March 15, 1966 C. J. MATHERNE 3,240,232

PIPE THREAD PROTECTOR

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Fig. 1

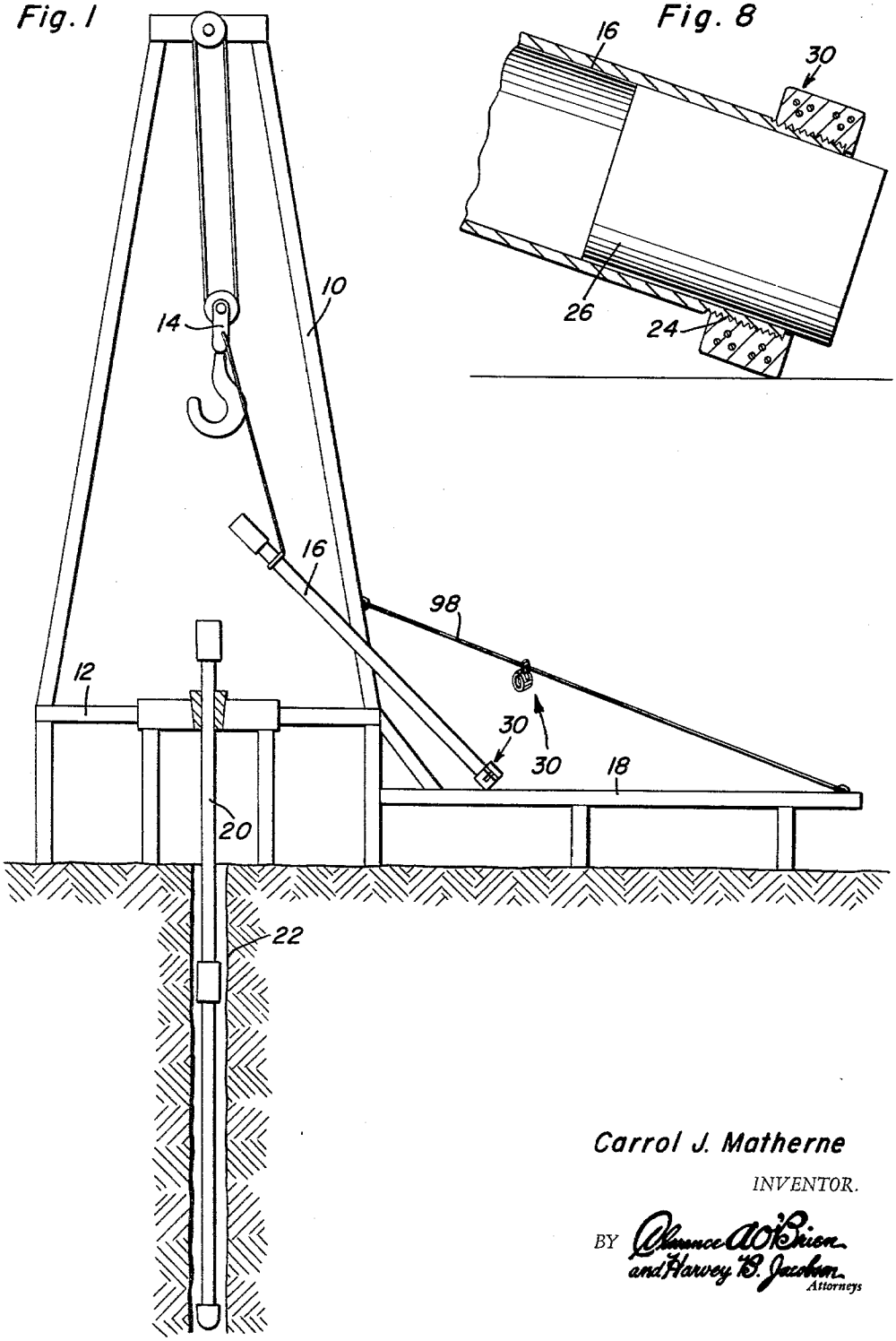



Fig. 8




