The present invention relates to a mining arrangement, and more particularly to such an arrangement including a mining conveyor and a mining machine, such as a planer, mounted with respect to the conveyor for displacement back and forth therealong, and longitudinally spaced apart individual bracket means, each containing a guide groove, and elongated axial composite guiding element means disposed on the mining machine for guiding coaction with such guide means to permit the mining machine to be displaced longitudinally back and forth in extractive engagement with the mine face thereat, while avoiding difficulties in construction and operation heretofore encountered.

In accordance with conventional constructions, such as are shown in U.S. Patents 2,823,908 and 3,164,412, the planer, especially one having a rearwardly extending keel underlining the conveyor, is provided with lug runner means which are guided in longitudinal guide grooves on the conveyor to stabilize the longitudinal path of movement of the planer while advantageously providing the tractive force to displace the planer longitudinally by the presence of traction cable means mounted on the side of the conveyor on which such lug runner means are disposed, with the forward and return strands of the traction cables being slidably received within channels or grooves, usually superimposed, at such side of the conveyor. In all previous constructions, the superimposed channels were completely exposed, save for a longitudinal slit through which the connecting means of the planer was attached to the lug runner means within one of the channels at the appropriate conveyor side. However, to provide such a construction involves high expense and requires the dismantling of the channel means in order to inspect the condition of the traction cable and certainly in order to effect repairs to the traction cable, such as a chain, where a break therein occurs. As the artisan will appreciate, such rupture of the traction cable will occur under normal operating conditions due to the usual wear on the working parts, and much time is lost in dismantling the channel means on the conveyor to gain access to the chain break so that the required repairs can be undertaken.

Usually, the conveyor is provided in the form of individual end-to-end arranged conveyor sections which are articulatedly interconnected to permit some deviation from the normal longitudinal axis thereof whereby to accommodate unevenness in the mine floor and to permit incremental advance of the conveyor toward the mine face as new layers thereof are progressively exposed. In such instances, the individual conveyor sections are provided with corresponding subchannel means for housing the drive cable which is used to displace the mining machine, with the appropriate subchannel means being correspondingly arranged in end-to-end disposition so that substantially no gap is permitted at the abutting portions of the subchannel means. Thus, the prior art has utilized heretofore only articulatedly interconnected conveyor sections having subchannel means, usually on one side thereof, of equal length. Hence, as aforesaid, where a new chain must be installed or a chain break repaired, it is necessary to dismantle the various subchannel means to gain access to the chain, and of course the reverse operation is necessary once the new chain has been installed or the break repaired so as to effect reassembly of the constructive parts.

It is an object of the present invention to overcome the foregoing drawbacks and to provide a mining arrangement including a mining conveyor and a mining machine, such as a planer, mounted with respect to the conveyor for displacement back and forth therealong, and longitudinally spaced apart individual bracket means, each containing a guide groove, and elongated axial composite guiding element means disposed on the mining machine for guiding coaction with such bracket means to permit the mining machine to be displaced longitudinally back and forth in extractive engagement with the mine face thereat.

It is another object of the present invention to provide in particular a conveyor having longitudinally spaced apart bracket means provided thereon, rather than a co-extensive channel means, for the traction cable means used to displace the mining machine in connection with which such conveyor is used, such that the interconnecting means forming a part of the conveyor and to which the appropriate forward strand of the traction cable means is connected may be guidedly received in the bracket means for suitable guidance of the mining machine, yet with immediate inspection of the portions of the traction cable in the longitudinal spaces between the bracket means, as well as immediate replacement or repair of the traction cable means without cumbersome dismantling of the bracket means, being possible.

It is another object of the present invention to provide a mining machine having a forward cutting means for operatively engaging a mine face and a pair of separate longitudinally aligned spaced apart lug runner means positioned transversely rearwardly of the cutting means for appropriate connection to the traction cable means and elongated axial composite guiding element means capable of limited deviation from the normal axis thereof interposed longitudinally between the lug runner means, whereby to assist in guiding the mining machine along a mining conveyor used therewithout without deviation substantially along the longitudinal path yet with suitable adjustment of such guiding means by such deviation being possible so as to accommodate unevenness in the normal longitudinal path caused by the particular conditions of the mining operation.

It is still another object of the present invention to provide a mining arrangement by which longwall mining operations may be carried out with greater efficiency and with less expense in terms of time and capital investment than heretofore, utilizing constructional components simple to manufacture, durable in use, easier to handle, lending to a considerable saving in weight of the entire installation, yet assuring a reliable guidance of the mining machine in the desired longitudinal path under all operating conditions.

It is still another object of the present invention to provide a mining arrangement by which longwall mining conveyor and a mining machine, such as a planer, which permits simple and immediate access to the traction cable means used to displace the planer for replacement and repairs without sacrificing the necessary stable guidance of the mining machine on the conveyor, considering the high pulling force of the traction cable means, the counter forces met by the mining machine at the mine face, the unevenness of the mine floor and occasionally of the mine face, and the like.

Other and further objects of the present invention will become apparent from a study of the within specification and accompanying drawing, in which FIG. 1 is a schematic end view of a mining arrangement including a mining conveyor and mining machine, in the form of a planer, in accordance with one embodiment of the present invention.
FIG. 2 is a top schematic view of the embodiment shown in FIG. 1, illustrating details of the relationship between the bracket means and elongated axial composite guiding element means.

FIG. 3 is a longitudinal side view of an arrangement in accordance with the present invention similar to that of FIGS. 1 and 2, yet showing an alternate embodiment of the elongated axial composite guiding element means.

FIG. 4 is a schematic perspective view of another embodiment of the arrangement of mining machine and conveyor in accordance with the present invention, showing one of the hoods or cover elements in exploded disposition.

