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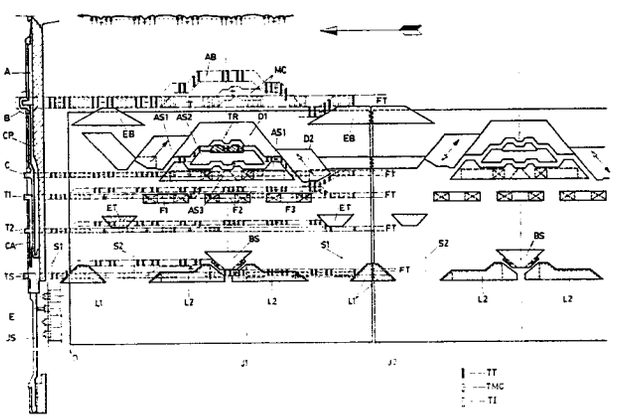
(54) Modular system of bolts actuating over the knitting elements in rectilinear knitting machines.

(57) The invention concerns a modular system of bolts, usable in the knitting systems of rectilinear knitting machines, in which each one of the bolts turns out to be «self-sufficient», in other words, functionally independent of the other ones and consequently provided with the cams proper for knitting or for transferring fabric, in such a way that the classic conventional movable cams of the machine are now stationary and the cams themselves of each bolt that turn out to be adjustable, which makes it possible to have a practically unlimited number of sets or working systems and besides the three basic operative possibilities can be done simultaneously: «knit», «mesh loaded» and «out of commission», as well as the two transfer possibilities» «deliver mesh» and «receive mesh».

For this purpose double action electromagnets (D) are used to raise the keys, each main key (CP) articulately receives the corresponding needle (A), and it is designed to act as a spring, and between the main key and the selector key (JS) there is an auxiliary key (CA), aided by the corresponding butt and whose purpose is to achieve the return of said main (CP) and selector keys (JS), by means of the corresponding feeding cams.



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TITLE MODIFIED
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Modular system of locks actuating over the weaving elements in rectilinear knitting machines.

The present invention refers to a modular bolt system, essentially designed to be used on the main weaving parts in rectilinear knitting machines, the invention also concerns some of these weaving parts, as will be seen later on, that are located in the grooves of the knitting head sections of said machines.

Basically the system that is proposed has been especially designed so that, independent of the amount and location of said bolts, each one of them turns out to be self-sufficient. More specifically, this means that, without the help or participation beforehand of any other module or bolt unit, each one of them is capable of driving, by itself, the main weaving parts for the obtainment of the basic structures of the stitch. Applying this new system to rectilinear knitting machines implies that, aside from attaining interchangeability between modules, there is the possibility of obtaining, for the first time, a knitting machine with an infinite number of sets or working systems, whose only limitation is the space available for this purpose.

Each one of said bolts has all of the eccentrics or cams needed to knit or transfer, for which reason, the three technical possibilities of weaving

are obtained simultaneously : "knitting operation", "mesh loaded" and "out of operation", without previous preparation in another system or set of bolts.

The system also makes it possible to perform the two possible transfer techniques simultaneously : "deliver mesh" and "receive mesh", in the aforementioned sole set or system, from front to back and vice versa.

As one of the features of the invention it has been provided that the cams, which in conventional systems are movable, now turn out to be stationary, which considerably limits the possibilities of breakdowns, with the subsequent repercussion that this implies on the aspect of maintenance.

On the other hand, the self-sufficient nature of the bolts or modular parts, according to which each one of them is capable of driving, by itself, the main parts for the obtainment of the basic structures of the stitch, in comparison with conventional systems in which there is a first operative module that prepares the work to be completed by a second module, entails the aforementioned possibility of obtaining a machine with an infinite number of sets or different systems and without any other limitation other than the space that is reserved for the modules.

Basically the system that is proposed is based on the use of electromagnets that appear in the Spanish Patent of Invention n° 405 001, filed on July 20, 1972, which the same applicant is the owner of, and whose purpose was to produce the raising of the keys, with the special particular feature that in the present case and as will be seen later on, said electromagnets have a double action.

In accordance with another one of the features of the invention a main key, especially designed so that it may act as a spring is joined articulately to each

needle and said main key has a single butt, but, nervertheless, it offers four operating possibilities : knitting, mesh loaded, receiving mesh and delivering mesh, while with the systems known up to now the keys have two butts built-in and consequently they depend on a larger number of cams.

