United States Patent [19]

Galis

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[54] **APPARATUS FOR POSITIONING CABLE-TYPE ROOF SUPPORTS IN A MINE ROOF**

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[52] **U.S. Cl.** ..... **61/63;** 61/45 B; 299/11

[51] **Int. Cl.²** **E21D 11/00**

[58] **Field of Search** ..... 61/45 B, 63; 299/11; 254/64, 161, 139.1

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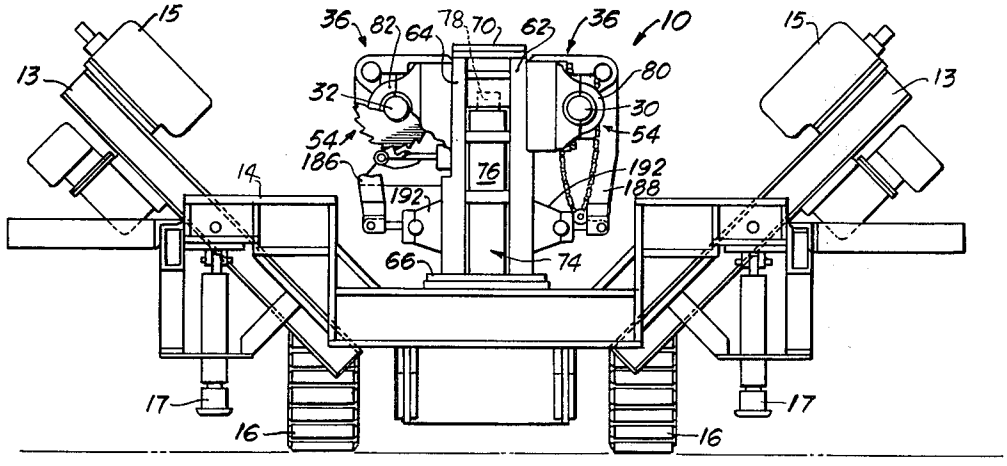
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Primary Examiner—Dennis L. Taylor
Attorney, Agent, or Firm—Stanley J. Price, Jr.

[57] **ABSTRACT**

A pair of cable spools for storing flexible cable are rotatably mounted in spaced relationship at one end portion of a mobile frame that is propelled through an underground mine by power driven endless tracks. The flexible cable is fed from the spools to the forward end portion of the mobile frame and onto a pair of cable drums that are rotatably supported in spaced relationship on a support frame that is vertically raised to abut the mine roof. A prime mover rotates the drums to transfer preselected lengths of cable from each of the spools to the respective drums and to feed the cables from the drums through a cable shearing mechanism and into a cable splicing mechanism provided on the support frame. The cables pass in overlapping relation through a compressible sleeve that is retained in the cable splicing mechanism. Expansion shells are attached to the end portions of the cables and are securely inserted in roof support holes drilled in the mine roof by a pair of rotary percussion drills that are mounted on the forward end portion of the mobile frame. Tensioning devices provided on each of the cable drums exert a preselected tension on the cables secured in the support holes. The cable sleeve is compressed by the cable splicing mechanism to join the overlapping portions of the cables. The cable shearing mechanism is then actuated to sever the spliced cables from the portion of each of the cables remaining on the drums to complete the installation of the cable-type roof support.

10 Claims, 12 Drawing Figures



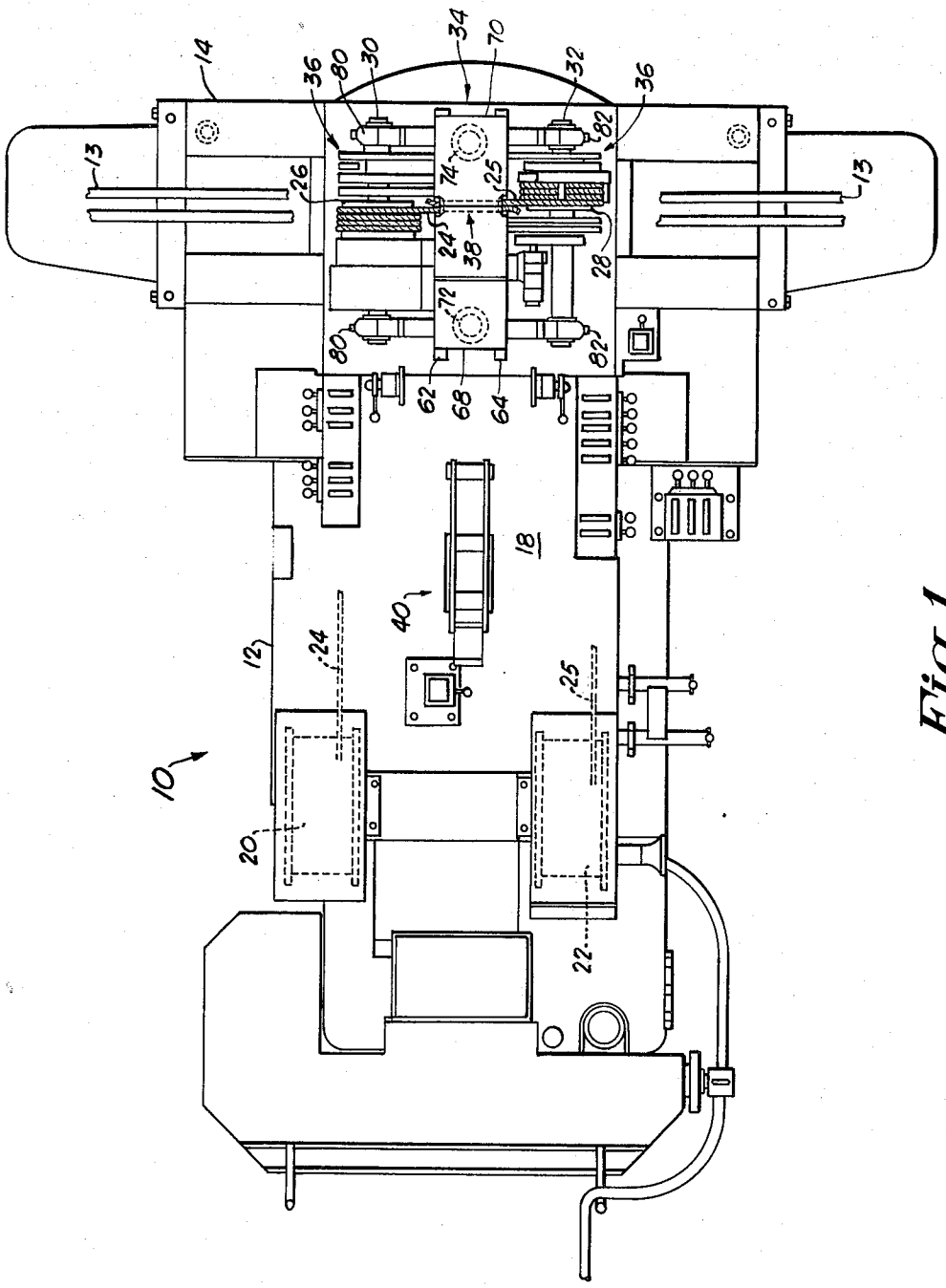

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Fig. 1.