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PIPE THREAD PROTECTOR

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Fig. 2

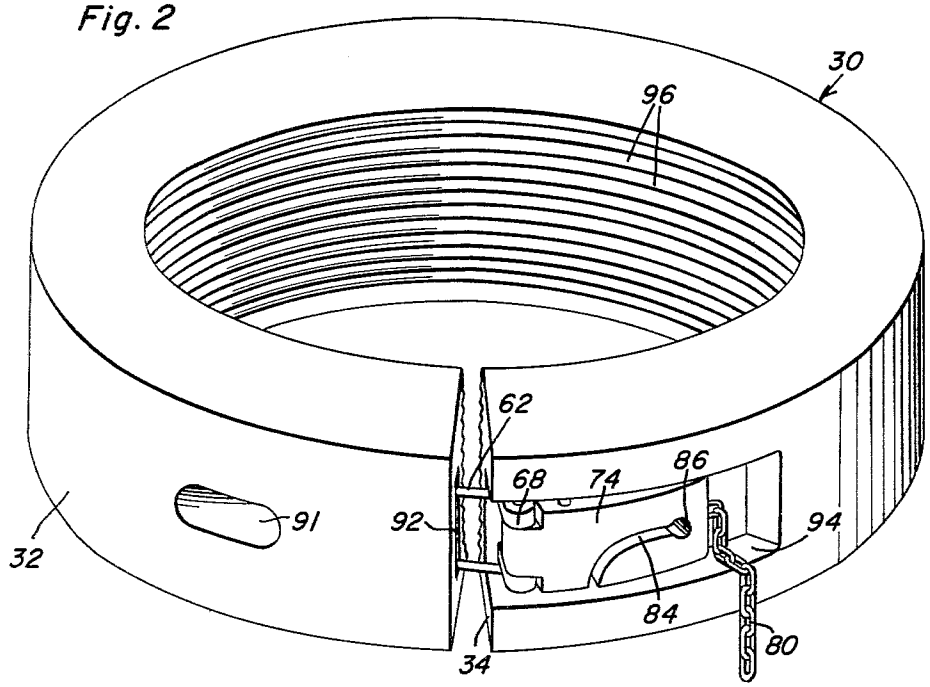
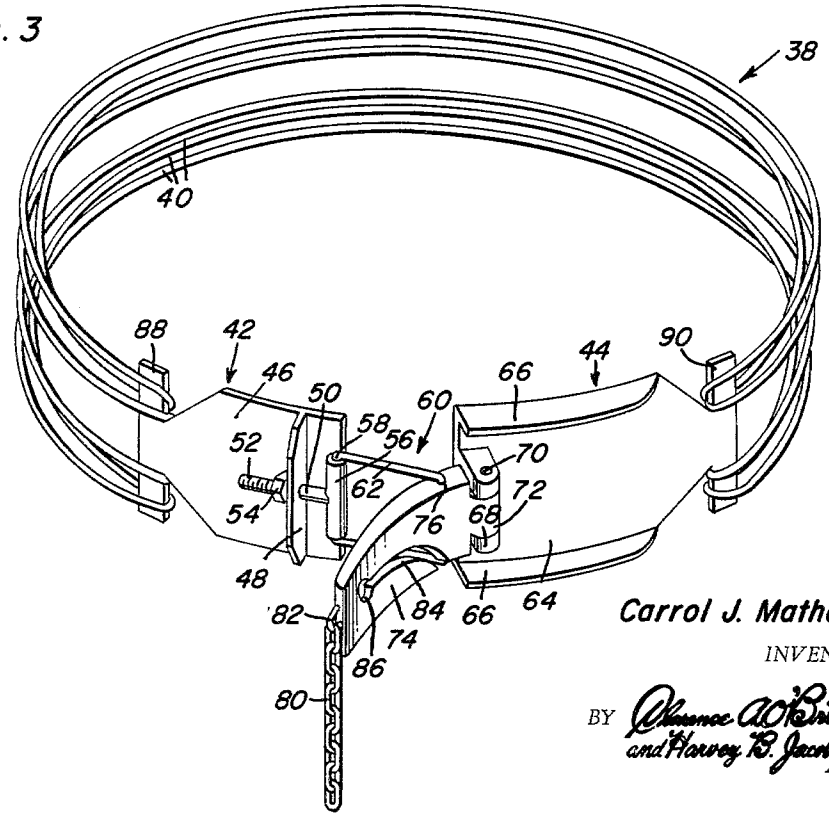