And on the other hand and for each needle, between said main key and the selector key, there is also an auxiliary key, aided by the corresponding butt and whose sole purpose is to attain the return of the auxiliary key itself, as well as that of the main key, by means of the corresponding alligning eccentrics.

In order to make the description that is being made more complete and for the purpose of a better understanding of the features of the invention, a set of drawings, is appended to the present specification .

Figures 1 and 2, respectively show examples of practical implementation of the modular system of bolts that is proposed, with the paths of the butts of the different weaving parts in different locations.

Figures 3, 4, 5, 6 and 7, show, in respective sequences, the five possibilities or essential technical tracks with the location, in each one of said sequences, of the main weaving parts.

Figure 8, finally shows a schematic representation of the bolts and knitting head sections as a whole, of a rectilinear knitting machine with four systems or sets, in which the different positions and paths that the knitting parts follow, during the sequences of the five basic technical possibilities, mentioned above, turn out to be clearly visible.

Before beginning the detailed description of the modular system of the bolt that is proposed, it is necessary to point out the fact that, though in the example of practical implementation represented in the

figures four sets appear, said number is merely an example, without there being any limitation to this effect, and said number may vary up or down in terms of the practical requirements of each case.

Analyzing in the first case figures 1 and 2, the working possibilities that the modular system of bolts that is proposed offers are derived from them. Specifically in the first one of these diagrams, in which a lateral section of the knitting head section is seen, along its weaving parts, the other drawing corresponding to a phantom view of the bolts of the machine, in which the different paths to be followed by the butts (B, C, T_1, T_2 and T_s) are represented. In the section of the knitting head section, that also appears in figures 1 and 2, all of the weaving parts are represented, among which the needle (A) which is of the transfer type to which the main key (CP) is joined (B) articulately, to work together. This manner of articulately joining (B) the needle (A) and the main key (CP) is a novelty and at the same time it represents an advantage when either of these two parts have to be replaced due to breakage.

The main key (CP) has been especially designed so that it may act as a spring, so that its sole butt (C) obtains the two basic operative and inoperative positions. The inactive position is obtained when the butt (C) is submerged inside the grooves of the knitting head sections, thanks to the joint action of the eccentrics (F), figure 3, and of the butt (T_1) of the auxiliary key (CA).

The other position, the active or working one, is obtained when the butt (C) projects beyond the grooves of the knitting head sections and remains inside the field of action of the eccentrics of the bolts (J_1 and J_2); it is possible to obtain any of the four

working positions, that will be specified in detail later on.

It is worth mentioning that the butt (T_2) of the auxiliary key (CA), just like the butt (B) formed by the joining of the needle (A) and the main key (CP) serve, exclusively for the return of the keys (CA and CP) to their initial position, by means of the respective aligning eccentrics (ET and EB).

The needle (A), the main key (CP) and the auxililiary key (CA) have been described up to here as weaving parts, but there is also a key or jack selector (JS).

This jack selector (JS) is chosen or raised towards its active position, as figures 1, 2 and 4 reveal, by means of the core (E) of any of the electromagnets (D) arranged broadwise on the knitting head sections. When the butts (TS) are selected, they project from the knitting head sections and enter inside the field of action of the cams (L_1 and L_2), figures 1 and 2, and by means of the inclined planes of said cams they make the jack selector (JS) move until the other weaving parts are placed in their working position, as figure 4 shows.

So that the jack selector returns to its initial position, the system has a built-in elimination eccentric (BS) that, with its special section, makes the butt (TS) of said key drop and at the same time sink in the corresponding groove of the knitting head section. In accordance with this structure for the modular system of bolts, the basic technical possibilities that the same offers are the following :

- Out of operation : in this position the needle (A) and the keys (CP, CA and JS) are not moved and for this reason they lack the normal up and down movements of the same. The actual situation of the main

weaving parts is the one represented in figure 3. In order to obtain said location or position, it is necessary for the jack selector (JS) to remain inoperative, without the electromagnet (D) being activated, in which case the cams (L_1 and L_2) that raise the jack selectors (JS) will go above the butt (TS). In this situation the butt (T_1) of the auxiliary key (CA) will remain sunk by the action of the stationary eccentrics (F), during the stroke of the carriage, which will cause the butt (C) of the main key (CP) to remain submerged inside the groove of the knitting head section, in each one of the positions in which it will coincide with the ascending (AS_1 and AS_3) and descending or forming (D_2) eccentrics.

