

Dividing bar for internal division of an energy guide chain

5 The invention generally concerns the field of energy guide chains for guiding lines like for example cables or hoses. Energy guide chains typically serve to guide supply lines for power, data or media between a connection and a connection which is moveable relative thereto at a moveable consumer. They typically include a multiplicity of pivotably interconnected chain links.

10 The invention concerns in particular a so-called dividing bar or separating bar for a chain link of an energy guide chain.

At least one part of the chain links is respectively made up of two laterally outwardly arranged side plates or side portions and at least one transverse bar, occasionally also referred to as a transverse member, which
15 holds the side plates parallel. The transverse bar or bars can be connected fixedly or releasably (the so-called opening bar) to the side plates. Considered in cross-section perpendicularly to the longitudinal direction of the energy guide chain the side plates and transverse bars define a receiving space in the chain link. The chain links therefore jointly form a guide passage
20 which is continuous in the longitudinal direction and in which the lines are received.

In applications having a large number of guided lines it is advantageous for the receiving space or the guide passage to be subdivided into separate regions, that is to say to provide for so-called internal division
25 of the energy guide chain. In that way inter alia friction between the lines, due to different radii of curvature or a relative movement in the direction-changing arc, can be reduced or avoided. Basically lines involving greatly different diameters should be guided separating from each other. Internal division of the energy guide chain also allows a long-lasting arrangement for
30 the distribution of weight in the case of lines of differing weight.

The internal division avoids inter alia unwanted movements of the lines, for example rotational movements (so-called "corkscrews" and the like) in the guide passage or displacement of lines one over the other, which for example can result in hoses being squashed by heavy electric lines.

Separating bars or dividing bars are provided for vertical subdivision, that is to say for dividing up the width of the receiving space. They extend substantially parallel to the side plates and are generally mounted to the transverse bars. Separating bars for links of an energy guide chain are
5 described for example in German Utility Model DE 299 07 443 U1 or German patent application DE 43 13 242 A1 to the present applicant.

Horizontal division, that is to say for subdividing the usable height of the receiving space, is effected by the provision of so-called compartment shelves (also referred to as support shelves, insert shelves or the like)
10 similarly to rungs. They can serve as a support for the lines. They extend parallel to the transverse bars, that is to say substantially perpendicularly to the side plates, and are usually mounted to dividing bars or separating bars. Compartment shelves are described in patent EP 0 343 192 B1.

The term dividing bars is used here to denote special separating bars
15 which at least at one side and preferably at both sides, have a plurality of holders for shelves or means for fitting shelves. Dividing bars therefore inherently afford various possible options for selectively fitting shelves in the internal space.

A tried-and-tested structure for dividing bars, which allows finely
20 graded heightwise division by means of shelves is also shown in EP 0 343 192 B1 to the present applicant. EP 0 343 192 B1 discloses a dividing bar having a plate-like main body with upper and lower end regions for releasable fixing to the transverse bars, two large main sides and two opposite narrow sides which extend in a heightwise direction between the end regions.
25 Provided at both main sides are a respective number of holding grooves extending substantially perpendicularly to the heightwise direction. A plate-like shelf with a corresponding end can be inserted into and held in each holding groove, wherein the shelf at the end forms a kind of tongue which cooperates with the holding groove in the manner of a tongue-and-groove
30 connection.

Such dividing bars allow finely graded divisions in the heightwise direction. By virtue of smaller spacings between the holding grooves, in comparison with continuous receiving openings or apertures for shelves, a

reduced modular dimension for selective positioning of the shelves is made possible.

Basically easy handlability and mountability of the components for internal division with the smallest possible amount of time and force is desirable for the mounting operation. The separate regions of the internal division of the receiving space should also be made easily accessible for maintenance purposes, for example for replacement of a line, which generally requires dismantling of shelves. Equally it is desirable to be able to easily alter the division when required, for example if subdivision is to be implemented subsequently. In previously known structures for internal division there is still a need for improvement in regard to ease of handling or user-friendliness.

Taking the above-depicted state of the art as its basic starting point a first object of the present invention is to propose a structure for internal division, in particular a dividing bar which is further developed for that purpose and which simplifies handling upon assembly and maintenance or which is more user-friendly.

That is achieved by a dividing bar according to claim 1 and a chain link according to claim 14 and an energy guide chain according to claim 15 respectively.

According to the invention in a dividing bar or separating bar as set forth in the classifying portion of claim 1 it is proposed that at least some and preferably all holding grooves are respectively of a continuous structure from the one narrow side to the other and each have an insertion opening at each narrow side. Accordingly a shelf can be respectively inserted into the respective holding grooves at both sides or from both sides or in both (travel) directions of the chain through the corresponding insertion opening and thus selectively in one of two opposite assembly directions and can be removed again in that way. In addition it is provided according to the invention that the dividing bar has a securing device or a securing mechanism which secures the fitted shelf or shelves against unwanted displacement in both assembly directions and thus against unwanted release from the respective holding groove.