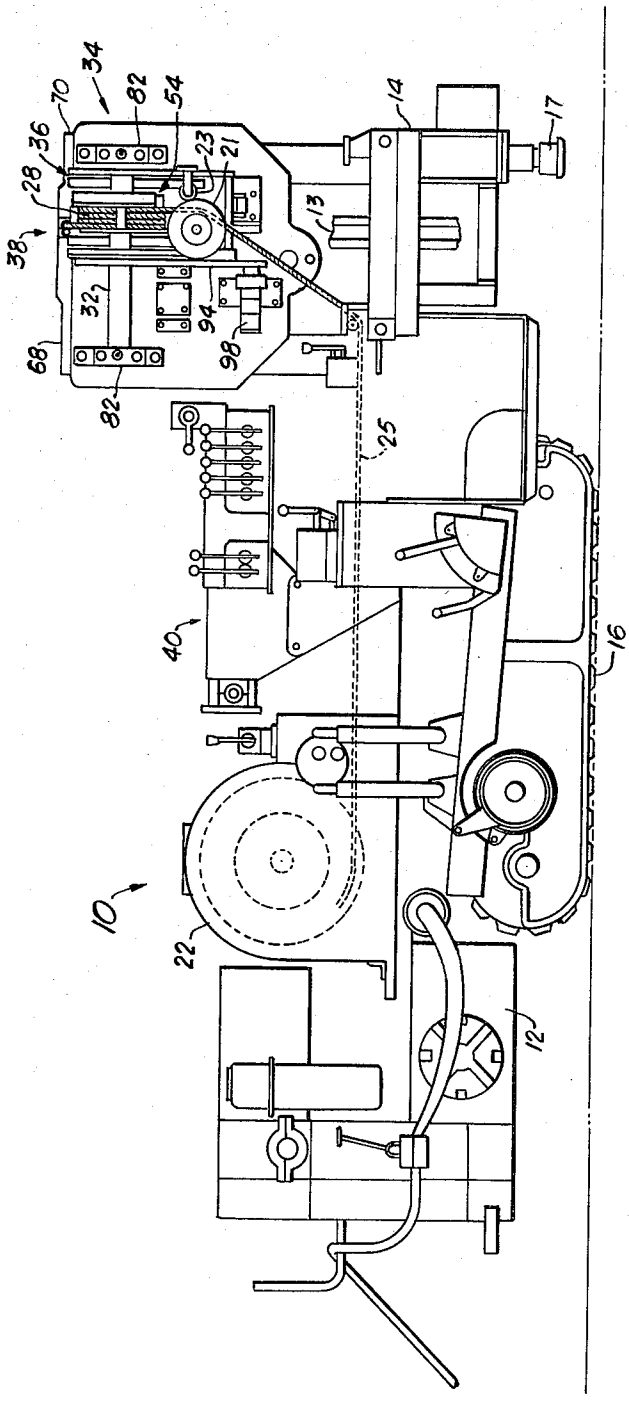


Fig. 2.

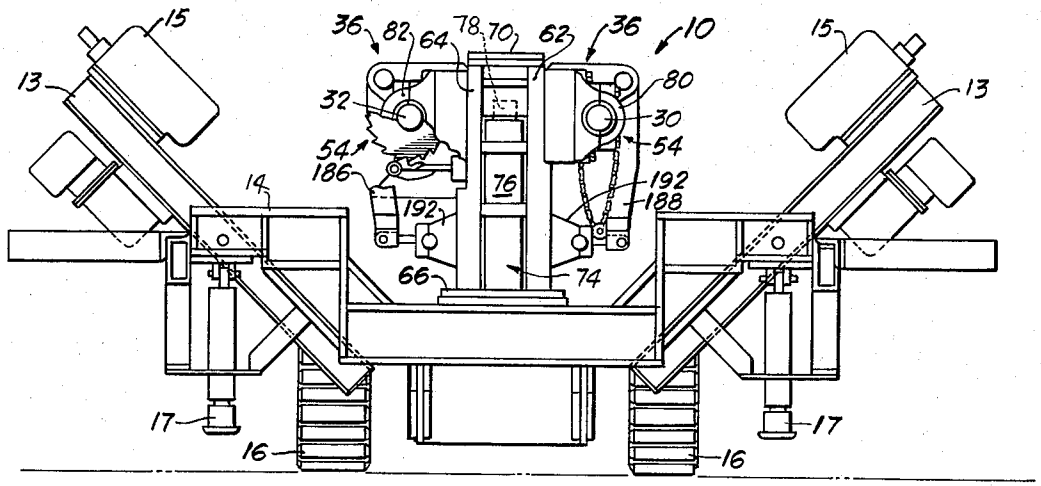

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Fig. 3.

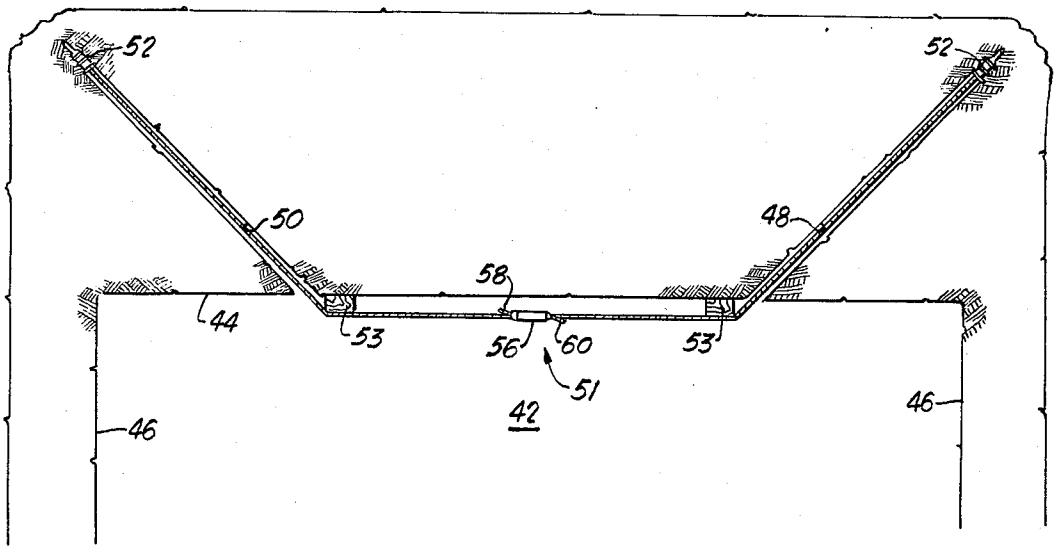

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Fig. 3a.

