opposite knitting line. The body represented in figure 11 is to make up a garment of a "NORDIC" style, and in it are noted the changes of smooth knit, Jacquard, cannalé, and their internal and external drop stitches.

All these samples can be made not only manually with the conventional semi-automatic machines, but also in a fully automatic mode, with a machine provided with the improvements object of the invention. It should be highlighted that with the automatic process preconized, besides obtaining its industrialization, one accedes to an unknown and unlimited sample collection within this branch of knit wear.

In a more concrete mode, the improvements that are preconized are centered in the disposition above the two knitting lines of normal needles or of weaving 2A and 2B such as shown in figures 12 to 18, of two other auxiliary knitting lines 5A and 5B which serve as a stand to the punches of side transfer or drawers 6A and 6B, which are actuated by corresponding cams 7A and 7B, which transmit to them a longitudinal movement, synchronized with that of the corresponding needles 1A and 1B.

These needles, as well, are mounted with the possibility of a longitudinal movement, impulsed by their cams in the corresponding knitting lines of needles 2A and 2B, supporting, inside the hook of each of said needles, the meshes 3A and 3B of the fabric 4.

The auxiliary knitting lines 5A and 5B are mounted in a sliding mode, as represented in figure 12. These knitting lines have a side movement which is transmitted from the step by steps motors 9A and 9B, through spindles 10A and 10B and the nuts 11A and 11B, to the solidary tensioners 12A and 12B respectively, of the auxiliary knitting lines 5A and 5B.

This side movement is transmitted to the cited knitting lines as per the program of the pattern, at the adequate time, in a selective and independent mode, not only for each of them in between but also with regard to the weaving knitting lines. The movements may be one, two, three, four, five, etc. steps, each step making up a "module of movement" of amplitude coincident with the movement between two adjacent needles, which movement is made in accordance with the arrow represented in figure 12.

On the operational stage shown in figure 13, the needles 1A and 1B are at rest, as well as the tacks or punches of side transfer 6A and 6B. The carriage, on its longitudinal movement along the knitting lines, causes needle 1A to go up, through the transfer cams, as shown by figure 14, and thanks to the action of the auxiliary cams 7A, fixed in the very carriage, the punch 6A of side transfer initiates, at the same time, the advance movement, also indicated in the cited figure 14.

Afterwards and as in turn shown by figure 15, the needle 1A in its ascent movement forces the mesh 3A to get located in the position 8, formed by an echeloning ofthe very needle, being kept at said position until the punch 6A, which continues with its advance movement, is introduced in the cited

mesh 3A, between the body of needle and its corresponding transfer.

Afterwards, a descent movement of the needle 1A is initiated, which goes back to its initial position, as shown by figure 16, whilst the mesh 3A is hooked in the punch of side transfer 6A which, through the action of the cam 7A starts a go back and a slight oscillation, until attaining that the rear hook G of said punch is under the safety wire AS, as shown by figure 16.

In this safety position the punches of transfer 6A reach a higher situation, in the sense indicated by the arrow of figure 16, and remain outside the reach of the detachment teeth DD of the knitting lines of needles or of weaving.

It is precisely in this situation shown in figure 16, when the carriage in its longitudinal movement, has arrived at one of the ends of its travel, when it is produced the side movement of the knitting line 5A, support of the side transfer punches, causing that all the meshes supported in the previously indicated mode, move modularly in an amplitude corresponding to the space defined by one, two, three or more needles, as per the disposition preset in the program of the pattern, remaining the meshes situated opposite new needles, which have been referenced with 1AG.

In figures 20 and 21, it has been schematically represented these positions for the translation of the meshes. Concretely in figure 20 the position is equivalent to that of figure 16,that is, the meshes 3A are opposite the needles 1A. After a movement to the left, equivalent to two spaces between needles, one passes to the position of the figure 21, in which the meshes are situated opposite two new needles 1AG, which are neighbours of the needles 1A which supported the meshes before.

