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(54) **Titre : VOIE PREFABRIQUEE POUR UNE INSTALLATION DE TRANSPORT EN PLAN INCLINE DESTINEE A DES ENGINS
MINIERS**

(54) **Title: FINISHED-PART TRACK FOR AN INCLINED CONVEYOR SYSTEM FOR MINING TRUCKS**

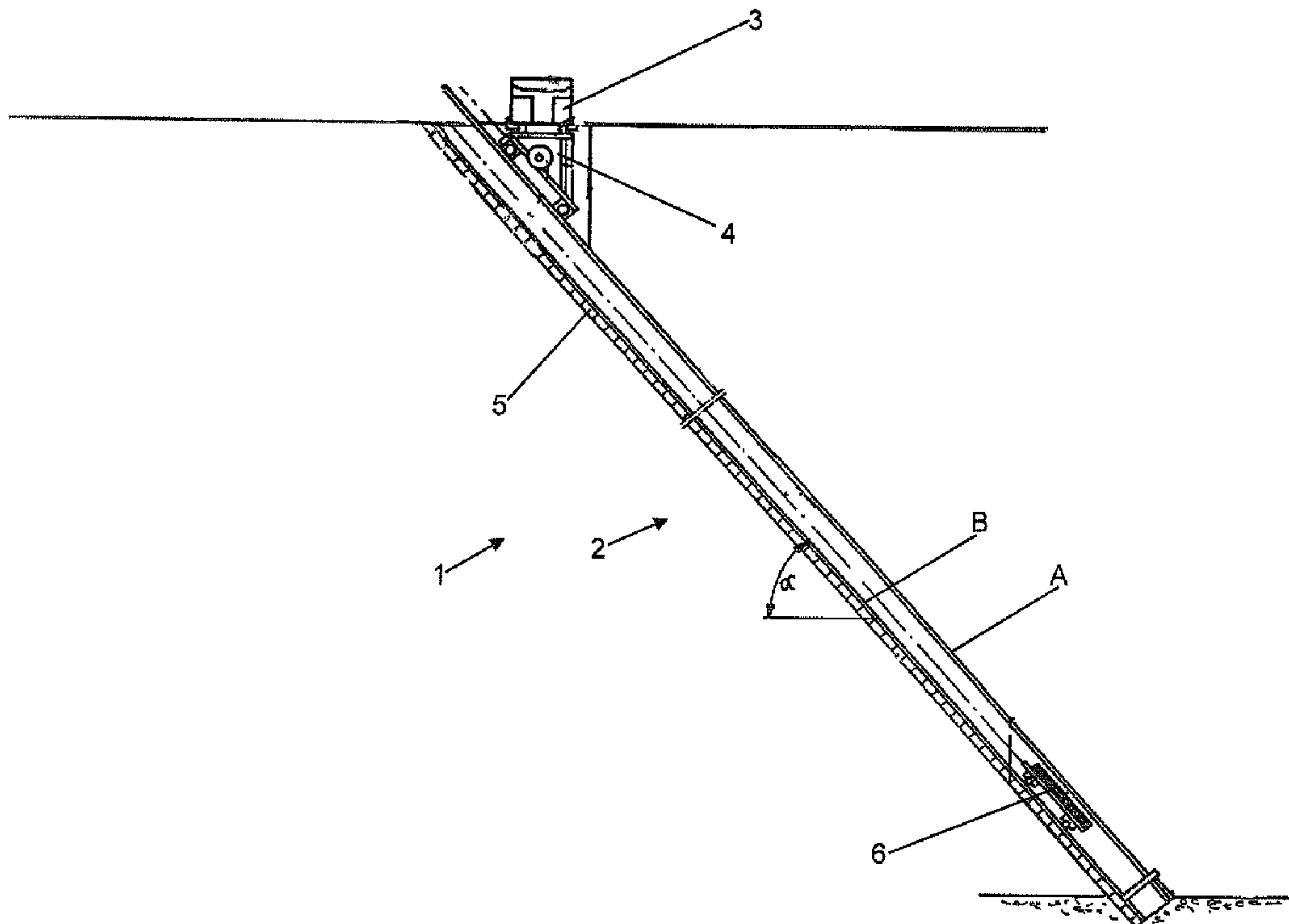
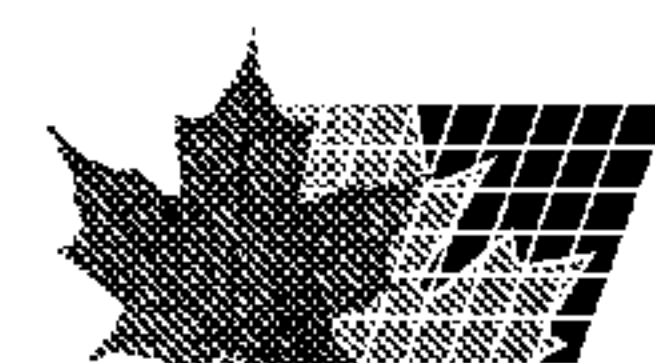


Fig. 1

(57) **Abrégé/Abstract:**

The invention relates to a method for producing a finished-part track for an inclined conveyor system having a conveying platform



(57) Abrégé(suite)/Abstract(continued):

and a counterweight in opencast mining, comprising the following steps: providing a foundation; placing at least one base element, which comprises base members and cross members, onto the foundation; fastening the base element to the foundation; placing track elements onto the base element, while adjustable spacer elements, at least one respective shear cleat, and a support are arranged between the base element and track element; and orienting the track elements relative to one another, with respect to the respective base elements, by means of the spacer elements.

