United States Patent

Mostyn

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[54] **TELESCOPIC TUBE LOCKING AND UNLOCKING SYSTEM**

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[73] Assignee: **The Government of the Commonwealth of Australia as represented by the Minister of State for Defense**

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[52] **U.S. Cl.** .....**287/58 CT,** 248/188.5, 248/407, 285/396

[51] **Int. Cl.** **E21d 15/16**

[58] **Field of Search**.....285/396, 302, 303, 362, 361, 285/360, 377, 376, 401, 402; 287/58 CT; 248/161, 407, 188.5; 175/321, 300

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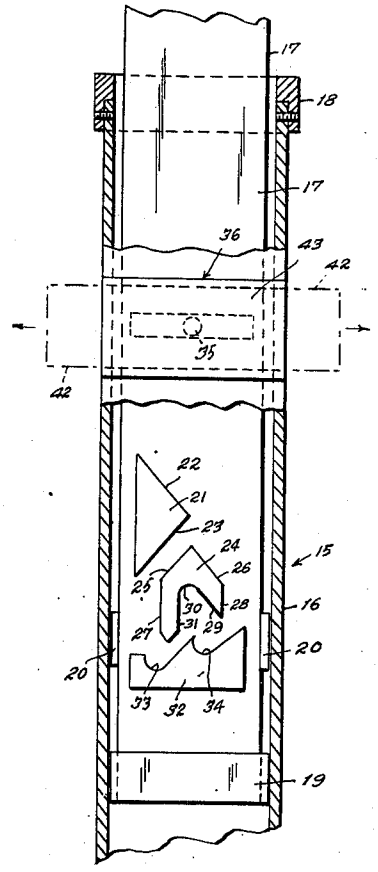
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[57] **ABSTRACT**

A telescopic tube locking and unlocking system in which one square tube is slidable within another square tube of larger diameter. The outer tube is provided with a transverse slot and a pin mounted in a slide which slides laterally in a guideway plate fixed to the wall of the outer tube. The pin extends through the slot to engage the edges of a series of vertically arranged and vertically spaced cams fixed to at least one wall of the inner tube. By pulling the tubes apart then pushing them together the pin cooperates with the cams to lock the inner tube in an extended position or permit telescoping thereof in the outer tube.

6 Claims, 5 Drawing Figures



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SHEET 1 OF 2

Fig. 1.

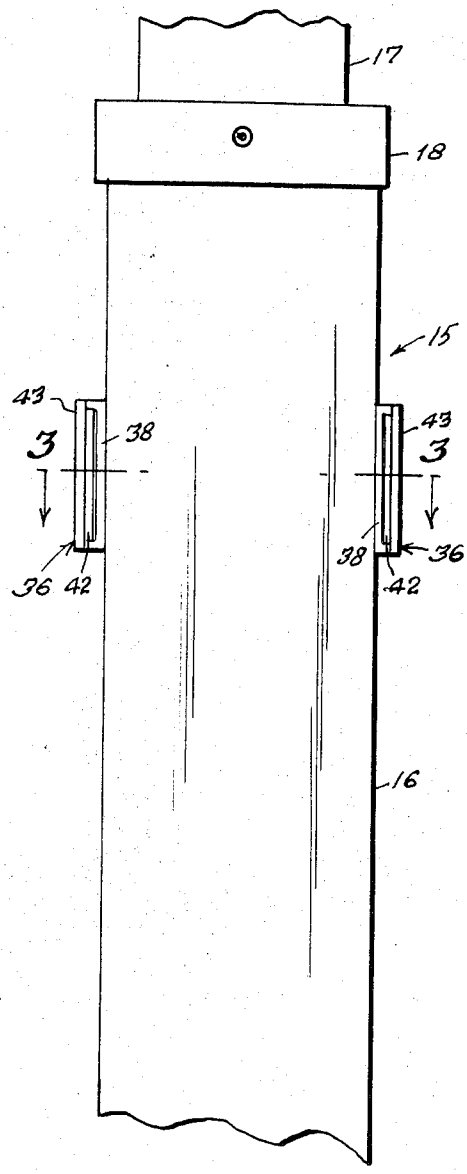


Fig. 2.