Fig. 3




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Fig. 4

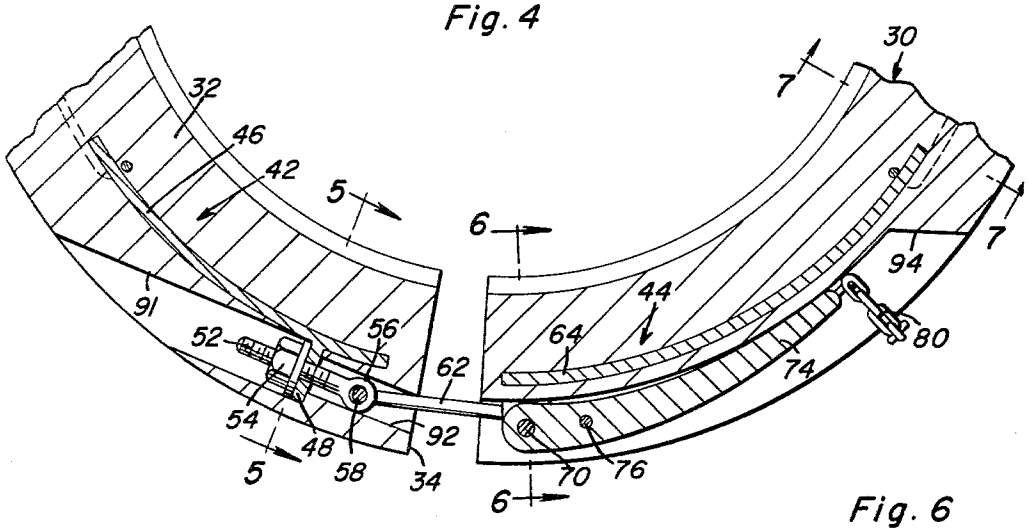



Fig. 5

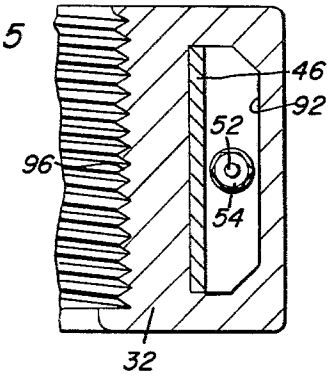



Fig. 6

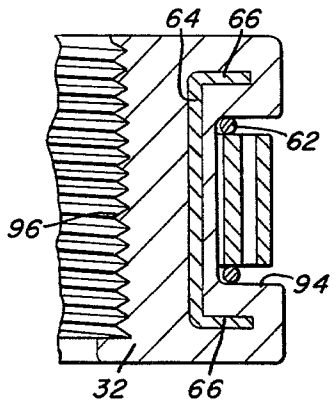
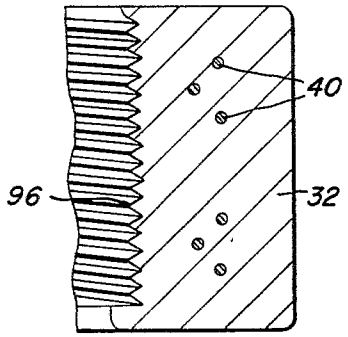



Fig. 7




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3,240,232

# PIPE THREAD PROTECTOR

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5 Claims. (Cl. 138—96)

This invention comprises a novel and useful thread protector and method of running well casing and more particularly pertains to the art of making up strings of well casing or tubing for inserting the latter in a well bore during well drilling or well servicing operations. In its broader aspects, this invention relates to a novel and improved means and method for applying a protective radially deformable and yieldable sleeve constrictively and compressively upon the exterior surface of a cylindrical article.

In the well drilling and servicing industry as in other fields of activity, the mounting costs of labor are becoming an increasingly important factor in determining whether the associated operation will involve a profit or loss. It is therefore extremely important to effect improvements and changes in operation which will reduce insofar as possible the labor required for a given operation as well as the time necessary to carry out the operation. It is therefore the primary purpose of this invention to provide a method and a construction which will reduce the requirements as to time and labor as much as possible in connection with the operation of making up and running in casing or tubing strings in a well bore.

A primary object of this invention is to provide a thread protector adapted to be quickly attached to or removed from the external threads at the end of a length of well casing or tubing in order to protect those threads during the handling of the pipe length when applying the pipe to or removing it from a casing or tubing string.