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(54) Title: FINISHED-PART TRACK FOR AN INCLINED CONVEYOR SYSTEM FOR MINING TRUCKS

(54) Bezeichnung : FERTIGTEILFAHRBAHN FÜR SCHRÄGFÖRDERANLAGE FÜR BERGBAUTRUCKS

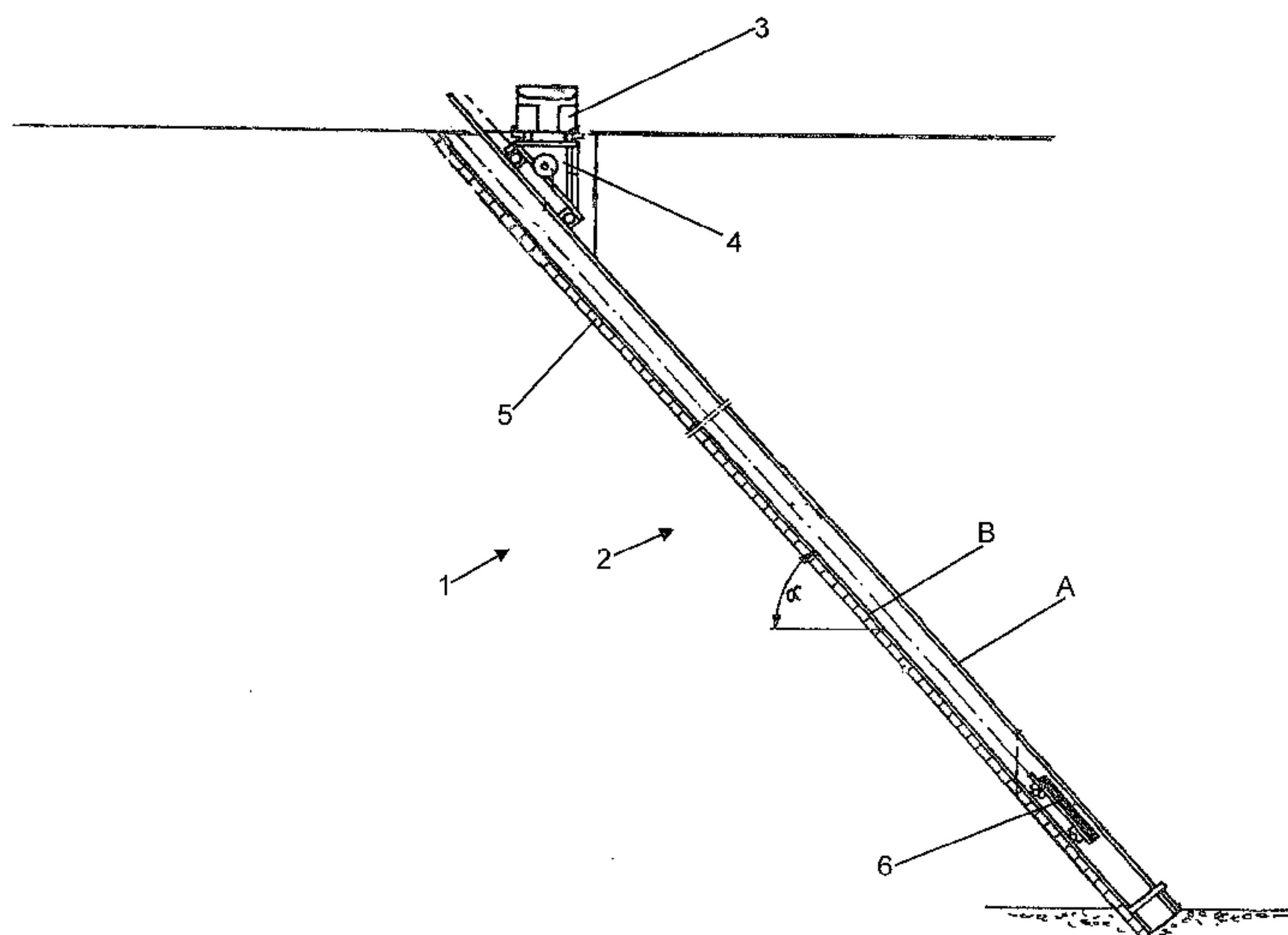


Fig. 1

(57) Abstract: The invention relates to a method for producing a finished-part track for an inclined conveyor system having a conveying platform and a counterweight in opencast mining, comprising the following steps: providing a foundation; placing at least one base element, which comprises base members and cross members, onto the foundation; fastening the base element to the foundation; placing track elements onto the base element, while adjustable spacer elements, at least one respective shear cleat, and a support are arranged between the base element and track element; and orienting the track elements relative to one another, with respect to the respective base elements, by means of the spacer elements.

(57) Zusammenfassung:

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— vor Ablauf der für Änderungen der Ansprüche geltenden Frist; Veröffentlichung wird wiederholt, falls Änderungen eingehen (Regel 48 Absatz 2 Buchstabe h)

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Die Anmeldung umfasst ein Verfahren zur Herstellung einer Fertigteilfahrbahn für eine Schrägförderanlage mit Förderplattform und Gegengewicht im Tagebau, mit den Schritten: Bereitstellen eines Fundamentes; Aufsetzen zumindest eines Basiselements, welches aus Grundträgern und Querträger besteht, auf das Fundament; Fixieren des Basiselements am Fundament; Aufsetzen von Fahrbahnelementen auf das Basiselement unter Zwischenschaltung von einstellbaren Distanzelementen, zumindest jeweils einer Schubknagge und einem Auflager zwischen Basiselement und Fahrbahnelement; und Ausrichten der Fahrbahnelemente zueinander, gegenüber den jeweiligen Basiselementen mittels der Distanzelemente.

Description

FINISHED-PART TRACK FOR AN INCLINED CONVEYOR SYSTEM FOR MINING TRUCKS

BACKGROUND OF THE INVENTION

[0001] The invention relates to a finished-part track and the production thereof. Specifically, the invention relates to a finished-part track for an inclined conveyor system for mining trucks in opencast mining.

[0002] Application for the invention is found in opencast mining, particularly for removing the mineral deposit and the waste piles accumulating during horizontally progressing mining taking place in stair-like sections, wherein with increasing mining depth, a mining funnel is formed that is widening correspondingly greatly towards the top.