In short, in this position, the location of each part is the following : the key or jack selector (JS), without being selected. The auxiliary key (CA) pressed on or sunk by the eccentrics (F) and the butt (C) of the main key (CP) submerged. This location is observed in figure 3, as it has been said above, while the paths (FT) of the butts are seen in figure 1, and the position of out of operation is in turn seen over-all in figure 8.

- Knitting : Obviously this position (fig. 4) is the active or working one. It is obtained when the jack selector (JS) is raised by means of the core (E) of the electromagnets (D); so that its butt (TS) projects beyond the corresponding groove of the knitting head section (see figure 1). The acting or tripping of the electromagnets is produced in both directions of operation of the carriage, and in a position somewhat advanced in terms of that of the cams (L_1) that always, precede, each one of the bolts of the machine. These selection positions or tripping lines (S_1) turn out to be clearly visible in the aforementioned figure 1.

The jack selector (JS) selected is moved by the eccentrics (L_1), figure 4, whose special section is perfectly coupled to the section of the butt (TS) that in turn pushes the auxiliary key (CA), for the purpose of placing the butt (T_1) out of reach of the cams (F); this causes the butt (C) to project beyond the grooves of the knitting head sections and it may be driven by the cams (AS_1, AS_2 and D_1 and D_2), for the ascent and subsequent descent or forming of the stitch of the needle (A).

The butts that have been chosen for knitting, pointed out in black, follow the fan-shaped section (AB) shown in figure 1 and described by the same during their ascending and descending stroke.

In this basic working position, the location of each one of the weaving parts is the following : the jack selector (JS) is selected in the line (S_1). The butt (T_1) of the auxiliary key (CA) remains out of reach of the eccentrics (F). The main key (CP), along with the needle (A) reach their ascending position.

This location is reflected in figure 4, that represents a cut made in the knitting head section, in accordance with the cutting line (T-T') of figure 8.

- Mesh loaded : This position is attained, just like in the aforementioned position, upon raising the jack selector figure 1, in a second selecting or tripping line (S_2) and whose position is somewhat advanced, in the same extent in both directions of operation of the carriage, in terms of the cams (L_2).

The jack selector (JS) selected is moved by the eccentrics (L_2), figure 5, that in turn push the auxiliary key (CA), in such a way that it manages to place the butt (T_1) out of the reach of the last two cams (F_2 and F_3), as is shown in figure 1. This causes the delay in the butt (C) coming out of the

grooves of the knitting head sections, to a sufficient extent that the inside section of the eccentrics (AS_3, AS_2 and AS_1) must continue up to the "mesh loaded" position. The butts that have been selected in (S_2), mesh loaded, have been drawn in white with a line that divides the butt into two; one can clearly follow its stroke (MC) in the figure.

In this basic position, named "mesh loaded", as it has been said above, the location of each one of the parts that take part is the following : the jack selector (JS) is selected in the line (S_2). The butt (T_1) of the auxiliary key (CA) remains outside of the reach of the eccentrics (F_2 and F_3). The main key (CP) and the needle (A) are located half way up, in other words, in the mesh loaded position. This all turns out to be clearly visible in figure 5 that is a section in the knitting head section, in accordance with the cutting line (M-M') of figure 8.

- Mesh delivery (transfers) : This position, serves to transfer or pass the meshes from one knitting head section to another. In order to obtain said position, the same process described to obtain the "knitting" position is followed exactly with the only difference being that it is necessary to put the special transfer cam (TR), figure 2, in the working position.

- The butts that have been selected in (S_1) are shown in black and the section (AB) that they describe during their stroke, can be clearly followed in figure 2.

In this basic position of "mesh delivery" the transfer, the location for each one of the parts is the following : The jack selector (JS) in the line (S_1). The butt (T_1) of the auxi 'CA) remains out of reach of the eccentrics (F). Th (CP), along with the needle (A) reach

a position of maximum ascent, supplied by the eccentric (TR).

This position turns out to be clearly visible in figure 6, which represents a section in the knitting head section in accordance with the cutting line (EN-EN') of figure 8.