Accessibility for the holding grooves in both opposite directions, upon insertion and removal of the shelves, affords crucial advantages in practice and enhances user friendliness as the user no longer has to note any particular assembly or dismantling direction for the shelves. An alternate operation in both directions is also possible, which can be advantageous in relation to a plurality of shelves arranged in mutually superposed relationship. There are different possible options in regard to the securing device, in particular those which are operable with the application of a low level of force.

Insertion and removal of the shelves into and from respective holding grooves can be effected in particular by translatory insertion and withdrawal in the longitudinal direction of the energy guide chain or perpendicularly to the heightwise direction.

For that purpose the proposed dividing bar, at at least a predominant proportion of the holding grooves and preferably at each holding groove, has a first insertion opening at a narrow side, a second insertion opening at the opposite other narrow side, that is to say the holding grooves are accessible or are open at both sides. That can be provided in particular for all holding grooves at both main sides. With the two insertion openings, each holding groove opens substantially in the longitudinal direction of the energy guide chain and is thus open at both sides. A holding groove respectively holds an end of a corresponding configuration of the shelf in a direction perpendicular to the main body. The holding grooves preferably extend perpendicularly to the heightwise direction and parallel to the main plane between the two main sides of the main body. The holding grooves can be in particular in the form of recesses in the main sides, the cross-section of which perpendicularly to the main plane allows a positively locking holding action, in particular in the manner of a tongue-and-groove connection, for example with a dovetail shape or a T-shape or the like.

Depending on the respective structural height the narrow sides can form the long sides of the main sides, the end regions representing the short sides. The terminology in relation to direction of "height" and "width" refers to the receiving space and in the present case denotes directions in the cross-

sectional plane perpendicularly to the longitudinal direction of the energy guide chain. In the present case horizontal means in the direction of the width of the receiving space and vertical means in the direction of the height of the receiving space, in each case irrespective of the actual spatial orientation of the chain link. The terms "up" and "down" are also not to be interpreted in an absolute sense, but in relation to an arrangement in space by way of example and are interchangeable in that respect. The terms "parallel" and "perpendicular" are to be interpreted in the present case technically and not strictly geometrically. Slight deviations from geometrical parallelism by smaller angle amounts are also deemed to be parallel.

For the avoidance of applying force for securing the shelves in force-locking relationship it is provided in a preferred embodiment that the securing device has a locking slider which is displaceable in a receiving means in the main body in the heightwise direction between a locking position and an unlocking position and has lock elements, wherein each lock element is associated with a holding groove. In that respect each lock element is displaceable into the associated holding groove for securing cooperation with the shelf, in particular with an end recess at a shelf. Preferably all required lock elements are provided on the same locking slider so that there are provided a number of lock elements corresponding to the total number of the holding grooves.

In that case each lock element preferably cooperates as a lock or blocking element with a recess on a shelf, that serves as a catch for the lock.

It is possible to provide a locking slider, for example centrally, for the holding grooves at both main sides, at each main side a locking slider for the holding grooves there, or for example also at both narrow sides for both main sides involving a respective common locking slider for locking the ends of the shelves. The securing device can therefore substantially comprise a locking slider arranged centrally in the main body. In a particularly preferred embodiment there is provided a common central locking slider for the holding grooves at both main sides. In that case the plate-like main body can include two plate portions which are preferably of identical structure or which are produced in the form of identical parts, which respectively form a number of

continuous holding grooves at an outside and form a recess for the locking slider at an inside. The plate portions can be connected together by suitable connecting elements, for example they can be latched together by conjugate connecting elements or they can be fixed to each other by snap connectors and so forth.

For greater simplification of operation the locking slider can have at least one actuating projection projecting at a narrow side of the main body to allow easier operation by hand, similarly to a slider button or the like. Preferably operability at both sides is also achieved here, by the locking slider having two opposite, preferably symmetrical actuating projections which respectively project at one of the narrow sides of the main body. In that case the actuating projection can form a slider button at one side.

The locking slider is preferably in one piece with the lock elements and optionally with actuating projections.

In a further embodiment the securing device includes two locking sliders. They can be displaceable in a receiving means in the main body in the heightwise direction between a locking position and an unlocking position and can have lock elements, for example corresponding to the number of holding grooves. Here too preferably a lock element is associated with a holding groove and is displaceable therein for securing cooperation with a shelf, for example with an end recess. In this embodiment the main body can have two receiving means displaced perpendicularly relative to the heightwise direction for a respective locking slider. In that case one of the two receiving means and the locking slider mounted therein can be respectively provided at each main side.

In all embodiments with a locking slider or sliders it is advantageous if each locking slider in the unlocking position projects with an end projection at the upper or lower end region of the main body in the heightwise direction. That makes it possible to ensure by closure of the transverse bar that the locking slider is displaced into the locking position, that is to say in the closed condition of the transverse bar and the chain link the shelves are secured against unwanted release. This also prevents or blocks unwanted unlocking when the chain link is closed (with the transverse bar mounted/closed at

both sides) as unlocking is only possible when the transverse bar is open. Preferably the locking slider is of such a configuration that, depending on which respective transverse bar is opened (inside radius or outside radius), it can project alternately with the end projection beyond the upper and the lower end region and is of a suitable structural height.