In this new situation and under the action of the carriage of cams that initiates a new longitudinal travel, opposite the former, the needles 1AG ascends, as per figure 17, which is introduced within the mesh 3A, between the body of the punch 6A and its transfer T, as per the drawing in figure 18, and by means of synchronized movements, goes back the punch of side transfer, with which the mesh is supported within the hook of a new needle 1AG as shown in figure 19.

With these movements, described previously, one attains to move the meshes from the normal knitting line 2A to the punches 6A of the auxiliary knitting line 5A, which is located above the opposite knitting line. When the side movement of the auxiliary knitting line equivalent to one, two, three or more needles, has been effected, said meshes, on being transferred to the initial knitting line 2A will have effected a side movement of one, two, three or more needles, as per what is programmed, without interfering at any moment to the meshes 3B which are formed in the opposite knitting line 2B.

In the same way as it has been described for the needles 1A, one may actuate on the needles 1B situated in the opposite knitting line, following the same process. Likewise, the side movement of the knitting lines 5A and 5B may be from right to left or from left to right, as convenient.

When this sytem of transfer is used in the edges of the sides of the fabric, one may obtain the drop stitch at only one knitting line, acting alternatively on the two edges, or either with fabric at two knitting lines, acting alternatively on the two or four edges and making the movements toward the inside of the fabric.

The punch of side transfer offers a structure which appears perfectly reflected in figures 21 and 22, in which it is also appreciated the form of the transfer T associated to same, and which cooperates with it, as well as the safety hook G previously cited.

It is not considered necessary to make more extensive this description so that any expert in the art may understand the scope of the invention and the advantages derived from same.

The materials, shape, size and disposition of the elements will be susceptible of variation, provided it does not mean an alteration to the essentiality of the invention.

The terms under which this specification has been described must always be taken in a broad and non limitative sense.

Claims

1.- Improvements introduced in rectilineal knitting machines, which, having by purpose to attain a full automatization in the obtention of patterns of mesh transfer, over one same knitting line and with selective side movement, are essentially characterized in that they consist in the disposition, in correspondence with the classical knitting lines of normal or weaving needles, of respective auxiliary knitting lines which make up the physical support for punches of side transfer, having it been provided that said knitting lines, auxiliary, be provided with means of longitudinal movement regarding the needles knitting lines, which allow their relative movement in a selective mode, independent and with modular movements, on basis of a module of slide coincident with the distancing between two adjacent needles, in a variable amplitude, coincident with said module or multiple of same, whilst each punch of side transfer is in turn provided with means of longitudinal actuation, synchronized with the movement of the needles, between two limit situations, one of retroaction or inoperance and

another operating one in which said punches are projected towards the medium plane of the machine where it is produced the transfer of mesh and where said punches cooperate with the needles of the opposite knitting line.

2.- Improvements introduced in rectilineal knitting machines, as per claim 1, characterized in that the means of longitudinal or side movement for the auxiliary knitting lines to which purpose these are mounted in a sliding mode over the knitting lines of needles, consist in step by step motors, to which outlet axles are coaxially solidary respective spindles, which operate in the sine of nuts solidarized to two tensioners which in turn are solidary to the respective auxiliary knitting lines, having it been provided that each impulse or step of the motor determines an axial movement of the corresponding tensioner, or what is the same, a longitudinal movement of the corresponding auxiliary knitting line, in accordance with the modular movement cited, being the specific amplitude of the movement for each auxiliary knitting line and at every time, the one determined by the number of impulses or steps made by the motor at that time, according to the program or governing of same, adequate to the pattern to be obtained.

3.- Improvements introduced in rectilineal knitting machines, as per claim 1, characterized in that the means of longitudinal actuation of each of the punches or tacks set forth at one of the auxiliary knitting lines, consist in a cam fastened to the very carriage of actuation of the needles, in consequence existing in said carriage two auxiliary cams, one for each auxiliary knitting line bearing the punches of side transfer.