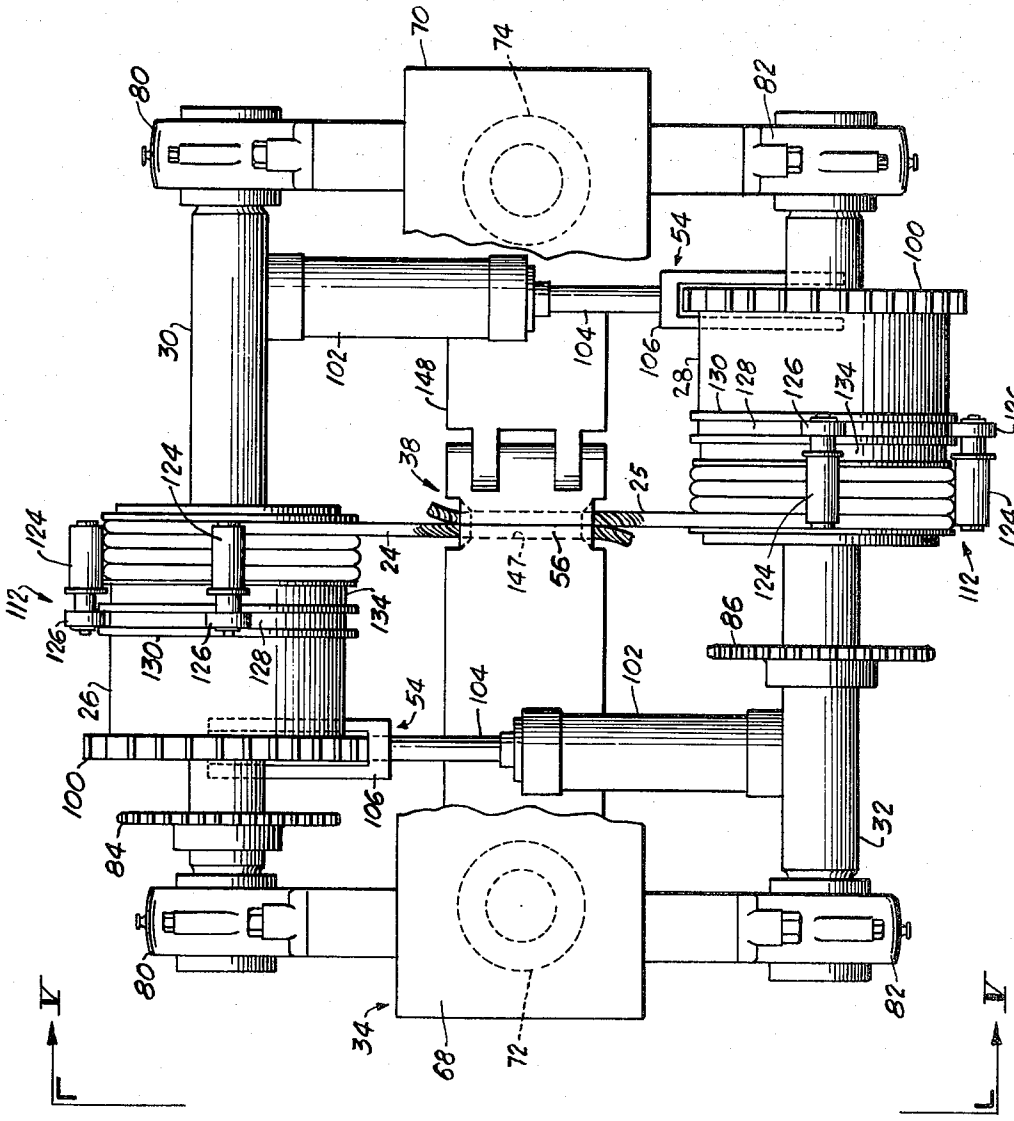
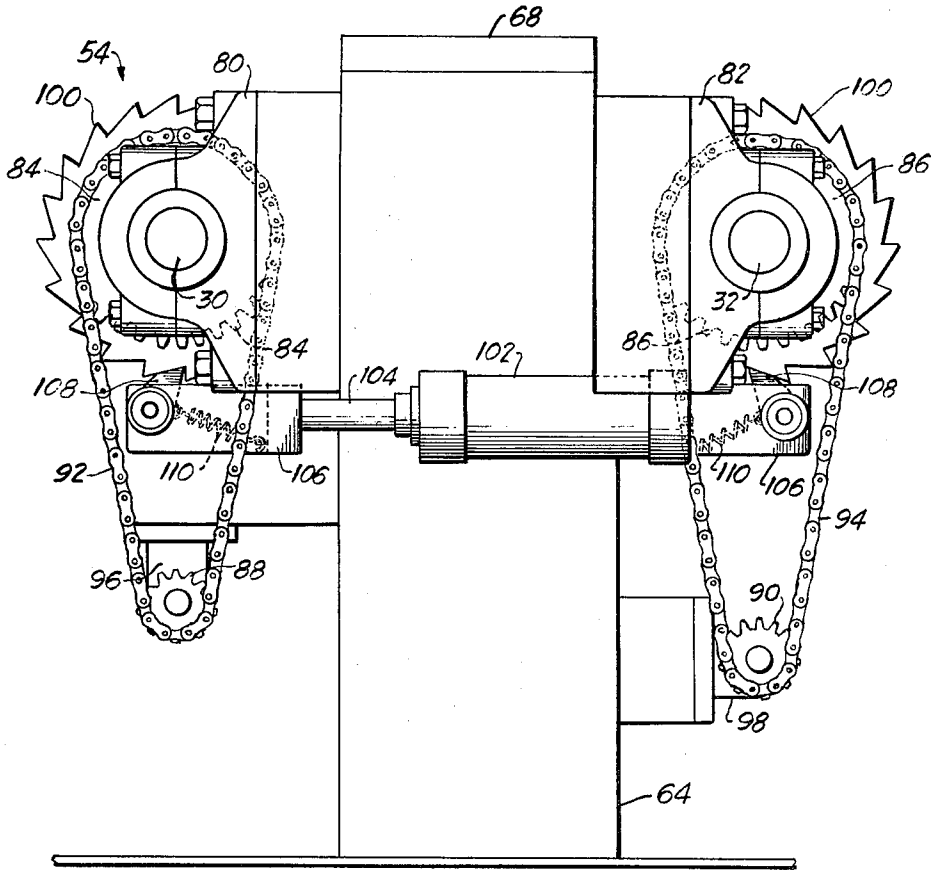

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Fig. 4.

Fig. 5.


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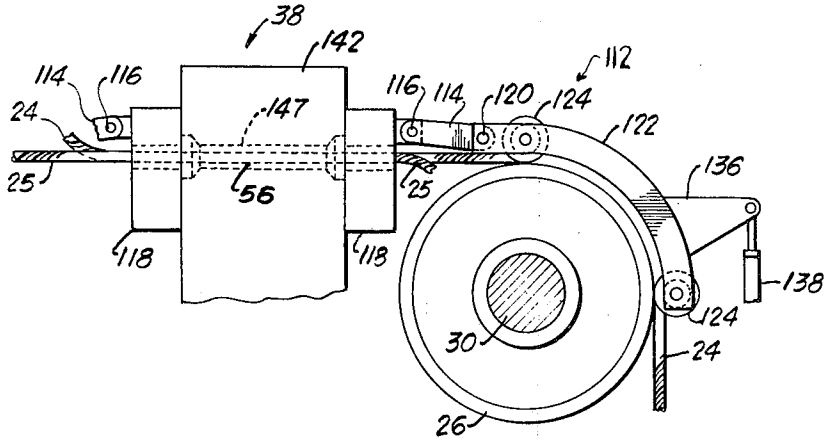

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Fig. 6.

