United States Patent

[11] 3,593,613

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[21] Appl. No. **802,010**
[22] Filed **Feb. 25, 1969**
[45] Patented **July 20, 1971**

[54] **ADJUSTING TOOL**
8 Claims, 4 Drawing Figs.

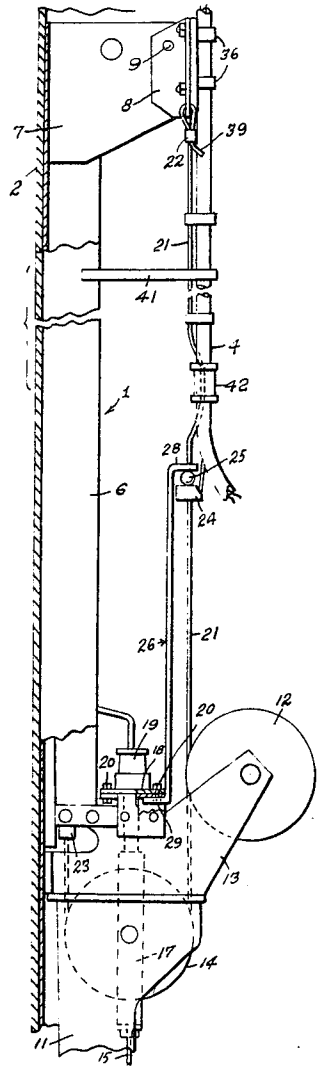
[52] **U.S. Cl.** **89/1.811**
[51] **Int. Cl.** **F41f 3/04**
[50] **Field of Search** ..... 33/168 B, 180, 143 J; 269/36; 81/1, 3; 248/300, 301; 25/131; 89/1.811

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ABSTRACT: A tool for automatically adjusting the required slack in umbilical cables for their separation from a missile in a launching shell using spring actuated cable retractors and consists of a flat bar having notched, oppositely turned end portions. The tool is inserted over the explosive nut assembly at one end, the other end engaging the wire cable separation rope which is attached to the cables and to the retractor. By taking up the slack of the cables until the wire rope engaging end of the tool stops a terminal block fixed on the cables, the correct amount of slack is left for proper separation of the cables by the retractor.



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Fig. 1.