A further object of the invention is to provide a protector for pipe threads in accordance with the foregoing object which shall not obstruct the interior of the pipe or interfere with the passage of an internal gauge through the interior of the pipe section.

A further object of the invention is to provide a protector device in accordance with the foregoing objects in which the clamping means for securing the protector compressively and constrictively upon the external pipe threads of a section or length of pipe shall be protectively housed within the body and material of the protector itself thereby affording protection against deterioration of the clamping means as well as offering protection against injury to persons or objects adjacent to the protector.

Yet another purpose of the invention is to provide a protector in accordance with the foregoing objects which shall include therein provision for varying the constrictive action of the protector in order to readily adapt the latter to different sizes of pipe as well as to compensate for wear in the protector itself during use.

Another important object of the invention is to provide a protector in accordance with the preceding objects which shall be quick and secure in its operation of locking the protector in place or releasing the protector from a threaded pipe end, and whereby the releasing operation may be effected from a position remote from the protector to thereby prevent the necessity for workmen placing their hands upon the protector or within portions of the latter.

Still another purpose of the invention is to provide a protector as set forth in the above mentioned objects which shall include a one-piece body of a resilient pliable or deformable material into which are incorporated reinforcing strands in a novel and improved manner.

Yet another purpose of the invention is to provide a method which will greatly facilitate the moving of pipe sections from a horizontal storage rack into vertical position for attachment to a string of casing or tubing for insertion into a well bore which will result in a saving of time, a reduction in the amount of labor required and will greatly minimize possible damage to the threaded ends of the pipe sections or injury to workmen adjacent thereto.



Still another object is to provide a protective sleeve of a yieldable material and having reinforcing, tensionable elements embedded therein for compressive embracing attachment to an article of a generally cylindrical configuration.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a view partly in elevation and partly in vertical section showing a portion of a typical well drilling or working installation incorporating therein the principles of this invention;

FIGURE 2 is a perspective view showing the thread protector of this invention in its locked or clamped position;

FIGURE 3 is a perspective view of the reinforcing elements removed from the body of the protector and with the locking means being in its released position;

FIGURE 4 is a fragmentary detail view in horizontal section through a portion of the protector of FIGURE 2 and showing in particular the disposition of the clamping or locking means and its association with the reinforcing elements embedded within the protector in the locked position of the latter;

FIGURES 5–7 are vertical transverse sectional views taken respectively upon the planes indicated by the section lines **5—5**, **6—6** and **7—7**, respectively, of FIGURE 4 but upon an enlarged scale; and

FIGURE 8 is a detail view in vertical central section through a portion of the lower end of the pipe section being lifted as shown in FIGURE 1 and showing the protector in place and the movement of an internal gauge block through the pipe section.

Reference is made first to FIGURE 1 wherein the numeral **10** designates generally an oil well drilling or servicing rig having a drilling or servicing platform **12** together with a traveling block **14** by means of which lengths of casing or tubing pipes or sections **16** are removed from a horizontal pipe storage rack **18** into vertical position for attachment to a string of casing or pipe **20** disposed in a well bore **22**. Inasmuch as the details of this structure and operation are generally well known to those skilled in the art, a further description is deemed to be unnecessary for an understanding of the principles of the invention set forth and claimed hereinafter.

In the moving of pipe from the storage rack **18** to a vertical position above the well bore in order that the pipe may be applied to the string **20**, it will be evident that the lower end of the pipe is dragged across the rack and across the platform **12** until it reaches a substantially vertical position. During this dragging operation owing to the heavy nature of the pipe, the threads at the lower end thereof whereby the pipe section is to be secured to the string **20** are frequently damaged and burred. It has been customary heretofore to provide thread protectors for the threaded lower extremities, indicated at **24** in FIGURE 8, for the section **16** to prevent this damage thereto. However, such protectors although effective for this purpose, have the disadvantage usually that they require considerable time to apply or to remove from the pipe, and even when applied they frequently obstruct the interior opening of the pipe.