A suitable securing device however does not necessarily have to be in the form of a locking arrangement with a slider. In a structurally simple alternative configuration the securing device can have cooperating latching elements. It can have cooperating latching depressions and/or latching projections for example at the holding grooves and end regions of the shelves, that engage therein. In that case at least one latching depression and/or latching projection is preferably provided at each holding groove for latching cooperation with a correspondingly conjugate end latching element on the shelf. Additionally or alternatively it is also possible to consider resilient latching tongues, preferably at the ends of the shelves, as the latching elements. That can cooperate with corresponding latching edges, for example of a latching depression, at a boundary surface of the latching grooves. In particular it is possible to provide at both sides of the end region of the shelf, that engages into the latching groove, a respective resilient latching tongue or a resilient latching hook which cooperates with a respective latching edge at a boundary surface of the latching groove, for example in the manner of a barb or the like in order to lock or secure the shelf against unwanted release in the longitudinal direction, and is inoperative upon insertion.

To provide a robust positively locking holding action in the horizontal direction or perpendicularly to the main plane the holding grooves, at both main sides, are of a respective cross-section perpendicularly to the main plane of a T-shape in order to cooperate with a corresponding projection at the end of a shelf for holding the shelf. As an alternative to the T-shape cross-section it is also possible to provide a cross-section of a dovetail shape or the like.

Preferably the holding grooves extend parallel to each other and perpendicular to the heightwise direction continuously from one narrow side

to the other. The holding grooves are preferably provided at each main side in respective pairs facing away from each other at the same height, but this is not necessarily the case. A so-called side portion for bearing against the side plates, that is to say with holding grooves only at one side, is deemed
5 herein to be a dividing bar.

Preferably both end regions of the main body have a fixing device for releasable fixing by force-locking and/or positively locking connection at an upper and a lower transverse bar. In that case at least one end region and preferably both can be in the form of a latching foot for latching engagement
10 with a transverse bar of per se known type.

Preferably the main body is of a mirror-image symmetrical configuration with respect to its heightwise central plane so that the end regions are interchangeable at top and bottom and that orientation is not an important consideration in terms of assembly.

15 By virtue of equivalent operability at both sides this arrangement preferably provides symmetry properties in respect of the dividing bar.

Preferably the main body is of a mirror-image symmetrical configuration with respect to its main plane, that is particularly advantageous if a common slider or lock is used at both sides on both main sides.
20 Alternatively the main body can be of an axially symmetrical configuration with respect to its heightwise central axis, for example if a dedicated slider or lock is provided at each main side.

The invention is particularly advantageous in regard to finely graded internal division with a comparatively large number of positions for shelves, that is to say if at least five holding grooves are respectively provided at each
25 main side, thus affording many selection options. In particular when using a locking slider, all inserted shelves in that case can be simultaneously locked and unlocked by a single actuation.

For further ease it can be provided that the two insertion openings of
30 each holding groove respectively have opposite end inclined insertion portions or rounded insertion portions. Such inclined insertion portions or rounded insertion portions can be provided in particular at both sides and in

paired relationship in a mirror-image symmetrical arrangement with respect to the longitudinal axis of the holding groove.

The invention also concerns a chain link for an energy guide chain, including two side plates and at least one transverse bar connecting the side plates together to define a receiving space for lines, wherein the chain link has two or more dividing bars according to the invention and at least one shelf respectively held at its ends by those dividing bars. The invention further concerns an energy guide chain including a multiplicity of chain links, wherein at least each second chain link has dividing bars according to the invention. Furthermore the invention concerns a construction kit for internal division of chain links for an energy guide chain, including at least two dividing bars according to the invention and at least one corresponding shelf, and finally also the use of the dividing bar according to the invention for internal division in an energy guide chain.

Further details, features and advantages of the invention will be apparent from the detailed description hereinafter of preferred embodiments by way of example with reference to the accompanying Figures in which purely by way of example:

Figure 1 shows an exploded view of a chain link of an energy guide chain according to an embodiment,

Figures 2A-2B show the chain link of Figure 1 as a front view (Figure 2A) and a sectional view (Figure 2B),

Figure 3 shows an exploded view of a dividing bar according to a first embodiment,

Figures 4A-4B show a shelf as a plan view (Figure 4A) and a front view (Figure 4B),

Figures 5A-5B show the dividing bar of Figure 3 as a side view with the locking slider in the unlocking position (Figure 5A) and in the locking position (Figure 5B),

Figures 6A-6B show detail views of Figure 5A (Figure 6A) and Figure 5B (Figure 6B),

Figures 7A-7B show the dividing bar of Figure 3 with the locking slider in the locking position with an inserted shelf as a front view (Figure 7A) and a sectional view along AF (Figure 7B),

Figures 8A-8B show the dividing bar of Figure 3 with the locking slider in the unlocking position (Figure 8A) and the locking position (Figure 8B),

