United States Patent [19]

Simms

[11] **3,755,880**

[45] **Sept. 4, 1973**

[54] **TENSIONING DEVICES**

[76] Inventor: **James S. Simms,** 5301 W. Patterson, Chicago, Ill. 60641

[22] Filed: **Oct. 21, 1971**

[21] Appl. No.: **191,246**

Related U.S. Application Data

[62] Division of Ser. No. 861,364, Sept. 26, 1969, Pat. No. 3,703,030.

[52] **U.S. Cl.** **29/452,** 254/29

[51] **Int. Cl.** **B21d 39/00**

[58] **Field of Search** 29/452; 254/29

[56] **References Cited**

UNITED STATES PATENTS

3,194,536	7/1965	Simms	29/452
3,207,829	9/1965	Nieber	254/29
2,728,978	1/1956	Birkenmair et al.	29/452
2,761,649	9/1956	Woolcock	29/452
3,255,558	6/1966	Middendorf	29/452
3,298,075	1/1967	Shoe	29/452

Primary Examiner—Richard J. Herbst
Assistant Examiner—J. W. Davie
Attorney—Ernest S. Kettelson

[57] **ABSTRACT**

A method for tensioning cables embedded in concrete, including fluid actuated units, cable gripping members, jacking means and a de-tensioning assembly permitting to cut off the excess portion of the cable without danger to personel and equipment.