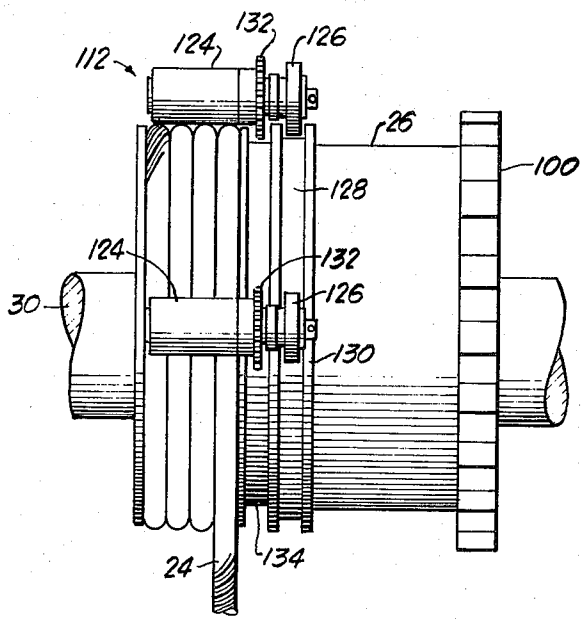

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Fig. 6a.

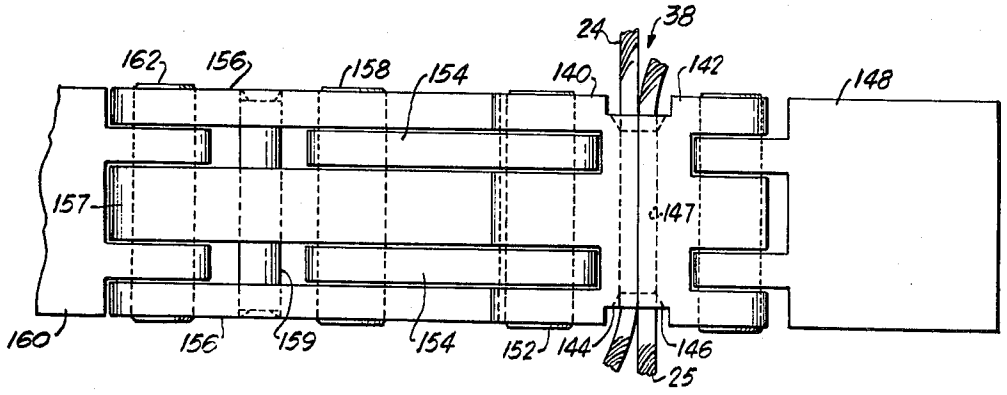
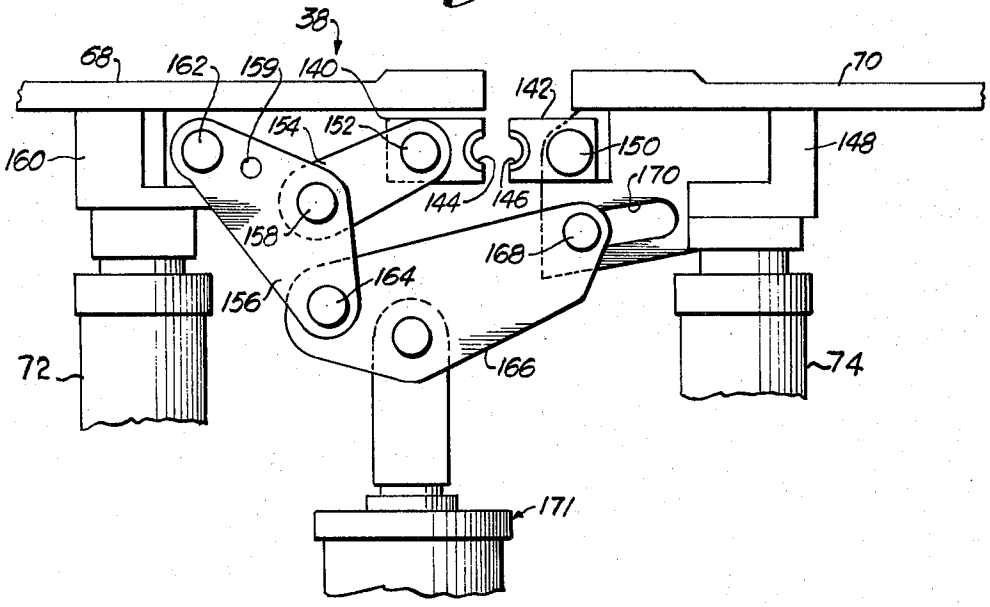

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Fig. 7a.

Fig. 7.



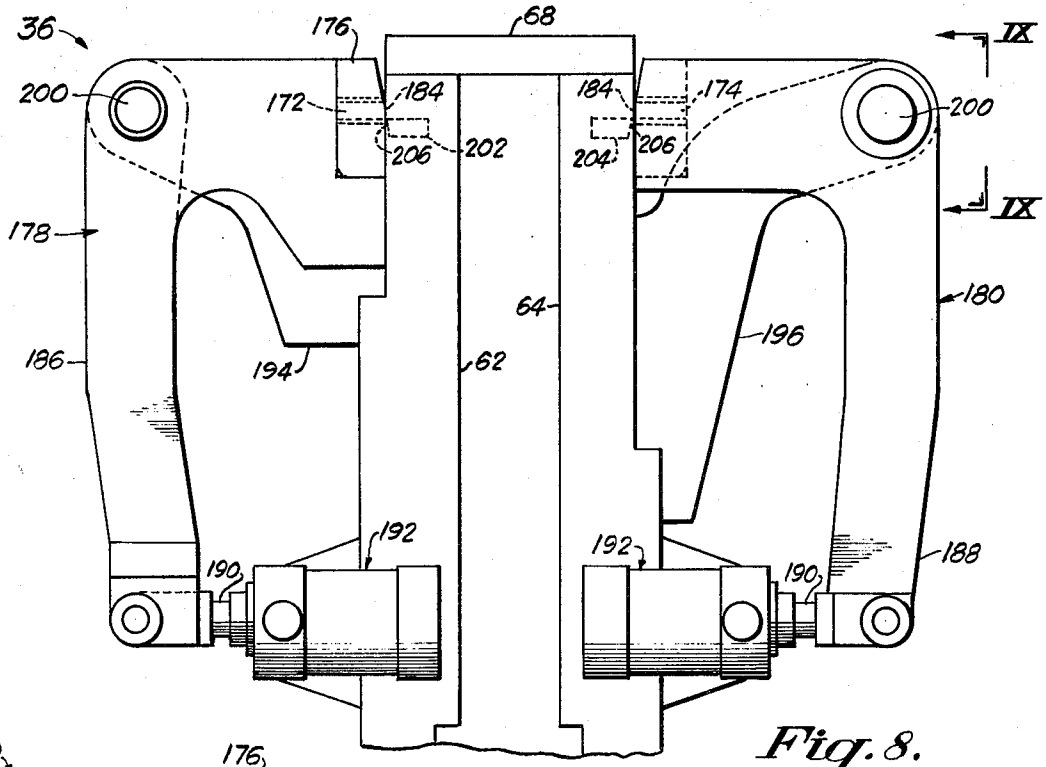


Fig. 8.

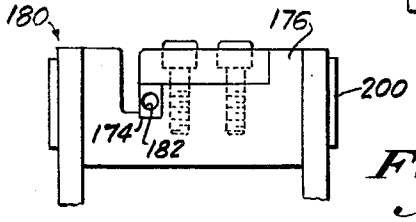


Fig. 9.