[0003] Mining excavation on the earth's surface requires that the waste located on top of the deposit, and subsequently, deposit and waste be removed, for which purpose deposit and waste are mined in so-called stopes, that is, in step-like sections. The height of the stopes determined by the firmness of the ground, the equipment used, and economic considerations is on average about 15 m. For removing the loosened material, inclined planes between the stopes are made into transport routes. The deeper the deposit is mined, the larger is the opening of the mining funnel thus being formed, widening by about 40° to 60° towards the top. As a general rule, the material to be mined loosened by drilling or blasting (hard stone, compact ores) as well as the waste are transported from the mining sites to the earth's surface by mining trucks, which are heavy goods vehicles built as dump trucks, via the transport routes established between the stopes. The serpentines getting longer and longer with increasing extraction are thereby travelled upwards at about 10 km/h and downwards at about 35 km/h, which requires extraordinarily high concentration from the drivers, and always bears the risk of serious accidents.

[0004] In order to circumvent this problem, inclined conveyor systems are proposed, with the aid of which the mining trucks are conveyed in an empty state to the mining site, and are then conveyed out of the mining funnel in a loaded state. Essentially, the inclined conveyor system is a mobile platform, which can be moved up and down on an inclined track by way of corresponding tackles.

[0005] The travel track extending down below with the incline of the mining funnel thereby makes serpentine navigation dispensable, which on the one hand makes working conditions substantially easier, and on the other hand relieves the mining trucks at the same time. For a mining truck loaded on the floor of the funnel only needs to be placed onto the lowered mobile platform equipped with locking means for the car wheels, and is then conveyed automatically to the top, where a driver enters the truck for further transport. In this way, a very flexible, economical interplay can be achieved, for which different personnel is on hand at the funnel floor than is on the earth's surface.

[0006] However, the problem with these inclined conveyor systems is that as a general rule, the inclined tracks have to be installed using site-mixed concrete, which is costly on the one hand, and on the other hand makes it almost impossible to extend or alter the inclined track as the mining progresses.

SUMMARY OF THE INVENTION

[0007] It is the object of the invention to provide a class-specific conveyor system, which can be constructed and installed directly at the site of operation in a simple and cost-effective manner.

[0008] This objective is met according to the invention by the method and the finished-part track as defined in the claims.

[0009] Accordingly, an inclined conveyor system is installed extending from the edge of the mining funnel, that is, the opencast mine, on the earth's surface to the floor of the mining funnel, starting at an upper edge of the opencast mine.

According to the invention, the travel track of the inclined conveyor system is made of prefabricated components. The inclined conveyor system further comprises a conveyor platform that can be accessed by mining trucks, and a counterweight, which runs underneath said conveyor platform in the travel track. In this way, conveyor platform and counterweight travel within the travel track on different tracks arranged in a superimposed fashion, said tracks being provided with rails.

[0010] In the method for producing a track system from prefabricated parts, a foundation is provided initially. The track system can thereby be assembled starting from the floor of the open pit, or else from the upper edge of the open pit to the floor. Preferably, this foundation is built from the excavation material at disposal in opencast mines, that is, directly into the walls of the open pit. At least one base element is placed onto the constructed foundation. This base element is formed of at least two base plates, wherein said base plates are spaced apart by at least one cross member, and the base plates are connected to the cross member. This connection of the base plate to the cross member can be done by way of a form-fit and/or force-fit connection. Beneficial are form elements in the connection, which are complemented by screws. For this purpose, both in the base plate and in the cross member, preferably metal structures are provided at appropriate locations, which, particularly preferably, are integrally cast. Furthermore, the space provided in the supports for the screw connection (pockets, recesses etc.) can be filled by a grouting with concrete or another suitable material.

[0011] In order to improve the stability, it is conceivable to construct an adhesion-promoting, that is, adhesion increasing intermediate layer from suitable materials between the base element and the foundation.

[0012] The base element is fixed in place on the foundation by way of anchorages, which can also extend through the foundation into the natural subsurface. At least some of the anchorages can thereby be installed in an

overlap area of two adjacent base elements so that the anchors used there anchor both base elements.

[0013] When anchoring, the anchors can be mounted on previously prepared structures in the respective base elements, or else these structures are only prepared when installed at the installation site. Preferably, these structures are bores, through which the anchors are driving into the subsurface. However, other structures, to which the anchors can be connected, are also feasible. The number of anchors primarily depends on the weight of the assembly to be anchored and the condition of the subsurface.

[0014] After anchoring, at least one track element, preferably at least two track elements, are placed onto and connected to the base element. Alternatively, the base element can be mounted together with the track elements, wherein in this case, the structures for the anchors can already be present, or they can be prepared at the place of installation, wherein the structures can extend both through the respective track element and through the base element. It is beneficial that the track elements for the two tracks are identical parts so there is no need to manufacture, store, and install different parts.

[0015] With the aid of spacer elements, which are interposed between the base element and the track element, the individual track elements are aligned with one another. Furthermore, the individual faces of work, or possible gaps that developed, both between the adjacent base parts and the adjacent track parts, and the adjacent rails positioned on the track parts, can be filled, and the parts can be coupled in this way. This is particularly beneficial with regard to the rails since vibrations of the conveyor platform, that is, the counterweight can be reduced.

[0016] Furthermore, the respective bordering base elements and track elements can be connected by way of connection structures like tension anchors, thread connections, or any other imaginable form-fit, force-locked, or adhesively joined

type of connection. The connections, with which cross member and base plate are connected, are also conceivable here.