8 Claims, 19 Drawing Figures

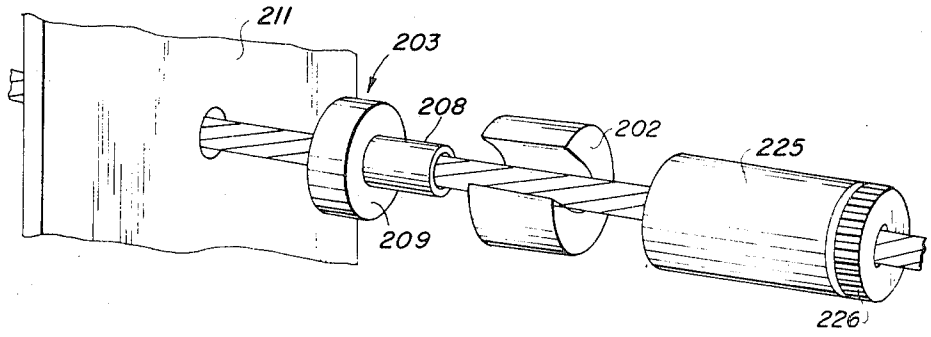


FIG. 1

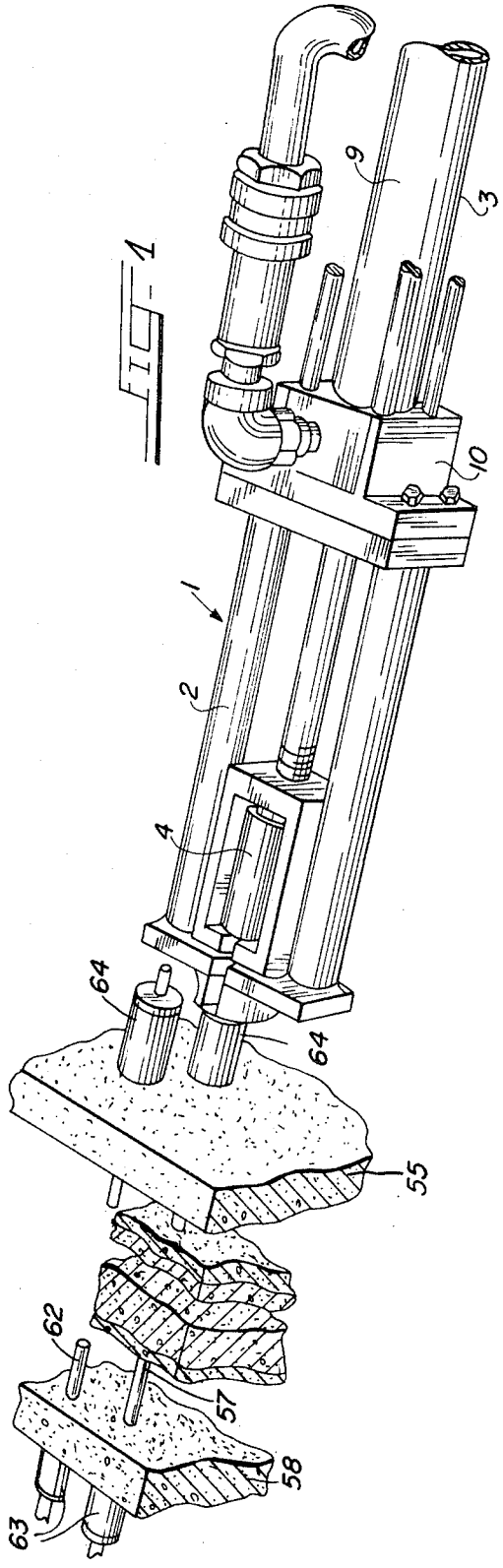


FIG. 2

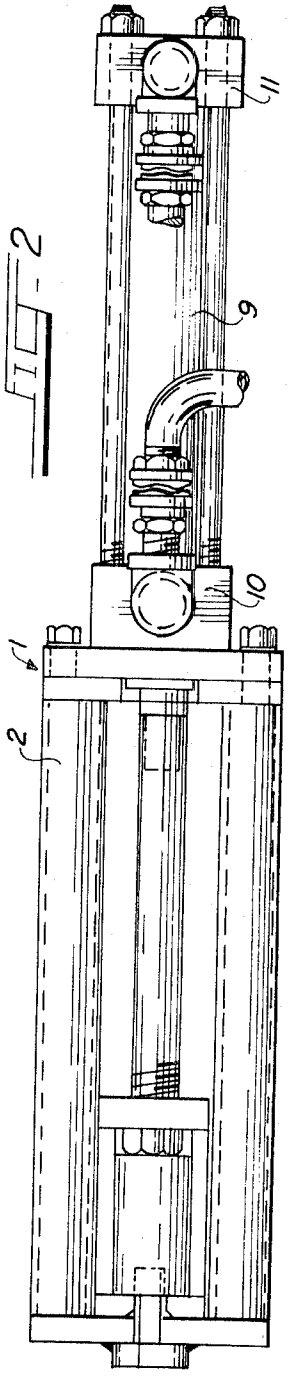


FIG 3