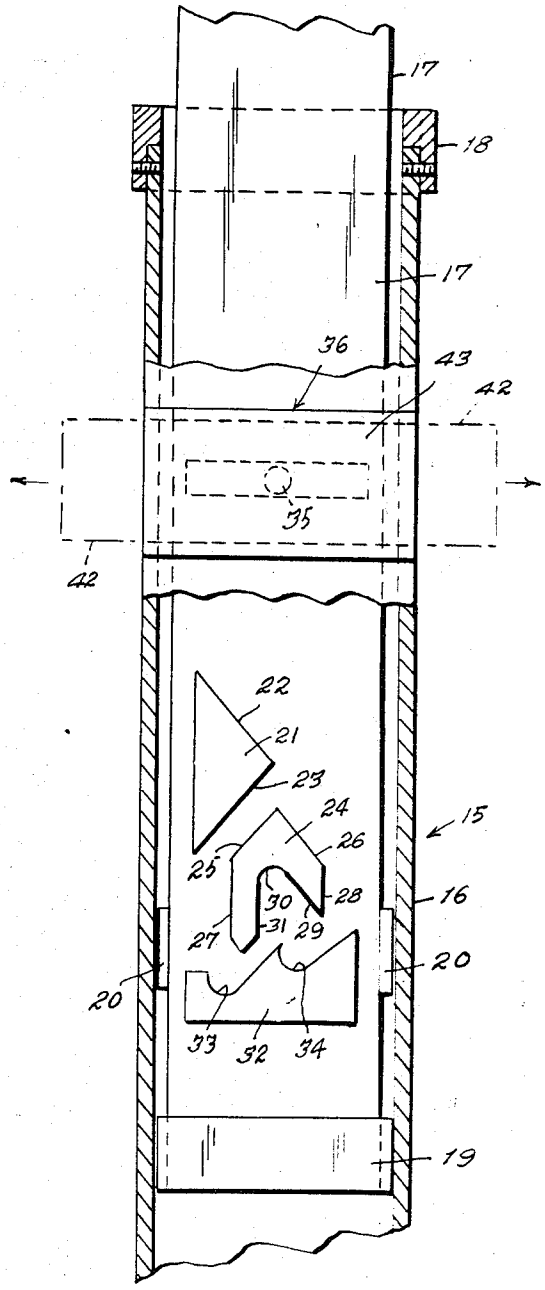
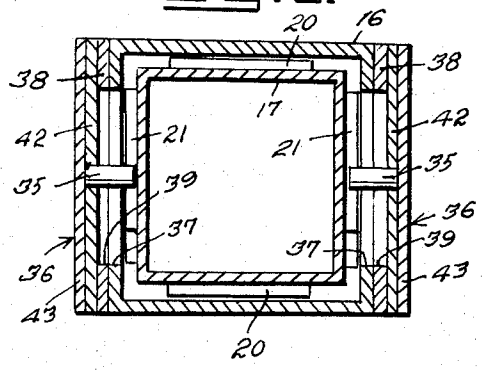