[0017] An element of the prefabricated track comprises at least one base carrier, at least one track element, and a plurality of spacer elements, which are arranged between the base carrier and the track elements for the alignment thereof with one another. Furthermore, at least one shear cleat is provided, which is likewise arranged between the base carrier and the track element, and which transfers the static and dynamic stresses impacting the track element to the base carrier/the base element, and thus to the foundation by way of the anchorages. Preferably, the shear cleats are centered and in conformity with one another, both in the track element and in the base carrier. The surfaces of the shear cleats touching one another can be made without cladding of the material of the base carrier/track element, or, for example, metal plates can be interposed. Furthermore, shear force consoles for the occurring shear forces (not in the direction of the travel direction of the platform/the counterweight) are provided on the base carrier. These absorb potentially occurring shear forces and transfer them to the foundation by way of the anchorages.

[0018] The base carrier can also be provided with at least one structure on the two ends pointing to the next base carrier during installation, which allows adjacent base carriers to be connected to one another, preferably by form fit, such that while being anchored to the foundation, the base carrier no longer has to be held by additional structures. The underside of the base elements facing the foundation can be calculably roughened by way of inlaid, that is, attached strips or similar structures molded on the base element, and can be connected to the foundation, that is, the subsurface, by local grouting. Furthermore, shelves can be placed into the developing interspaces between the cross members and the base plates for reinforcement. Preferably, these are geometrically designed such that they are held between the base carriers and cross members by form-fit.

[0019] The track elements form two levels of different heights on each base carrier, and together with another base carrier in a base element, form two tracks, which, as a result of the differing height levels, are arranged superimposed upon one another, and are formed of two rails each. These rails can be connected to the track element either directly, or by way of interposed structures. Preferably, the rails are of a two-part design so that an upper part of the rail is connected to a lower part of the rail by a – preferably detachable - connection. Said lower part is detachably or fixedly connected to the track element. For example, the lower part of the rail – or with a one-piece design, the one rail – can be directly cast with the track element. This has the advantage that a worn upper part of a rail can be replaced, and no elaborate welding of material on site, for example, is needed. Preferably, all rails for the two tracks are of the same type and size so that there is no need for different types of rail to be held available at the building site. The spacer elements are arranged between the base element and the track elements such that a space between the two elements can be varied. Furthermore, the spacer elements can be placed such that they are able to transfer the dynamic and static stresses impacting the track part to the base element. Thus, shear cleat can be dispensed with. In a preferred embodiment, a spacer element is a trapezoidal thread spindle with fitting nut, that is, threaded sleeve. A spacer element such as this is then inserted into a base carrier, that is, a track element such that it can be adjusted, and the respective screw part can engage with the nut part in the state of assembly of both elements. Generally, any kind of spacer element can be used (wedges, hydraulic presses etc.). The spacer elements allow a precise alignment of the travel tracks for the platform and the counterweight, even with lower installation precision of the base elements. Furthermore, once the interspace has been adjusted, it can be advantageous to relieve the spacer elements, at least partially, by using supports between the track element and the base carrier.

[0020] Furthermore, the track element can be provided with shear force holders, which, in turn, can carry rope guide pulleys. Preferably, each track has a

dedicated shear force holder and with rope guide pulleys. However, a central shear force holder is also feasible. Separate rope guides not configured for transferring the shear forces are feasible as well. The shear force holders, together with the shear force consoles, reinforce the prefabricated component in a beneficial way.

[0021] Possible materials for the prefabricated components are concrete and steel, however, fabrication from composite materials is also feasible, which can also have recycled portions, where appropriate.

[0022] On the outer sides of the base plates, devices for fastening handrails and stair segments can be provided so that a walkway next to the track can be provided.

[0023] The aforementioned features of the invention can be used in any desired combination without deviating from the essence of the invention. Likewise, it is not necessary for all features to be present in one embodiment.

Additional features, characteristics and advantages are shown in the following description of a preferred embodiment of the present invention, with reference made to the attached figures, which are to be viewed exclusively as illustrative, and in no way as limitative.

BRIEF DESCRIPTION OF THE FIGURES

[0024] Fig. 1 is an overview of an inclined conveyor system for mining trucks built of prefabricated components according to the invention.

[0025] Fig. 2 is a perspective sectional view of a prefabricated component of an embodiment of the invention according to Fig. 1.

[0026] Fig. 3 is a side view from the outside of a prefabricated component of an embodiment of the invention according to Fig. 1.

[0027] Fig. 4 is a cross-sectional view of a prefabricated component of an embodiment of the invention according to Fig. 1.

DETAILED DESCRIPTION OF THE EMBODIMENT

[0028] Fig. 1 shows an inclined conveyor system for mining trucks 1, the travel track of which is built from the prefabricated components 5 according to the invention. On said travel track 2, both a conveyor platform 4, which can accommodate a mining truck 3, and a counterweight 6 travel. The conveyor platform 4 and the counterweight 6 travel on tracks A and/or B, which are arranged superimposed upon each other. The incline of travel track 2 is identified by angle α , which is typically between 40° and 60° .

[0029] Fig. 2 shows the prefabricated component 5, the primary elements of which are a base element 51 comprising two base carriers 510 (only one is shown) and three cross members 520 (only one is shown), as well as four track elements 52 (only two are shown). The base element 51 is connected to the track elements 52 by way of shear cleats 53 and a plurality of spacer elements 54, and supports 60. The spacer elements 54 are anchored both in the base carrier 510 and in track element 52, thus connecting elements 510 and 52 in an adjustable manner. The spacer elements 54 are configured as trapezoidal spindle lifting units. After adjustment of the spacer elements 54, the supports 60 relieve the spacer elements 54, at least partially.

[0030] The prefabricated component 5 is provided with two tracks A and B, as can further be seen in Fig. 2. Said tracks A and B are arranged superimposed upon one another so that the counterweight 6 can travel through underneath the conveyor platform 4 when the two meet. The different levels of the tracks come about as a result of the shape of the base carriers 510, where the fittings (shear cleats, spacer elements, support elements etc.) for the track elements 52 are located on different levels. The track width of the inner and lower track for the counterweight 6 is smaller than that of the track for the conveyor platform 4.

Tracks A and B each are comprised of a pair of rails 55 (shown schematically). In this embodiment, crane rails of type DIN 536 A 150 are used.