APPARATUS FOR POSITIONING CABLE-TYPE ROOF SUPPORTS IN A MINE ROOF

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus for positioning cable-type roof supports in a mine roof and more particularly to apparatus that combines and coordinates the operations of tensioning, splicing and cutting the cables after they have been anchored in the mine roof.

2. Description of the Prior Art

Mine roofs are now presently supported by roof bolts that have expansion shells and bearing plates. Vertical bolt holes are drilled in the mine roof and roof bolts are inserted therein with the base plate adjacent the roof surface. The bolts are rotated to expand the shell adjacent the end portion of the bolt to engage the bolt hole and to squeeze or compress the rock strata therebetween. In addition, transverse or longitudinally positioned wood or metal beams are positioned adjacent the roof surface, and the roof bolt members are extended therethrough. Roof support in this manner is effective to support rock strata adjacent the roof surface.

It is also known to support a mine roof by drilling a pair of bolt holes in the roof adjacent the pillar walls. Conventional roof bolts are positioned in the holes, and a flexible cable is connected to the bearing plate portions of the spaced roof bolts. The flexible cable is then manually tensioned by means such as a turnbuckle. The cable end portions may also be secured in support holes of the mine roof by expansion sleeves that engage the walls of the support holes. However, the operation of installing cable-type roof supports is hindered by the limited tension that can be exerted on the separate lengths of cable by manually operated tensioning devices. In addition, the end portions of the cables must be maintained in overlapping relationship under tension as the cable end portions are spliced together to provide support for the mine roof.

There is need for apparatus for the positioning of cable-type roof supports in a mine roof by automatically performing the operations of exerting a preselected tension on cables that have been secured in support holes of the mine roof, splicing the overlapping portions of the cables under tension and cutting the free end portions of the cables to complete the cable-type roof support.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided apparatus for positioning cable-type roof supports in a mine roof that includes a mobile frame. A pair of cable spools are rotatably mounted in spaced relationship at one end portion of the mobile frame. A quantity of flexible cable is reeved around each of the cable spools. A vertically movable support frame is positioned at the other end portion of the mobile frame. A pair of cable drums are rotatably supported in spaced relationship on the support frame. Each of the cable drums is transversely positioned on the mobile frame to receive a portion of the cable from each of the cable spools respectively. A drive means is provided on the movable support frame and is operable to rotate the cable drums and thereby transfer a preselected length of cable from each of the spools to the respective drums. The drive means is further operable to rotate the drums and feed therefrom in a direction transverse

to the longitudinal axis of the mobile frame a preselected length of cable to be inserted in a pair of spaced support holes drilled in the mine roof. Each of the drums includes a tensioning device for exerting a preselected tension on the cables having end portions anchored in the support holes and the remaining portions reeved around the drums. The cable splicing mechanism is secured to the support frame and positioned transversely between each of the cable drums. The cable splicing mechanism is operable upon actuation to join the overlapping parallel positioned portions of the cables by a compressible sleeve. A cable shear mechanism is positioned on the support frame adjacent to the cable splicing mechanism and functions to sever the spliced cables from the portion of each of the cables remaining on the cable drums.

When the mobile frame has been advanced to a selected location in the mine haulageway for installing the cable-type roof supports and the machine has been rigidly braced, rotary drills, which are mounted on the lateral end portions of the mobile frame, are extended into drilling position relative to the mine roof. The support holes for the cables are then drilled and thereafter the drills are retracted on the frame. The free end portions of the respective cables pass through the cutting elements of the cable shearing mechanism and extend in overlapping relation through a compressible sleeve that is retained in the cable splicing device. From the cable splicing device the cables pass in opposite directions to a hydraulically operated end sleeve installation device that is positioned to the rear of the vertical movable frame on the mobile frame. Conventional expansion shells and compression sleeves are attached to the end portion of the cables to be inserted in the support holes of the mine roof. In this manner, the cables are securely anchored in the mine roof.

With the end portions of the cables securely anchored in the mine roof and the remaining portions of the cables reeved about the cable drums, a pair of telescoping devices that are secured to the movable support frame are actuated to vertically raise the support frame so that the top surface of the support frame is positioned in abutting relation with the mine roof. The cable is then tensioned by operation of the cable tensioning device provided on each of the cable drums. With a preselected tension exerted on the cables, a pair of opposed die housings of the cable splicing device are moved into abutting relationship by a piston cylinder assembly that is linked to the die housings. The die housings compress the cable sleeve and thus join the cables in overlapping relation.

The cable shearing mechanism includes pairs of cutting elements moved into cutting relation by a fluid actuated device to sever the spliced cables from the portion of the cables remaining on the drums. Once the cables have been severed, the die housings of the cable splicing mechanism are disengaged to free the cable splice and permit the vertically movable support frame to be lowered from contact with the mine roof. Thus, the installation of the cable-type roof support is completed, and the mobile frame may be forwardly advanced to a second location for further installation of cable-type roof supports.

Accordingly, the principal object of the present invention is to provide apparatus for positioning cable-type roof supports in a mine roof that is easily maneuvered in the mine and automatically combines and per-

forms the operations of tensioning, splicing and cutting the cables from a continuous supply of cables provided on the mobile frame portion.

Another object of the present invention is to provide a cable feeding device which supplies a preselected length of cable from storage reels rotatably mounted on the mobile frame.

A further object of the present invention is to provide a tensioning device that permits a preselected tension to be exerted on the cables once they have been anchored in the mine roof and before they have been severed from the cable drums.

A still further object of the present invention is to provide a cable splicing mechanism that joins the overlapping portions of the cables having a preselected tension exerted thereon with the tensile strength of the cable splice substantially equal to that of the maximum safe tension on the cables.

An additional object of the present invention is to provide a shearing mechanism that severs the tensioned and spliced cables from the portion of the cables remaining reeved around the cable drums to complete the cable roof support installation.

Another object of the present invention is to provide apparatus for positioning cable-type roof supports in a mine roof that includes provision to support the roof of underground excavation during the roof drilling and cable installation operations.

These and other objects of this invention will be more completely disclosed and described in following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of the apparatus for positioning cable-type roof supports in a mine roof.

FIG. **2** is a view in side elevation of the apparatus illustrated in FIG. **1.**

FIG. **3** is a view in end elevation of the apparatus illustrated in FIG. **1,** showing a pair of rotary percussion drills mounted on the apparatus and operable to drill support holes in the mine roof for installation of the cable-type roof support.

FIG. **3***a* is a schematic view in elevation of a mine passageway with the cable-type roof support positioned in the mine roof by the apparatus of the present invention.

FIG. **4** is a fragmentary plan view of the cable drum drive and the cable splicing mechanism for joining over lapping portions of the cables by a compressible sleeve, illustrating the hydraulically actuated tension device for tensioning the cables when securely anchored in the mine roof.

FIG. **5** is a view in side elevation taken along the line V—V of FIG. **4,** illustrating the chain drive for the cable drums and the ratchet and paw arrangement of the cable tensioning device.

FIG. **6** is a fragmentary view in elevation of the cable drum, illustrating the cable retaining device provided on each of the cable drums for preventing relative movement of the cables when tensioned on the drums.

FIG. **6***a* is a fragmentary plan view of the cable retaining device illustrated in FIG. **6.**

FIG. **7** is a fragmentary view in side elevation of the cable splicing mechanism, illustrating the opposed die housings in open position.