- Receive mesh (transfer) : This position is the one that serves to receive the mesh that the needles of the opposite knitting head section deliver. In order to obtain said selection the same process that has served to obtain the "mesh loaded" position must be followed with the only difference being that the ribbed part of the cam (AS_1) of figure 2 will be cancelled out, or else its symetrical part, depending on the direction of operation of the carriage. The butts that have been chosen in (S_2) to receive mesh, are represented in white with a line that divides the butt 2, and the section (MC) that it describes during its stroke, can be perfectly followed in figure 2. In this position of "receiving mesh" for transfer, the situation of the basic parts is the following : the jack selector (JS) is selected in line (S_2). The butt (T_1) of the auxiliary key (CA) remains outside of the action of the eccentrics (F_2 and F_3). The main key (CP), along with the needle (A) reach the position of "receiving mesh". This position turns out to be clearly visible in figure 7, that represents a section of the knitting head section, made in accordance with the cutting line (RE-RE') of figure 8.

Finally it is worth pointing out that in the schematic and over-all representation of figure 8 of the modular system of bolts coupled to the knitting head sections of a rectilinear knitting machine, the following references have been used : (FT) placement of the system in "out of operation", (T) "knitting"

position, (MC) the "mesh loaded" position, (RM) the "receive mesh" position and (EM) "mesh delivery" position.

The materials, shape, size and arrangement of the parts will be liable to variation as long as this does not imply an alteration of the essential nature of the invention.

CLAIMS

1. A modular system of bolts acting on the weaving parts of rectilinear knitting machines, characterized by the fact that each operating module, as a weaving part, has a transfer type needle (A), a main key (CP) articulatedly joined to said needle (A), an auxiliary key (CA), an extension of said main key (CP) and a selector jack (JS) with the particular feature that the main key (CP) acts as a spring, and that it is capable of adapting two basic positions, operative and inoperative, with the cooperation of a single butt (C), with the auxiliary key (CA) having another butt (T1) and defining a third butt (B) in the area where the main key (CP) is joined to the needle (A).

2. A modular system of bolts acting on the weaving parts of rectilinear knitting machines, in accordance with claim no. 1, characterized by the fact that the inoperative position of the module is obtained with the cooperation of some cams or eccentrics (F) that are stationary, which act on the butt (T1) of the auxiliary key (CA) and simultaneously on the sole butt (C) of the main key (CP) where it is provided that the auxiliary key (CA) has a second butt (T2) that, just like the butt (B) formed by the joining of the needle (A) and the main key (CP) serves solely for the return of said keys

to their initial position, with the aid of the corresponding aligning eccentrics (ET and EB), at the same time that the selector jack (JS) is activated by an electromagnet (D) in an upward direction or movement towards the operative position, in which its sole butt (TS) enters within the field of action of the cams (L1 and L2) that, through the inclined planes, make the aforementioned key move until the rest of the weaving parts are put in the working position, where it is also provided that there exists an ellimination eccentric (BS), with which the selector jack (JS) returns to its inoperative position by sinking in the corresponding groove of the knitting head section.

3. A modular system of bolts acting on the weaving parts of rectilinear knitting machines, in accordance with the above claims, characterized by the fact that in the out of operation position the selector jack (JS) remains inoperative, with the corresponding electromagnet (D) disactivated, and its butt (TS) reinserted at the bottom of the groove of the gaiting, just like the butt (T1) corresponding to the auxiliary key (CA) on which the eccentrics (F) fixed in the stroke of the carriage travel, while the butt (C) of the main key (CP) likewise remains resunk in the groove of the knitting head section and it turns out to be inoperative in terms of the ascending (AS1-AS3) and descending or forming (D2) eccentrics.

4. A modular system of bolts acting on the weaving parts of rectilinear knitting machines, in accordance with claims 1 and 2, characterized by the fact that the "knitting" position is obtained by means of raising the selector jack (JS) by activating the corresponding electromagnet (D), producing the activation of said electromagnet in both directions of operation of the carriage and in a position slightly advanced in terms of the cams (L1) that precede each one of the bolts of the machine,

in said working position the selector jack (JS) and by means of its corresponding butt (TS) is moved by said cams (L1), pushing said key (JS) to the auxiliary key (CA) in order to place the butt (T2) of the latter outside of the reach of the stationary cams (F), which causes the butt (C) of the main key (CP) to emerge from the groove of the knitting head section and so that it may be activated by the cams (AS1, AS2, D1 and D2) so that the needle (A) raises and subsequently lowers or forms the stitch.