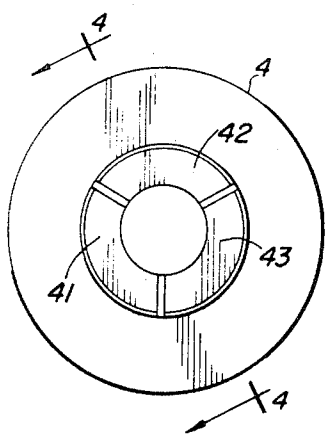


FIG 4

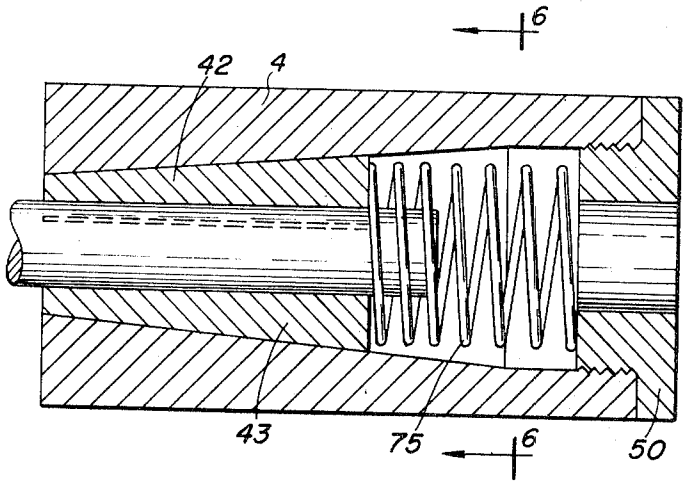


FIG 5

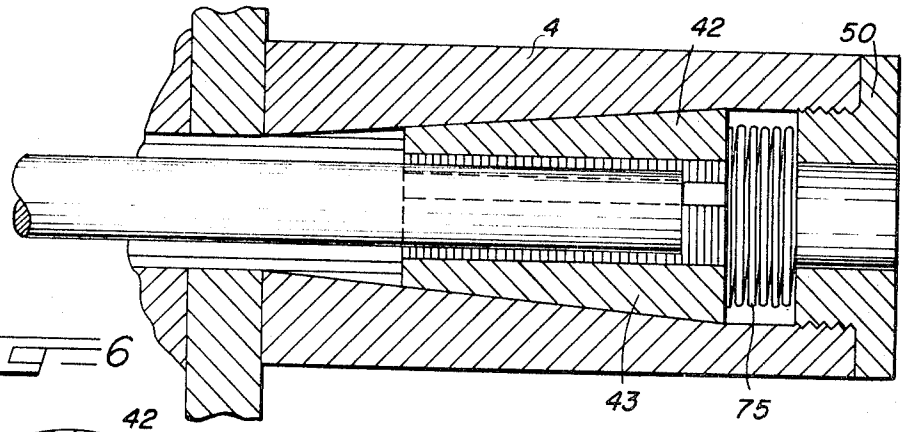
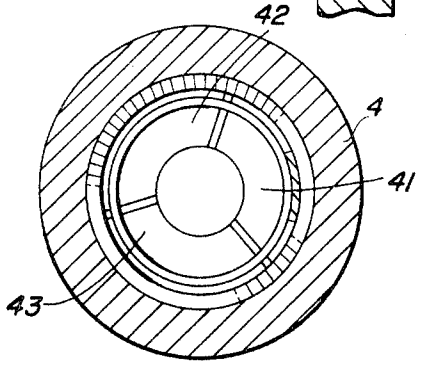