FIG. **7***a* is a fragmentary plan view of the cable splicing mechanism illustrating the pair of opposed die housings in abutting contact for compressing the cable sleeve to splice together the overlapping portions of the cables.

FIG. **8** is a fragmentary view in side elevation of the sheer linkage for severing the spliced cables from the portion of each of the cables remaining reeved around the cable drums.

FIG. **9** is a fragmentary view of the cable sheer linkage taken along the line IX—IX of FIG. **8,** illustrating the movable cutting element that guides the cable into cutting relation with the fixed cutting element.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, and more particularly to FIGS. **1–3,** there is illustrated apparatus for positioning cable-type roof supports in a mine roof, generally designated by the numeral **10** that includes a main frame **12** having a forward end portion **14** and mounted on a pair of propelling endless tracks **16.** A suitable prime mover (not shown) is drivingly connected to the endless tracks **16** for rotating the tracks and propelling the main frame **12** to a selected position in a mine passageway for positioning the cable-type roof support in a mine roof or in the roof of any underground excavation to be supported. Opposed operators' stations **18** are provided on the frame **12** to permit efficient access to the controls for propelling and steering the apparatus **10** and installing the cable-type roof support.

A pair of upwardly extending drill racks **13** are mounted to opposed sides of the forward end portion **14** of the main frame **12.** Each of the drill racks **13** slidably supports a conventional rotary percussion drill **15** having a drill steel mounted therein. A drill bit is secured to the end of the drill steel, and the drill motor rotates the drill steel and bit to drill support holes a preselected depth into the mine roof for the installation of the cable-type roof support. Power actuated floor jacks **17** are provided on the forward end portion **14** and are operable to engage the mine floor and rigidly brace the forward end portion **14** during the roof drilling and cable installation operations.

A pair of cable spools **20** and **22** are rotatably mounted on the main frame **12** and are positioned thereon rearwardly of the operators' stations **18.** A suitable supply of flexible cables **24** and **25** is reeved around each of the spools **20** and **22.** The flexible cables **24** and **25** are fed from the spools **20** and **22** toward the forward end portion **14** in a direction parallel to the longitudinal axis of the main frame **12.** The cables **24** and **25** are transferred from the spools **20** and **22,** in a manner hereinafter described, between cable guide reels **21** and **23** onto a pair of cable drums **26** and **28** that are rotatably supported on shafts **30** and **32** of a vertically movable support frame generally designated by the numeral **34.** The cable drums **26** and **28** are longitudinally supported by the shafts **30** and **32** of the support frame **34** so that when the free end portions of the cables **24** and **25** are fed from the drums **26** and **28,** respectively, they extend transversely relative to the longitudinal axis of the main frame **12.**

The free ends of the cables **25** and **24** pass through a cable shearing mechanism, generally designated by the numeral **36,** that is positioned on each side of the vertically movable support frame **34** adjacent to the

drums 26 and 28. Thereafter the free end portions of the cables 24 and 25 enter and extend through a cable splicing device generally designated by the numeral 38. The overlapping portions of the cables pass through a compressible sleeve that is crimped by the splicing device 38 to join the cables. From the splicing mechanism 38 the free end portions of the cables 24 and 25 are extended rearwardly on the main frame 12 and are inserted in a roof anchor installation device 40 that is positioned between the operators' stations 18 on the frame 12. The anchor installation device 40 operates in a conventionally known manner to attach compression sleeves having expansion shells to the end portions of the cables.

Referring to FIG. 3a there is illustrated an underground excavation such as a mine having a passageway or haulageway 42 with a roof portion 44 and rib sections or pillar walls 46. Support holes 48 and 50 are drilled upwardly into the roof 44 through the rock strata thereabove to a predetermined depth by the rotary drills 15. The holes 48 and 50 are preferably drilled at an angle adjacent the rib sections 46 but may extend perpendicular to the roof surface 44.

A cable-type roof support 51 is installed by anchoring the expansion shells 52 attached to the cable end portions in the support holes 48 and 50. The anchored cables 24 and 25 are then tensioned by cable tensioning devices generally designated by the numeral 54 in FIGS. 1–3. The cable tensioning devices 54 are nonrotatably mounted on the shafts 30 and 32 adjacent to each of the cable drums 26 and 28.

Spacer blocks 53 may be positioned between the roof surface 44 and the cables 24 and 25 prior to tensioning the cables. The spacer blocks 53 serve to provide space for the operation of the cable splicing device 38 and to increase the truss effect of the cable-type roof support 51. The tensioned cables are then spliced by crimping the compressible sleeve 56 surrounding the overlapping portions of the cables. The cable end portions 58 and 60 of the spliced cables 24 and 25 are severed from the cable portions remaining reeved around the drums 26 and 28 by the cable shearing mechanism 36 to complete installation of the cable-type roof support.

With the ends of the spliced cables anchored in the mine roof as above described, any vertical movement of the rock strata above the roof surface 44 between the ends of the spliced cables places the cables in tension to thereby increase the loading capacity of the cable-type roof support. As compared to roof bolts which function to tie the rock strata together, the truss effect achieved by the cable-type roof support 51 transfers the stresses generated by fracture of the roof surface 44 to the solid rib sections 46. Furthermore, the spliced cables resist the tensile stresses produced by a sagging roof surface. Subsidence of the roof surface 44 increases the tension in the cables to thereby increase the restraining force applied to the roof surface. Consequently, the compressive force applied to the roof surface by the tensioned cables increases the frictional forces between the fracture planes of the rock strata and thus reduces the tendency of the rock strata to slip and ultimately fail. Preferably, the cable-type roof support is installed before subsidence occurs to increase the roof stability provided by the cable-type roof support.

In greater detail, the vertically movable support frame 34 includes a pair of parallel spaced vertical plate members 62 and 64 that rest upon the base plate 66 of the main frame 12 when the support member 34 is retained in its lowermost position, as illustrated in FIG. 3. A pair of cover plates 68 and 70 are secured to the upper edge portions of the plate members 62 and 64 on opposite sides of the cable splicing device 38. A pair of telescoping devices, 72 and 74 are positioned between the vertical plate members 62 and 64 and are operable to raise the support frame 34 to a preselected height above the main frame 12.

Each of the telescoping devices 72 and 74 includes a first tubular member 76 that is rigidly secured at its lower end portion to the base plate 66 and a second tubular member 78 concentrically positioned within the first tubular member 76 for vertical movement relative thereto. The upper end portion of the second tubular member 78 is secured to the cover plates 68 and 70 respectively. With this arrangement, a fluid actuated piston cylinder assembly (not shown) is operable to extend the second tubular member 78 upwardly from the first tubular member 72 to thereby raise the vertical plate members 62 and 64 together with the cable drums 26 and 28 rotatably supported thereon. The plate members 62 and 64 may be raised to a preselected height above the main frame 12 and are preferably raised to a height in the mine passageway such that the cover plates 68 and 70 are urged into abutting relationship with the mine roof. Thus, the support frame 34 functions as a roof jack in supporting the mine roof between the support holes drilled in the mine roof during the installation of the cables 24 and 25 therein.