Figures 9A-9B show a further second embodiment of a dividing bar with two locking sliders in the unlocking position (Figure 9A) and the locking position (Figure 9B),

Figures 10A-10C show a main body of the dividing bar of Figures 9A-9B (Figure 10A), a locking slider of the dividing bar of Figures 9A-9B (Figure 10B) and a shelf matching the dividing bar of Figures 9A-9B,

Figures 11A-11C show a detail view of the dividing bar of Figure 9A (Figure 11A), Figure 9B (Figure 11B) and a partial view of the dividing bar with an inserted shelf in a section along the main plane of the shelf (Figure 11C),

Figures 12A-12B show perspective views of a further third embodiment of the dividing bar (Figure 12A) and the corresponding shelf (Figure 12B), and

Figures 13A-13B show a detail view of the dividing bar of Figure 12A (Figure 13A) and a partial view of the dividing bar with an inserted shelf in a section along the main plane of the shelf (Figure 13B).

Figure 1 and Figure 2A show an exploded view and a front view respectively of an internal structure by way of example of a chain link 10 of an energy guide chain 1 for actively guiding lines like for example cables and hoses (not shown). A multiplicity of chain links 10 are pivotably connected together to form an energy guide chain 1 in a longitudinal direction L perpendicularly to the plane of Figure 2A. The longitudinal direction L corresponds to the longitudinal extent of the guided lines. The chain links 10 here consist of individual parts and have at least two side plates 11. In each chain link 10 or for example each second chain link 10 the side plates 11 are fixedly connected in a box configuration by two parallel identical transverse bars 12, as shown in Figure 2A, and held at a spacing in the

transverse direction Q of the chain link 10 perpendicularly to the longitudinal direction L and parallel to each other.

In the illustrated example the transverse bars 12 are releasable (referred to as opening bars). For that purpose the transverse bars 12 are
5 releasably or pivotably fixed to the side plates 11 by means of end fixing regions, for example by means of clamping receiving means at horns 110 (indicated in Figure 1) of the side plates 11. The transverse bars 12 of a chain link 10 are spaced from each other in the heightwise direction H. The heightwise direction H extends perpendicularly to the longitudinal direction L and perpendicularly to the transverse direction Q. The side plates 11 and transverse bars 12 define a receiving space 14 for the lines to be guided. Both transverse bars 12 can thus be in the form of opening bars in order to allow access to the receiving space 14 in the opened state.

The energy guide chain 1 is composed of a multiplicity of chain links
15 10 pivotably connected together in the longitudinal direction L. When guiding lines between two connecting locations which are moveable relative to each other the energy guide chain 1 can form an upper run, a lower run and therebetween a portion which is curved about a direction-changing axis, the direction-changing arc. The structure of an energy guide chain 1 is known
20 per se and can be of any desired structure, for example with cranked side plates or alternate inner and outer plates constituting side plates 11. In particular two-part chain links are also considered, in which the two side plates 11 and a transverse bar 12 are made from one portion, that is to say in one piece, and only the other transverse bar 12 is releasable (not shown).

25 For internal division, as shown by way of example in Figure 2A, it is known to provide vertical dividing bars 20 for dividing the receiving space 14 in the transverse direction Q and horizontal shelves 18 for dividing the receiving space 14 in the heightwise direction H.

The dividing bar 20 typically has a plate-like or flat main body 13 with
30 a main plane which in the state of the dividing bar 12 assembled in the appropriate fashion in a chain link 10 extends in the longitudinal direction L and in the heightwise direction H parallel to the side plates 11. The shelves 18 are also of a plate-like configuration and in the state of being assembled

in the appropriate fashion in the chain link 10 extend parallel to the transverse bars 12. Separating bars 20 and shelves 18 can be provided in an identical arrangement at each n-th chain link 10, in particular each second chain link 10 in order to provide the receiving space 14 for orderly arranged
 5 and better protected guidance of the lines in compartments or divisions 140 which remain the same. The illustration in Figure 2A is here only by way of example and in simplified form, there are typically provided further dividing bars 20 and further shelves 18.

In the heightwise direction H the dividing bar 20 has two end regions
 10 16a, 16b each having a fixing device, here a respective clip-like latching foot 160, and can be fixed at least at one of the end regions 16a, 16b to the ends 23 of the transverse bars 12 at a selectable position in the transverse direction Q or in the direction of the length of the transverse bar 12 as well as in the longitudinal direction L, for example by a latching connection. Along
 15 the ends 23 thereof the transverse bars 12 can have toothed bars, as shown in Figure 1, for cooperating with the latching feet 160 of the dividing bars 20. The transverse bars 12 are at any event secured in the longitudinal direction L of the chain link 10 or in the direction of the width of the transverse bar 12.

20 The shelves 18 are to be mounted to the dividing bars 20 in selectable steps in relation to the heightwise direction H. In that respect Figures 1 and 2A show by way of example only one shelf 18 which divides a part of the receiving space 14 between two dividing bars 20.