FIG 6



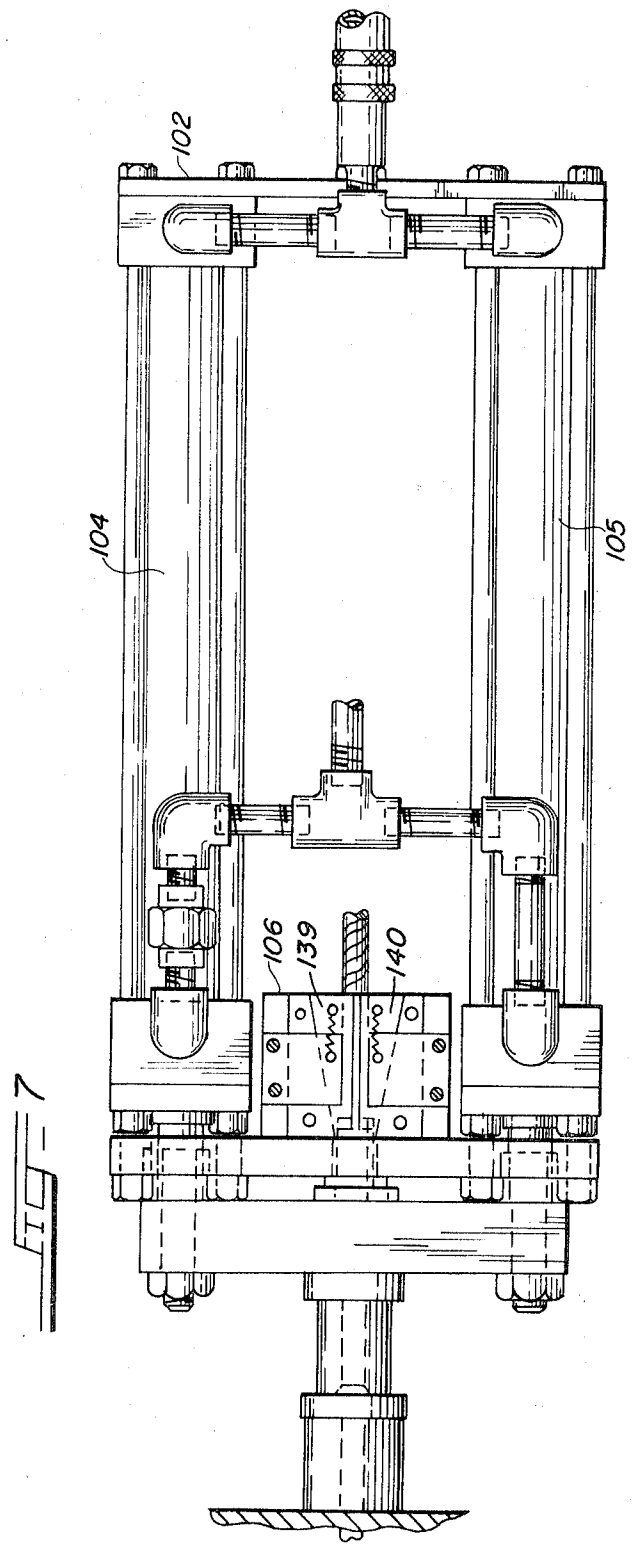


FIG - 7

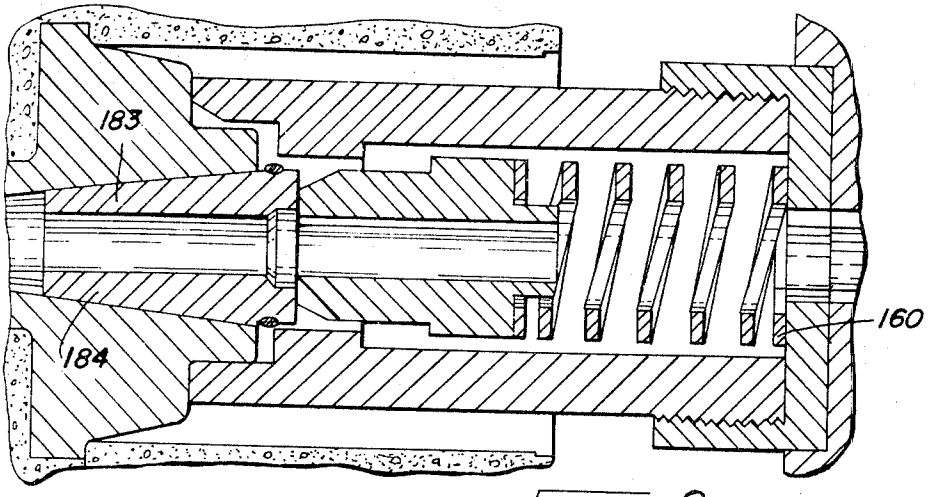


FIG. 8

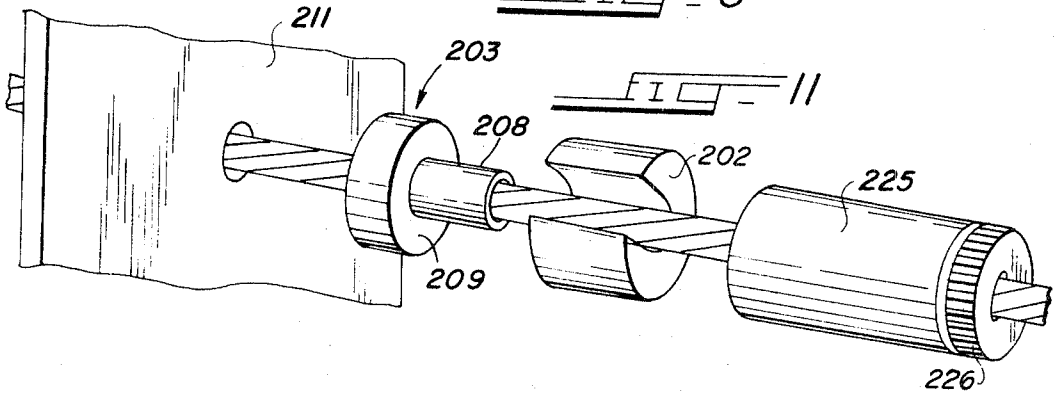


FIG. 11

FIG. 13

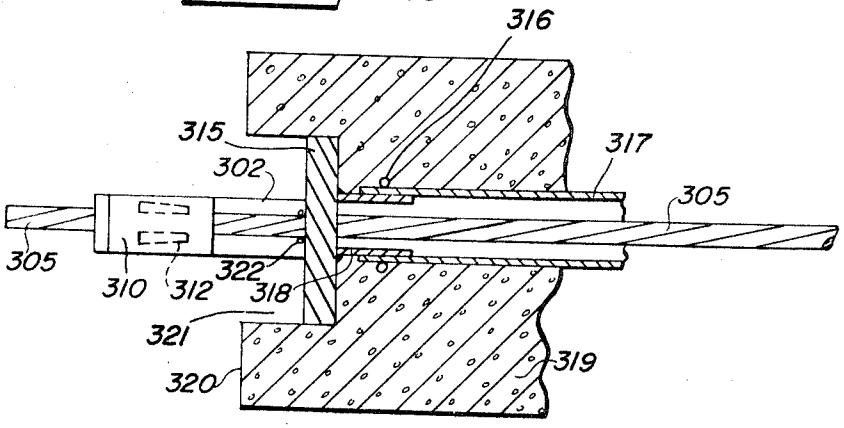


FIG. 9

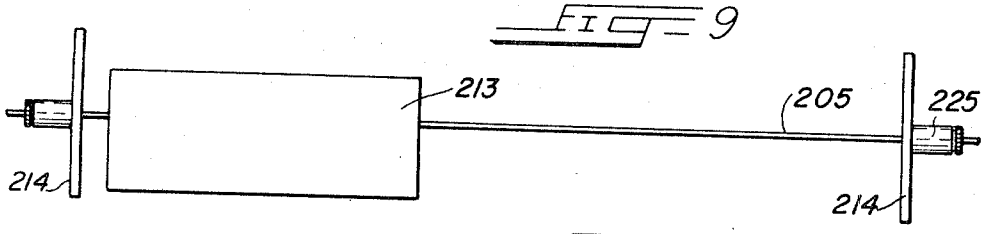


FIG. 10

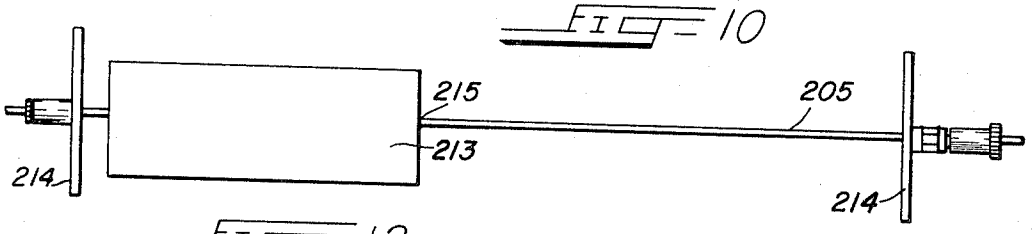


FIG. 12

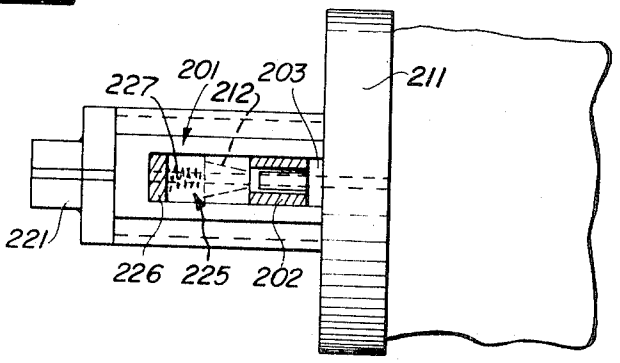


FIG. 14

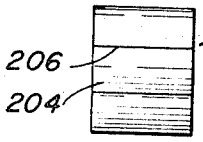


FIG. 15