Referring to FIGS. 4 and 5 the shafts 30 and 32 that nonrotatably support the cable drums 26 and 28 are, in turn, supported at their end portions in pairs of pillow blocks 80 and 82. The pillow blocks are secured to and extend outwardly from the upper end portions of the vertical plate members 62 and 64. Sprockets 84 and 86 are nonrotatably secured to the shafts 30 and 32 and are connected to sprockets 88 and 90 by drive chains 92 and 94. The sprockets 88 and 90 are, in turn, nonrotatably secured to shafts of motors 96 and 98 respectively that are mounted on the vertical plate members 62 and 64. Preferably, the motors 96 and 98 are reversible motors that permit the cable drums 26 and 28 to be rotated in either a clockwise or counterclockwise direction at a preselected speed.

Each of the tensioning devices 54 for exerting a preselected tension on the cables 24 and 25 once they have been anchored within the mine roof support holes includes a ratchet 100 that is nonrotatably supported on each shaft 30 and 32 adjacent to the end portions of the drums 26 and 28. A pair of piston cylinder assemblies 102 having extensible rod members 104 are secured to the end portions of vertical plate members 62 and 64. Yoke members 106 are secured to the end portions of the piston rods 104 and rotatably support pawls 108 that are arranged to engage the teeth of the ratchets 100. The pawls 108 are retained in abutting contact with the teeth of the ratchets 100 by springs 110 that are secured to the yoke members 106.

In operation when the cable drums 26 and 28 are rotated in a clockwise direction to feed the cables to be inserted in the support holes of the mine roof, the piston cylinder assemblies 102 are extended. The pawls 108 then advance forwardly with the rods 104 and engage subsequent teeth of the ratchets 100. The ratchets 100 rotate together with the shafts 32 and 34 and the

cable drums **26** and **28** in a counterclockwise direction and thereby exert a preselected tension on the cables.

Referring to FIGS. **4, 6** and **6***a*, there is illustrated a cable retaining device, generally designated by the numeral **112** that is provided on each of the cable drums **26** and **28.** Each of the cable retaining devices **112** includes a pair of parallel spaced link members **114** that are rotatable about a shaft **116** that is secured to a spacer block **118** mounted on the vertical plate members **62** and **64.** The opposite end portions of the link members **114** are also maintained in spaced relationship by pin member **120** that connects the links **114** to a pair of arcuate arm members **122.** The arcuate arm members rotatably support a pair of friction rollers **124** that are arranged to frictionally engage the outer surface of the cable reeved around the drums **26** and **28.**

The friction rollers **124** are maintained in parallel relationship with the respective shafts **30** and **32** of the drums **26** and **28** by roller end portions **126** as shown in FIG. **6***a*. The roller end portions **126** are arranged to rotate within a groove **128** provided by a flanged intermediate portion **130** of each of the cable drums. Each of the friction rollers **124** includes a sprocket **132** that is nonrotatably secured thereon and is arranged to engage in meshing relationship a drive chain (not shown) that is reeved around each of the cable drums within the groove **134** to thereby drive the rollers **124.**

As illustrated in FIG. **6,** the end portions of the arcuate arm members **122** are provided with a lever arm **136** that is linked to the end portion of a toggle clamp **138.** With this arrangement, pivotal movement of the toggle clamp **138** about its connection to the lever arm **136** moves the friction rollers **124** into and out of frictional engagement with the cable reeved around the cable drum. The toggle clamp **138** may be locked to retain the rollers **124** in frictional engagement with the cable to prevent the cable from slipping relative to the surface of the cable drum when the cable is tensioned by the tensioning device **54.**

Referring to FIGS. **7** and **7***a*, there is illustrated a cable splicing device **38** that is positioned between the vertical plate members **62** and **64** beneath the cover plates **68** and **70** as illustrated in FIG. **1.** The cable splicing device **38** includes a pair of opposed die housings **140** and **142** that are operable to be positioned in abutting relation. Each of the opposed die housings **140** and **142** includes a semicircular die **144** and **146.** The dies **144** and **146** extend longitudinally relative to the die housings **140** and **142** respectively. With this arrangement, as illustrated in FIG. **7***a*, when the die housings **140** and **142** are positioned in abutting relationship, a channel shaped crimping die **147** extending longitudinally through the abutting die housings is formed.

With the die housings **140** and **142** in spaced relationship the cable splice is then formed by extending overlapping portions of the cables **24** and **25** through an annular sleeve member having a configuration conforming to that of the semicircular dies **144** and **146.** The annular sleeve member maintains the cables in abutting relationship and is fabricated from a deformable metal, such as copper. The sleeve with the pair of overlapping cable portions positioned therein is inserted in the die housing **142** and by moving the die housing **140,** in a manner hereinafter described, into abutting relationship with the die housing **142,** the sleeve is compressed to thereby form a cable splice having the desired tensile strength. The tensile strength of the splice preferably is substantially equal to the maximum safe tension of the cables being spliced.

The die housing **142** is connected to a support block **148** by a pin member **150** that extends through aligned bores in the housing **142** and the flanged bores of the support block **148.** The support block **148** is rigidly secured to the upper tubular member of the telescoping cylinder **74** and is vertically movable therewith. The opposed die housing **140** is connected by a pin member **152** to the end portion of a pair of spaced apart link members **154.** The pin **152** extends through aligned bores of the die housing **140** and the end portion of the link members **154** to permit pivotal movement of the link members **154** relative to the die housing **140.**

The opposite end portions of the link members **154** are pivotally connected to the intermediate portion of a pair of link members **156** and link member **157** by pin **158** that extends through aligned bores in link members **154, 156** and **157.** The link members **156** and **157** are maintained in spaced parallel relation by pin **159.** The upper end portions of link members **156** and **157** are connected to the outwardly extending flange portions of support block **160** by pin **162.** The pin **162** extends through the bores of the link members **156** and **157** and the flanged portions of support block **160.** The support block **160** is, in turn, rigidly secured to the upper telescoping member of the telescoping cylinder **72.** The telescoping cylinder **72** is operably upon actuation to raise and lower the support block **160.**

The lower end portions of the link members **156** and **157** are pivotally connected by pin **164** as illustrated in FIG. **7,** to the first end portion of a pair of link members **166.** The opposite end portions of the link members **166** are provided with a pin **168** that is arranged for slidable movement in the inclined slots **170** that are provided on opposed sides of the support block **148.** The lower intermediate portions of the link members **166** are rigidly connected to an extensible member of a fluid actuated cylinder **171.**

With the die housings **140** and **142** in spaced relationship, as illustrated in FIG. **7,** the extensible cylinder **171** is operable, upon actuation, to vertically raise the link members **166** so that the pin members **168** advance to the opposite end portion of the slots **170** to pivot the link members **166** about their pivotal connections to the cylinder **171** and thereby raise the opposite end portion of the link members **166** together with the link members **156** and **157** pivotally connected thereto. By vertically raising the lower end portions of the link members **156** and **157** the link members **154** are moved to a substantially horizontal position as the opposite end portions of the link members **156** and **157** pivot about pin members **162.** Vertically raising the link members **154** urges the die housing **140** toward the die housing **142.** Thus, when the deformable sleeve, retaining the cables **24** and **25** in overlapping relation, is positioned in the die housing **142** the force exerted upon the die housing **140** by the moving link members is sufficient to compress the sleeve and thereby splice together the overlapping portions of cables **24** and **25.**

In accordance with the present invention, the above described operation for splicing the cables **24** and **25** takes place after the cables have been inserted in the mine roof support holes **48** and **50** and a preselected tension has been exerted on the cables by the tensioning device **54.** Accordingly, with a maximum safe tension on the cables **24** and **25,** the crimped cable sleeve

56 as illustrated in FIG. 3*a* provides a splice having a tensile strength which is equal to but not in excess of the tension exerted on the cables. With this arrangement, an effective cable splice is provided having a strength that is substantially equal to the strength of the cable, and therefore the spliced cables constitute a substantial equivalent to a continuous unspliced cable inserted in the support holes for supporting the mine roof.