4.- Improvements introduced in rectilineal knitting machines, as per claims 1 and 3, characterized in that each tack of punch of side transfer incorporates at its rear end or opposite to the area of transfer of mesh of the machine, a hook with which a safety wire cooperates set forth in the corresponding auxiliary knitting line, so that after the reception of a mesh on the part of said punch, same initiates a go back process and a slight inclination, governed by the correspodning carriage cam, with which its hook fits in the safety wire, in a position in which its mesh bearing end is overelevated and out of the reach of the detachment teeth of the needle or weaving knitting lines, at which mesh bearing end besides is set forth duly solidarized to the side transfer punch, a transfer.

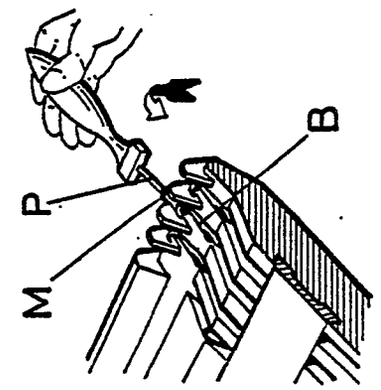


FIG.-3

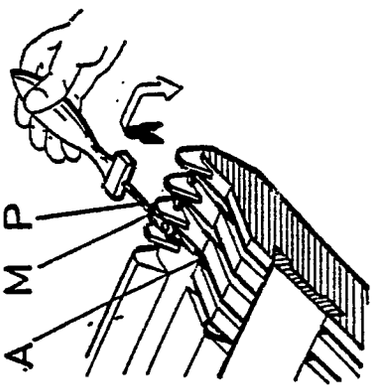


FIG.-2

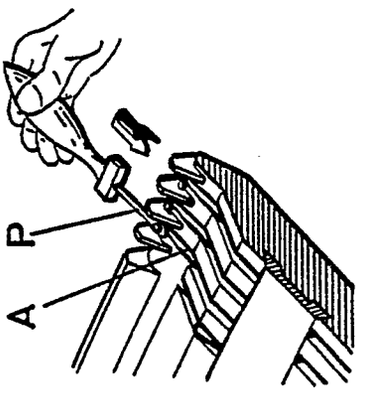


FIG.-1

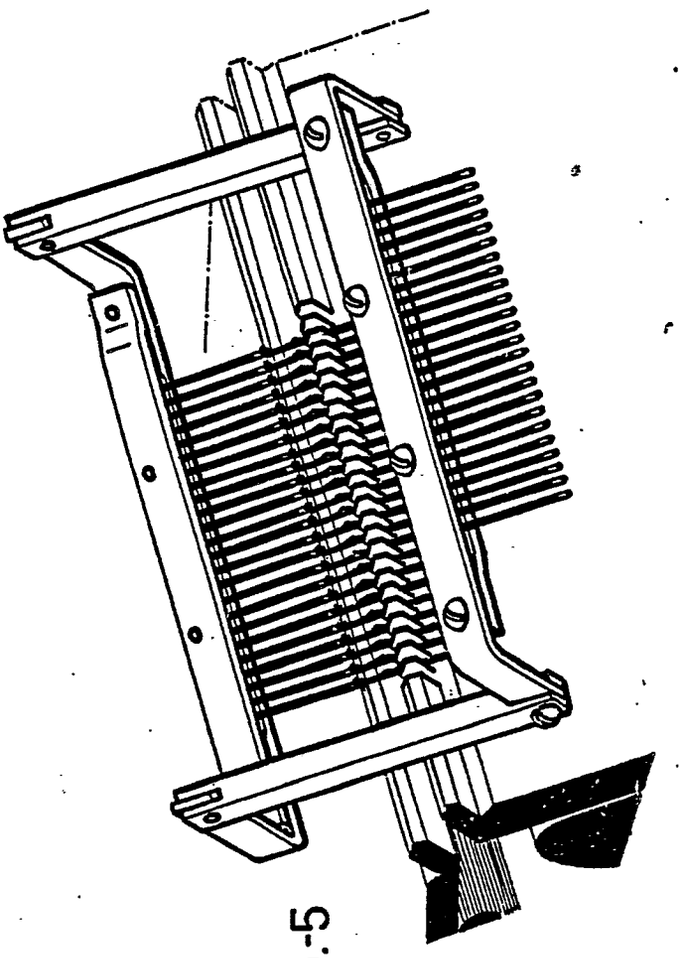


FIG.-5

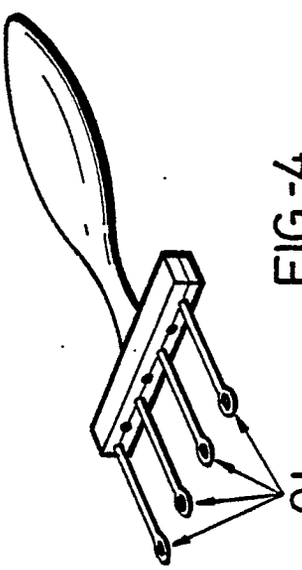


FIG.-4