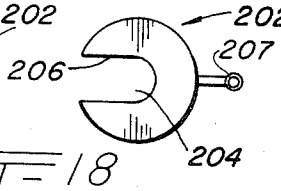


FIG. 16

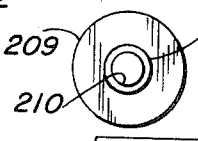


FIG. 17

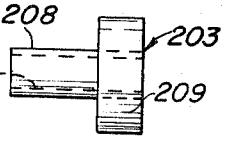


FIG. 18

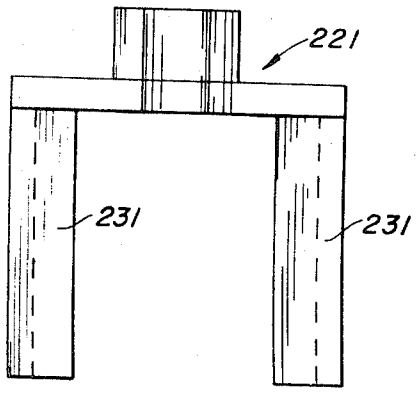
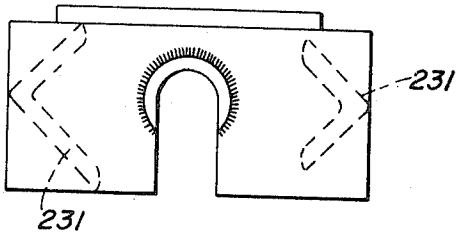


FIG. 19



TENSIONING DEVICES

This is a divisional application to my patent application Ser. No. 861,364 filed Sept. 26, 1969, now U.S. Pat. No. 3,703,030 for IMPROVEMENTS IN TENSIONING DEVICES.