Since it is well known that a smooth unobstructed interior is necessary for the pipe since it is frequently desirable to pass a string of tools or equipment through the pipe for various purposes, it is obvious that such obstructions will greatly interfere with this function. Therefore, it has become customary to pass an internal gauge indicated generally by the numeral **26** in FIGURE 8 through the length of pipe **16** from the upper to the lower end thereof in order to make certain that the pipe is of uniform minimum diameter throughout its length and is unobstructed. Conventional protectors by their obstruction of the outlet or lower end of the pipe frequently interfere with such travel of the gauge. Consequently, considerably greater time is required for applying and removing such protectors and to effect the necessary gauging operation before the pipe section can be lifted into a vertical suspended position over the string **20** to which it is to be attached.

The primary purpose of this invention is to provide a pipe thread protector and a method of running pipe which will effectively overcome the above mentioned difficulties, will greatly facilitate the ease of connecting the pipe sections to the string and minimize damage to the pipe sections or injury to others during these operations.

The present invention makes use of a novel and improved construction of pipe protector indicated generally by the numeral **30**. As will be apparent from FIGURE 8, this pipe protector in its applied position effectively covers, embraces and protects the threaded lower extremity **24** of a pipe but offers no obstruction whatsoever to the interior of the pipe and the lower end thereof. Consequently, as shown in FIGURE 8, an internal gauge **26** may be freely slid longitudinally through the pipe under the influence of gravity and will emerge from the lower end thereof without interference by the protector. Thus, the pipe protector of this invention greatly facilitates the normal gauging operation of the pipe sections prior to their attachment to the pipe string **20**.

Referring next primarily to FIGURE 2 of the drawing it will be observed that the protector **30** consists of a generally annular body **32** of C-shaped configuration which is open at its ends to provide an entrance slot **34** of varying width therebetween. The body **32** is of any desired material of a resilient character such as rubber, a suitable plastic or the like. As will now be best apparent from FIGURES 3–4, the body **32** has embedded therein a reinforcing and tensioning assembly designated generally by the numeral **38** and shown in FIGURE 3. This assembly consists of a plurality of tensioning members **40** which may be in the form of strands of suitable cables. Thus, the members may be of nylon or other synthetic material, having some degree of elasticity therein. In other instances, however, relatively non-elastic members such as steel cables may be employed for this purpose. As shown in FIGURE 4, the reinforcing tension members are disposed medially of the body and are embedded therein. However, in some instances these tensioning members may be disposed very closely adjacent to either the inner or outer peripheries of the arcuate C-shaped protector body.

A fastener is provided connected to the opposite ends of the tensioning members **40** of the reinforcing element **38** in order to controllably vary the opening **34** in the C-shaped body and thus effectively circumferentially constrict the body upon the threaded extremity **34** of the section **16**. A convenient and preferred form of fastener for this purpose is shown in FIGURES 2–4 and comprises a pair of brackets indicated generally by the numerals **42** and **44** and which respectively constitute anchor and latch lever brackets. Each of the brackets may consist of a plate-like steel member. Thus, the anchor bracket **42** may comprise a flat steel plate **46** having intermediate its ends a perpendicular upstanding flange **48** comprising an apertured lug. A T-shaped element consisting of a stem **50** externally threaded as at **52** is received through the apertured lug **48** and is provided with an adjustable locking nut **54** thereon. The other end of this member has a transverse tubular



cross member **56** in which is pivotally mounted the web portion **58** of a U-shaped anchor link designated generally by the numeral **60**. The latter has a pair of parallel arms **62** by which it is pivotally connected to the other component of the fastener.

The latch lever plate **44** likewise has a plate-like base **64** with marginal upstanding side walls **66**. Between the side walls there are provided a pair of parallel apertured ears **68** and a pivot pin **70** is secured in these ears and extends through the central tubular portion **72** of a latch lever **74**.

The ends of the arms **62** of the anchor link are inturned and are received in bores **76** on the side of the latch lever **74** so that the anchor link is pivoted to the latch lever in an off-center relation with respect to the pivot **70**.

A chain, cable or the like as at **80** is secured as by a member **82** to the extremity of the lever **74** to effect removal operation of this lever.

A slot **84** is formed in one side edge of the latch lever **74** and terminates in a diametrically enlarged aperture **86** therethrough. The purpose of this slot will be subsequently apparent.