After the cable end portions have been anchored in the mine roof and the cables sufficiently tensioned and the overlapping cable portions spliced, in accordance with the present invention, the spliced cables are then severed from the portion of each of the cables remaining reeved around the cable drums **26** and **28** by the cable shearing mechanism **36** illustrated in FIGS. **8** and **9.** As the end portions of cables **24** and **25** are fed from their respective drums and before they enter the cable splicing device **38,** they pass through cutting elements **172** and **174** that are securely retained in holders **176** of linkages **178** and **180** respectively. Each of the cutting elements **172** and **174** includes a longitudinal bore **182** illustrated in FIG. **9** through which the respective cables pass and a lower transverse cutting edge portion **184.**

The shear linkages **178** and **180** include lever arms **186** and **188** respectively. The lower end portion of each of the lever arms **186** and **188** is pivotally connected to an extensible rod **190** of a fluid actuated piston cylinder assembly **192.** The piston cylinder assemblies **192** are secured to the vertical plate members **62** and **64** of the support frame **34.** Extending outwardly from each of the vertical plate members **62** and **64** are arm members **194** and **196.** The intermediate portion of each of the lever arms **186** and **188** is pivotally connected by a pin **200** to the connecting arms **194** and **196.**

Positioned adjacent to and below the movable cutting elements **172** and **174** in the vertical plate members **62** and **64** are fixed cutting elements **202** and **204** each having an upper transverse cutting edge portion **206.** With the above described arrangement, the spliced cables are severed from the cable drums **26** and **28** by actuating the piston cylinder assemblies **192** to outwardly extend the rods **190.** Outward extension of the rods **190** pivots lever arms **186** and **188** about their connection to the arm members **194** and **196.** In this manner the cutting elements **172** and **174** with the respective cables positioned in the bores **182** move downwardly through an arcuate path and the cutting edge portions **184** are urged into cutting relation with cutting edge portions **202** of the fixed cutting elements **202** and **204.** The cutting elements **172** and **174** continue to move downwardly until the cables are severed from the portion of the cables remaining on the cable drums **26** and **28.**

The free ends **58** and **60** of the cables **24** and **25** thus formed, extend outwardly from the crimped cable splice **56** as illustrated in FIG. 3*a*. Upon completion of the cable shearing operation, the telescoping cylinders **72** and **74** are actuated to retract the tubular members **78** into the tubular members **76** to thereby lower the movable support frame **34** from contact with the mine roof **46.** Thus, the installation of the cable-type roof support is completed and the mobile frame **12** may be forwardly advanced for installation of additional cable-type roof supports in the mine roof.

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for positioning cable-type roof supports in a mine roof comprising,

a mobile frame, a pair of cable spools rotatably mounted in spaced relationship at one end portion of said mobile frame for storing flexible cable,

a vertically movable support frame positioned at the other end portion of said mobile frame,

a pair of shafts rotatably secured to said support frame and arranged in spaced parallel relationship,

a pair of cable drums nonrotatably supported on said pair of shafts respectively and positioned on said support frame to receive a portion of the cable stored on each of said cable spools respectively,

drive means for rotating each of said cable drums to transfer preselected lengths of cable from said cable spools to said cable drums, said drive means operable to rotate said cable drums and feed therefrom in a direction transverse to the longitudinal axis of said mobile frame preselected lengths of cable for inserting in a pair of spaced support holes drilled in the mine roof,

said cable drums each having means for tensioning the cable having one end portion securely positioned in the support holes and the remaining portion of each of the cables reeved around said cable drums,

a cable splicing means secured to said support frame and positioned transversely between said cable drums for joining overlaping parallel positioned portions of the cables, and

a shear means positioned on said support frame adjacent to said cable splicing means for severing the spliced cables from the portion of each of the cables remaining on said cable drums.

2. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** which includes,

a pair of upwardly extending drill racks mounted to opposed sides of the forward end portion of said mobile frame,

said drill racks arranged to support means for drilling support holes at a preselected angle in the mine roof.

3. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** which includes,

vertically adjustable means for engaging the mine roof in abutting relationship to thereby support the mine roof during installation of the cable-type roof support.

4. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** which includes,

said movable support frame having an upper surface arranged to abut the surface of the mine roof and to support the mine roof during the installation of cable-type roof support.

5. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **4** which includes,

a fluid actuated telescoping mechanism for raising and lowering said support frame into and out of abutting relationship with the mine roof.

6. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** which includes,

a cable retaining means provided on each of said cable drums for preventing relative movement between said cable drums and the cables reeved about said cable drums as the cables are being tensioned by said tensioning means.

7. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **6** in which said cable retaining means includes,

a linkage connection pivotally secured at one end portion to said support frame and having the other end portion positioned adjacent to said respective cable drums,

a plurality of friction rollers rotatably supported by said linkage connection and positioned parallel and adjacent to said respective cable drums, and

lever means connected to the other end portion of said linkage connection for pivoting said linkage connection relative to said support frame to move said friction rollers into and out of frictional engagement with the cable reeved around each of said cable drums.

8. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** in which said cable splicing means includes,

a pair of opposed die housings arranged to move into and out of abutting relationship,

said die housings each having a semicircular die arranged to form a channel shaped crimping die for receiving a compressible sleeve to be compressed when said die housings are positioned in abutting relationship,

a power actuated device for moving said die housings into and out of abutting relationship, and

a linkage means for connecting said power actuated device to said die housings so that upon actuation of said power actuated device said die housings are urged into abutting relationship to form said channel shaped crimping die.

9. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** in which said tensioning means includes,

a ratchet nonrotatably secured to each of said shafts and coaxially mounted thereon relative to each of said cable drums, said ratchet having a plurality of radially projecting teeth located at the periphery thereof,

a pawl arranged to engage said ratchet teeth and permit rotation of said shaft in only one direction, and

a power actuated device having an extensible rod member,

said pawl secured to the end portion of said rod member and movable therewith upon actuation of said power actuated device,

said rod member arranged to extend outwardly from said power actuated device and transfer said pawl between successive teeth of said ratchet to thereby rotate said ratchet and said shaft and exert a preselected tension on said cable reeved around each of said cable drums.

10. Apparatus for positioning cable-type roof supports in a mine roof as set forth in claim **1** in which said shear means includes,

a pair of arm members pivotally connected at one end portion to opposed sides of said support frame,

power means connected to the other end portion of said arm members for pivoting said arm members toward and away from said support frame,

a first cutting element secured to each of said arm members and having a transverse cutting edge portion,

said first cutting element having a bore extending therethrough for receiving the portion of the cable being fed from each of said cable drums to said cable splicing means, and

a second cutting element immovably secured to opposed sides of said support frame adjacent to said cable splicing means,

said second cutting element yaving a transverse cutting edge portion arranged to engage the cutting edge portion of said first cutting element so that the cable is severed when said first cutting element is urged into cutting relation with said second cutting element by said power means.

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