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(54) **Apparatus for assisting the return of threads into respective presentation channels within warpers which carry out thread-by-thread warping**

(57) Apparatus for assisting the return of threads into respective dwell and presentation channels within warpers carrying out thread-by-thread warping and provided with a thread-holding hook (2) intended for picking up and winding individual threads onto a support offered by the warper according to a sequence corresponding to the selected warping program, comprising a plurality of flat elements (1) cascade-like disposed unidirectionally in the direction (D) of transit of the threads each time

engaged by the thread-holder (2) within an area (H) between the warper and a reel for the support of the threads, each of said elements (1) exhibiting a portion (11) which engages the corresponding thread being in a dwell and presentation attitude and movable between a position in which said portion (11) engages the corresponding thread and a position in which the thread is disengageable from said portion (11) by means of the thread-holding hook (2) which transits within said area (H).

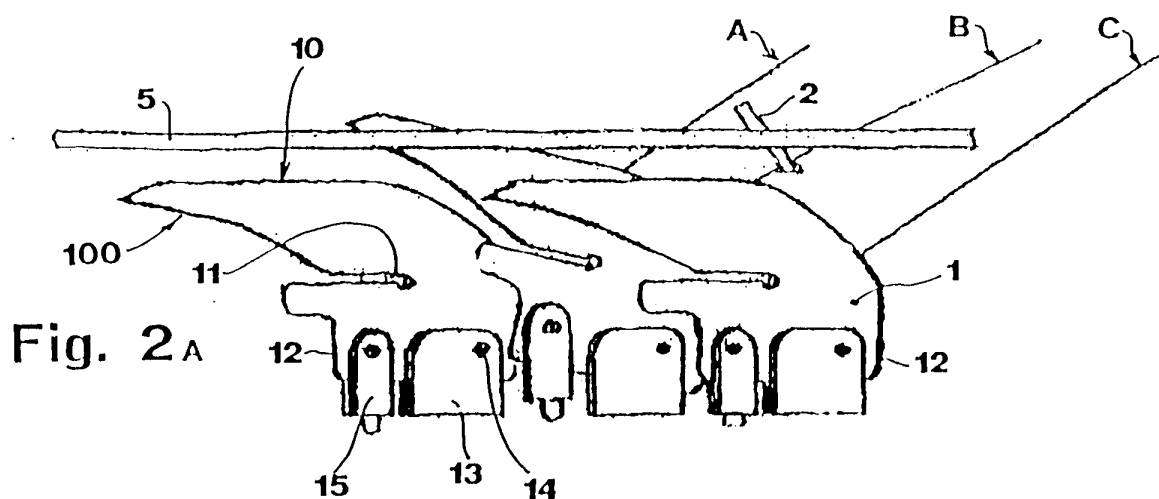


Fig. 2 A

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Description

[0001] The present invention refers to an apparatus for assisting the return of threads into respective presentation channels within warpers which carry out thread-by-thread warping.

[0002] It is known to those skilled in the art that the so-called thread-by-thread warping is carried out by means of drum warpers and by vertical or Hergeth warpers. The former comprise a cylindrical drum on which the threads are made to wind up in a number and a sequence preset by the selected warping pattern, the threads being wound up one-by-one on said drum with the aid of a thread-holding rod rotating about its longitudinal axis and carrying at its free end a hook which engages, one at a time, the threads being wound up. Mounted on the periphery of the drum is a series of ring-closed belts, the latter developing parallel to the axis of rotation of the thread-holding rod and having the threads being laid thereon. By moving said belts there is obtained a progressive moving away of the turns of thread wound up onto the drum from the point of their deposition, that is, a progressive moving away of the turns from the front of the drum, that is, the side of the drum facing the creel which supports the reels of threads. Provided in correspondence of the lower part of the drum front, that is, downstream of the creel, are threads-presentation or dwell channels in correspondence of each of which there are mounted members intended for presenting the respective threads, when required by the warping program, to the hook of the rotating thread-holding rod, the presentation of the threads being made after the release of said hook since, as set forth above, this type of warping provides for treating one thread at a time. The said presentation channels are also those into which the threads move back when coming from the thread-holding rod. In order to eject the threads from this rod, provision may be made for one or more ejectors, each being mounted in a corresponding channel as described in EP 832998. To guide the re-entry of the threads removed from the hook of the thread-holding rod, a cam is provided, so-called "sabre cam", which extends over the whole area of the channels for the dwell, presentation and return of the threads, so as to guide the re-entry of same threads by its lower edge. The upper edge of the sabre cam acts as a thread-guide body for the threads carried by the rotating rod and passing in correspondence of said area.

[0003] In the Hergeth-type warpers, the deposition support of the turns of threads forming the warper has a substantial vertical, instead of cylindrical, development, and the thread-guiding hook is solid to a belt wound over two opposite pulleys of said support. The above described procedure for dwell, presentation, winding and re-entry of the threads is carried out also for this type of warpers.

[0004] One of the major problems in this technique relates to the simplification and speeding up of the proce-

cedure for the return of the threads into the respective presentation channels after they have been released from the hook of the thread-holding rod. In fact, owing to the inertia, each thread tends, after being ejected from the hook of the thread-holding rod, to move beyond the region of said channels and to form a loop whose recovery takes a time which is longer the greater is the development of the loop.