The main body 13 of the dividing bar 20 further has two main sides
 25 15 which face away from each other and which extend parallel to the main plane, as well as two narrow sides 17 which face away from each other and which respectively extend perpendicularly to the main sides 15 in the heightwise direction H from the upper end region 16a to the lower end region 16b. At its main sides 15 the main body 13 respectively has a plurality of
 30 holding grooves 19 of identical configuration for receiving shelves 18. The holding grooves 19 extend parallel to each other and continuously from one narrow side 17 to the other perpendicularly to the heightwise direction H. Each holding groove 19 opens at each narrow side 17 into a respective

insertion opening 170. A correspondingly profiled end of a shelf 18 can thus be inserted into the respective holding groove 19 from each narrow side 17, that is to say in each of the two assembly directions along the longitudinal direction L, and can be removed therefrom in the same way.

5 Figure 3 shows an exploded view of a first embodiment of a dividing bar 30. To secure the shelves 18 against unwanted displacement in the longitudinal direction L and unintentional release from the holding groove 19 the dividing bar 30 has a securing device having a locking slider 31.

10 The dividing bar 30 has a main body 33 which is of mirror-image symmetry in the main plane (see W-W in Figure 2A) and is composed of two identical plate portions 33a. Each of the plate portions 33a is also symmetrical relative to the heightwise central plane perpendicularly to the main plane. In addition each of the two structurally identical plate portions 33a is point-symmetrical relative to the central axis which extends as a
15 broken line in Figure 3 through the centres of symmetry of the two plate portions 33a.

The plate portion 33a has an outside 35 which forms one of the main sides 15 of the main body and the holding grooves 19, and an inside 36 which faces away from the outside 35 and has latching projections 37a and
20 corresponding depressions 37b as connecting elements for latching to the second plate portion 33a to form a main body 33. In addition the inside 36 has a cross-shaped recess 32. When the two plate portions 33a are assembled to form a main body 33 the recesses 32 form a receiving means 34 for the locking slider 31 so that the locking slider 31 can be received
25 centrally in the main body 33.

The locking slider 31 is mounted in the receiving means 34 of the dividing bar 30 displaceably in the heightwise direction H between a locking position and an unlocking position. In the embodiment shown in Figure 3 the locking slider 31 is of a cross-shaped configuration, with a vertical bar
30 311 extending in the heightwise direction H and a horizontal bar 312 perpendicular to the vertical bar 311. The terms vertical and horizontal in the present case refer to the appropriate operative position of the locking slider 31 in a chain link 10, wherein vertically means along the heightwise

direction H and horizontally means along the longitudinal direction L. The spatial orientation can be different depending on the respective position of the chain link or the energy guide chain.

At both ends of the horizontal bar 312 the locking slider 31 has a
 5 respective actuating projection 38 which is ergonomically shaped for manual displacement of the locking slider 31 between the unlocking and the locking positions. When the locking slider 31 is mounted between the two plate portions 33a of the main body 33 the two actuating projections respectively project at a narrow side 17 of the main body 33. For that purpose the
 10 recesses 32 are also cross-shaped and open at the narrow sides 17.

At both sides the vertical bar 311 has a row of lock elements 39 in the form of block-like projections, the number of which corresponds to the number of holding grooves 19 of the respective main side. The lock elements 19 project in a direction perpendicular to the main plane and are arranged
 15 at the same vertical grid spacing as the holding grooves 19. The locking slider 31 is produced in the form of a one-piece injection moulding with the lock elements 39.

When the locking slider 31 is in the locking position the lock elements 39 extend into the respective holding groove 19 and can be disposed
 20 approximately centrally there.

Figures 4A and 4B show a shelf 18 which is of a plate-like elongate configuration, with an extent in the transverse direction Q between the ends 48. In the end view in Figure 4B the ends 48 each have a respective end projection 48a which extends in the longitudinal direction L and is
 25 complementary to the profile of the holding groove 19, in the illustrated example being T-shaped, for insertion of the end 48 into the holding groove 19. Another, for example dovetail-shaped profile of the holding groove 19 and the ends 48 of the shelves 18 is also possible. With that profile, the inserted shelf 18 is secured in the transverse direction Q perpendicularly to
 30 the main plane of the dividing bar 30.

For securing the shelf 18 in the longitudinal direction L, that is to say in the longitudinal direction of the holding groove 19, the ends of the shelf 18 each have a respective opening 46 for cooperating with a respective

associated lock element 39. For insertion of an end 48 of a shelf 18 into the holding groove 19 the locking slider 31 has to be in the unlocking position. When an end 48 of the shelf 18 is received in the holding groove 19 the locking slider 31 can be displaced into its locking position in which the lock elements 39 respectively extend into a holding groove 19 and engage into the end opening 46 in the shelf 18. In that position the shelf 18 is fixed or secured in the longitudinal direction L to the dividing bar 30 and cannot be displaced or can be only slightly displaced along the holding groove 19.