BACKGROUND OF THE INVENTION AND PRIOR ART

The invention relates to tensioning units for tensioning cables in stressed concrete and in more particular to improvements of tensioning units such as described in my U.S. Pat. Nos. 3,184,219 and 3,194,536. In fact the FIGS. 1 to 8 are exact copies of FIGS. 1,2,8–11 of U.S. Pat. No. 3,194,536 and FIGS. 1,8 of U.S. Pat. No. 3,184,219. They are placed herein solely for purposes of illustrating the prior art.

The tensioning units disclosed in these patents have the general object of "pre-tensioning" or "post-tensioning" cables embedded in concrete blocks or slabs.

This invention is concerned with improvements to apparatus described in the above noted patents. In such apparatus certain problems have been observed involving the safety of the operator, when the excess cable portion is cut off from the tensioned cable portion which is within the concrete block or slab. For example, in a long precasting bed wherein half of the casting bed is used for preparing a slab, the cable outside the slab can be cut off with a torch. However, there is a danger that the cable upon being cut under tension will snap due to the sudden release and perform a whipping and coiling action which may cause injuries to persons engaged in the preparation of concrete blocks. Also, the cut-off cabel may be coiled and twisted to a degree that it is unusable and, therefore, wasted.

A method for tensioning cables using a de-tensioning assembly for de-tensioning the cables embedded in concrete blocks. The detensioning assembly comprises spacer means and a release member, both mounted on the cable. In de-tensioning the cable the spacer means is removed causing the release member to open the cable gripping means and de-tension the excess portion of the cable which may conveniently be cut off from the stressed cable in the concrete.

It is an object of this invention to provide a method enabling to cut off the excess cable portion without danger of whipping and coiling.

Other objects and advantages of the invention not at this time enumerated, will become readily apparent as the nature of the invention is better understood from the following description and claims, and are illustrated in the accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of a tensioning device operating with one fluid-actuated unit, as described in my U.S. Pat. No. 3,194,536;

FIG. 2 is a top plan view of the tensioning device shown in FIG. 1;

FIG. 3 is an end elevational view of the chuck embodied in the device shown in FIG. 1;

FIG. 4 is a longitudinal sectional view taken substantially along the line 4—4 in FIG. 3;

FIG. 5 is a longitudinal sectional view similar to FIG. 4 but showing certain parts in different operative positions;

FIG. 6 is a transverse sectional view substantially along the line 6—6 in FIG. 4

FIG. 7 is a fragmentary top plan view of a tensioning device operating with two fluid-actuated units, as described in my U.S. Pat. No. 3,184,219;

FIG. 8 is an enlarged fragmentary sectional view of the unit as sown in FIG. 7;

FIG. 9 is a schematic ilustration of a tension system wherein the excess cable strand is torch-cut under tension;

FIG. 10 illustrates a tensioning system wherein the excess cable strand is cut after de-tensioning thereof, according to the invention;

FIG. 11 is a perspective blown up view of the elements of a de-tensioning assembly according to the invention;

FIG. 12 is a side elevational and partly sectional view of the jacking chair and of the de-tensioning assembly placed between the chuck and the casting bed header;

FIG. 13 is a side elevational and partly sectional view of another embodiment of the de-tensioning assembly;

FIGS. 14,15 are side and front elevational views of a spacer element;

FIGS. 16,17 are front elevational and sectional views of a release plunger;

FIGS. 18,19 are front elevational and side views of a jacking chair.

Referring now the drawings. FIGS. 1 to 6 show a tensioning device 1 including a supporting frame 2 on which is mounted a fluid-actuated unit 3 operatively connected to an elongated cable-gripping member for griping cables 57,62 in the form of a chuck 4 for reciprocating the chuck longitudinally of the supporting frame 2. Two cables 57 and 62 are held in chucks 63,64 outside walls 55,58.