[0005] To this end, the re-entry of threads is usually made faster by using a series of heavy discs which the same threads are made to go through. But the weight of these discs, that is, the tension in the threads under work, cannot exceed that value that would cause the same threads to break during the formation of the warp.

[0006] The main object of the present invention is to provide an apparatus able to optimize the procedure for the return of the threads into the respective dwell and presentation channels.

[0007] This result has been achieved, according to the invention, by providing an apparatus having the features indicated in the characterizing part of claim 1. Further characteristics being set forth in the dependent claims.

[0008] Thanks to the present invention, the return of the threads into the corresponding presentation channels results faster, more reliable and, above all, capable of being carried out without having to necessarily intercept the threads being wound on the drum of the warper, in order to disengage them from the hook of the thread-holding rod, which brings about the further advantage of maintaining the structural integrity of the same threads also when the angular speed of the thread-holding rod, that is, the speed of deposition of the threads onto the relevant support of the warper, is very high. A further advantage of the present apparatus lies in its simple construction and operation as well as in its relatively moderate cost.

[0009] Moreover, the present apparatus is applicable both to Hegeth and drum-type warpers and does not require the use of too heavy discs for stretching the threads.

[0010] These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein:

- Figs. 1A-1C show respectively a side view, a plan view and a cross-sectional view of the apparatus according to the invention under rest condition, that is, with all the sections of the thread-guide cam being lowered;
- Figs. 2A-2C show a side view, a plan view and a cross-sectional view of the apparatus in question as it presents a thread to the hook of the thread-holding rod of a drum-type warper;
- Figs. 3A-3C show the apparatus in question, as

viewed as above, under a condition in which a channel is predisposed for the re-entry of the respective thread;

- Figs. 4A-4C show, in the same views as above, the apparatus according to the invention, upon the re-entry of a thread;
- Fig. 5 shows schematically the operation of a thread-holding hook with a disengagement mechanism associated thereto;
- Fig. 6 is a further schematic representation of the actuation of the thread-holding hook with thread-disengaging mechanism.

[0011] The description that follows refers to the case of a drum warper with thread-holding hook rotating about the longitudinal axis of the drum. However, the same description holds true also for vertical warpers of Hergeth type in which the thread-holding hook, although operated in a different way, carries out the same function of removal and winding of threads which are each time presented.

[0012] Reduced to its basic structure, and reference being made to the figures of the attached drawings, an apparatus according to the invention comprises a plurality of substantially plate-shaped elements 1, in a number equal to that of the channels of the warper which the apparatus is intended for, which elements are cascade-like disposed unidirectionally in correspondence of an area H, the area for the dwell, presentation and re-entry of the threads, in which a thread-holding hook (2) is made to transit for depositing, onto the warper drum (not shown), the threads each time presented to said channels, the latter being delimited by the same elements 1. Each element 1 has an upper edge 10 which acts, in cooperation with the corresponding edge of the other elements 1, as a guide for the threads each time carried by the hook 2 transiting through said area H. Moreover, each of said elements 1 has a recess 11, whose function is to be described later, and a base portion 12 hinged to a fixed support 13 to allow the rotation thereof about the axis of the hinge 14, under control of a corresponding electric or pneumatic actuator 15. Said axis of the hinge 14 is orthogonal to the plane of development of the element 1, so that the rotation of the latter takes place in this same plane. The present apparatus is disposed between the warper front and the creel of the reels which feed the threads A,B,C to be treated, and is provided in place of the sabre cam commonly used for guiding the threads upon their moving back into the respective channels. The said channels are delimited laterally by a series of plates 3 parallel to, and spaced apart from each other and orthogonally oriented to the direction D in which the threads come in, frontally (that is, on the side facing the warper) by a rod 4 acting as a limiter for the angle with which the threads are presented (see Fig. 2C), and at the bottom (that is, on the side facing the creel) by a rod 5 which causes the incoming threads to remain at a level lower than the upper

end of elements 1 which are in lifted condition (see Fig. 4C). Provided in correspondence of each channel is a thread-presentation member 6, of conventional type, with a hook 6 the lower part of which engages the corresponding thread in order to keep it, under dwell condition, at a level below that of transit of the thread-holding hook 2 (as shown in Fig. 1C) and, under presentation condition, at a higher level, that is, a level allowing the interception thereof by the hook 2 (as shown in Fig. 2C). To this end, each thread-presenter 6 is rotatively mounted about a corresponding horizontal axis under control of a respective actuator (not shown) in order to be lowered and raised each time according to the preset program for the presentation and re-entry of the threads.

[0013] Advantageously, said elements 1 are equal to each other and so oriented as to form an angle of predetermined value to the direction D of transit of the threads in correspondence of said area H.

[0014] The operation of the present apparatus is as follows.