FIG. 5 is a schematic enlarged view partially in section, showing specific constructive details and the relationship of the lug runner means of the mining machine in the guide groove of the bracket means mounted on one side of the conveyor, in accordance with a further embodiment of the invention similar to that shown in FIG. 4, and

FIG. 6 is a perspective view of an alternate form of the lug or cover element usable to cover the distance between longitudinally spaced apart bracket means, in accordance with an optional feature of the invention.

It has been found in accordance with the present invention that a mining machine adapted to be displaced along an elongated guide means back and forth in a longitudinal path adjacent such mine face may now be provided advantageously having forward cutting means thereon for operatively engaging such mine face for the extraction of mineral therefrom, slide surface means thereon for engaging slidably such elongated guide means to maintain the mining machine in normal relation to such longitudinal path, a pair of separate longitudinally aligned spaced apart lug runner means thereon positioned transversely rearwardly with respect to said cutting means, which lug runner means are adapted to be received in guide groove means of said elongated guide means for stabilized guiding of the mining machine in relation to such longitudinal path and each of which lug runner means is adapted to be connected to an appropriate end of a traction cable means used to displace the mining machine along such elongated guide means for extraction of mineral from the mine face, and elongated axial composite guiding element means capable of only limited deviation from the normal axis thereof interposed longitudinally between said lug runner means, whereby to assist in guiding the mining machine along such elongated guide means without deviation substantially from the normal longitudinal path thereof with suitable adjustment of said guiding element means by such limited deviation to accommodate unevenness in the normal longitudinal disposition of said conveyor and in turn said longitudinal path caused by particular conditions of mining operations.

Referring to the drawing, FIG. 1 shows a mining machine in the form of a mining planer 1, having a forward cutting tool 1a and a slide surface 1b rearwardly of the cutting tool 1a for slidably engaging said longitudinally aligned spaced apart bracket means 20 of a mining conveyor 3, and with the sword plate or keel 2 slidably underlying the conveyor 3 to stabilize the positioning of the planer 1 with respect to the mine face adjacent thereto and with which the cutting tool 1a is in extractive engagement during normal mining operations. Specifically, the mining conveyor 3 is provided with the side walls 4 and 5 whereby suitable scraper chain means may be employed in conjunction with transverse spaced apart scraper bars for the removal of extracted mineral disposed on the conveyor from the site of mining operations. Conveyors of the type in question are generally well known, as may be appreciated from the aforementioned U.S. patents. Such conveyors are usually in the form of individual conveyor sections articulatedly connected to one another in end-to-end disposition whereby to accommodate unevenness in the mine floor and deviations from the normal longitudinal path of movement of the planer 1 adjacent the mine face being worked. On the side wall 5 of conveyor 3 remote from the mine face (not shown), an upright bounce plate or retaining plate 6 is provided so that mineral plowed onto the conveyor 3 by the planer 1 during the back and forth movement of such planer will not overflow the conveyor in the direction of the side thereof remote from the mine face. The bounce plate 6 is also of benefit in increasing the capacity of the trough of conveyor 3. On the side of bounce plate 6 remote from the mine face, a bawser bracket or upright three-armed member 7 of radially aligned spaced apart lug runner means provided for operatively engaging such mine face for the extraction of mineral therefrom, and for guidingly receiving traction cable means adapted to be connected to said lug runner means for displacing such mining machine thereby.

More particularly, the present invention contemplates as well a mining arrangement advantageously including a mining conveyor adapted to be disposed adjacent a mine face and having longitudinally spaced apart bracket means mounted along one side thereof, each of which contains a guide groove, a mining machine, mounted on said conveyor for displacement back and forth therealong in a longitudinal path adjacent such mine face, and having forward cutting means operatively engaging such mine face for the extraction of mineral therefrom as well as a pair of separate longitudinally aligned spaced apart lug runner means thereon positioned transversely rearwardly with respect to said cutting means, which lug runner means are longitudinally guidingly received through said guide grooves of the mining machine in relation to said longitudinal path, said lug runner means being adapted to be connected with the appropriate ends of the forward strand of a traction cable means used to displace such mining machine along said conveyor for extraction of mineral from the mine face and said guide grooves being further adapted to receive therethrough such forward strand of the traction cable means, and elongated axial composite guiding element means capable of only limited deviation from the normal axis thereof interposed longitudinally between said lug runner means, whereby to assist in guiding the lug runner means through the guide grooves of said spaced apart bracket means and in turn the mining machine along said conveyor without deviation substantially from the normal longitudinal path thereof with suitable adjustment of said guide element means by such limited deviation to accommodate unevenness in the normal longitudinal disposition of said conveyor and in turn said longitudinal path caused by particular conditions of mining operations.

In the same way, it has been found in accordance with the present invention that a mining conveyor adapted to be disposed adjacent a mine face may now be provided, advantageously having longitudinal spaced apart bracket means mounted along one side thereof, each of which contains a guide groove for longitudinally guidingly receiving therethrough appropriate longitudinally aligned spaced apart lug runner means of a mining machine, adapted to be slidably displaced back and forth along said conveyor for operative engagement with such mine face for the extraction of mineral therefrom, and for guidingly receiving traction cable means adapted to be connected to said lug runner means for displacing such mining machine thereby.