5. A modular system of bolts acting on the weaving parts of rectilinear knitting machines, in accordance with claims nos. 1 and 2, characterized by the fact that in order to attain the position of mesh loaded the selector jack (JS) is activated by the corresponding electromagnet (D), in a second selecting or tripping line (S2) whose position remains slightly advanced, in both directions of operation of the carriage, in terms of a second group of cams (L2) pushing in turn the auxiliary key (CA) with the butt (T1) of the auxiliary key remaining outside of the reach of the last two cams (F2 and F3) which delays the butt (C) from coming out of the main key (CP) to a sufficient extent so that the internal section of the eccentrics (AS3, AS2 and AS1) that correspond provoke the movement of the needle (A) towards the "loaded mesh" position.

6. A modular system of bolts acting on the weaving parts of rectilinear knitting machines", as per claims 1, 2 and 4, characterized in that for the obtention of the position of "deliverying mesh" one proceeds in a mode analogous to the contents of claim 3 to reach the "knitting" position with the only exception that on the working position is located a special transfer cam (TR) which provokes a position of maximum lift for the needle (A) through the main key (CP) acting in the

same way for the obtention of "receiving mesh" in which there remains cancelled one part of the cam actuating in the previous case, concretely according to the running sense of the carriage.

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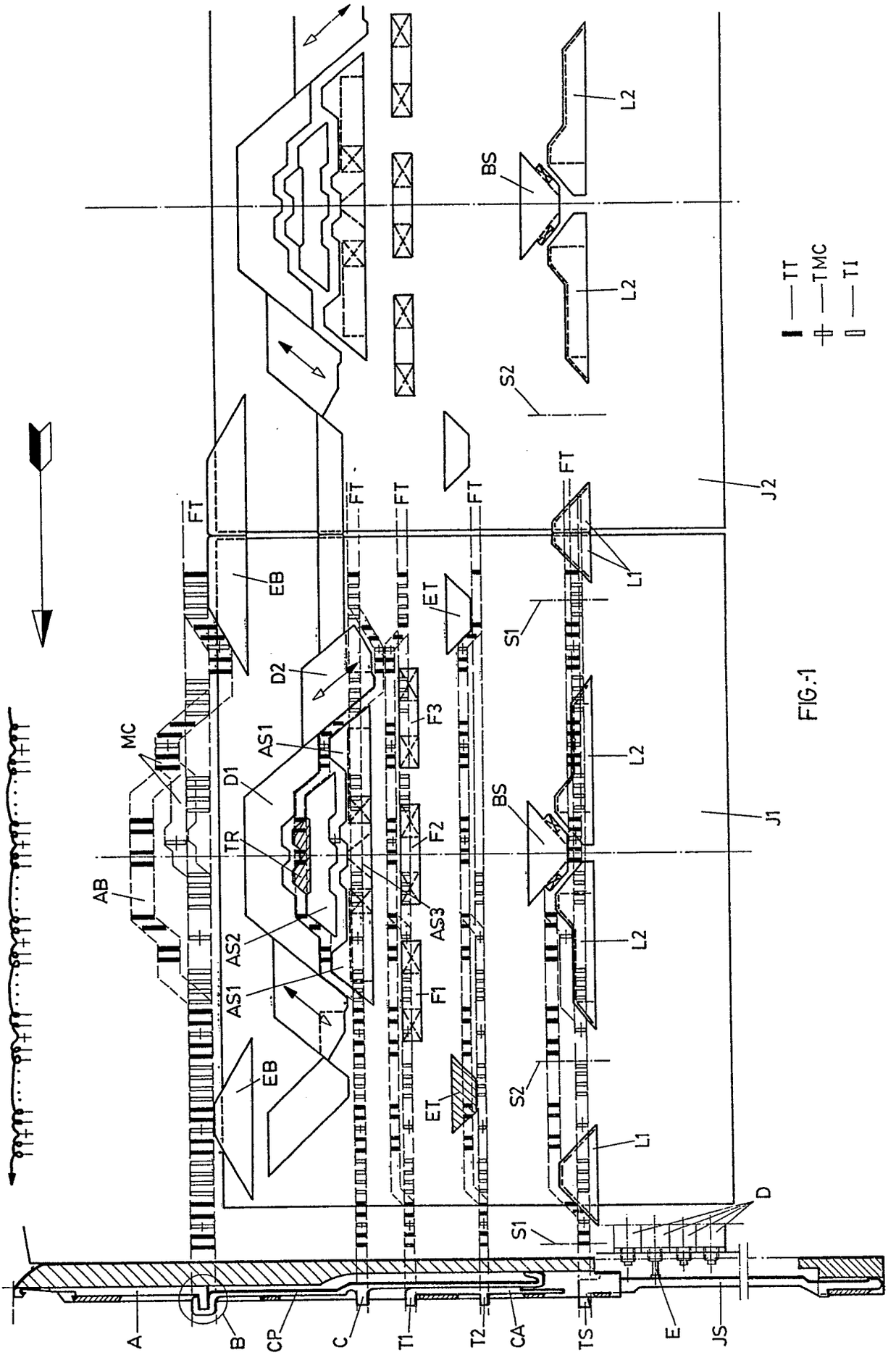