Under rest condition, upon the winding of any of the threads, and when the thread-holding hook 2 has to perform, as necessary, one or more idle revolutions, all the elements 1 are lowered as illustrated in Figs. 1A-1C. In this configuration, if a thread is being wound over the warper drum, the upper edges 10 of elements 1 define, in cooperation with each other, a guide for the thread being wound and passing through the area H. Upon the presentation of one thread, as illustrated in Figs. 2A-2C in relation to the channel of thread B, the corresponding element 1 is raised before the arrival of the thread-holding hook 2. Under this condition, the respective thread (the thread B in this example), normally kept by the element 1 in correspondence of the recess 11, is intercepted by the hook 2 and taken over by the latter, upon a lift of the corresponding thread-presenter 6, in order to form the programmed turns of warp over the warper drum. Afterwards, the said element 1 is lowered and the apparatus takes up the configuration shown in Figs. 1A-1C. Upon the predisposition of the channel for the re-entry of the respective thread, as illustrated in Figs. 3A-3C, the corresponding element is lifted, as it is the respective thread-presenter 6. Upon the re-entry of the thread, as illustrated in Figs. 4A-4C, the latter is disengaged from the thread-holder 2 just downstream of the element 1 located as above mentioned, so that, owing to the tension exerted by the stretcher discs, the thread in question move towards and up to the recess 11 of the lifted element 1. During this movement, the thread results guided by the edge 100 of the element 1 which connects the upper edge 10 with the recess 11. Fig. 4C shows the thread B still engaged by the thread-holder 2 (represented by a solid line) and the same thread B upon its re-entry, as it is guided by said edge 100 of element 1 (represented by a dashed line).

[0015] As far as the disengagement of the thread from the thread-holding hook 2 is concerned, use can be made either of a thread-holder, whose orientation may

be varied as illustrated in the Italian Patent Application FI/96/A/279, or of an apparatus like the one illustrated in Fig. 5, in which a rod 7 is associated to the body of the thread-holder, said rod being pivotally mounted about an axis 70 orthogonal to the rod 20 of the thread-holding hook 2 and being associated to a return spring 8 in order to maintain the free end thereof on the side of the hook 2 opposite to the free end of the latter, except on the occasion of the disengagement of the thread which, in this figure, is indicated with B for sake of uniformity over the figures of the other drawings and, for the same reason, is represented by a dashed line in its condition of disengagement from the hook 2. The disengagement of the thread from the hook 2 is obtained, with this type of apparatus, by merely rotating the rod 7 about its axis 70, under control of an actuator 9 which is intended to act on an appendix 700 of rod 7, provided opposite to the free end of same rod, with respect to axis 70. The actuator 9 may be electric or electromagnetic type and mounted directly on board of the rod 20 to be operated direct by the electronic unit which controls the execution of the warping program. For example, it may consist of an electromagnet fixed to the rod 20 and intended to attract the appendix 700 of the rod 7 by magnetic effect when a corresponding electric pulse is generated in order to disengage the thread. For clarity of representation, the actuator in Fig. 9 is depicted as a member external to the rod 20. It should be noted that, owing to the typical lability of the connection between the hook 2 and the thread each time engaged, a rotation of very modest angular amplitude is sufficient for the rod 7 to disengage the thread from the hook 2. This brings about a sufficiently fast action without any excess of stress in the thread to be disengaged.

[0016] With reference to the embodiment exemplarily illustrated in Fig. 6, the thread-holding hook 2 exhibits a straight appendix 200 supported, for freely rotating about its own longitudinal axis, by an arm 201 associated to a driving member which drives the hook 2 into rotation about the axis Q of the warper upon the formation of the warp. Fixed on the free end of said appendix 200 is a cam 202 operable by any of a plurality of actuators 203 disposed according to an arc of predetermined extension. The profile of the cam 202 is such that when any of the actuators 203 is extracted (with respect to the plane of the drawing of Fig. 6), that is, in active position, the contact between the cam and the relevant actuator determines the rotation of the cam, that is, of the appendix 200 and of the hook 2 therewith. In this way, there is obtained the disengagement of the thread from the hook 2 in correspondence of the desired position, according to the selected warping program. The actuators 203 result activated according to a sequence preset in relation to the warping program. As illustrated in Fig. 6, said actuators 203 may be disposed somewhat close to the axis of rotation of the arm 201, so as to have a reduced impact when the actuators 203 intercept the cam 202.

[0017] In order to keep the thread loop disengaged

from the thread-holding hook 2, each of said elements 1 may be associated to a body (not shown in the figures of the attached drawings), located downstream of the incoming threads in the direction D and able to be lifted upon the release of the threads in order to intercept the most forward portion thereof (which, by inertia, tends to go past the release point, that is, the point in which the threads are disengaged from the hook 2) and thus speeding up the re-entry thereof.

[0018] The present apparatus makes it possible to overcome the typical drawbacks of the traditional warpers in which the return of the threads into the respective channels takes a time, depending on the recovery of the loop formed upon the expulsion of the thread-holder from the hook, which results somewhat long with respect to the current production requirements. The present apparatus is intended for being assembled in lieu of the saber thread-guiding cams currently used for guiding the threads back into the respective channels, and is applicable to the current warpers with no difficulty. Moreover, as it is evident from the description and the drawings, this apparatus is of simple construction and, thus, of relatively moderate cost.