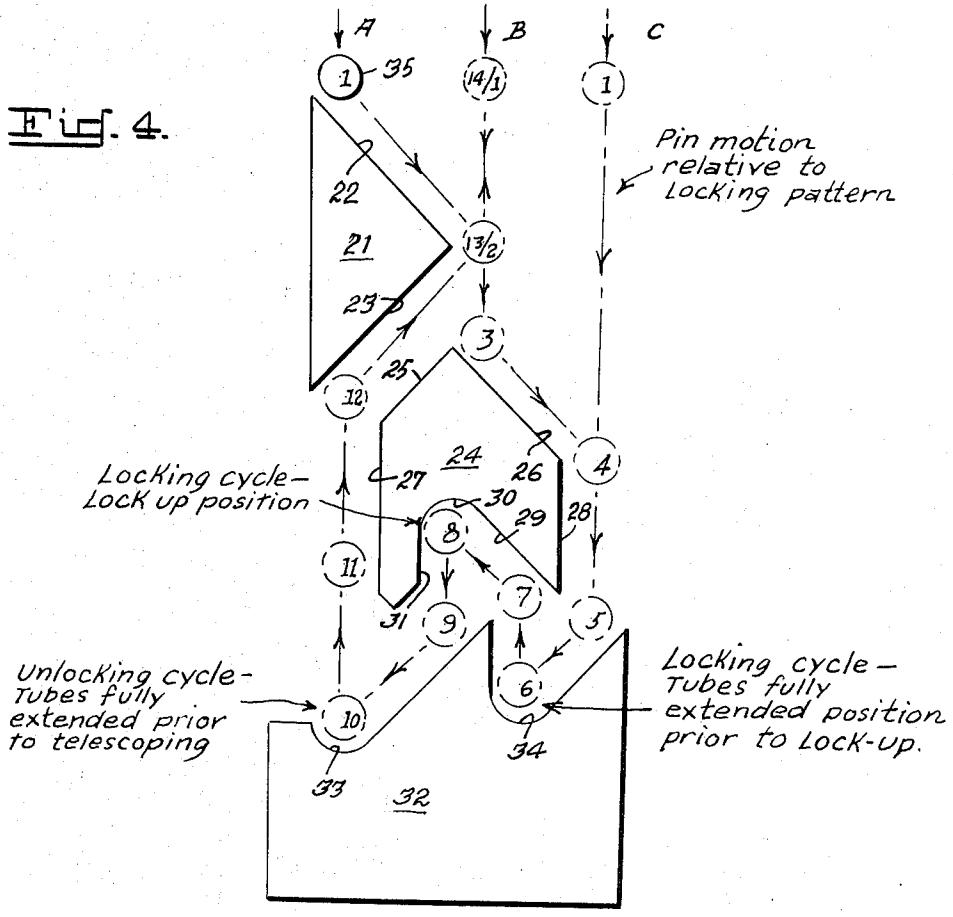
Fig. 3.



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Fig. 4.



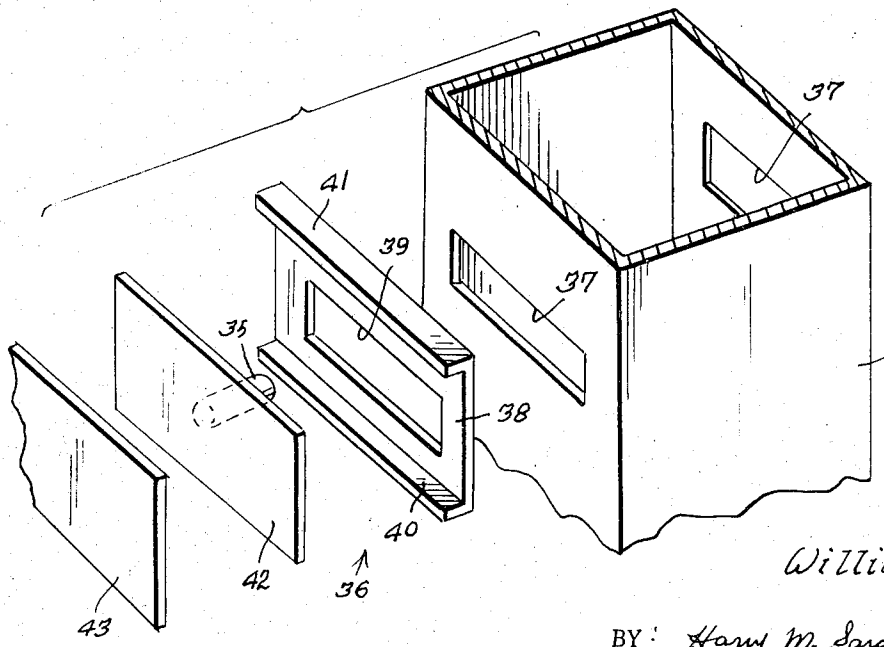


Fig. 5.

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TELESCOPIC TUBE LOCKING AND UNLOCKING SYSTEM

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.

The present invention relates to a telescopic tube locking and unlocking system and more particularly to a mechanism by which one or more telescopic tube sections may be locked or unlocked in an extended position automatically by a single pull-push action and is designed for tubes having flat sides, i.e., tubes that are of square, triangular, etc. in cross section, such as masts, adjustable legs for furniture and the like.

Previous telescoping tubes having means to maintain sections in extended position are round in cross section and require rotation of one of the sections to operate them. This is often not practical since rotation of the telescoping tube would cause whatever load it was supporting to be rotated also, such as a table top or an antenna. Furthermore, a telescoping flat sided tube section which is slidable within another flat sided tube section is not capable of rotation for locking or unlocking.