More particularly, the present invention contemplates as well a mining arrangement advantageously including a mining conveyor adapted to be disposed adjacent a mine face and having longitudinally spaced apart bracket means mounted along one side thereof, each of which contains a guide groove, a mining machine, mounted on
side wall 5 of the conveyor. The rearwardly extending stabilizer keel 2 of the mining machine shown is advantageously connected with at least two separate lug runners 14 such that the appropriate end of the forward strand 16 of a drive chain or other traction cable means may be connected correspondingly to the particular lug runner. The return strand 15 of the drive chain is slidably received in the upper channel 14 in the usual manner, with the ends of the drive chain being looped over drive sprocket wheels or drums, or the like, in order to achieve the reciprocal movement of the drive chain and, in turn, of the mining machine back and forth along the mine face in a guiding association with guide means shown in the form of a mining conveyor. It will be appreciated that in accordance with the present invention, the planer need not be utilized with a mining conveyor of the type shown and that the mining conveyor may be used with a different type of mining machine, without departing from the concept of the present invention, which in its broadest aspects concerns a cooperative association between a mining machine and a guide means therefor, regardless of the particular type, wherein the traction cable means for the mining machine is appropriately guided via individual longitudinally spaced apart guide grooves mounted along the guide means, e.g., conveyor, such that an appropriately connecting piece of the mining machine may be inserted thereinto along with the lug runners means attached thereto for the appropriate stabilized guidance of the lug runners means within the various guide grooves during the longitudinal back and forth movement of the lug runner means, connecting piece, keel, and mining machine, without the need for the complete and continuous channels for the forward and return drive chain strands and without a continuous longitudinal guide groove or slit for guidingly receiving the mining machine connecting piece and the lug runners associated thereof.

As may be seen from FIG. 2, the mining machine shown in the form of a planer 1 having the cutting tool 1e and the side surface 1f is provided in effect with a very broad stabilizer keel 2 underlying conveyor 3, such conveyor being in the form of individual articulately interconnected sections 3e, each having a side wall 4 adjacent the mine face and a side wall 5 remote from such mine face, preferably with a bounce plate 6 being mounted on the latter side wall as shown. If desired, the mining machine may be provided with separate hingedly interconnected keel sections of the type disclosed in the aforementioned U.S. Patent 3,164,412, so as to negotiate more readily unevenness in the minor floor. The upright brackets 7 are provided with outwardly disposed vertical reinforcing elements or spines 18 to impart extra strength to the brackets 7 with a minimum of extra constructional details. As may be appreciated from FIG. 2, each conveyor section 3e is provided, in the embodiment shown, with only two such upright brackets 7, each in turn having an upper channel 11 and a lower channel 12 as well as an accompanying slit 13 through which the appropriate portion of the keel 2 is inserted into the given lower channel 12 for maintaining the particular lug runner 14 in guiding association with the guide groove defined at the lower portion of bracket 7 in the vicinity of lower channel 12 and the marginal portion of the underside of conveyor 3 and the lower end of side wall 5, whereby to form the slit 13.

In order to negotiate upper and lower guide channel means of the type provided by bracket 7 in conjunction with the appropriate side wall 5 and/or bounce plate 6 through the lack of structural guidance of the guide channel in the longitudinal space between the various brackets 7, the longitudinal space between the pair of aligned lug runners 14 (see FIG. 2) is occupied by elongated axial composite guiding element means 19 shown in the form of tandemly positioned bead members, such as tubular beads strung along a reinforcing cable (not shown) interconnecting the inner end portions of lug runners 14.

Such reinforcing cable interconnects the lug runners 14 to relieve the opposing stresses placed on such runners by the pulling force of the traction cable means and considering the tortuous path which the mining machine and associated guiding means therefor, such as a conveyor, must negotiate under various mining conditions, the guiding element means 19 of the invention are of great value.

This is true since the lug runners 14 must be guidingly received, with a minimum of hindrance and without jamming, within the guide grooves of the respective brackets 7, i.e., in the lower channels 12 and the slits 13. In the usual case, the reinforcing cable or chain (not shown), which interconnects the lug runners 14, would become entangled with the appropriate portions of the various brackets 7 since the brackets are not provided in the usual continuous completely covering form as was the case in the past. Therefore, a great portion of the reinforcing cable or chain in question is not in constant guiding contact with the appropriate channel of the traction cable guide means of the conventional type arrangement, yet the provision for the tubular beads strung along the reinforcing cable serves to maintain such cable in the desired longitudinal alignment regardless of whether the same is in sliding contact with a particular guide groove of bracket 7 or out of contact therewith. A minimum of deviation from the normal axial disposition of the reinforcing cable is enjoyed by the positioning of the tubular beads 19, as aforesaid.

As shown in FIG. 3, which is a slightly different embodiment from that of FIGS. 1 and 2, with corresponding parts retaining the same reference numerals, the lug runners 14' are provided with an interconnecting resilient reinforcing bar shown schematically at 14a on which tandemly positioned tubular beads 19a are strung in the same manner as the beads 19 and are receivable on the reinforcing cable (not shown) between the lug runners 14 of FIG. 2. In either instance, as may be appreciated from FIGS. 2 and 3, the particular reinforcing cable or resilient reinforcing bar in any angular position between appropriate conveyor sections 3a, either with respect to the vertical or with respect to the horizontal, will accommodate deviations in the normal longitudinal path and will be maintained by the chain guide means in the form of guide beads 19 or 19a, or the like, in suitable disposition for discontinuous guidance within the guide grooves of the longitudinal spaced apart brackets 7. In order to achieve minor adjustments in disposition of brackets 7 along the guide path, appropriate longitudinal elongated slots 17 (see FIG. 3) are defined in the bounce plate 6. The particular bracket 7 is connected by suitable means with the appropriate side wall 5 on the opposite side of bounce plate 6 through such slot 17 whereby upon the connection in question, the bracket 7 may be moved along slot 17 in the desired direction to achieve the longitudinal adjustment sought.