The fluid-actuated unit 3 includes an elongated cylinder 9 having cylinder heads 10 and 11 mounted on the respective opposite end portions thereof. FIGS. 3 to 6 illustrate the chuck 4 comprising jaws 41,42,43, a cap 50 and a spring 75 disposed between jaws and cap. This tensioning device is described in detail in my U.S. Pat. No. 3,194,536.

A somehow differently operating tensioning device 101 is shown in FIGS. 7 and 8 which includes a supporting frame 102 on which two fluid-actuated units 104 and 105 are mounted with an elongated cable gripping member, in the form of a chuck 196 mounted on the frame 102. The chuck 106 in FIG.7 comprises jaws 139 and 140, the chuck in FIG. 8 includes a spring 160 and jaws 183, 184. All further details are given in my U.S. Pat. No. 3,184,219.

The present invention is not concerned with the aspect of the tensioning but rather with that of de-tensioning operation, including apparatus and method therefor.

The details of structure and operation of tensioning devices are set forth and explained in detail in my above noted U.S. Patents and do not concern the present invention.

Therefore, referencemay be had to the two mentioned U.S. Patents for a disclosure of details not specifically disclosed herein.

The principal concept of this invention may be stated in general terms as follows: In order to avoid the dangers described heretofore, there is a departure from the principle of cutting off the excess cable portion under tension. Expressed otherwise, the invention is based on the idea of cutting off the excess cable only after the cable has been detensioned.

To obtain a safe and efficient de-tensioning method the invention is described as using a de-tensioning assembly **201**, although other de-tensioning assemblies may be used. The assembly **201** comprises a spacer element **202** and a release plunger **203** which may be disposed over the cable strand **205**. A jacking chair **221** may be mounted over the de-tensioning assembly abutting the end of the casting bed **222**.

The spacer element **202** is a cylindrically shaped body having a central bore **204** of a size sufficient to embrace a part of the release plunger **203**. A longitudinal slot **206** having a width which is slightly larger than the diameter of the central bore **204**, is cut along the cylindrical body so that the slot extends from the bore **204** to the periphery of the body.

A grip hook **207** may be welded to the cylindrical body, for a purpose to be explained later.

The release plunger **203** comprises a cylindrical sleeve **208** and a cylindrical flange or disk **209** at one end thereof. A central bore **210** extends through the sleeve **208** having a diameter of a size such that the cable strand **205** is loosely embraced by the sleeve **208**. The outer diameter of the sleeve **208** is dimensioned so that the spacer element **202** may be conveniently mounted over the sleeve. The sleeve **208** may be integral with the disk **209** or they may be separate members and subsequently joined such as by welding or in any other known manner.

As best seen in FIGS. **11** and **12** the de-tensioning assembly is positioned between chuck **225** and the casting bed **211** of the casting from for concrete.

In operation, the de-tensioing process is performed after the tensioning of the cable has been completed up to a desirable degree of tension, in accordance with the operational details set forth in my two previously noted U.S. Patents. The de-tensioning is begun by an additional act of tensioning. This may be done by jacking against the jacking chair **221** and tensioning by a very small lnegth of about one sixty-fourth of an inch. This additional tensioning has the effect of setting the spacer element **202** free or loose around the cable strand **205**. In the event that the slot **206** of the spacer **202** is directed upwardly, the spacer will drop due to gravity and this causes the release plunger **203** to move against the engage the jaws **212** of a chuck **225** having a cap **226** and a spring **227** which jaws **212** grip the cable strand **205**. Once the jaws **212** are thus engaged they open the grip on the cable, as explained in detail in my noted U.S. Patents. Once the jaws release the cable, this portion thereof is de-tensioned and can now be cut without any danger of snapping or coiling.

If the slot **206** of spacer **202** is in a direction other than upwardly, a hook **207** welded onto the spacer permits the manual removal of the spacer which is now loosely seated on the cable strand **205**.

This arrangement offers also the advantage that the strand may be left on the cable reel and the tensioned and subsequently de-tensioned length of the strand can be saved and used again. Under the previous practice, the strand had to be cut off the cable reel, and the strand portion used for obtaining the necessary stress was wasted, see **FIG.9**, wherein the strand is cut off under tension adjacent the casting form **213**. The invention permits cutting the srand behind the form at **215** as seen in **FIG.10**, after it has been de-tensioned without danger of coiling up.