Claims

1. Apparatus for assisting the return of threads into respective dwell and presentation channels within warpers carrying out thread-by-thread warping and provided with a thread-holding hook (2) intended for picking up and winding individual threads onto a support offered by the warper according to a sequence corresponding to the selected warping program, characterized in that it comprises a plurality of flat elements (1) cascade-like disposed unidirectionally in the direction (D) of transit of the threads each time engaged by the thread-holder (2) within an area (H) between the warper and a reel for the support of the threads, each of said elements (1) exhibiting a portion (11) which engages the corresponding thread being in a dwell and presentation attitude and movable between a position in which said portion (11) engages the corresponding thread and a position in which the thread is disengageable from said portion (11) by means of the thread-holding hook (2) which transits within said area (H).
2. Apparatus according to claim 1, characterized in that said portion (11) of said elements (1) has a recess formed in the body of the latter.
3. Apparatus according to claim 1, characterized in that each of said elements (1) is mounted for rotating about an axis (14) orthogonal to its plane of development, under control of an actuator acting on the relevant base portion (12).

4. Apparatus according to claim 1, characterized in that its front side and its rear side are delimited by corresponding rods (4, 5) developing parallel to said direction (D). 5
5. Apparatus according to claim 1, characterized in that to each of said elements (1) a body is associated which is located downstream of the incoming threads in the direction D and is able to be lifted up on the release of the threads in order to intercept the most forward portion thereof and thus speeding up the re-entry thereof. 10
6. Apparatus according to claim 1, characterized in that said elements (1) are oriented with respect to the direction (D) of the transiting threads being wound up, so as to form an angle of predetermined amplitude therewith. 15
7. Apparatus according to claim 1, characterized in that said thread-holder (2) is of a type of variable orientation. 20
8. Apparatus according to claim 1, characterized in that the rod (20) of said thread-holder (2) carries a thread-disengaging device which is operable under control. 25

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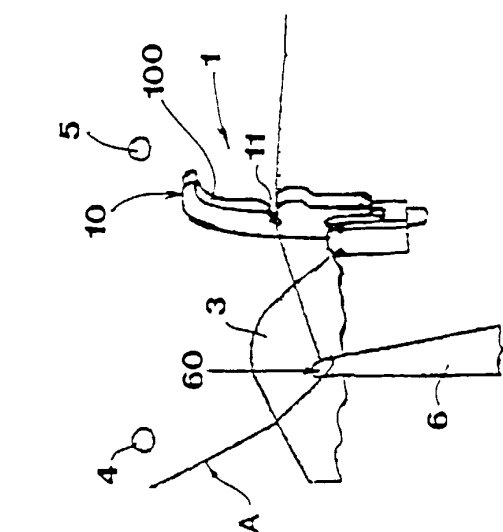