FIG.1

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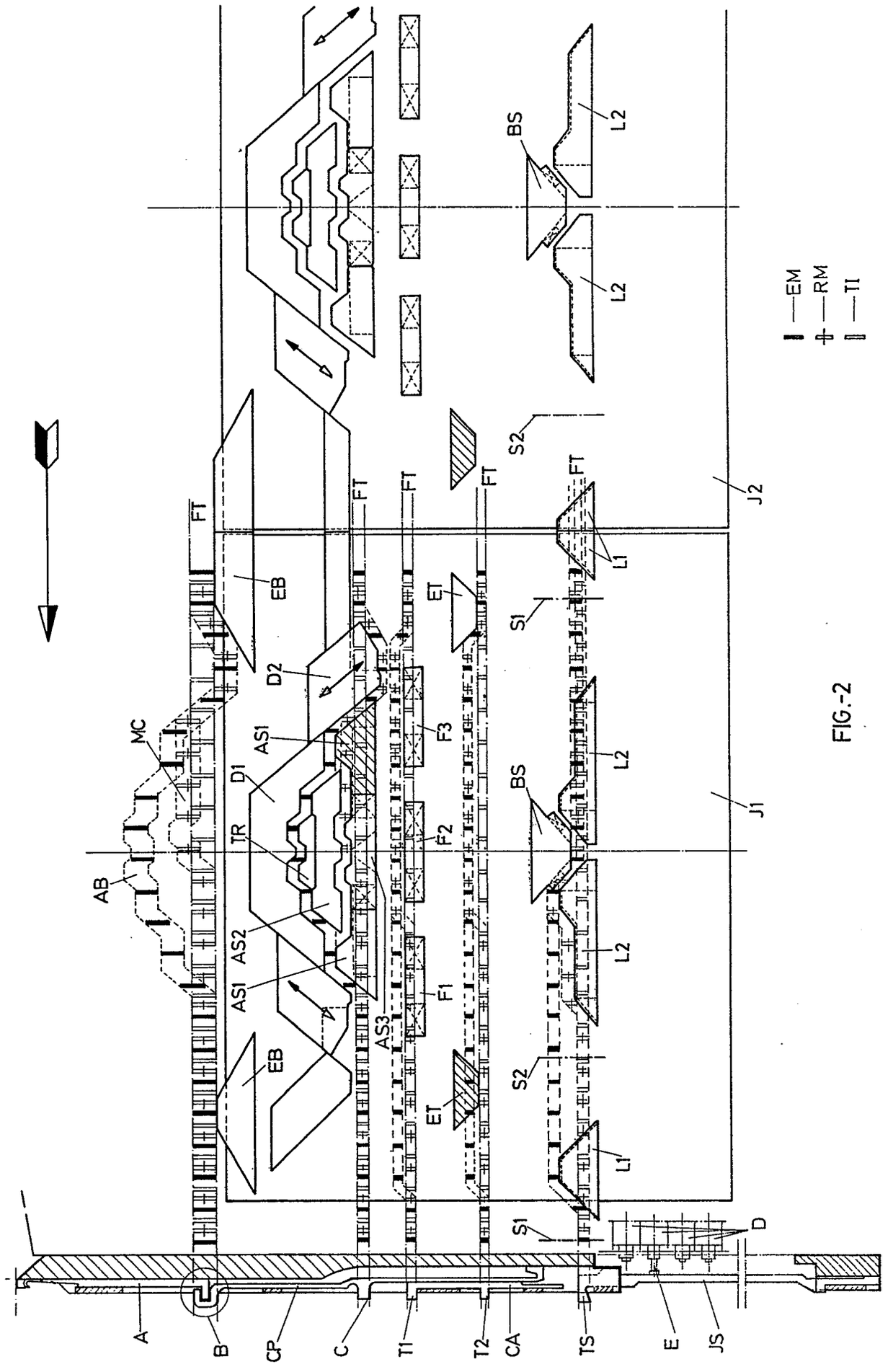