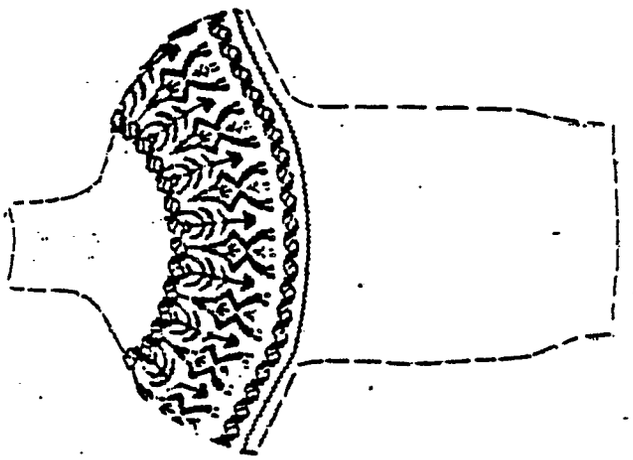


FIG.-11

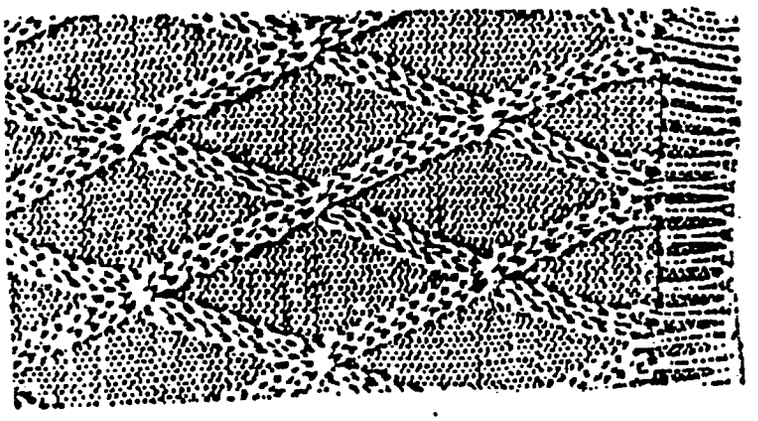


FIG.-10

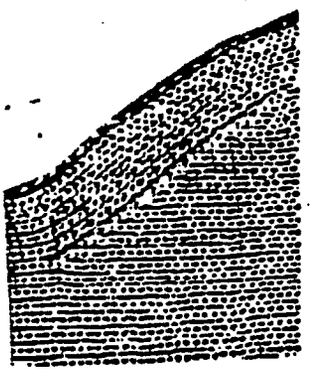


FIG.-7

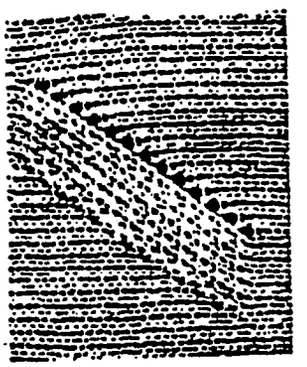


FIG.-9

FIG.-6

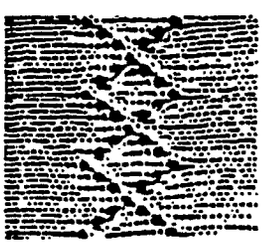


FIG.-8

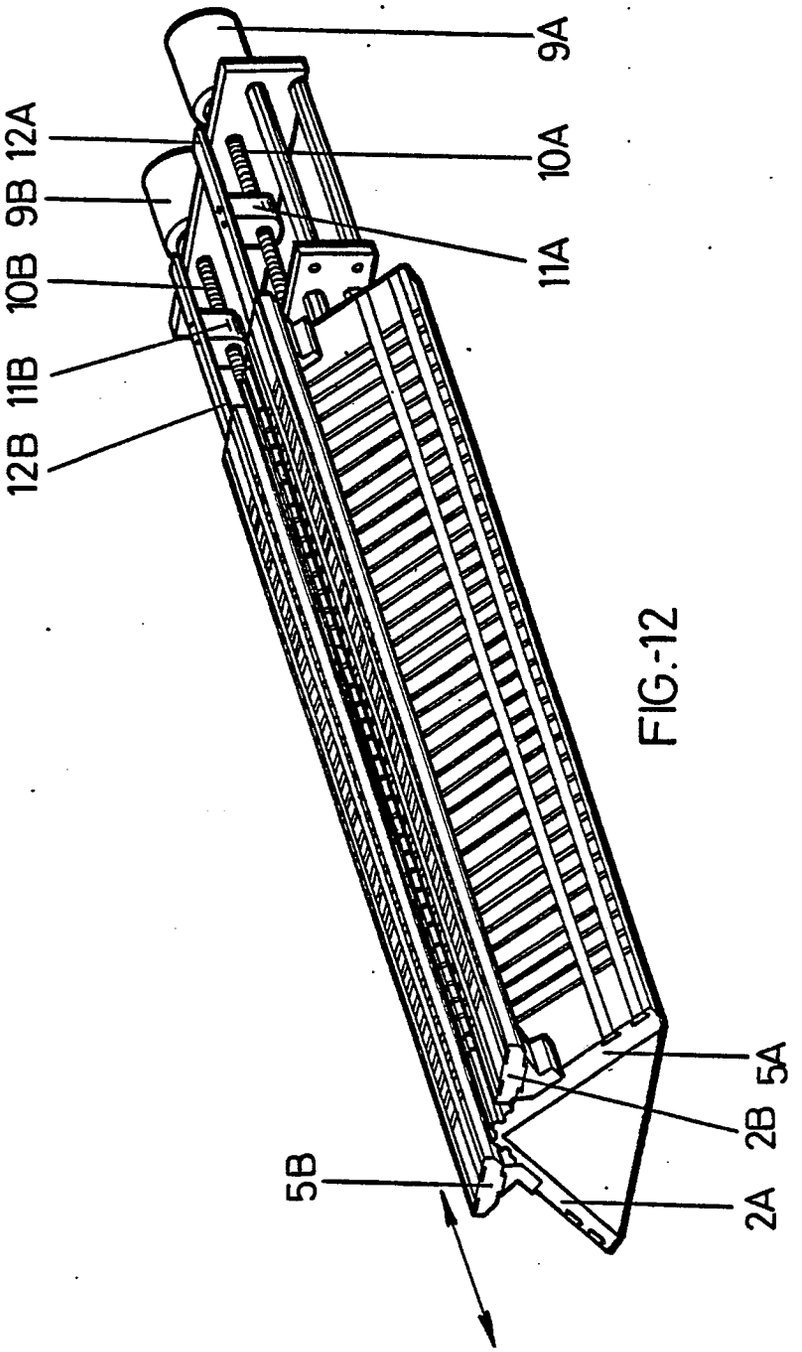


FIG.-12

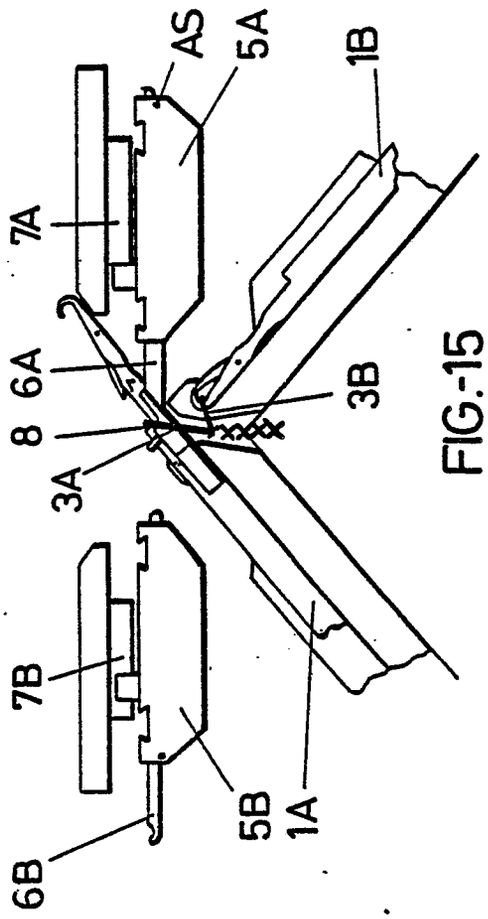