Fig. 1c

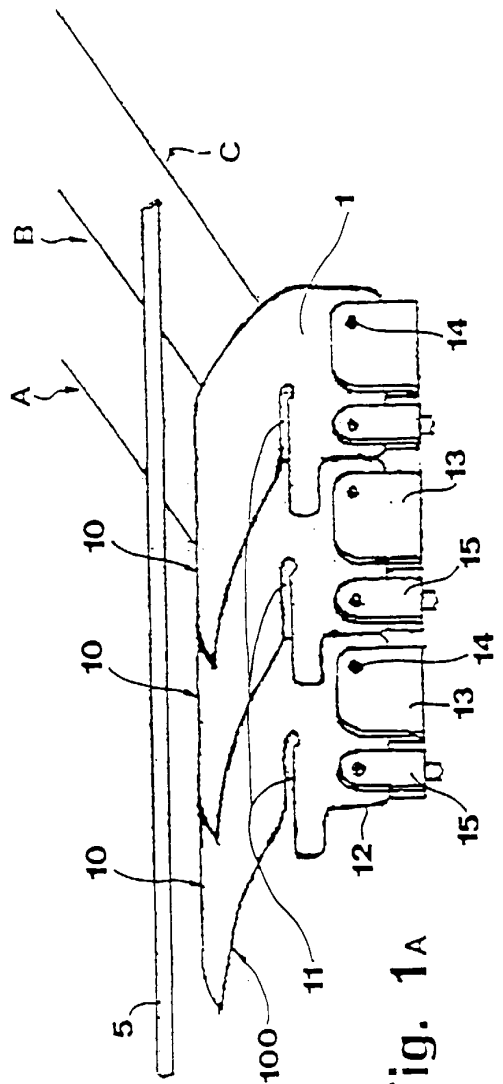


Fig. 1a

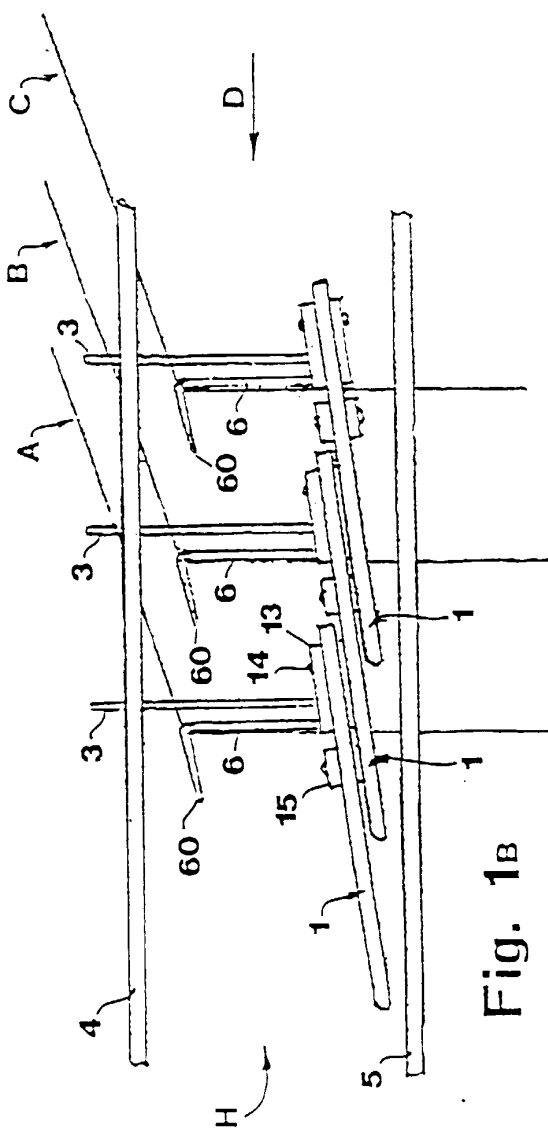


Fig. 1b

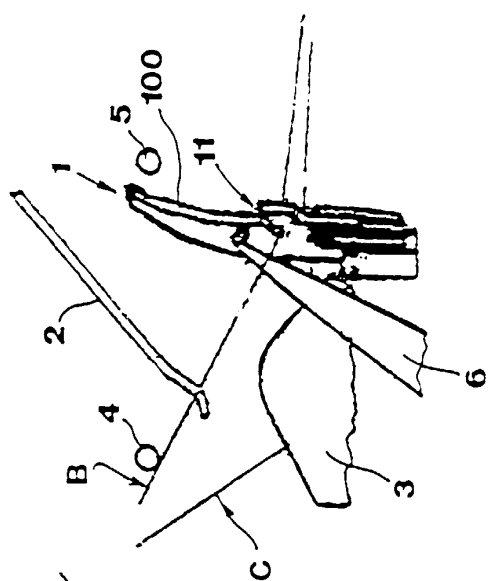


Fig. 2c

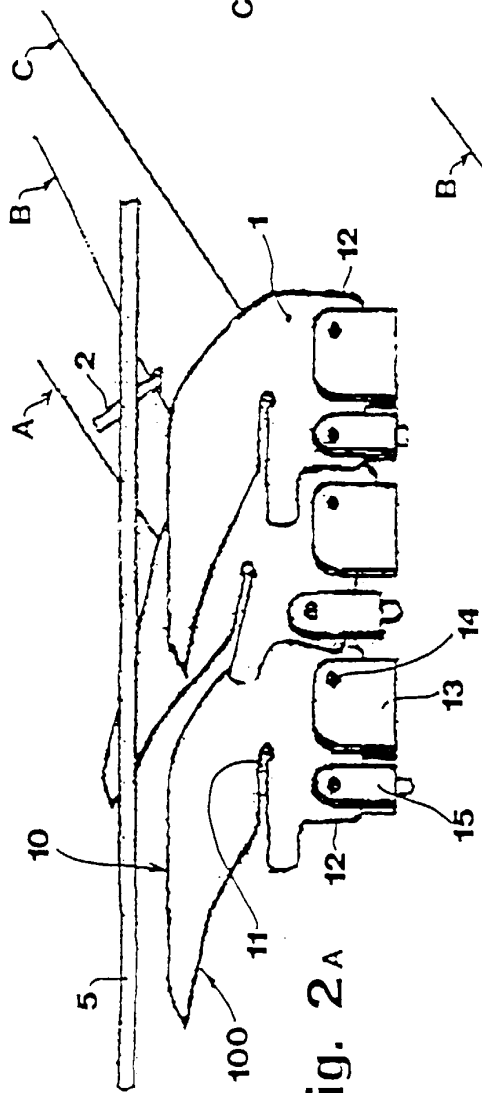


Fig. 2A