[0031] As can be seen in Fig. 3, the prefabricated component 5 has a shear cleat, however, only the shear cleat 53 formed between the base carrier 510 and the track element 52 is shown. Each of the shear cleats 53 of prefabricated component 5 is provided with an upper part 53a and a lower part 53b. The upper part 53a is arranged with respect to the lower part 53b such that it is in uphill position and overlaps with the lower part 53b. In this way, a static and dynamic stress can be transferred to the respective base carrier 510 of the base element 51 by way of frictional engagement of the two parts 53a and 53b. The shear cleats are each centered in the base carrier 510. The overlap of the two parts 53a and 53b of the shear cleat has to be large enough so that even at maximal distance between the base carrier 510 and the track element 52 a sufficiently large overlap surface is available in order to transfer the occurring static and dynamic stresses.

[0032] The track element 52 is further provided with a plurality of holes 59, into which the anchors are inserted, which then connect the base element to the foundation. The number of holes 59, and thus the anchors used per prefabricated component 2, primarily depends on the load to be transferred, the type of anchors, and the subsurface. The holes 59 can already be provided during the manufacture of the prefabricated component, or they can be made at the installation site at the open pit, depending on the number of anchors needed in the particular section.

[0033] Fig. 3 further shows overlap areas, that is, engagement areas C and D, respectively, by way of which adjacent prefabricated components are in engagement with one another. Furthermore, shear force consoles 511 of the base carrier 510 are shown, which laterally support the track element 52, and, together with the shear force holders 56, reinforce the prefabricated component 5. A handrail 512 is mounted to the shear force consoles 511. Together with a flight of stairs 513, the handrail 512 forms a staircase next to the travel track of

the platform. Sectional view E shows the use of interposed plates in the shear cleat.

[0034] Fig. 4 is a cross-sectional view of the essentially symmetrical construction of the prefabricated component 5. The prefabricated component 5 is further provided with two shear force holders 56 and 57, which support the respective track A and B. These shear force holders 56 and 57 prevent a deforming of the prefabricated component 5. In this embodiment, shear force holders 56 and 57 also carry a plurality of rope guide pulleys 58, with which the ropes needed for operating the inclined conveyor system 1 are guided. Sideways on the base carrier 510, shear force consoles 511 are shown. Shear force holders 56, 57, and shear force consoles 511 reinforce the track elements 52. By way of the holes 59, both the base carriers 510 and the cross members 520 can be anchored. A joining area of the base carrier 510 with the cross member 520 is not shown. Details E and F show, obscured, the shear cleats 53 between the respective track elements 52 and the base carriers 510.

CLAIMS

1. A method for producing a finished-part track for an inclined conveyor system having a conveyor platform and counterweight in opencast mining, comprising the steps:
 - Providing a foundation;
 - placing at least one base element onto the foundation;
 - fixing the base element to the foundation;
 - placing at least one track element onto the base element with the interposition of adjustable spacer elements, at least one shear cleat and one support, respectively, between base element and track element; and
 - aligning the track elements with one another and with respect to the respective base elements by way of spacer elements.
2. The method according to claim 1, wherein the placing of the base element comprises the following steps:
 - Placing at least two base plates onto the foundation;
 - spacing the base plates by way of at least two cross members; and
 - connecting the base plates with the cross members to the base element.
3. The method according to claim 1 or 2, wherein shelves are inserted between the cross members of the base element.
4. The method according to one of the previous claims, wherein after aligning the track elements with one another, the respective space is fixed into place by the supports.
5. The method according to one of the previous claims, wherein the track element, together with the base element, is placed onto the foundation, wherein spacer elements, shear cleat, and supports are already interposed between the base element and the track element.

6. The method according to one of the previous claims, wherein adjacent base elements are connected to one another in an overlap area.
7. The method according to one of the previous claims, wherein in an overlap area of two adjacent base elements, the base element is fixed in place on the foundation.
8. The method according to one of the previous claims, wherein the prefabricated track is installed beginning at an upper edge of the open pit.
9. A finished-part track for an inclined conveyor system having a conveyor platform and counterweight for opencast mining, comprising:
 - At least one base element for placing onto a foundation;
 - at least one track element for placing onto the base element;
 - a plurality of spacer elements arranged between base element and track element, for aligning same with one another; and
 - at least one shear cleat arranged between base element and track element.
10. The finished-part track according to claim 6, wherein the base element is comprised of at least:
 - Two base plates for placing onto a foundation; and
 - at least two cross members for spacing the base plates, wherein the base plates and the cross members are provided with corresponding connection structures.
11. The finished-part track according to claim 9, wherein the base carrier is provided with shear force consoles.
12. The finished-part track according to one of claims 8 to 10, wherein the base carrier is provided with a handrail and steps.

13. The finished-part track according to one of claims 8 to 11, wherein at least one shelf is inserted between the cross members of the base element.
14. The finished-part track according to one of the previous claims, wherein the respective track element is provided with at least one rail so that two track elements each form a track for the conveyor platform or the counterweight(s) on the same level.
15. The finished-part track according to one of claims 8 to 13, wherein the rail is fixedly connected to the track element.
16. The finished-part track according to one of claims 8 to 13, wherein the rails are of several parts, wherein the multi-part rail and the track element are provided with correspondingly defined fastening structures.
17. The finished-part track according to one of the previous claims, wherein the base element is provided with fastening holes for receiving ground anchors to be fixed in place on the foundation.
18. The finished-part track according to one of the previous claims, wherein the base element and/or the track element is provided with connection structures on both ends for a form-fit engagement with corresponding connection structures on adjacent elements.
19. The finished-part track according to claim 17, wherein the connection structures of adjacent track parts are provided for screw connection to the elements adjacent to the connection structures.
20. The finished-part track according to one of the previous claims, wherein the respective tracks are provided with guide pulleys.