In addition to the provision for guide beads 19 or 19a on an appropriate reinforcing cable (not shown) or resilient reinforcing bar 14a, the particular beads 19 or 19a may be disposed on the end portions of the given forward strand 16 of the drive chain adjacent the connection thereof to the corresponding lug runners 14 or 14a. Also, especially in the case of FIG. 3, the end portions of lug runners 14' to which the ends of the forward strand 16 of the drive chain are normally connected may be provided with an interposed resilient element means 19b (not shown) extending longitudinally outwardly from the appropriate lug runner 14' and upon which are mounted tubular beads 19u. Whether such sub-bar is interposed between the appropriate lug runner 14' and the end of the forward strand 16 is connected to the corresponding end of such sub-bar, or whether such sub-bar is terminated at the forward strand 16 is directly connected to the lug runner 14', in either instance, in accordance with a preferred embodiment of the present invention, suitable tubular beads 19a are provided on the portion of the traction cable means in the form of such sub-bar or such forward strand, where-
by preliminary guidance will be achieved of the drive cable means as it passes from one bracket 7 to the next so that the given lug runner 14 and 14' will be guided at the guide groove formed at the conjunction of the lower channel 12 while without jamming and without excessive wear on the parts meant to be in sliding contact with one another continuously or discontinuously, as the case may be.

In FIGURE 4, a further embodiment of the invention is shown, in which the planar 20, having the cutting tool 20a and the slide surface 20b, is utilized as the upstanding guide stabilizing the bracket 21, is disposed in slidable guiding contact with the conveyor 23 having the side walls 24 and 25 as well as the upright bumper plate 26 of analogous construction and relationship with respect to the arrangements shown in the embodiments of FIGS. 1 to 2 and FIG. 3. The keel 22 of the planar underlies the conveyor 23, extending rearwardly from the cutting tools 20a and the studs 21, whereby the separate longitudinally aligned spaced apart lug runners 34 may be disposed with chain 39 on that side of conveyor 23 outwardly of the given bumper plate 26. The individual spaced apart brackets 27 similar to the brackets 7 and the embodiments of FIGS. 1 to 2 and 3 are provided, each bracket 27 having upper flange or arm 28, a middle flange or arm 29, and a lower flange or arm 30, whereby to form an upper channel 31 for the return strand 35 of the traction cable means in the form of a drive chain and a lower channel 32 to accommodate the forward strand 36 of such traction cable means or drive chain. This arrangement is similar to that of the previously described embodiment. A silt 33 is provided between the lower arm 30 of a given bracket 27 and an appropriate marginal portion of the underside between the conveyor 23 and the lower portion of the side wall 25 and in the bumper plate 26 thereof. A longitudinal slot 37 is provided in the bumper plate 26 adjacent the portion thereof where a particular bracket 27 is to be situated. Therefore, by suitable connection of a bolt or other connecting means (not shown) through the appropriate apertures 41 in bracket 27 and extending through the particular middle arm 29 and slot 37 to the opposite side of bumper plate 26, the bracket may be loosened and in turn tightened to permit longitudinal shifting of such bracket to attain the desired longitudinal displacement. In order to effect a certain amount of projecting of the guideway for the forward strand 36 and return strand 35 of the traction cable means or drive chain or the like, in addition to the brackets 27, the longitudinal space therebetween may be provided optionally with covers or hoods 48. Hoods 48 are dimensioned to extend between adjacent brackets 27 and are provided with a desired profile permitting the desired coverage and with suitable latch elements 47 positioned on the adjacent ends of the hoods 48 to attain inserting engagement through the latch openings 40 of the ears 38 disposed on the outer surface of brackets 27.

Advantageously, a suitable pivotal mounting element 49 is disposed on the outward side of the appropriate bracket 27 in order to accommodate therewith an advancing means (not shown) commonly used in the form of a piston-cylinder means appropriately reinforced against rearward transverse travel whereby to force in the forward transverse direction not only the conveyor but also the mining means associated therewith, shown in the particular embodiment as a mining planer. Various advancing means are known to attain the advancing in question and besides simple advancing means constructions which are connected with the conveyor assembly, more elaborate systems may be used, such as ramming, appropriate advancing means associated therewith to achieve the desired step-by-step or continuous advancement of the arrangement. Such means are shown, for instance, in U.S. Patent 3,192,722.

In the embodiment of FIG. 5, which is similar to that of FIG. 4, the bracket 27' is provided with an outwardly directed vertically extending reinforcing rim or spine 38' at each longitudinal edge, and in such spine the appropriate latch openings 40' are defined to accommodate corresponding latch elements for an appropriate member of the type concepted in the embodiment of FIG. 4. An aperture 41' is also provided in bracket 27' to permit the bolt 42' to be inserted through the middle arm 29' and the longitudinally extending slot 37' of the bumper plate 26' into the V-shaped recess 44' defined at the central portion of side wall 25' in view of the appropriate configuration of the cross-section of the conveyor 23' illustrated. A connecting seat 43' is disposed in the recess 44', in the form of a nut into which the appropriate end of the bolt 42' is operatively inserted. The opposite threaded end 45' of bolt 42' extends outwardly through the apron 41' and is capped by a nut 46' or suitable releasable connecting means so that upon release thereof, the bolt 42' may be displaced longitudinally along the slot 37' together with the connecting seat 43' at the recess 44' to achieve a change in longitudinal position of a particular bracket 27'. Such bracket 27' contains an upper flange or arm 28' and a lower flange or arm 30' which together with the middle flange or arm 29' form the upper channel 31' within which the return strand 35', shown schematically, of the particular drive chain is conducted, and the lower channel 32' within which the forward strand of the particular drive chain is conducted. Such lower channel 32' slidably receives the appropriate lug runner 34' of the keel 22' of a planer or other mining machine through the longitudinal slit 33' defined between the lower arm 30' of bracket 27' and the marginal portion formed by the underside of conveyor 23' and the lower portion of the side wall 25' and/or the bumper plate 26' thereof. The latter construction may be considered the guide groove for guiding the lug runner means of the planer or other mining machine in the discontinuous course along the guide means, shown in the form of a conveyor, with a minimum of constructional parts and a maximum of advantages attendant the same. As may be appreciated from a review of FIGS. 4 and 5, for instance, and to some extent from the alternate embodiment shown in FIG. 1, the middle arm in question, i.e. 9 or 29 or 29', is constructed as a double concave arm which allows the particular strand of the drive chain to be suitably accommodated in sliding engagement therewith and desirably the longitudinal end portions of such arm are arcuate in configuration so as to provide a smooth transition to take up thereat the given portion of the drive cable and feed out the same, at the particular end thereof in question, whereby to minimize frictional contact between the drive chain and the middle arm. Such attendant jamming which might otherwise occur in conjunction with the provision for the elongated axial composite guiding element means of the invention in view of the discontinuous nature of the guide path provided by the guide grooves and/or the brackets at the particular side of the conveyor.