A modification of the de-tensioning unit as indicated in FIG. **12** may be used in connection with a tensioning method which is based on the principle of grouting. This de-tensioning unit is illustrated in **FIG.13**.

The particulars of grouting are old in the art, and there is, therefore, no need to explain them here.

After the tensioning, the strand is grouted. When the grout has reached sufficient strength, the strand is de-tensioned as described heretofore and the chuck, spacer and release plunger can be reclaimed and used again.

Under this particular method grouted post-tensioning, it is sufficient to use a spacer only, as shown in **FIG.13**.

The spacer is longer than that used in the previous method in order to facilitate the de-tensioning operation. The bearing plate **315** is embedded in the concrete **319**. In front of the bearing plate **315** a void **321** is left which is subsequently filled with cement up to outer edge **320** of the concrete **319**, after de-tensioning and removal of chuck and spacer.

A metal sheating **317** enabling the grouting is clamped in position with a wire **316**. A small tube **318** is welded to the bearing plate **315** or pressed tight-fit into a drilled hole. After removing the chuck **310** the strand **305** is welded to the bearing plate **315** as at **322**. Subsequently the void **321** is filled with cement as noted heretofore. The welding constitutes an additional safeguard to that of the grouting.

I have observed that when using a regular strand chuck (FIG.5) with cap **50** and spring **75**, it usually takes one fourth of an inch of elongation to seat the jaws **41–43**. The spacer **202** will fall out upon the creation of a clearance of one sixty-fourth of an inch between the release plunger **203** and the chuck **225**. Therefore, all that has to be done is tensioning the strand to the original load, and the spacer will fall out.

It has also been found that in order to facilitate the release of the jaws, it is advisable to loosen the chuck cap **226** prior to positioning the jacking chair **221** for de-tensioning.

The release of the jaws may further be made easier by using micro mesh graphite as a chuck releasing agent.

Finally, it is to be noted that when jacking against the jacking chair **221** care has to be taken that the chair legs **231** are positioned in a direction perpendicular to the header **211** of the casting form. Any other angle of the jacking chair would create dangerous conditions.

Thus while I have illustrated and described the preferred embodiment of my invention, it is to be understood that it is capable of variation and modification and I, therefore, do not wish to be limited to the precise details set forth.

I claim:

1. A method of tensioning a cable strand extending through a casting bed of any length, using a driving unit, chuck means including a cap and jaws for gripping the cable strand, a jacking chair, and de-tensioning means including a spacer element and a release plunger, wherein the same spacer element and release plunger may be used for any length of casting bed, said method comprising the steps of mounting the spacer element upon the release plunger and placing both intermediate the chuck means and the end wall of the casting bed, and jacking the fluid actuated driving unit

against the jacking chair for tensioning the cable to a desired degree.

2. The method as set forth in claim 1, including the steps of a further slight tensioning of the cable whereby the spacer is rendered loose and may be removed.

3. The method as set forth in claim 2, including the step of removing the spacer, whereby the release plunger is removed towards the chuck means cuasing it to release the strand, such that the strand may be cut without danger of snapping or coiling.

4. The method as set forth in claim 3, wherein the further slight tensioning of the cable is done to the original degree of tension.

5. The method as set forth in claim 4, including the step of loosening the chuck cap prior to positioning the jacking chair.

6. The method as set forth in claim 5, including the step of applying micro mesh graphite as a chuck releasing agent.

7. A method of tensioning a cable strand extending through a casting bed using a driving unit, chuck means including a cap and jaws for gripping the cable strand, a jacking chair, and de-tensioning means including a spacer element and a release plunger, said method comprising the steps of providing a metal sheath tubing around the cable strand within the casting bed, inserting a small tube into the metal tubing with the end of the small tube slightly protruding from the metal tubing, clamping the metal tubing over the small tube as by a wire ring, positioning a bearing plate in a void at the end of the bed perpendicular to the small tube and joining the plate to the tube as by welding, placing the spacer element over the cable strand in front of the bearing plate, mounting the chuck means over the cable strand in front of the spacer element, tensioning the cable strand, grouting within the metal sheath tubing, tensioning the cable strand additionally, removing the chuck means and the spacer element, and filling the void with cement.

8. The method as set forth in claim 7, including the step of welding the cable strand to the bearing plate subsequent to removal of the chuck means and the spacer element and prior to filling the void with cement.

* * * * *