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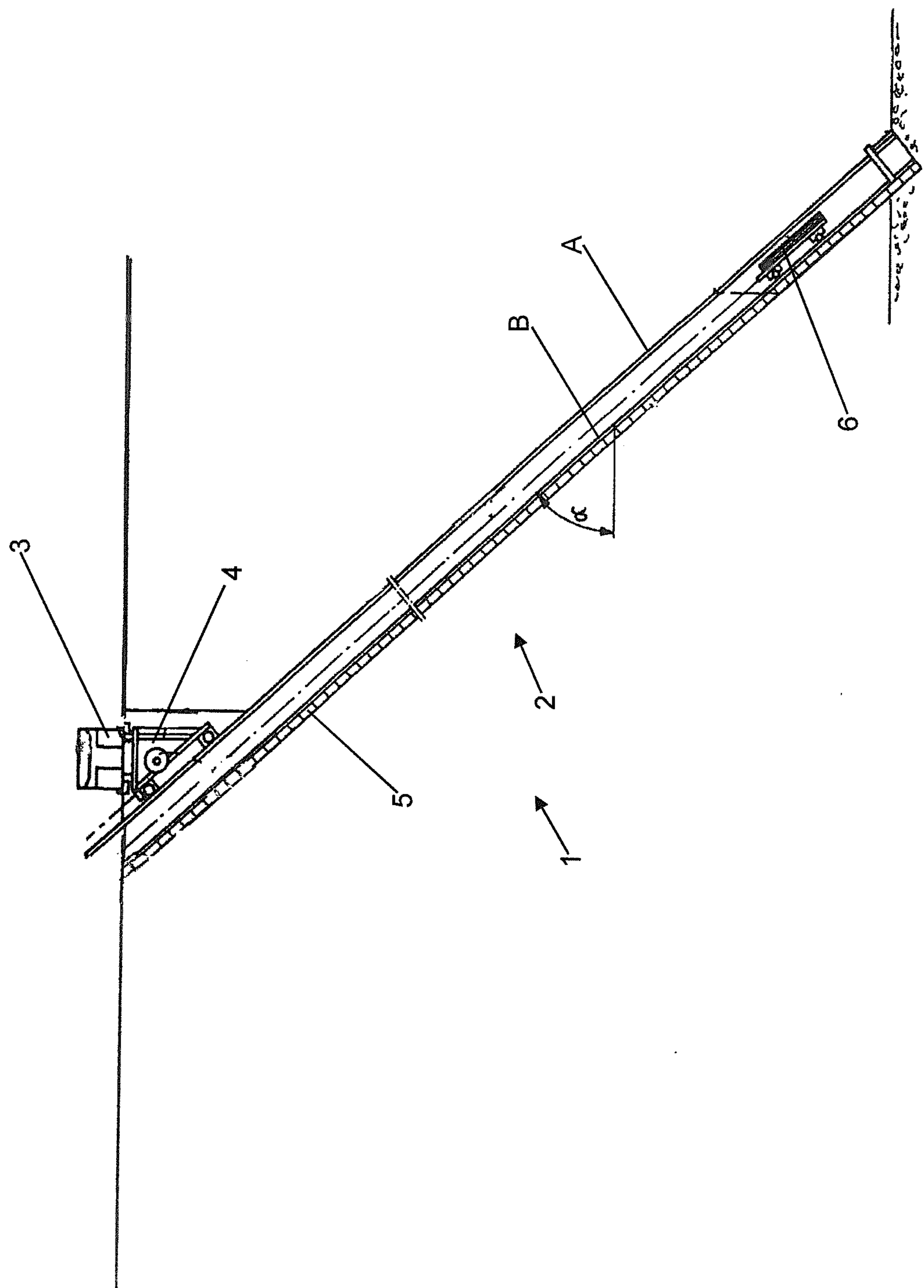
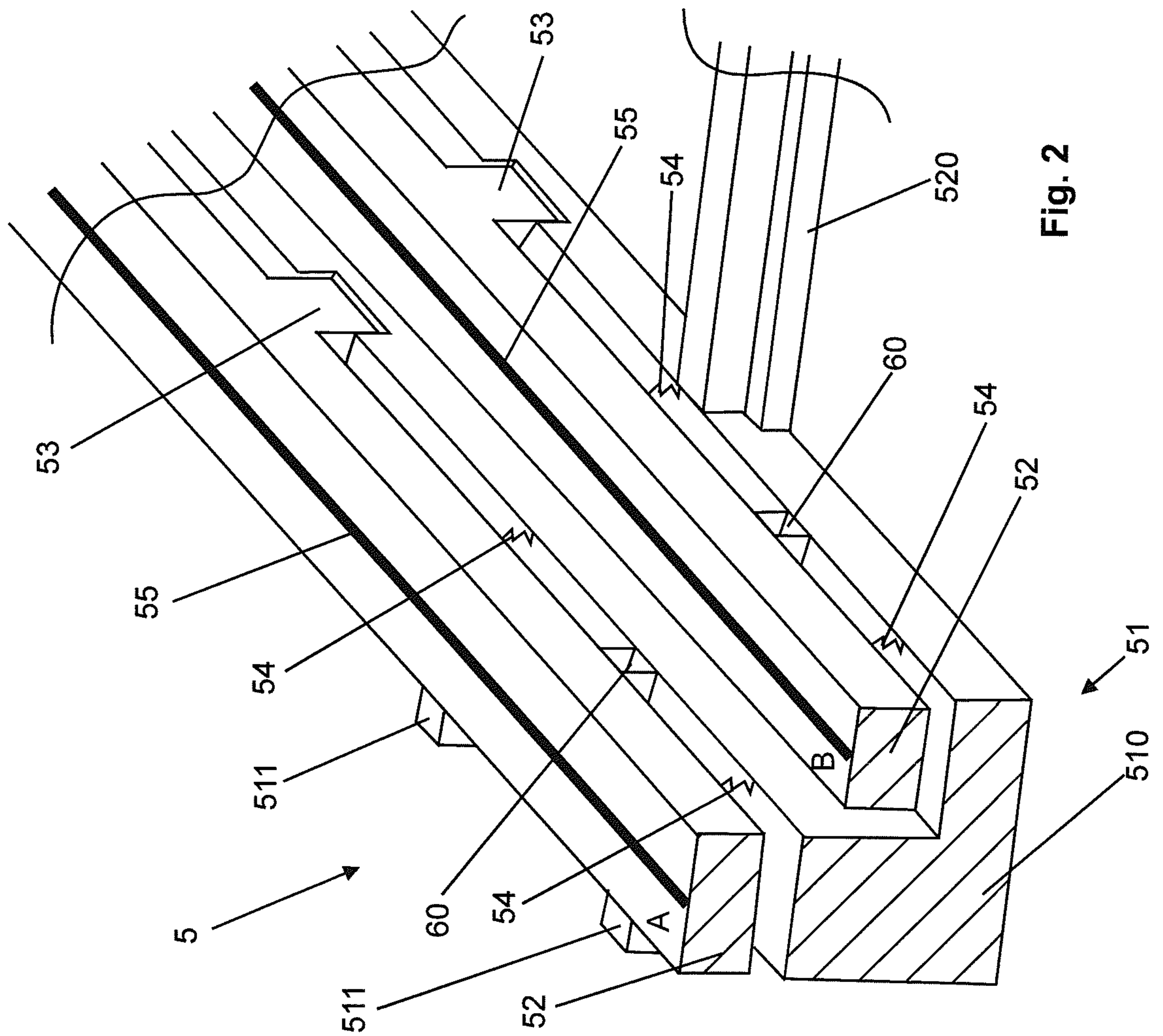