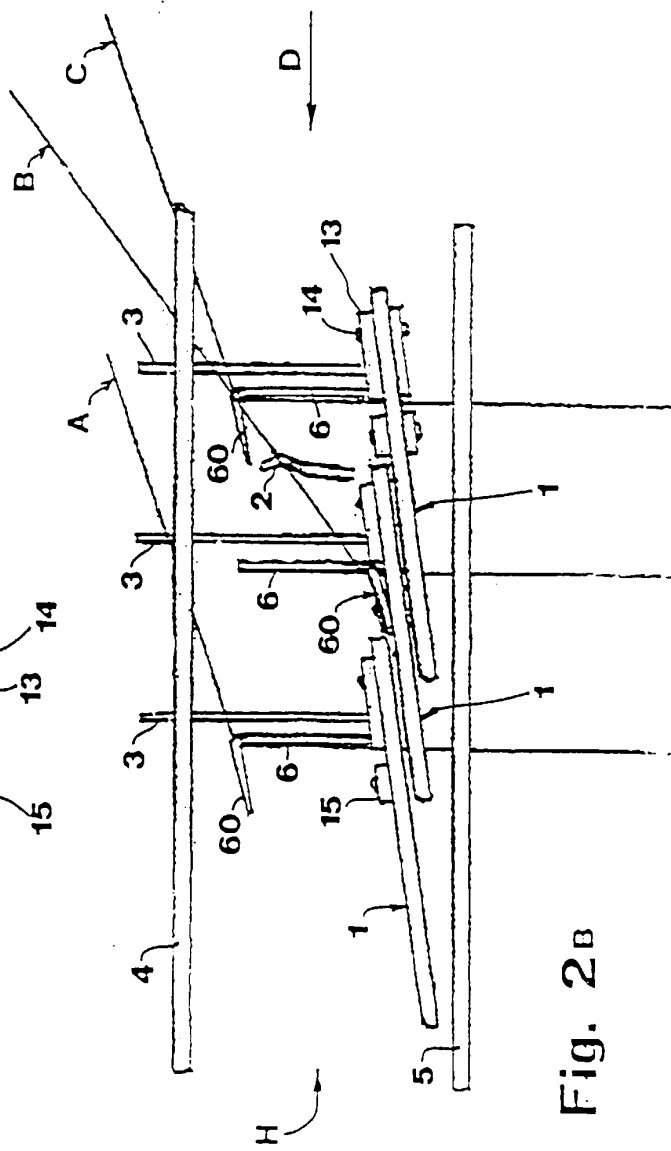


Fig. 2B

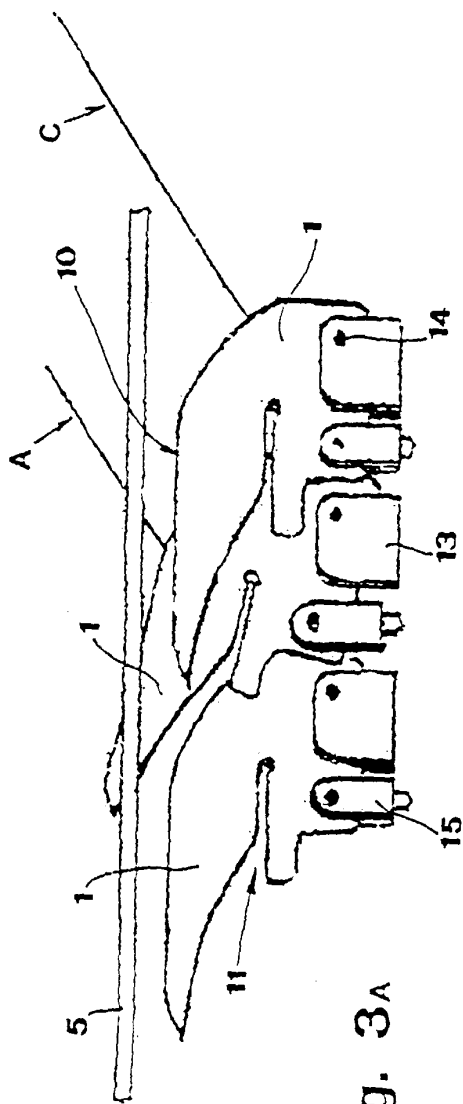


Fig. 3^A

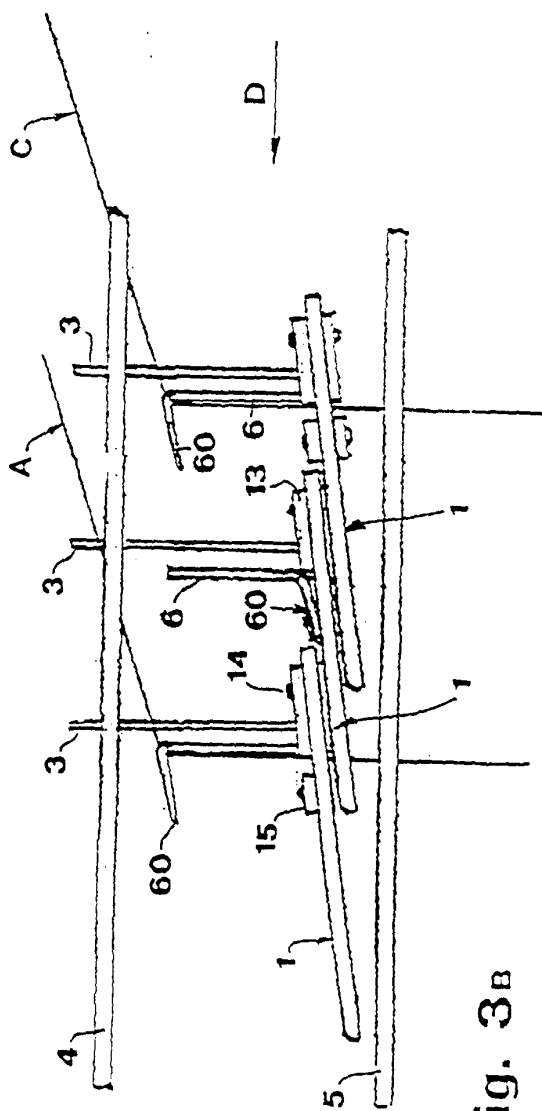


Fig. 3^B

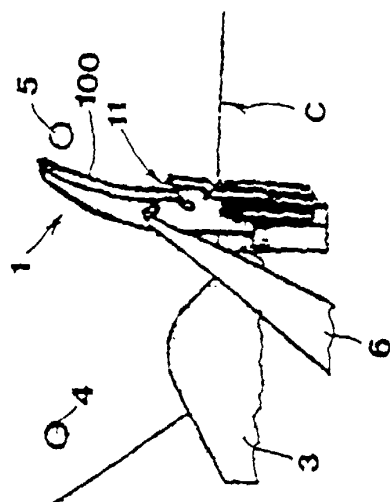


Fig. 3c

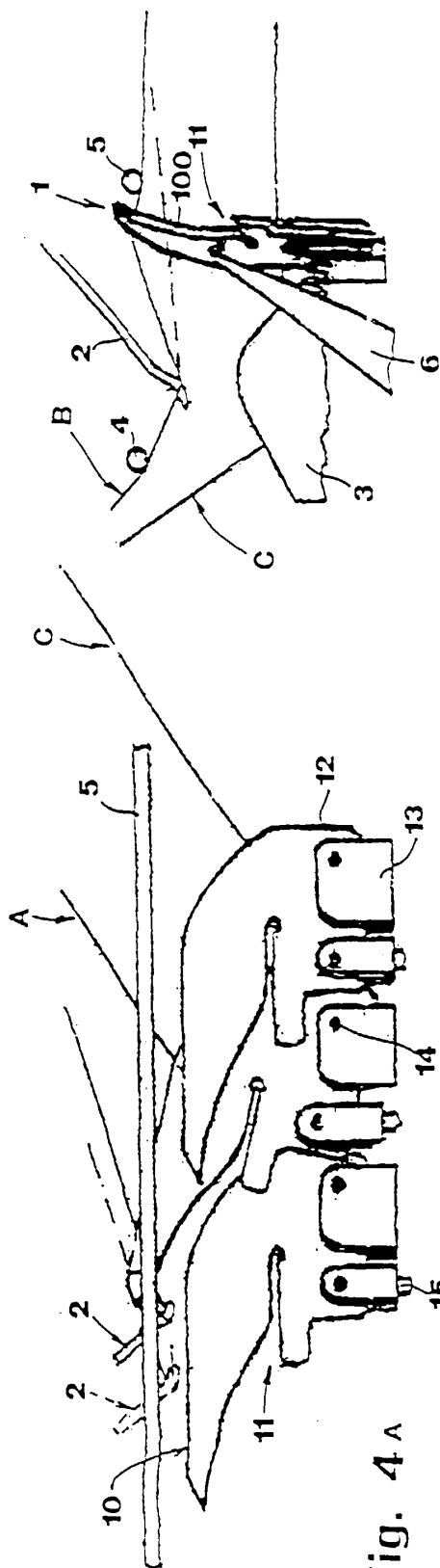