Figures 5A and 5B (as well as Figures 6A and 6B each showing a portion on an enlarged scale) show in a side view along the longitudinal direction L the dividing bar 30 with the locking slider 31 in the unlocking position (Figures 5A, 6A) and in the locking position (Figures 5B, 6B). The holding grooves 19 are free in the unlocking position for insertion of the shelves 18 whereas in the locking position the holding grooves 19 are blocked by the associated lock elements 39.

Figure 7A shows a side view along the longitudinal direction L illustrating the dividing bar 30 with a shelf 18 inserted into a holding groove 19 and the locking slider 31 in the locking position. Figure 7B shows the section through the main plane of the shelf 18, that extends in the longitudinal direction L and the transverse direction Q. It can best be seen from joint consideration of Figures 7A and 7B that the shelf 18 on the one hand is secured by the T-shaped profile of the holding groove 19 to prevent displacement in the heightwise direction H and the transverse direction Q and on the other hand is secured by the positively locking connection between the opening 46 of the shelf 18 and an associated lock element 39 of the locking slider 31 to prevent displacement in the longitudinal direction L.

The locking slider 31 is of a point-symmetrical and mirror-image symmetrical configuration with three respective planes of symmetry. In that way it can secure the shelves 18 on both sides of the dividing bar 30 and can be unlocked in both directions along the vertical. That is particularly advantageous in the case of a chain link 10 in which both transverse bars 12

are in the form of opening bars. If required the locking slider 31 can thus be unlocked at each of the transverse bars 12.

The locking slider 31 can be moved out of the locking position in both directions along the heightwise direction H into the unlocking position. Besides displacement by the actuating projections 38 the locking action can also be achieved by pressing on the vertical bar 311. For that purpose the ends of the vertical bar 311 respectively form an end projection 82 which can project out of the main body 33. In the unlocking position of the locking slider 31 which is received in the main body 33, one of the end projections 82 issues from the main body 33, as shown in Figure 8A, depending on the respective direction in which the locking slider 31 is displaced for unlocking along the heightwise direction H. By insertion of the end projection 82 upwardly in the illustrated case the locking slider 31 moves into the locking position. That can be effected in particular by closing an opened transverse bar 12. In that way it is possible to prevent locking bars 30 which are not locked remaining in a closed chain link 10 which is ready for operation, or automatic locking being caused.

Figures 9A to 11C show a further second embodiment of the dividing bar 90. A difference in relation to the locking bar 30 is that the main body 93 of the dividing bar 90 can be produced in one piece. The one-piece main body 93, as shown in Figure 10A, is of a plate-like configuration and has two main sides 95 which face away from each other and which extend parallel to the main plane as well as two narrow sides 97 which face away from each other and which respectively extend perpendicularly to the main sides 95 in the heightwise direction H from the upper end region 16a to the lower end region 16b. The end regions 16a, 16b are equipped with latching feet 160 similarly to the above-described embodiment. At its main sides 95 the main body 93 has a respective plurality of identical holding grooves 19 for receiving shelves 18. The holding grooves 19 extend parallel to each other and continuously from one narrow side 97 to the other perpendicularly to the heightwise direction H. Each holding groove 19 opens at each narrow side 97 into one of two end insertion openings 170. A correspondingly profiled end of a shelf 18 can be inserted into the respective holding groove 19 from

each narrow side 97, that is to say in each of the two assembly directions along the longitudinal direction L or the width of the dividing bar 90 and the shelf 18, and removed therefrom in the same way.

In Figures 9A to 11C the dividing bar 90 for securing the installed shelf
 5 18 in the holding groove 19 has two locking sliders 91, a respective one for each main side 95 of the main body 93. Each of the locking sliders 91 is displaceable in a respective receiving means 94 along the longitudinal direction L. The receiving means 94 are in the form of depressions at the
 10 respective main side 95 of the main body 93. The main body 93 has a central symmetry so that the dividing bar 90 can also be inserted turned through 180° about the heightwise direction H, the longitudinal direction L or the transverse direction Q.

The two locking sliders 91 are identical here. As Figure 10B shows the locking slider 91 is in the form of an elongated strip or bar member with a
 15 plurality of lock elements 99 in the form of projections. In an unlocking position of the locking slider 91 as shown in Figure 9A or as a detail portion in Figure 11A, the projections or the lock elements 99 are disposed between the holding grooves 19 with respect to the heightwise direction H so that the ends of the shelves 98 can be pushed into and moved out of the holding
 20 grooves 91.

The shelf 98 is of a plate-like configuration and at its ends for cooperation with the holding grooves 19 has a respective T-shaped projection 98a corresponding to the profile of the holding groove 19. As a further difference in relation to the first example the respective end of the shelf 98
 25 here does not have two openings 96 which can respectively receive a lock element 99. Thus the shelf 98 can be of a mirror-image symmetrical configuration. The spacing of the respective opening 96 from the respective long narrow side of the shelf 98 in the longitudinal direction L corresponds to the spacing of the respective receiving means 94 from the closest narrow
 30 side of the main body 93. An embodiment without openings 96 on the shelf with end locking at both end edges is also conceivable.