FIG. 6 shows an alternate embodiment of a cover or hood 48' of similar profile to the brackets 27' of FIG. 5 and brackets 27 of FIG. 4, and for that matter of the brackets 7 of FIGS. 1 to 2 and 3, which is provided at one end with an appropriate latch element 47' and a pair of mounting fingers 47" at the other longitudinal end thereof designed to be inserted into appropriate apertures, similar to apertures 40' shown in the spine 38' of the bracket 27' of FIG. 5. In place of a mounting for such a cover 48' with respect to bracket 27', the pair of mounting fingers 47" is also readily insertable into latching openings 40 in intermediate ears 38' of the type shown in FIG. 4 with the understandable modification of providing two such ears 38 at the particular side of bracket 27' at which the mounting fingers 47" of the hood 48' are to be releasably connected.

It will be appreciated from the foregoing that the separated longitudinally spaced apart brackets in conjunction with the appropriate elongated axial composite
guiding element means utilized preserve the desired guidance of a given mining machine, such as a planer, along a guide means mounted adjacent a mine face, such as a mining conveyor, without adverse effect on the mining operation, without excessive wear and/or jamming of the operating parts, yet with a decrease in cost, the use of smaller constructive parts resulting in a reduction of weight in the over-all system, all of which allows immediate inspection of the drive cable means and immediate access for repair or replacement thereof.

Although a mining planer having a rearwardly extending keel and a mining conveyor having guide means at the side thereof remote from the mine face for mounting the tractive cable means for displacing the planer back and forth in the operative manner, have been described and illustrated in the drawing, it will be appreciated by the artisan that the present invention in its broader aspects is concerned with any type of mining machine which is adapted to be drawn by traction cable means along a guide means for operative engagement of the mining machine with the mine face adjacent thereto, and that the guide means in question need not be in the form of a particular mining conveyor but any such guide means appropriate to the circumstances. Also, it will be appreciated that the guide grooves and the guide brackets provided need not be positioned at the sides of the conveying remote from the mine face, and that the mining machine need not be of the type having a keel rearwardly extending from the cutting means so as to underlie the guide means, such as a conveyor, for suitable attachment of the mining machine with the traction cable means via such keel at the side of the guide means remote from the mine face.

The broadest aspects of the present invention contemplate any type of mining machine with any type of guide means for conducting such mining machine longitudinally along a path in operative engagement with the mine face wherein traction cable means are associated with such guide means to displace the mining machine in the desired path. The important construction of the invention involves the use of discontinuous longitudinally spaced apart guide grooves on the guide means utilized in conjunction with lug runners on the mining machine having appropriate elongated axial composite guiding element means so as to achieve proper directing influence and longitudinal guidance of the lug runners of the mining machine along the guide means without substantial deviation along the desired path. Even where changes in the normal disposition of the path occur during advancement of the conveyor sections continuously or in increments towards the mine face, or by reason of unevenness of the mine floor, the properly positioned guide grooves, and the presence of the elongated axial composite guiding element means in cooperation therewith, will be able to accommodate any such unevenness in the longitudinal path without jamming the mining machine within the guide grooves.

Advantageously, utilizing the instant construction, the drive chain passage for the drive chain of the mining machine is accessible at all points therealong so that such chain or other traction cable means breaks during mining operations, the same can be repaired rapidly. The components utilized for such chain passage, unlike the conventional constructions herefore used, are simple to manufacture, easier to handle, and entail a considerable reduction in weight of the individual components and, in turn, of the entire installation than could be attained with the constructions of the prior art, while nevertheless assuring the reliable guidance of the mining machine under all circumstances normally encountered in underground longwall mining operations.

Thruside grooves of the invention are indeed utilized with cooperating elongated axial composite guiding element means on the mining machine whereby the guiding element means is able to execute only limited movement with respect to the normal axial disposition thereof in connection with the mining machine used.

The hawse elements or upright brackets containing the guide grooves are preferably composed of hard steel castings in an approximate E-shaped cross-section, for example as shown in the various embodiments of the drawing, with the connection of such brackets to the appropriate portion of the conveyor being releasable in nature to permit reasonable longitudinal displacement of the bracket with respect to the conveyor on which the same is mounted. Such brackets, because of their hard structure, are readily adapted for mounting of advancing means which are used to advance the entire conveyor assembly or other guide means toward the mine face being worked. Although removable covers or hoods are contemplated for covering over the space between adjacent ends of brackets, usable in accordance with the invention, such hoods are only optional and need not be provided since the entire guidance of the arrangement in question is achieved by the aforementioned relationship between the guide grooves and the elongated axial composite guiding element means.