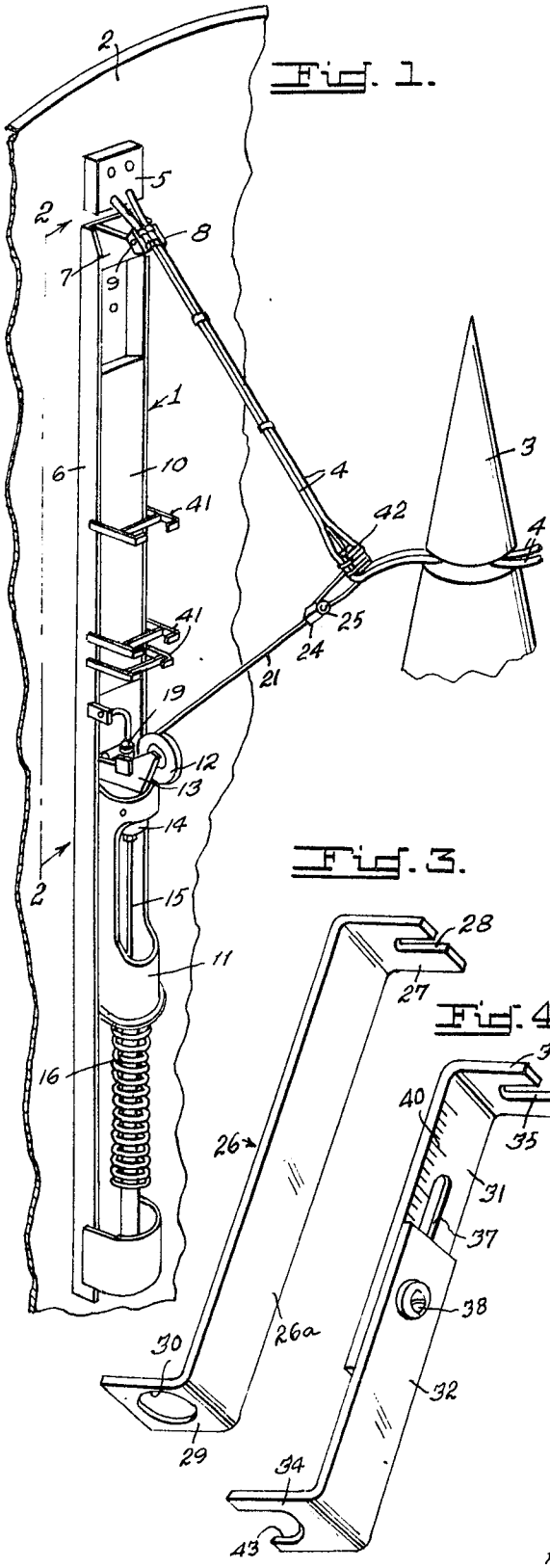


Fig. 2.

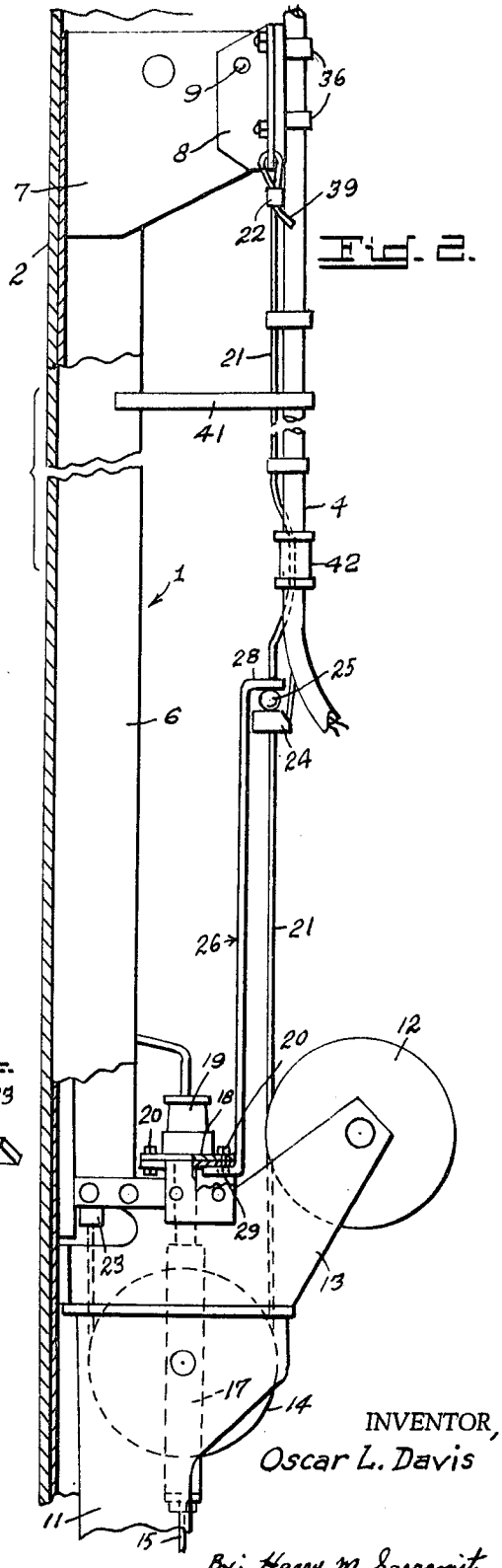


Fig. 3.

Fig. 4.

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ADJUSTING TOOL

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to me of any royalty thereon.

In the launching of missiles from launching shells, it is necessary that the umbilical cables, connecting the power source to the missile, be simultaneously disconnected from the missile at blast off. For this purpose, spring loaded retractors are used, generally two, and are secured to the inner wall of the shell on opposite sides of the missile, each retractor separating a set of cables simultaneously with the other set. Each retractor includes an explosive nut assembly, a spring actuated rod connected to the assembly and a wire rope attached to the cables and to the retractor. When an explosive nut in the assembly is fixed, the rod is released and a spring actuated pulley pulls the wire rope to separate the cables from the missile. In order to regulate the slack in the cables to the length of pull by a spring actuated pulley in the retractor the slack of the cables had to be adjusted manually. Since regulation of the slack was a critical step, it required considerable manual manipulation. One type of missile, for example required five men working approximately 4 hours to perform the operation.