Fig. 1

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3 / 4

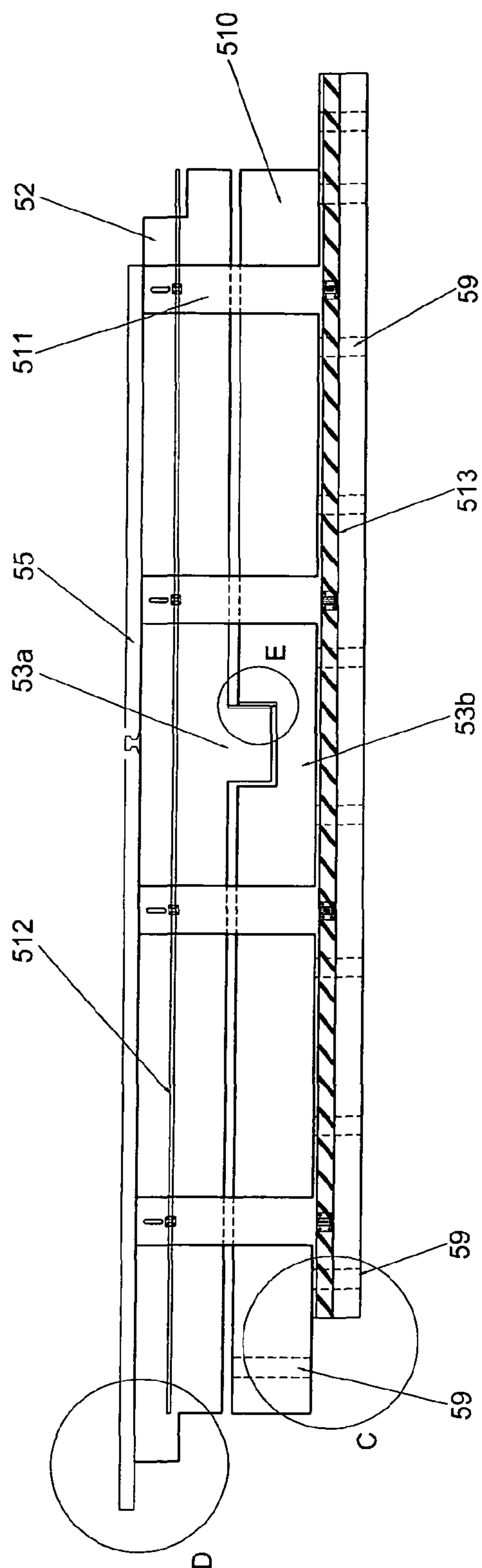