With respect to the elongated axial composite guiding element means, while in the embodiment shown such means are in the form of tubular beads mounted on an appropriate reinforcing cable or resilient reinforcing bar or sub-bar, other appropriate constructions may be utilized to achieve the guidance desired. In the usual instance, the tubular beads are strung along the reinforcing cable which may be in the form of a chain interconnecting the lug runners, and also strung along the appropriate end portion of the forward strand of the traction cable beyond the corresponding lug runners a certain distance to attain preliminary guidance of the lug runners during their passage in turn through the discontinuously arranged guide grooves. Therefore, in either direction of displacement of the mining machine, the appropriate end portion of the forward strand of the traction cable, preferably containing tubular beads or other elongated axial composite guiding element means, will assure unimpeded passage of the drive chain and lug runners within the guide grooves in an efficient manner.

The reinforcing cable or chain or resilient bar which may interconnect the pair of lug runners utilized in the preferred embodiment of the invention may be mounted with respect to such lug runners so that adjustment of the tension thereof is possible to change the elastic or resilient nature of the connection between the lug runners and especially in view of the tendency thereof to deviate from the normal axial longitudinal path in question. The stiffening of the appropriate construction between the lug runners may be attained within limits by use of an elastic rod, packs of leaf springs or bar springs, or the like, preferably with tubular beads of the foregoing type mounted therealong. The necessary stiffness coupled with the desired elasticity can be attained by the use of any combined construction of rigid and yielding parts suitable within the contemplation of the foregoing. Limited angular displacement of the tubular beads, considering their mounted disposition on a reinforcing cable or resilient bar, or the like, may be restricted in certain directions, depending upon the particular construction use. The elasticity of the system can be attained by adjustable clamping means at either or both of the lug runners in question, usable, for example, with reinforcing cable or resilient bar means and/or tubular beads whereby to achieve spring-elastic interconnections for limiting angular deviation of the lug runners and of the interconnecting means therebetween with respect to the normal path through the guide grooves, and vertically or horizontally. The resilient spring elements may be provided on the keel in order to connect the lug runners thereto to achieve particular effects in the guidance operation.

Advantageously, the dimension of the hawse element or brackets in the longitudinal direction is so related to the length of the particular pair of lug runners, in accord-
In preliminary guidance of such traction cable means and in turn said lug runner means along such elongated guide means. Furthermore, such guiding element means and guiding element extension portions are in the form of tandemly positioned head members.

In connection with one embodiment of the present invention, a reinforcing cable is provided to interconnect the lug runner means to relieve the elongated guide means disposed at the appropriate opposite side of each said lug runner means as in form of tandemly positioned tubular beads strung along said reinforcing cable.

In connection with an alternate embodiment of the invention, a resilient reinforcing bar interconnects said lug runner means to relieve the opposing stresses placed thereon by the pulling force of such traction cable means and said guiding element means are in the form of tandemly positioned tubular beads strung along said reinforcing bar.

Preferably, the mining machine utilized will be a mining planer with such forward cutting means positioned for operatively engaging such mine face and having a rearward stabilizer keel extending transversely rearwardly from said cutting means and underlying the conveyor, the free end of said keel remote from said cutting means carrying said pair of elongated guide runner means thereon and said bracket means being corresponding positioned on the side of the conveyor remote from the mine face and said cutting means and guidingly receiving there-through said lug runner means thereat.

In connection with one specific feature of the invention, each bracket means defines with the adjacent side of such conveyor a traction cable channel for receiving the return strand of the traction cable adapted to be used for displacing such mining machine, the forward strand of such traction cable being adapted to be received in the corresponding guide groove of such bracket means.

More particularly, such bracket means are in the form of an upright three-armed member of E-shaped cross-section, with the open end thereof being disposed adjacent the corresponding side wall of such conveyor with the lowermost arm thereof spaced slightly below the underside of said conveyor, whereby to form an upper return strand traction cable channel between the confining portions of the conveyor side wall and the uppermost and middle arm portions of said upright member and a combined lower forward strand traction cable channel and lug runner guide groove between the confining portions of the conveyor side wall and the lowermost arm portions of said upright member, the adjacent portion of said conveyor defined by the margin between the adjacent side wall and underside thereof together with the adjacent portion of said lowermost leg forming a longitudinally directed slit for receiving thereat the free end of said keel carrying said pair of spaced apart lug runner means thereon. Optionally, the bracket means are provided with vertical reinforcement spines thereon and/or pivotal mounting means for connection with advancing means adapted to be used to displace the conveyor transversely toward the mine face.

The bracket means in accordance with a further preferred feature of the invention are limitedly longitudinally displaceably mounted on the adjacent side of the conveyor to adjust the distance longitudinally between adjacent bracket means.

Also, preferably an upwardly extending bounce plate is mounted on the adjacent side wall of the conveyor intermediate such side wall and the corresponding bracket means, said bounce plate having a plurality of longitudinal slots therein, and said upright members are in the form of an upright bracket wall having an upper transverse flange extending into a shroud with said plate, a lower transverse flange extending toward the adjacent portion of the conveyor defined by said margin between the adjacent side wall and underside thereof to define said
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13 longitudinal slit, and a middle arm of double concave cross-section extending from the middle portion of said upright wall to said plate and having a bore transversely defined therethrough, with a bolt connection means being inserted through the adjacent portion of each said upright wall, the corresponding bore of each said middle arm and a corresponding slot in said plate for interconnecting the corresponding upright walls, middle arms and in turn the bracket means with the conveyor for adjustable displacement of such bracket means longitudinally within the longitudinal limits of the appropriate bounce plate slots.

It will be appreciated that the instant specification and drawings are set forth by way of illustration and not limitation, and that various modifications and changes may be made without departing from the spirit and scope of the present invention which is to be limited only by the scope of the appended claims.