The opposite or remote ends of the plates **46** and **64** are laterally reduced and terminate in cross arms as indicated at **88** and **90**. The tension members **60** are secured to these cross arms as by being looped or entrained thereover although it will be appreciated that they may be fastened thereto in any desired manner.

It will be noted from FIGURE 3 that the anchor and latch lever brackets **42** and **44** are actuated from end to end thereof so that, as shown in FIGURE 4, they may be uniformly embedded in the material of the body **32** of the protector. That end of the protector in which is embedded the anchor bracket **42** is provided with a bore **92** which opens into the slot **34**. The lug **48** of the anchor bracket extends into this bore so that the externally threaded stem **52** and the lock nut **54** may be received in the bore and may be accessible from the open outer end of the latter for adjusting the lock nut upon the stem and thus adjusting the overall length of the two fastener components **42** and **44** and thus regulating or adjusting the opening **34** between the opposite ends of the protector body. As shown in FIGURE 4, and in *FIGURE* 5, that end of the bore **91** which opens the slot **34** is laterally enlarged as at **92** to movably receive therein the anchor link **62** as the latter pivots about its bight portion **58** in the tubular cross member **56**.

In a similar manner, the latch bracket **44** is likewise embedded in the material at the outer side of the opening **34**. As shown best in FIGURE 6, the exterior surface of the protector body is provided with a circumferentially extending channel **94**. The base plate **64** and the side walls **66** thereof are embedded in the bottom and side walls of the channel to constitute a reinforcing member therefor. The apertured ears **68** project upwardly through this material into the channel and thus position the pivot pin **70** of the latch lever **74** in the channel itself. Owing to the overcenter relation of the pivotal connection of the anchor link to the latch lever with respect to the connection of the latter upon the apertured ears **68**, a stable positioning of the fastener in its locking position is obtained. In this position all of the parts of the device are fully recessed into the exterior surface of the protector except that the manual actuating member **80** will project therefrom.

As will be noted, the concave interior surface of the annular protector **30** may be threaded or grooved as at **96** to conform to the threaded extremity **24** of the section **16**.

In operation, the protector may be placed when in its expanded position about the externally threaded lower end of pipe section **16** whereupon the latch lever **74** may be moved to its closed position in the channel **94**. This will close or reduce the gap **34** between the ends of the protector thus causing the latter to compressibly grip and engage the exterior surface of the pipe. As will be noted,

the protector thus leaves the end of the pipe completely open and unobstructed. Owing to the over-center relation, as will be apparent from a comparison of FIGURE 3 with FIGURE 4, the tension applied to the reinforcing elements **40** will produce a stable closed or locked position of the fastener thereby securely retaining the protector upon the pipe. When it is desired to remove the protector it is merely necessary for the user to pull the cord or cable **80** without it being necessary to insert the hands into proximity of the pipe.

The method of setting pipe in accordance with this invention is as follows:

With the series of pipe sections **16** disposed horizontally upon the storage rack **18**, the protectors **30** are secured to the lower threaded extremity of each of the pipe sections. The internal gauge **26** is placed in the upper end of a pipe section so that when the pipe is engaged by the block **14** of the rigging and lifted to the inclined position shown in FIGURE 1, the gauge will slide by gravity through the pipe to the lower end of the latter and will emerge from this lower end as suggested in FIGURE 8. This indicates that the pipe is of uniform minimum diameter and unobstructed throughout its length and thus is ready for use in the string of pipe to be set. From the position shown in FIGURE 1, the pipe is limited to a freely suspended vertical position, whereupon by actuation of the cable **80** the protector is released from the pipe and the section **16** is then secured to the string of pipe **20** in the well bore.

It will thus be evident that a minimum amount of labor and time is required to effect the internal gauging and the making up of a string of pipe.

As will be noted in FIGURE 1, there is provided a guy line **98** which is strung betwen the derrick **10** and the support rack **18**. When the protector is removed from the depending end of this section **16** after the latter is lifted from the storage rack above the drilling platform **12**, the slot **84** in the latch lever **74** is threaded upon the guy line **98** and under the influence of gravity protector slides downwardly from the platform to the rack where it may be readily removed when its use is again desired.