Fig. 3

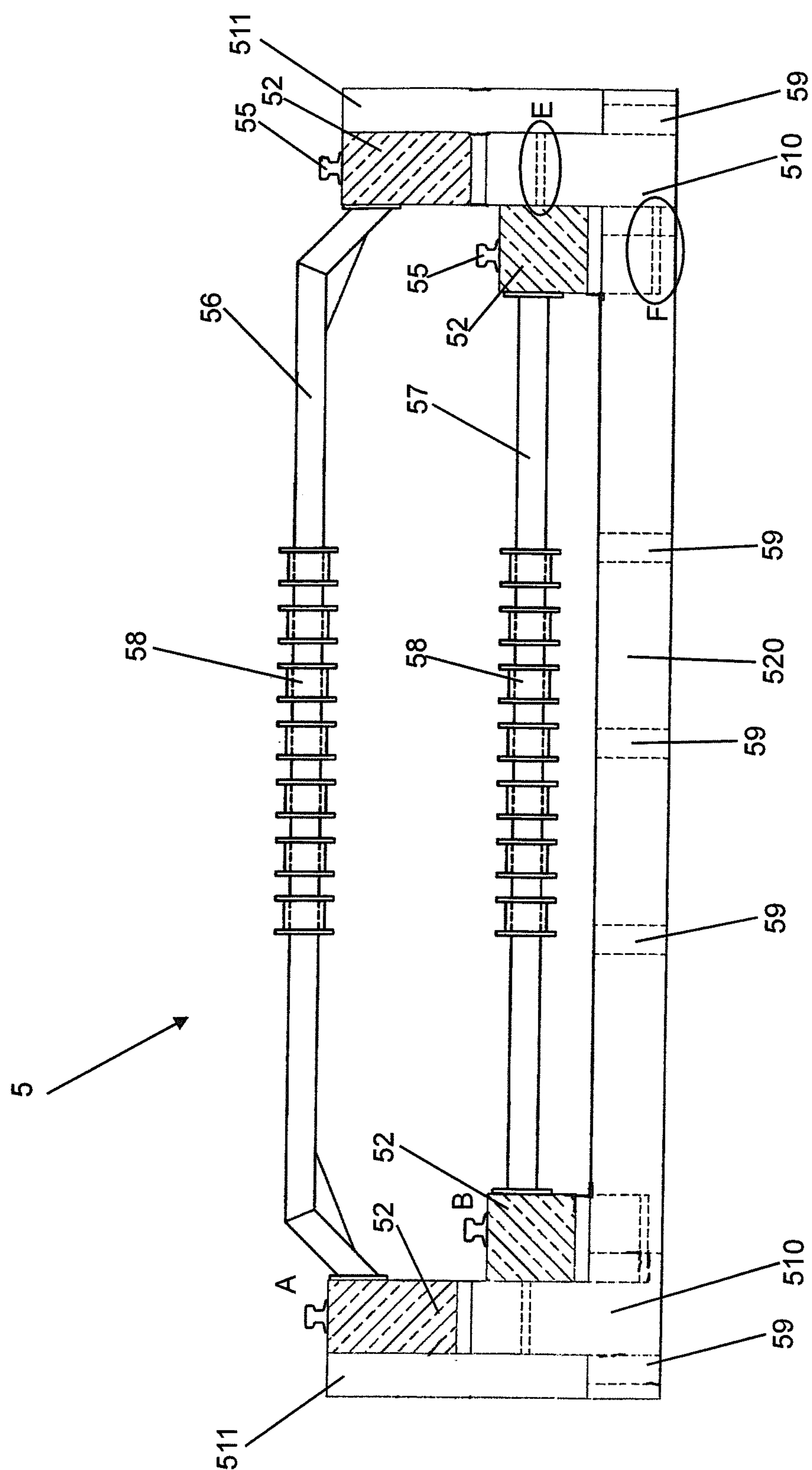


Fig. 4

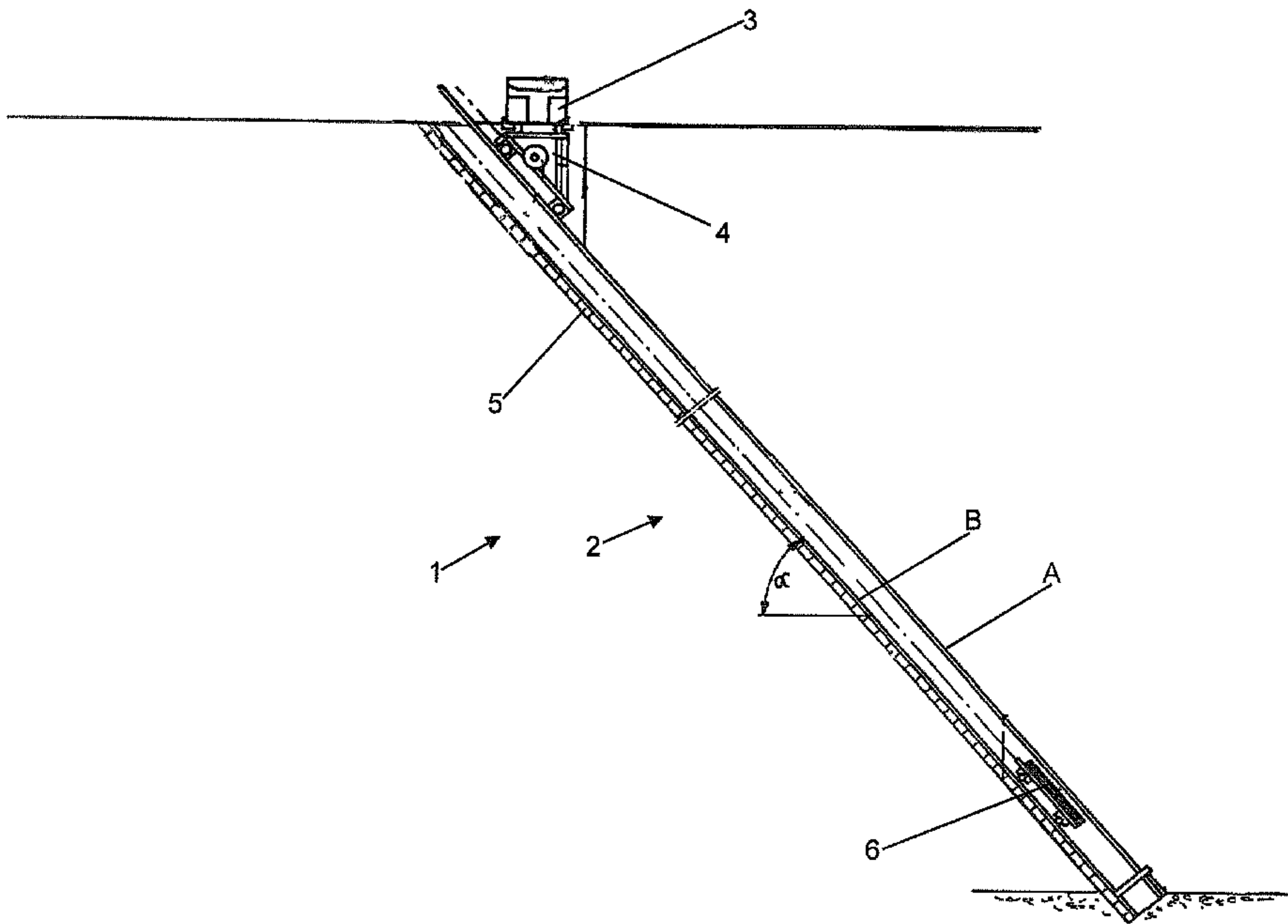


Fig. 1