FIG.-15

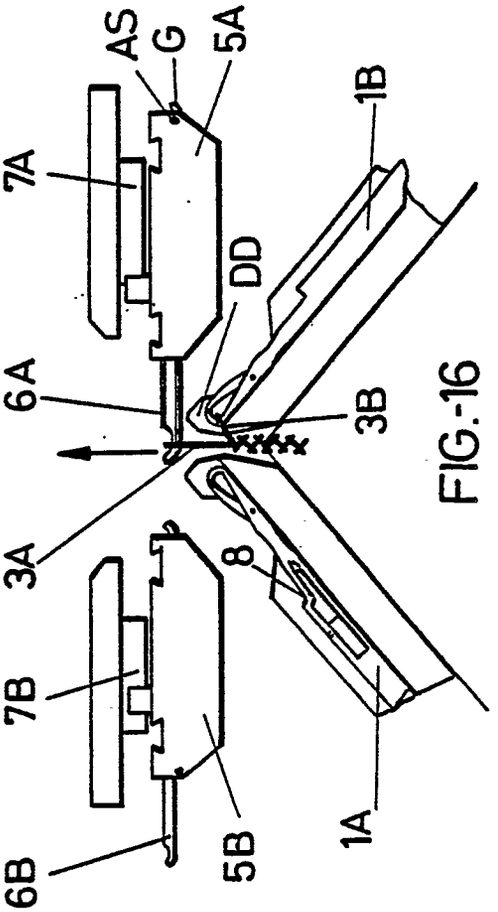


FIG.-16

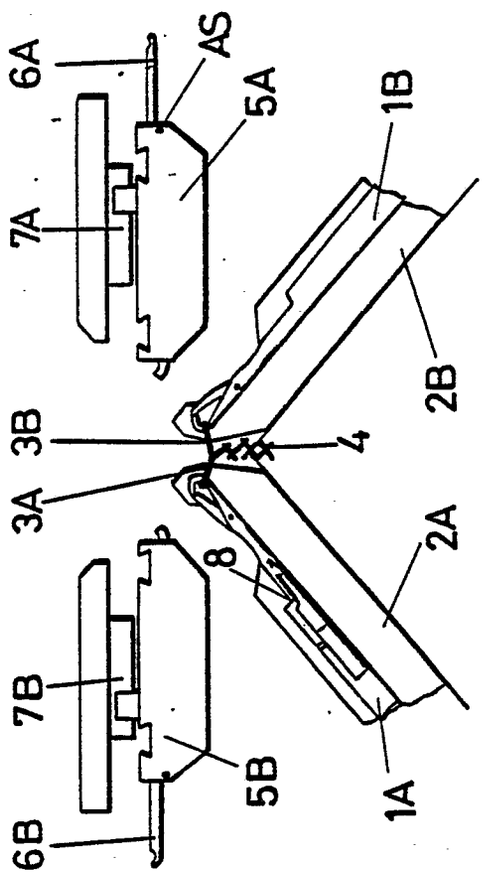


FIG.-13

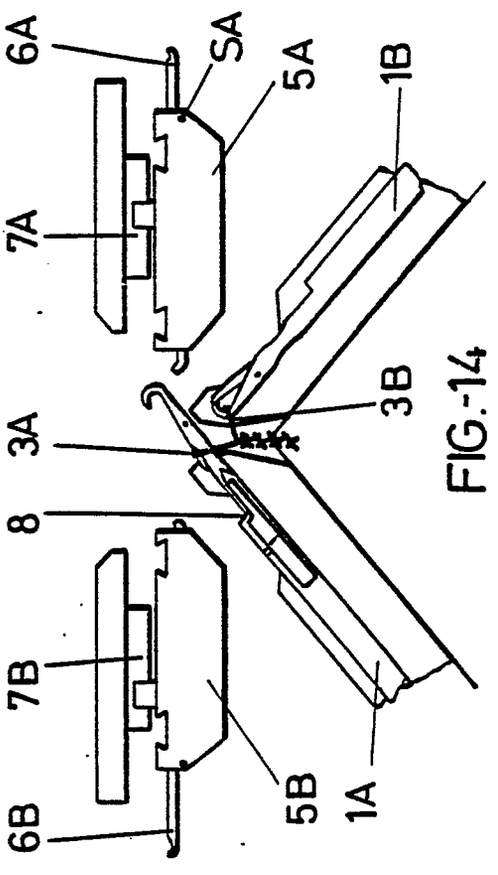


FIG.-14

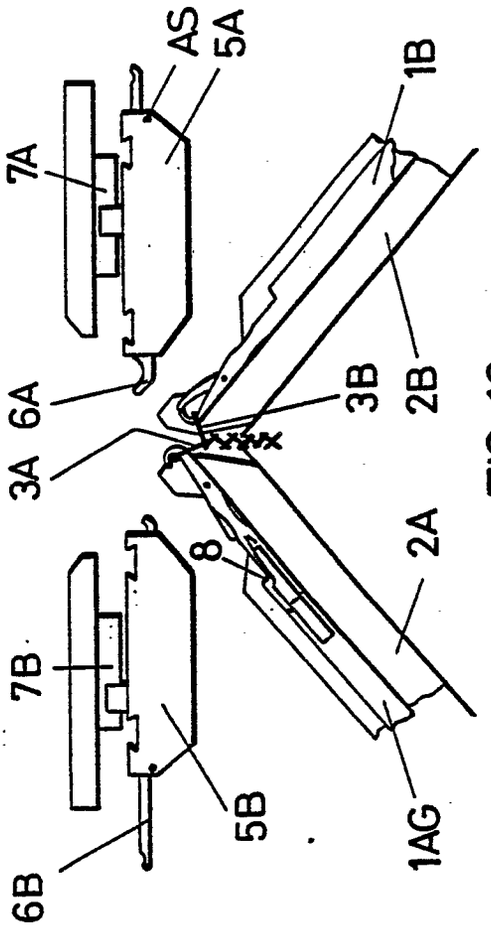


FIG.-19

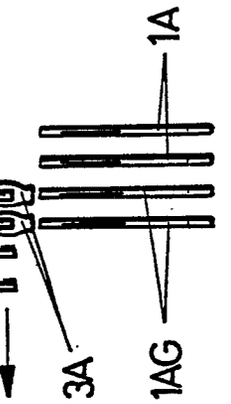


FIG.-21

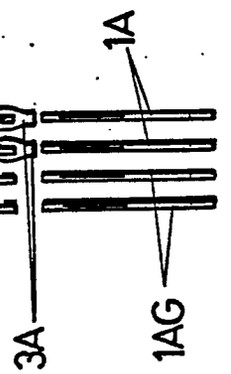
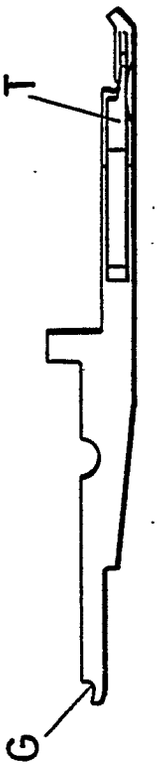