When the locking slider 91 is displaced or moved in the receiving means 94 into the locking position in the heightwise direction H, as shown in

Figure 9B and Figure 11B (without shelf) or in Figure 11C the lock elements 99 extend perpendicularly to the main side 95 into the holding grooves 19. In that position of the locking slider the shelf 98 is secured to prevent unwanted displacement along the holding groove 19.

5 Figures 12A-13B show a further embodiment of the dividing bar 120 which is produced in one piece, but here without the locking slider. As in the above-illustrated example the dividing bar 120 also has a symmetrical plate-like main body 123 with two main sides 125 and two narrow sides 127. The main sides 125 each have a respective row of profiled holding grooves 19 for
10 receiving and positively lockingly holding an end 128a of a shelf 128. In this embodiment the holding grooves 19 also extend continuously from one narrow side 127 to the other and open at both sides, that is to say into a respective insertion opening 170, at each of the narrow sides 127. At their
15 ends the shelves 128 have a projection which corresponds to the profile of the holding groove 19 and extends in the longitudinal direction L. Here, securing of the shelves 128 which are inserted into the holding grooves 19 to prevent displacement thereof along the holding groove 19 is effected by latching engagement of latching elements. For that purpose latching
20 protrusions 124 are provided at ends 128a of the shelves 128, which latchingly engage into corresponding latching recesses 122 at the main sides 125 of the main body 123. An inverted configuration with latching protrusions on the main body is also conceivable.

25 All the above described components of the chain link 10 and in particular of the dividing bar 20, 30, 90, 120 are preferably produced in the form of plastic parts using an injection moulding method.

List of references

5	Figures 1, 2A, 2B:	
	1	energy guide chain
	10	chain link
	11	side plate
	12	transverse bar
10	13	main body of the dividing bar
	14	receiving space
	15	main side of the main body
	16a, 16b	end regions of the dividing bar
	17	narrow side of the main body
15	18	shelf
	19	holding groove
	20	dividing bar
	23	ends of the transverse bar
	110	horns of the side plates
20	140	compartments of the receiving space
	160	latching foot of the dividing bar
	170	insertion opening of the holding groove
	H	heightwise direction
	L	longitudinal direction
25	Q	transverse direction

Figures 3 – 8:

	15	main side of the main body
	17	narrow side of the main body
30	18	shelf
	19	holding groove
	30	dividing bar
	31	locking slider
	32	recess

	33	main body of the dividing bar
	34	receiving means
	33a	plate portion of the main body
	35	outside of the plate portion
5	36	inside of the plate portion
	37a	latching projections
	37b	depressions
	38	actuating projection
	39	lock element
10	46	opening on the shelf
	48	ends of the shelf
	48a	projection at the end of the shelf
	82	end projection of the locking slider
	170	insertion opening of the holding groove
15	311	vertical bar
	312	horizontal bar
	H	heightwise direction
	L	longitudinal direction
	Q	transverse direction

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Figures 9 – 11:

	16a, 16b	end region of the dividing bar
	18, 98	shelf
	19	holding groove
25	90	dividing bar
	91	locking slider
	93	main body of the dividing bar
	94	receiving means
	95	main side of the main body
30	96	opening on the shelf
	97	narrow side of the main body
	98a	projection at the end of the shelf
	99	lock element

	160	latching foot
	170	insertion opening of the holding groove
	H	heightwise direction
	L	longitudinal direction
5	Q	transverse direction

Figures 12 - 13:

	19	holding groove
	120	dividing bar
10	122	latching recess
	123	main body
	124	latching protrusion on the shelf
	125	main side of the main body
	127	narrow side of the main body
15	128	shelf
	128a	end of the shelf
	170	insertion opening of the holding groove
	H	heightwise direction
	L	longitudinal direction
20	Q	transverse direction

5 CLAIMS

1. A dividing bar (20; 30; 90; 120) for internal division of a chain link (10) of an energy guide chain, wherein the chain link (10) has two side plates (11) which are connected together by at least one transverse bar (12) and define a receiving space (14) for lines, the dividing bar (20; 30; 90; 120) including:

a plate-like main body (13; 33; 93; 123) having an upper end region (16a), a lower end region (16b) and two main sides (15; 95; 125) and two opposite narrow sides (17; 97; 127) which extend in a heightwise direction (H) between the end regions (16a, 16b), wherein at least one of the end regions (16a, 16b) is adapted for releasable fixing to a transverse bar (12); and

wherein provided at both main sides (15; 95; 125) is a respective number of holding grooves (19) which extend substantially perpendicularly to the heightwise direction (H) and into which a respective end of a plate-like shelf (18) for internal division can be inserted and held,

characterised in that

each holding groove (19) is of a continuous configuration respectively from the one narrow side (17; 97; 127) to the other and at each narrow side (17; 97; 127) has an insertion opening (170) so that a shelf (18) can be respectively introduced into the respective holding grooves (19) and removed again therefrom from both sides through the corresponding insertion opening (170) selectively in one of two opposite assembly directions, and

the dividing bar (20; 30; 90; 120) has a securing device which secures fitted shelves (18) from unwanted displacement in both assembly directions and thus against unwanted release from the respective holding groove (19).