The present invention is designed to reduce the labor and time interval of the aforesaid operation to approximately 30 minutes with two men and consists of a flat bar of a predetermined length and having each end turned at a substantial right angle in opposite directions, the turned ends being notched. In the use the tool is inserted at one end to hook over the explosive nut assembly of the retractor while its other end is engaged under the wire cable rope in advance of a swage ball and terminal block which is fixed on the rope. The cables and rope are fastened in the retractor and tensioned until the swage ball is stopped by a turned end of the tool whereupon the right amount of slack is obtained for connection of the cables to the missile and their separation therefrom by the retractor.

It it therefore a principal object of this invention to provide a tool to adjust the slack of umbilical cables when connecting them from a power source to the missile in a launching shell.

It is another object to provide a tool for use with a spring loaded retractor in a launching shell to adjust slack in the cables connecting a power source to a missile.

A further object is to provide a tool for reducing the time and labor required in connecting umbilical cables from a power source to a missile in a launching shell.

FIG. 1 is a perspective view of a spring actuated umbilical cable retractor fixed to the wall of a launching shell, a portion of which is shown;

FIG. 2 is a vertical sectional view taken along line 2–2 of FIG. 1 with parts broken away;

FIG. 3 is a perspective view of the tool of the invention, and,

FIG. 4 is a similar view of a modified tool.

Referring now in detail to the drawing wherein reference numeral 1 designates generally a spring actuated umbilical cable retractor and, in FIG. 1, is shown fixed to the inner wall of a missile launching shell 2. A portion of a missile is indicated by 3 while 4 indicates a pair of umbilical cable assemblies, one pair being shown complete and shown as connected to a power outlet 5 and to missile 3.

While the retractor 1 forms no part of this invention, a description of its construction is necessary in order to understand the manner in which the tool of this invention is used therewith.

As seen in FIG. 1, the retractor 1 is secured to the inner wall of the launching shell 2. While only one retractor is illustrated, two are ordinarily used and they will be arranged in diametrically opposed location in the shell. Each retractor consists of a channel member 6 which is secured to the inner wall of 2 as shown. A support bracket 7 is fixed to the upper end of channel member 6 and a second bracket 8 is pivoted as at 9 to bracket 7. An impact pad 10 is carried by channel member 6

and is disposed below support bracket 7. A housing 11 is fixed in channel member 6 below pad 10. A fixed pulley 12 is secured to the upper end of housing 11 by a bracket 13. The cable retracting elements include a spring actuated pulley 14 connected to a rod 15 which is spring-loaded by a coil spring 16 and is connected at its upper end to an explosive nut assembly by a connector 17. The explosive assembly consists of a plate 18 which carries an explosive nut 19 which is fastened to the upper end of housing 11 by nuts and bolts 20. A wire rope 21 is fastened at one of its ends to bracket 8 and secured by a thimble 22 and is engaged under pulley 12 and around pulley 14 and secured to housing 11 as at 23. A terminal block 24 is secured on wire rope 21 at a predetermined point and abuts a swage ball 25 on the rope in advance thereof.

The tool of the invention is indicated generally by 26 and comprises a flat bar having a body portion 26*a* of a predetermined length. Body 26*a* is turned substantially at 90° at each end and in opposite directions. One end 27 is provided with a notch 28 while the other end 29 is provided with an opening 30.

A modified form of tool is seen in FIG. 4 which is adjustable in length. In this form, the body is divided into two sections 31 and 32. Each section is turned as at 33 and 34 respectively as in the form shown in FIG. 3. In this form each turned portion is notched as at 35 and 43. The turns are in opposite directions. Notch 43 being larger than notch 35. Section 31 is provided with an elongated slot 37. The sections are slidable on one another and secured by a bolt 38 of any suitable type which passes through section 32 and into slot 37. A tightening nut (not shown) may be used to secure the sections in desired positions. Thus the sections may be compressed or extended to a predetermined length for use in adjusting cables of different lengths with respect to the retractor.

In operation, the umbilical cables 4 are connected at one of their ends to the power outlet 5.