What is claimed:

1. Mining machine, adapted to be displaced along an elongated guide means back and forth in a longitudinal path adjacent to a mine face, having forward cutting means thereon for operatively engaging such mine face for the extraction of mineral therefrom, slide surface means thereon for engaging slidably such elongated guide means to maintain the mining machine in normal relation to such longitudinal path, a pair of separate longitudinally aligned spaced apart lug runner means thereon positioned transversely rearwardly with respect to said cutting means, which lug runner means are adapted to be received in guide groove means of said elongated guide means for stabilized guidance of the mining machine in relation to such longitudinal path and each of which lug runner means is adapted to be connected to an appropriate end of a traction cable means used to displace the mining machine along such elongated guide means for extraction of mineral from the mine face, and elongated axial composite guiding element means capable of only limited deviation from the normal axis thereof interposed longitudinally between said lug runner means, whereby to assist in guiding the mining machine along such elongated guide means without deviation substantially from the normal longitudinal path thereof with suitable adjustment of said guiding element means by such limited deviation to accommodate unevenness in the normal longitudinal disposition of such elongated guide means and in turn such longitudinal path caused by the particular conditions of mine operation.

2. Machine according to claim 1 wherein said guiding element means includes a corresponding elongated axial composite guiding element extension portion capable of only limited deviation from the normal axis thereof disposed at the appropriate opposite side of each said lug runner means at which the particular end of such traction cable means is adapted to be connected, whereby to assist in preliminary guidance of such traction cable means and in turn said lug runner means along such elongated guide means.

3. Machine according to claim 2 wherein said guiding element means and guiding element extension portions are in the form of tandemly positioned bead members.

4. Machine according to claim 2 wherein a reinforcing cable interconnects said lug runner means to relieve the opposing stresses placed thereon by the pulling force of such traction cable means and said guiding element means are in the form of tandemly positioned tubular bead bars strung along said reinforcing bar.

5. Machine according to claim 3 wherein a resilient reinforcing bar interconnects said lug runner means to relieve the opposing stresses placed thereon by the pulling force of such traction cable means and said guiding element means are in the form of tandemly positioned tubular bead bars strung along said reinforcing bar.

6. Machine according to claim 1 wherein said mining machine is a mining planer, adapted to be guided via said slide surface means in a longitudinal path back and forth along a mining conveyor as such elongated guide means with said forward cutting means positioned for operatively engaging such mine face and having a rearwardly directed keel extending transversely rearwardly from said cutting means and said slide surface means for underlying such conveyor, the free end of such keel remote from said cutting means carrying said pair of spaced apart lug runner means thereon.

7. Mining conveyor, adapted to be disposed adjacent to a mine face, and having longitudinally spaced apart bracket means mounted along one side thereof, each of which contains a guide groove for longitudinally guidingly receiving therethrough appropriate longitudinally aligned spaced apart lug runner means of a mining machine, adapted to be slidably displaced back and forth along said conveyor for operative engagement with such mine face for the extraction of mineral therefrom, and for guidingly receiving traction cable means adapted to be correspondingly connected to such lug runner means for displacing such mining machine thereby, and wherein means defining corresponding longitudinal slots are provided on the side of the conveyor adjacent said bracket means and said bracket means are provided with bracket connecting means operatively engaging said slots whereby to mount said bracket means limitedly longitudinally displacably on said adjacent side of the conveyor via said slots to permit the distance longitudinally between the adjacent bracket means to be adjusted.

8. Conveyor according to claim 7 wherein the longitudinal space between adjacent spaced apart bracket means is covered with an interposed hood mounted removably on the corresponding ends of such adjacent bracket means.

9. Conveyor according to claim 7 wherein each said bracket means defines with the adjacent side of such conveyor a traction cable channel for receiving the return strand of the traction cable adapted to be used for displacing such mining machine, the forward strand of such traction cable being adapted to be received in the corresponding guide groove of such bracket means.

10. Conveyor according to claim 9 wherein said bracket means are in the form of an upright three-membered V-shaped cross-section, with the open end thereof being disposed adjacent to the corresponding side wall of such conveyor and with the lowest arm thereof spaced slightly below the under side of said conveyor, whereby to form an upper return strand traction cable channel between the confining portions of the conveyor side wall and the uppermost and middle arm portions of said upright member and a combined lower forward strand traction cable channel and lug runner guide groove between the confining portions of the conveyor side wall and the middle and lowest arm portions of said upright member, the adjacent portion of said conveyor defined by the margin between the adjacent side wall and under side thereof together with the adjacent portion of said lowermost arm forming a longitudinally directed slit for receiving theretoward appropriate connection means between such lug runner means and such mining machine with respect to which the conveyor is adapted to be used.

11. Conveyor according to claim 10 wherein said bracket means are provided with vertical reinforcement spines thereon.

12. Conveyor according to claim 10 wherein said bracket means are provided with pivotal mounting means for connection with advancing means adapted to be used to displace the conveyor transversely toward the mine face.

13. Conveyor according to claim 10 wherein an upwardly extending bounce plate is mounted on the adjacent side wall of the conveyor intermediate such side wall and the corresponding bracket means, a plurality of said longitudinal slots being defined in said bounce plate, wherein said upright members are in the form of an up-
right bracket wall having an upper transverse flange extending into abutment with said plate, a lower transverse flange extending toward the adjacent portion of the conveyor defined by said marginal line and under said thereof to define said longitudinal slit, a middle arm of double concave cross-section extending from the middle portion of said upright wall to said plate and having a bore transversely defined therethrough, and wherein said bracket connecting means include a bolt connection means inserted through the adjacent portion of each said upright wall, the corresponding bore of each said middle arm and a corresponding slot in said plate for interconnecting the corresponding upright walls, middle arms and in turn the bracket means with the conveyor for adjustable displacement of such bracket means longitudinally within the longitudinal limits of the appropriate bounce plate slots.