2. A dividing bar (20; 30; 90) according to claim 1 characterised in that the securing device has a locking slider (31; 91) which is displaceable

in a receiving means (34; 94) in the main body (33; 93) in the heightwise direction (H) between a locking position and an unlocking position and has lock elements (39; 99), wherein each lock element (39; 99) is associated with a holding groove (19) and is displaceable into same for securing cooperation with a shelf (18).

3. A dividing bar (20; 30) according to claim 2 characterised in that the plate-like main body (33) has two plate portions (33a) which respectively form a number of continuous holding grooves (19) at an outside (35), form a recess (32) for the locking slider (31) at an inside (36) and can be connected together by connecting elements (37a, 37b), and in particular can be latched to each other by conjugate connecting elements (37a, 37b).

4. A dividing bar (20; 30) according to claim 2 and/or claim 3 characterised in that the securing device comprises a locking slider (31) arranged centrally in the main body (33).

5. A dividing bar (20; 30) according to one of claims 1 to 4 characterised in that the locking slider (31) has at least one actuating projection (38) which projects at a narrow side (17) of the main body (33), and preferably has two opposite, preferably symmetrical actuating projections (38) which respectively project at one of the narrow sides (17) of the main body (33).

6. A dividing bar (90) according to claim 2 characterised in that the securing device has two locking sliders (91) which are respectively displaceable in a receiving means (94) in the main body (93) in the heightwise direction (H) between a locking position and an unlocking position and have lock elements (99), wherein each lock element (99) is associated with a holding groove (19) and is displaceable into same for securing cooperation with a shelf (98), wherein the main body (93) preferably has two receiving means (94) which are perpendicularly displaced in relation to the heightwise direction (H) for a respective locking slider (91).

7. A dividing bar (20; 30; 90) according to one of claims 2 to 6 characterised in that the locking slider or sliders (31; 91) projects or project in the heightwise direction (H) in the unlocking position with an end projection (82) at the upper or lower end region (16a, 16b) of the main body (33; 93).

8. A dividing bar (120) according to claim 1 characterised in that the securing device has latching elements (124), in particular cooperating latching depressions (122) and/or latching projections, wherein provided at each holding groove (19) is at least one latching element, preferably a latching depression (122) and/or a latching projection, for latching cooperation with a corresponding latching element (124) on a shelf (128).

9. A dividing bar (20; 30; 90; 120) according to one of claims 1 to 8 characterised in that

- the holding grooves (19) have a respective cross-section of T-shape at both main sides (15; 95; 125) to cooperate with a corresponding projection (48a; 98a) of T-shaped cross-section at the end (48) of a shelf (18) for holding purposes; and/or

- the holding grooves (19) continuously extend in mutually parallel relationship and respectively perpendicularly to the heightwise direction (H), wherein preferably two respective holding grooves (19) are provided facing away from each other at the same height at each main side (15; 95; 125).

10. A dividing bar (20; 30; 90; 120) according to one of claims 1 to 9 characterised in that both end regions (16a, 16b) of the main body (13; 93; 123) form a fixing device for releasable fixing by force-locking and/or positively locking relationship at an upper and a lower transverse bar (12) and are preferably in the form of a latching foot (160) for latching to a transverse bar (12).

11. A dividing bar (20; 30; 90; 120) according to one of claims 1 to 10 characterised in that

- the main body (13; 93; 123) is of a mirror-image symmetrical configuration with respect to its heightwise central plane; and/or

5 - the main body is of a mirror-image symmetrical configuration with respect to its main plane; or

- the main body is of an axially symmetrical configuration with respect to its heightwise central axis.

10 12. A dividing bar (20; 30; 90; 120) according to one of claims 1 to 11 characterised in that at least five holding grooves (19) are respectively provided at each main side (15; 95; 125).

15 13. A dividing bar (20; 30; 90; 120) according to one of claims 1 to 12 characterised in that the two insertion openings (170) of each holding groove (19) respectively have opposite end inclined insertion portions or rounded insertion portions.

20 14. A chain link (10) for an energy guide chain, including two side plates (11) and at least one transverse bar (12) which connects the side plates (11) together to define a receiving space (14) for lines,

characterised in that for internal division in the receiving space two dividing bars (20) according to one of preceding claims 1 to 13 are provided in parallel relationship with the side plates (11) and at least one shelf (18)
25 respectively held at its ends by the dividing bars (20) is provided in parallel relationship with the transverse bar (12).

30 15. An energy guide chain (1) including a plurality of chain links characterised in that at least each second chain link is in the form of a chain link (10) according to claim 14.

16. A construction kit for the internal division of chain links (10) for an energy guide chain, including at least two dividing bars (20; 30; 90; 120) according to one of preceding claims 1 to 13 and a corresponding shelf (18).