The cables 4 are now secured in cable clamps 36 which are provided on the upper surface of bracket 8 and on cable ties 41 which rise from channel 6. All clamps are then tightened. A spacer block 42 is attached to cables 4 at a predetermined point. Wire rope 21 is now threaded through spacer block 42, cable ties 41 and through thimble 22, bracket 8 and looped through thimble 22 to protrude a distance as at 39.

The end 29 of tool 26 is now inserted into bracket 13 and the opening 30 is placed over the uppermost nut 20 and the end 27 is placed under wire rope 21 so that it receives wire rope 21 in the notch 28, in the advance of swage ball 25.

To adjust the slack in cables 4, the protruding end 39 of wire rope 21 is pulled by any suitable means, not shown, until swage ball 25 is stopped by end 27 of tool 26. The correct amount of slack in cables 4 is now reached and their free ends ready for attachment to missile 3. The cable ties 41 are opened to release the cables 4 which are then connected to missile 3 as shown in FIG. 1. The tool 26 is then removed. Upon firing of the explosive nut 19, connector rod 15 is released and spring 16 will retract pulley 14 and disconnect cables 4 from missiles 3.

The length of tool 26 is critical in that it must be relative to the length of pull by spring 16 on rod 15, the length of cables 4 as well as the radial distance of missile 3 from wall 2 of the shell.

While the form of tool shown in FIG. 3 is of a unitary piece of material and can be used only for the particular specifications for which it is designed, the adjustable tool of FIG. 4 may be applicable to varying specifications. Indicia 40 may be etched on section 31 if desired for measuring the required adjustment.

While only a preferred form of the invention has been shown and described, other forms of the invention are contemplated and numerous changes and modifications may be made therein without departing from the spirit of the invention as set forth in the appended claims.

What I claim is:

1. A structure for accurately gauging line slack in a guide wire retrieval system including retrieved item connecting means, comprising a guide wire secured to fixed means at one end and to means movable between a first and a second position at its other end, said first position being closer than said second position to the fixed means end, guage means, for establishing a specific amount of guide wire slack with respect to the first position while the movable means is in its second position comprising a predetermined length of rigid material connected to the movable means and having apertured flanged means on its other end with the guide wire passing through the aperture, platform means attached to the guide wire at a point adjacent to the flange means and a ball bearing of low friction material interposed between the platform means and the flange means and held in such position by the tautness of the guide wire.

2. A structure as claimed in claim 1 wherein said gage means comprises a flat strip of material having right angled, oppositely turned end portions, one of said end portions having a notch in its edge for receiving said guide wire rope slidably therein, the other portion having an opening for engagement over a nut on said structure.

3. A structure as claimed in claim 1 wherein said gage means is formed of two sections adapted to slide on one another, one of said sections having an elongated slot therein and a fastening member piercing the other said section and adapted to ride in said slot whereby said sections may be slidably adjusted and tightened in selected positions.

4. A gage means as claimed in claim 3 wherein the outer end of each said section is turned substantially 90° and in opposite directions relative to each other, there being a notch in the outer end of each turned portion.

5. A tool as claimed in claim 3 wherein each section is formed of a flat strip of material.

6. A structure as set forth in claim 1 including propelling means associated with said movable means to exert a propelling force upon it when it is in the first position and means to arrest the application of the said propelling force.

7. A structure as set forth in claim 6 in which the propelling means is a tensioned spring and the arresting means is an explosive nut.

8. In combination with a missile launching shell including at least one extractor fixed to its inner wall for the separation of electrical umbilical cables from a missile when launched from said launching shell; said extractor comprising a supporting member, a first bracket mounted to the upper end of said supporting member, a second bracket mounted on said supporting member ans spaced below said first bracket, an explosive nut mounted on said second bracket, a spring-loaded rod normally held in a cocked position by said explosive nut, a guide wire for attachment to said umbilical cables connected at one of its ends to said second bracket and being adjustably connected at its other end to said first bracket, said guide wire being retracted by release of said rod upon firing of said explosive nut to separate said umbilical cables from said missile, a platform member fixed at a predetermined point on said wire and a separable gage member of predetermined length having one end adapted to be hooked under said second bracket, its other end being flanged and adapted to engage said wire in advance of said platform member, a swage ball interposed between the platform member and the flange whereby the guide wire may be tensioned until said swage ball is firmly positioned and the slack in the guide wire is thereby established as the amount required by said umbilical cables for accurate separation from said missile.