FIG.-2

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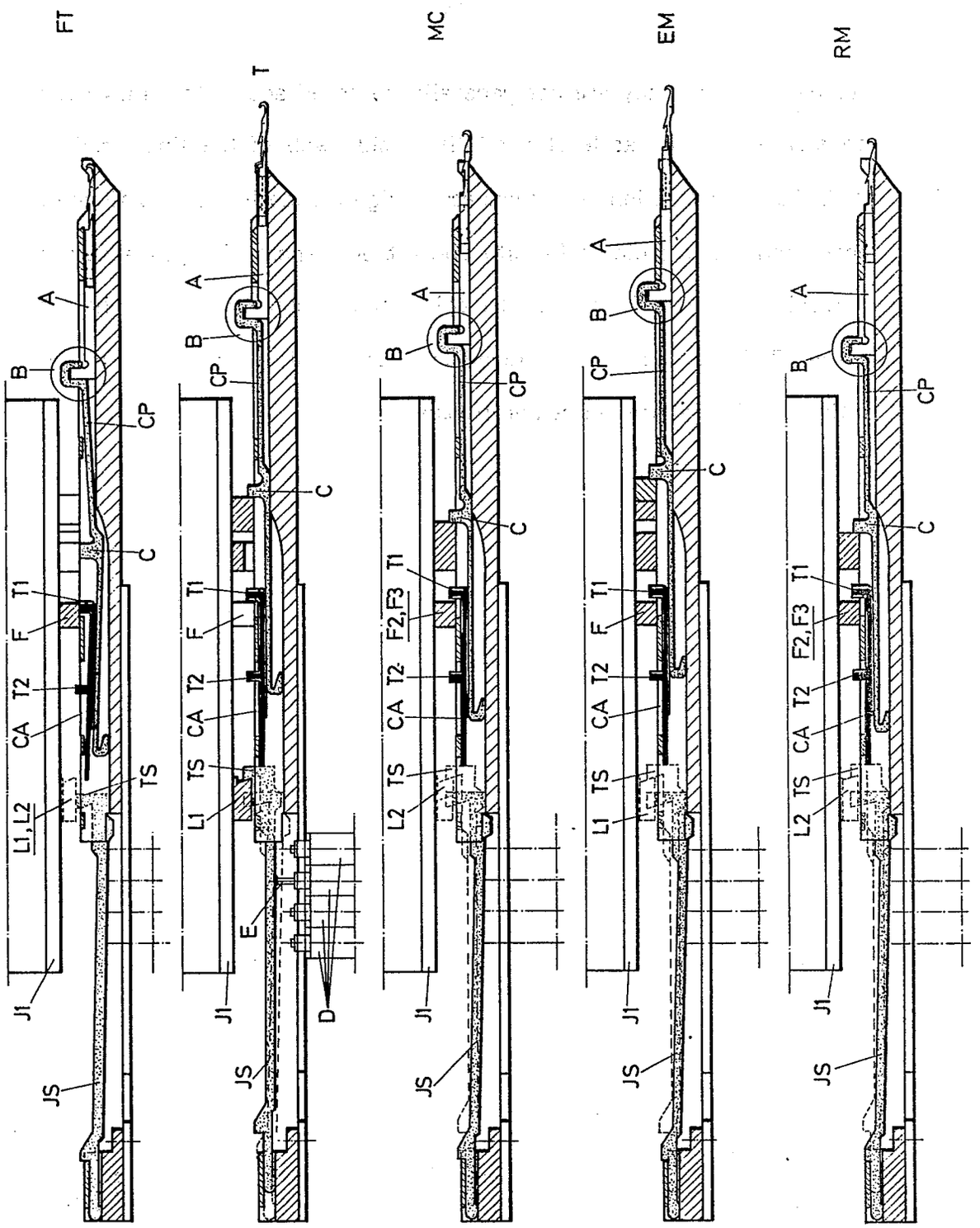