FIG.-20



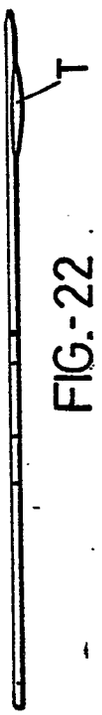


FIG.-22

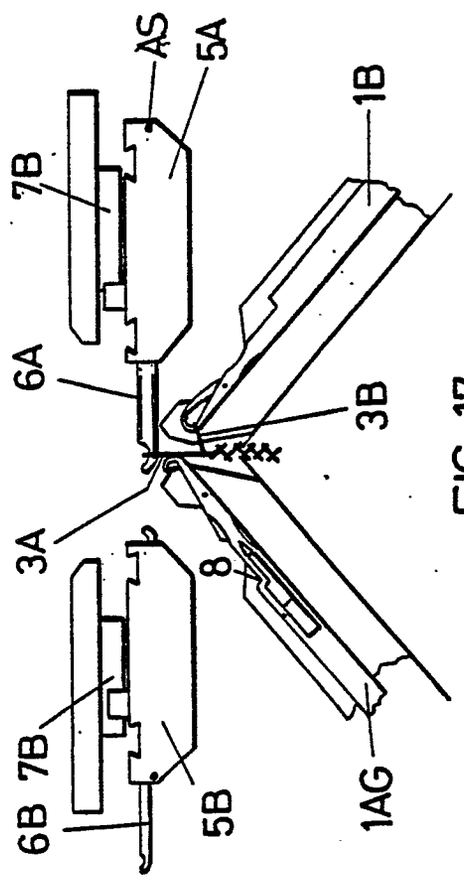


FIG.-17

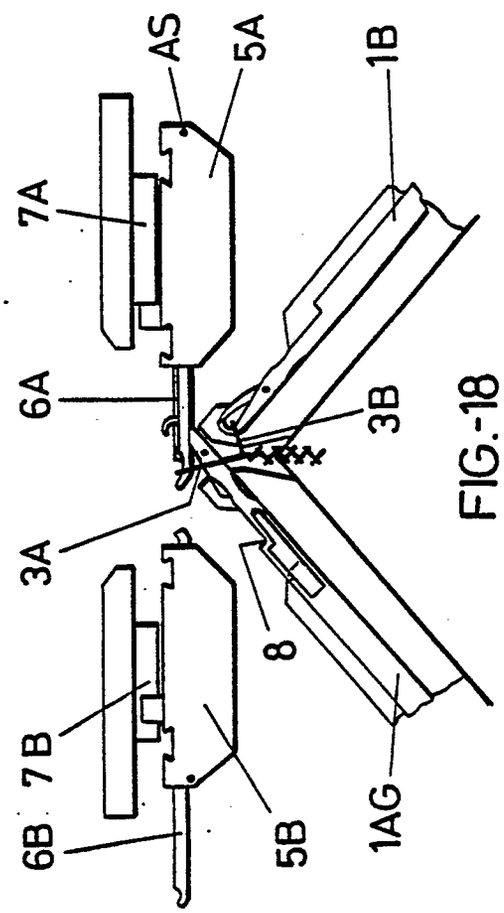


FIG.-18

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 87 50 0065

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE-A-2 262 199 (ABRIL CULLELL) * Claims 1-5; figures 1-9 *	1,3	D 04 B 7/20
A	US-A-3 668 895 (BRUELEMANS) * Column 1, lines 62-68; figures 2,3 *	1	
A	US-A-3 783 643 (LADYMAN et al.) * Abstract; claim 1; figure 1 *	1,2	
A	EP-A-0 055 545 (SILVER SEIKO)		
A	EP-A-0 103 033 (COMET MARTINELLI)		
A	US-A-2 110 915 (NOGLER)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

D 04 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16-06-1988	VAN GELDER P.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)