14. Mining arrangement including a mining conveyor, adapted to be disposed adjacent to a mine face, and having longitudinally spaced apart bracket means mounted along one side thereof, each of which contains a guide groove, a mining machine, mounted on said conveyor for displacement and forth the length in a longitudinal path adjacent to such mine face, and having forward cutting means thereon for operatively engaging such mine face for the extraction of material therefrom as well as a pair of separate longitudinally aligned spaced apart lug runner means thereon positioned transversely rearwardly with respect to said cutting means, which lug runner means are longitudinally guidingly received through said guide grooves for stabilized guidance of the mining machine in relation to said longitudinal path, said lug runner means being adapted to be connected with the appropriate ends of the forward strand of a traction cable means used to displace such mining machine along said conveyor for extraction of material from the mine face and said guide grooves being further adapted to receive thereon such forward strand of the traction cable means, and elongated axial composite guiding element means capable of only limited deviation from the normal axis thereof interposed longitudinally between said lug runner means, whereby to assist in guiding the lug runner means through the guide grooves of said spaced apart bracket means and in turn the mining machine along said conveyor without deviation substantially from the normal longitudinal path thereof with suitable adjustment of said guide element means by such limited deviation to accommodate unevenness of the normal longitudinal disposition of said conveyor and in turn said longitudinal path caused by particular conditions of mining operation.

15. Arrangement according to claim 14 wherein said guiding element means includes a corresponding elongated axial composite guiding element extension portion capable of only limited deviation from the normal axis thereof disposed at the appropriate opposite side of each said lug runner means at which the particular end of such traction cable means is adapted to be connected, whereby to assist in preliminary guidance of such traction cable means and in turn said lug runner means along such elongated guiding means.

16. Arrangement according to claim 15 wherein said guiding element means and guiding element extension portions are in the form of tandemly positioned bead members.

17. Arrangement according to claim 16 wherein a reinforcing cable interconnected said lug runner means to relieve the opposing stresses placed thereon by the pulling force of such traction cable means and said guiding element means are in the form of tandemly positioned tubular beads strung along said reinforcing cable.

18. Arrangement according to claim 16 wherein a resilient reinforcing bar interconnected said lug runner means to relieve the opposing stresses placed thereon by the pulling force of such traction cable means and said guiding element means are in the form of tandemly positioned tubular beads strung along said reinforcing cable.

19. Arrangement according to claim 14 wherein said mining machine is a mining planer with said forward cutting means positioned for operatively engaging such mine face and having a rearward stabilizer keel extending transversely rearwardly from said cutting means and under the conveyor, the free end of said keel remote from said cutting means carrying a said pair of spaced apart lug runner means thereon and said bracket means being correspondingly positioned on the side of the conveyor remote from the mine face and said cutting means and guidingly receiving thereon said lug runner means thereon.

20. Arrangement according to claim 19 wherein the longitudinal space between adjacent spaced apart bracket means is covered with an interposed hood mounted movably on the corresponding ends of such adjacent bracket means.

21. Arrangement according to claim 19 wherein each said bracket means defines with the adjacent side of such conveyor a traction cable channel for receiving the return strand of the traction cable adapted to be used for displacing such mining machine, the forward strand of such traction cable being adapted to be received in the corresponding guide groove of such bracket means.

22. Arrangement according to claim 21 wherein said bracket means are in the form of an upright three-armed member of E-shaped cross-section, with the open end thereof being disposed adjacent to the corresponding side wall of such conveyor and with the lowermost arm thereof spaced slightly above the side of said conveyor, whereby to form an upper return strand traction cable channel between the confining portions of the conveyor side wall and the uppermost and middle arm portions of said upright member and a combined lower forward strand traction cable channel and lug runner guide groove between the confining portions of the conveyor side wall and the uppermost and lowermost arm portions of said upright member, the adjacent portion of said conveyor defined by the margin between the adjacent side wall and under side thereof together with the adjacent portion of said lowermost arm forming a longitudinally directed slit for receiving thereon the free end of said keel carrying said pair of spaced apart lug runner means thereon.

23. Arrangement according to claim 22 wherein said bracket means are provided with vertical reinforcement spines thereon.

24. Arrangement according to claim 22 wherein said bracket means are provided with pivotal mounting means for connection with advancing means adapted to be used to displace the conveyor transversely toward the mine face.

25. Arrangement according to claim 22 wherein said bracket means are limitedly longitudinally displaceably mounted on the adjacent side of the conveyor to adjust the distance longitudinally between adjacent bracket means.

26. Arrangement according to claim 25 wherein an upwardly extending bounce plate is mounted on the adjacent side wall of the conveyor intermediate such side wall and the corresponding bracket means, said bounce plate having a plurality of longitudinal slots therein, wherein said upright members are in the form of an upright bracket wall having an upper transverse flange extending into abutment with said plate, a lower transverse flange extending toward the adjacent portion of the conveyor defined by said marginal line and under said thereof to define said longitudinal slit, a middle arm of double concave cross-section extending from the middle portion of said upright wall to said plate and having a bore transversely defined therethrough, and wherein a bolt connection means is inserted through the adjacent portion of each said upright wall, the corresponding bore of each said middle arm and a correspond
ing slot in said plate for interconnecting the corresponding upright walls, middle arms and in turn the bracket means with the conveyor for adjustable displacement of such bracket means longitudinally within the longitudinal limits of the appropriate bounce plate slots.

27. Arrangement according to claim 26 wherein the appropriate ends of the forward strand of a traction cable, for displacing the planer back and forth along the conveyor, are connected to the corresponding lug runner means and such strand is disposed guidingly within said guide grooves while the return strand of such traction cable means is disposed guidingly within said upper return strand channel.

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