The plurality of tensioning members are of great tensile strength and may be of a material possessing both resilience or elasticity as well as flexibility as in the case of nylon or other synthetic material or may be flexible but with little elasticity as in the case of steel cables. Further, the tensioning members function as drawstrings effect a compressive engagement of the sleeve or ring **30** upon the article being embraced. For this purpose, the embedded members may be either bonded to or may possess a more or less limited slidability with reference to the material in which they are embedded.

Although in the illustrative embodiment of the invention the protector is of a generally annular C-shaped configuration with an entrance slot, it should be understood that the invention is not limited thereto, but comprehends within its scope other shapes and configurations as well as continuous and unbroken rings and sleeves. The essence of the invention resides in the broad concept of a sleeve or jacket of a pliable material having reinforcing and tensioning members embedded therein together with means for tensioning the members which act as drawstrings to constrict the protector body.

In a preferred form, the previously described anchor link **60** is a continuous rectangular frame or rod-like member having its ends joined and welded together, as upon one exposed side leg thereof, see FIGURE 3. This provides the maximum strength and prevents the anchor link from being accidentally disengaged from either the latch lever **74** or the cross member **56**, thereby maintaining the continuity of the protector.

A very important and novel feature of this invention resides in the provision of the lug **48** and its association with the stem **52** and lock nut **54**. This enables the protector to be set, or released, and the tension to be adjusted by merely manipulating the nut **54** ensuring against the possibility of failure of the gripping action or possible dropping and loss of loose parts, a frequent source of failure of prior devices.

Further, the means for adjusting the tension of the drawstrings or strands, members **48, 52, 54**, is incorporated for convenient handling into the fastener members **74, 68, 60** but could also be separate and independent therefrom.

Should for any reason the tension applied to the reinforcing elements **40** be insufficient, the nut **54** can be readily adjusted by a conventional wrench inserted in the bore **91** and turning the lock nut until sufficient tension is produced to obtain the desired gripping and holding power of the protector.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, if is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

**1.** A pipe protector comprising an arcuate C-shaped body of a resiliently deformable material for compressively embracing and protectively enclosing the threaded extremity of a pipe, a quick releasable fastener joining the ends of said body and operable to circumferentially tension and release said ends, said fastener being mounted and recessed within said body whereby in the tensioned position of the fastener and body all portions of the former are recessed into the latter, said fastener including an anchor bracket and a lever bracket each recessed and fixedly secured in an adjacent end of said body, an anchor link secured to said anchor bracket and a latch lever pivoted to said lever bracket, said anchor link having an over-center pivot connection to said latch lever, a suspending slot in said latch lever.

**2.** A pipe protector comprising an arcuate C-shaped body of a resiliently deformable material for compressively embracing and protectively enclosing the threaded extremity of a pipe, a quick releasable fastener joining the ends of said body and operable to circumferentially tension and release said ends, said fastener being mounted and recessed within said body whereby in the tensioned position of the fastener and body all portions of the former are recessed into the latter, said fastener including an anchor bracket and a lever bracket each recessed and fixedly secured in an adjacent end of said body, an anchor link secured to said anchor bracket and a latch lever pivoted to said lever bracket, said anchor link having an over-center pivot connection to said latch lever, said lever bracket being U-shaped in cross-section with a base plate and side walls, said body having a circumferentially extending channel at one end in which said bracket is received, pivot means securing said latch lever to said bracket.

**3.** The combination of claim **2** wherein said pivot means comprises parallel ears upstanding from said said base plate between said side walls, said latch lever being pivoted between said ears.

**4.** The combination of claim **3** wherein said anchor link includes side arms which embrace said ears in the closed position of said fastener.

**5.** A pipe protector comprising an arcuate C-shaped body of a resiliently deformable material for compressively embracing and protectively enclosing the threaded extremity of a pipe, a quick releasable fastener joining the ends of said body and operable to circumferentially tension and release said ends, said fastener being mounted and recessed within said body whereby in the tensioned position of the fastener and body all portions of the former are recessed into the latter, said fastener including an anchor bracket and a lever bracket each recessed and

fixedly secured in an adjacent end of said body, an anchor link secured to said anchor bracket and a latch lever pivoted to said lever bracket, said anchor link having an over-center pivot connection to said latch lever, said lever bracket being U-shaped in cross-section with a base plate and side walls, said body having a circumferentially extending channel at one end thereof, said base plate and side walls being embedded respectively in the bottom and sides of said channel for reinforcing said body.


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