FIG.-3

FIG.-4

FIG.-5

FIG.-6

FIG.-7

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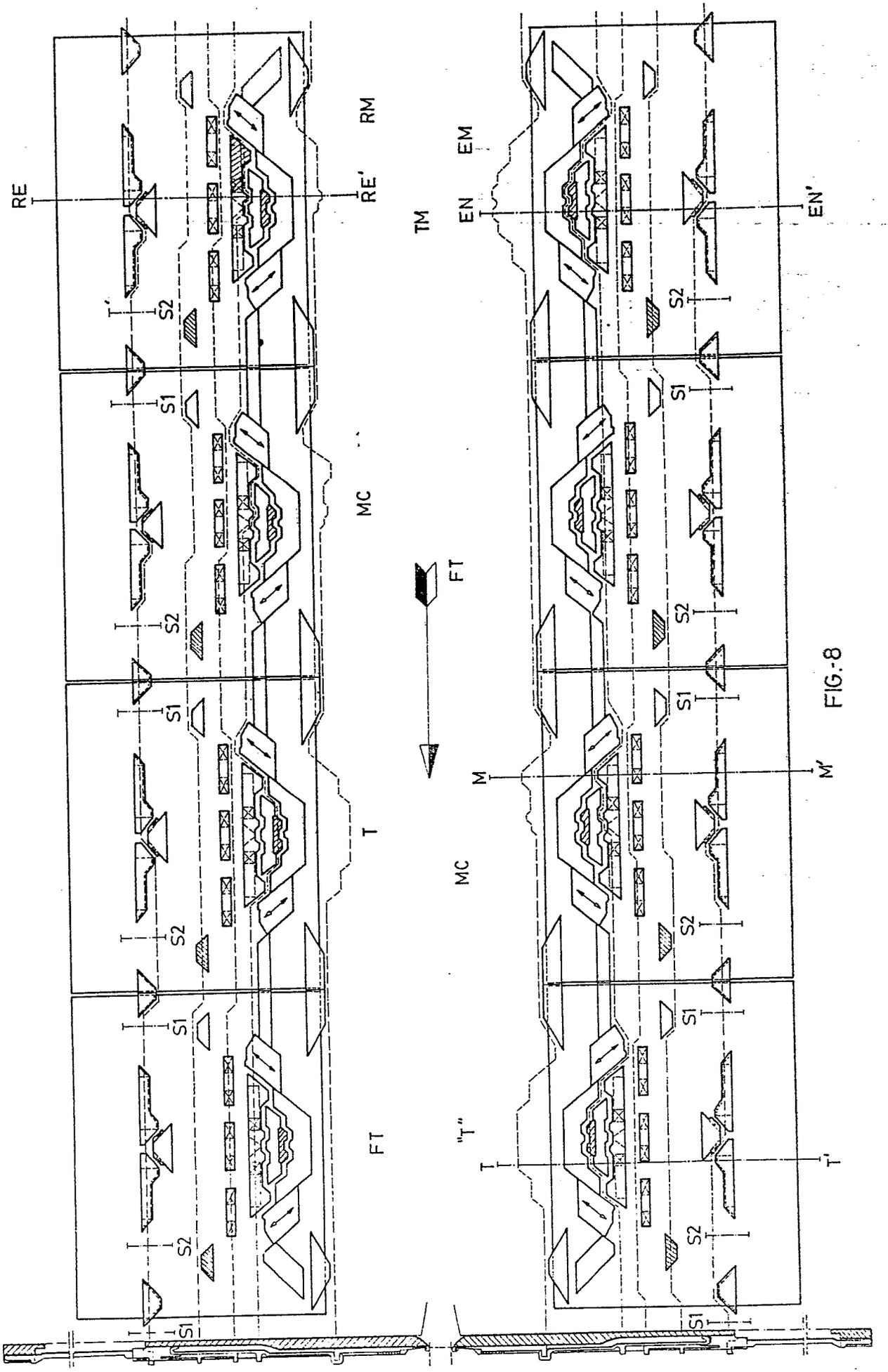

FIG-8

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Application number

EP 87 40 0170

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EUROPEAN SEARCH REPORT

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	FR-A-2 075 791 (H.STOLL & CO.) * Claim 1; page 5, line 30 - page 6, line 39; figures 1,2 *	1	D 04 B 15/68
A	US-A-4 197 722 (COTE-PETIT)		
A	GB-A-2 008 157 (SHIMA IDEA CENTER)		
A	WO-A-8 100 868 (BENTLEY ALEMANNIA LTD.)		

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	12-06-1987	VAN GELDER P.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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