Fig. 4A

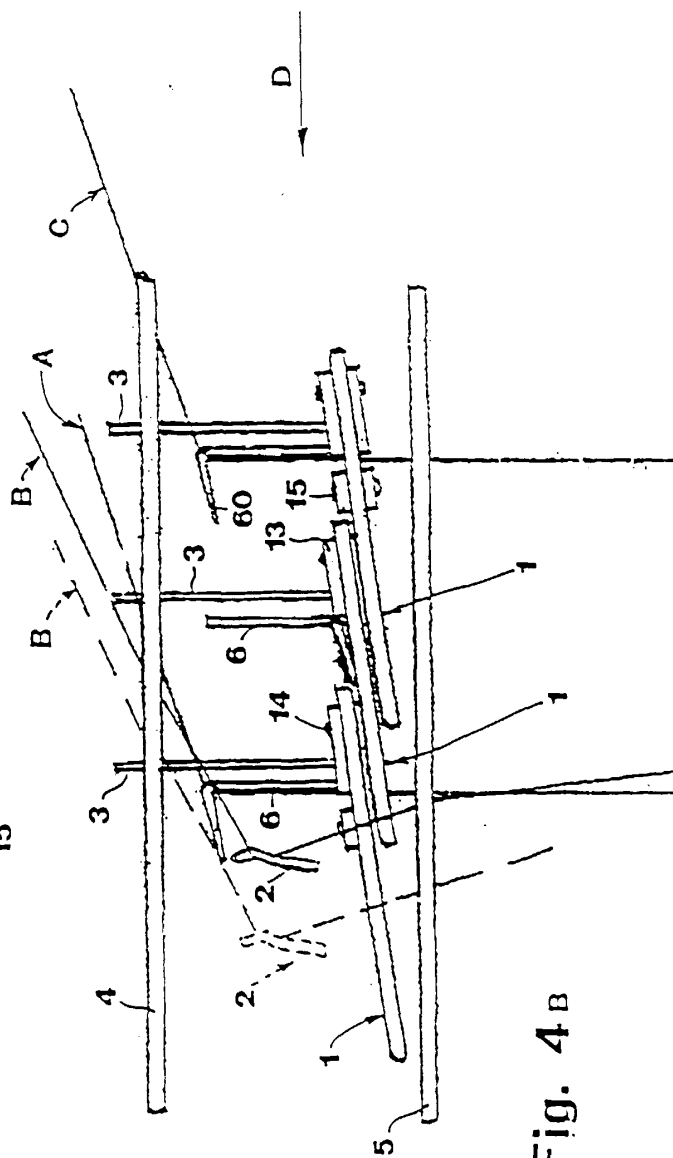


Fig. 4B

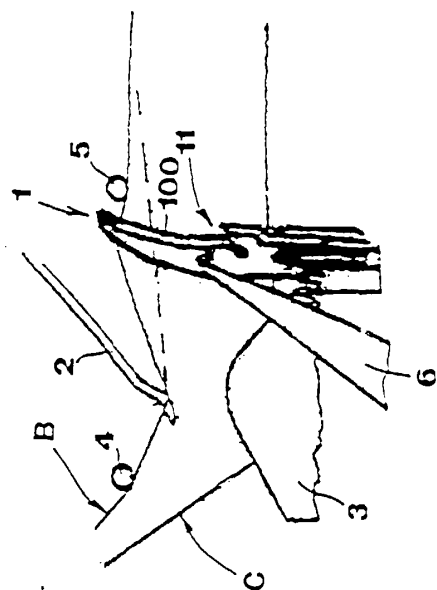


Fig. 4C

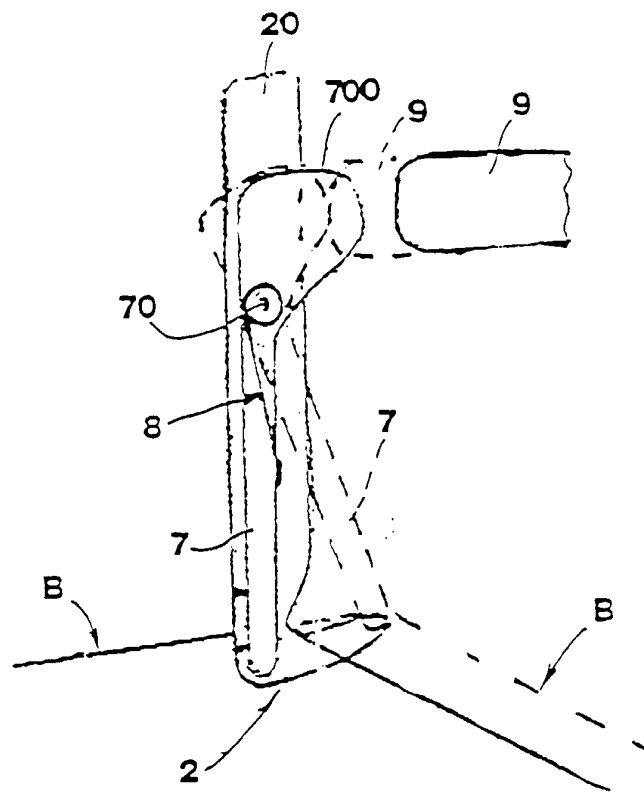


Fig. 5

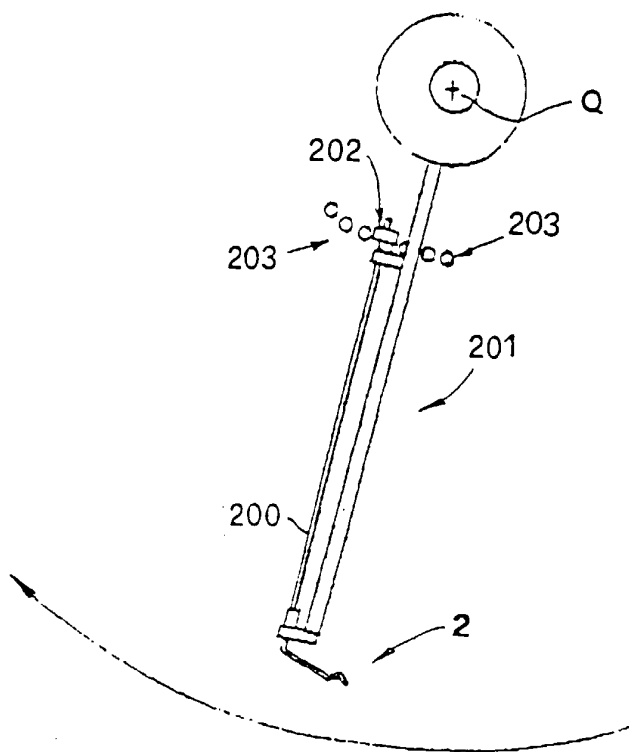


Fig. 6



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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D02H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		14 July 2000	Rebiere, J-L
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