The present invention eliminates the need for rotation of the tube sections by providing a series of pattern cam plates that are fixed to one or more sides of the inner tube and a laterally sliding pin mounted on the outer tube which engages the edges of the cams so that by a simple pull-push of the inner tube it may be locked in an extended position or collapsed within the outer tube.

It is therefore an object of this invention to provide a mechanism to enable locking or unlocking telescoping tubes having flat sides in extended positions automatically by a pull-push motion of the tubes.

It is another object to provide a series of pattern cams vertically spaced and fixed to a side wall of a flat sided telescoping tube and a laterally slidable pin mounted in a flat sided socket tube whereby when the tubes are pulled apart, the pin will travel through a complete cycle to maintain the telescoping tube in an extended position and when the motions are repeated the telescoping tube may be collapsed within the socket tube.

Still another object is to provide quick and automatic action in the extension or collapse of the tubes.

In the drawings:

FIG. 1 is a side elevation view of the flat sided tubes of this invention;

FIG. 2 is a view of the tubes turned ninety degrees and the outer tube being in section to expose the pattern cams on the inner tube, the sliding pin arrangement being in elevation;

FIG. 3 is a cross sectional view taken along the lines 3—3 of FIG. 1;

FIG. 4 is a schematic view of the pattern cam arrangement and illustrating the cycle of the sliding pin in its travel through the cams for the locking and unlocking operation, and,

FIG. 5 is an exploded view of the sliding pin supporting elements.

With reference to the drawings in detail wherein like reference numerals denote like parts throughout the several views, reference character **15** designates generally the tubes of the invention and includes a socket tube **16** and a telescoping tube **17**. Tube **16** is of

larger diameter than tube **17** and both tubes are illustrated as square in cross section, see FIG. **2**. Socket tube **16** is provided with a top cap **18** while the inner or telescoping tube **17** is provided with a band **19** at its lower end acting to fill in the space between the two tubes to prevent play therebetween. Spacing plates **20** may be fixed to the inner tube sides to steady the tube **3** in its sliding movement as shown in FIG. **3**.

Locking pattern cams are provided and consists of three vertically spaced flat plates as shown in FIG. **2**, and are fixed to at least one of the walls of tube **17**, and preferably also to an opposite wall thereof. The uppermost plate **21** is triangular in shape and defines a downwardly inclining edge **22** and an upwardly inclining edge **23**. The middle plate **24** defines an upwardly inclining edge **25**, a downwardly inclining edge **26** at its upper portion, a pair of vertical edges **27** and **28** and at its bottom portion an upwardly inclining edge **29** which terminates in a locking recess **30**, then a vertical edge **31** as shown.

The bottom plate **32** is of a saw tooth contour at its upper portion and includes a pair of pin stopping recesses **33** and **34**.

Plates **21**, **24** and **32** provide a path through which a laterally sliding locking pin **35** must travel in its cycle for locking or unlocking the tubes in extended position and this pin **35** is supported by means generally indicated by **36** which is attached to at least one side of tube **16** as shown in FIG. **3**, and preferably to an opposite side also. Means **36** comprises an elongated, transversely disposed slot **37** in a side wall of socket tube **16**. Only one means **36** is illustrated in FIG. **5** since the means is identical on either side. A guide plate **38** having an elongated slot **39** of the same size as slot **37** is adapted to be fastened to the wall of tube **16** with the slots **37** and **39** in registry by any suitable means, such as welding, etc. Plate **38** is provided with outwardly directed guideways **40** and **41** which may be portions bent at right angles at the top and bottom thereof. Pin **35** is carried by a slide plate **42** and slide plate **42** is adapted to slide laterally in guideways **40** and **41** of plate **38** with the pin **35** protruding through slots **37** and **39** to a distance in tube **16** where it will engage against the edges of plates **21**, **24** and **32** when the tubes **16** and **17** telescope. A cover plate **43** is provided to abut the guideways **40** and **41**. The entire assembly of **38** and **43** may be by welding or screws when fastening them to **16**.

OPERATION

Assuming that the tubes **16** and **17** are collapsed within one another, the operator will pull the tubes apart as far as possible. During this operation, each locking pin **35** will engage either a triangular plate **21** or plate **24**, which is the locking pattern peice and will slide laterally to align with the right hand gap position and be guided to engage in pin stop recess **34** of plate **32**. Next, the tubes **16** and **17** are pushed together. Each locking pin **35** will engage edge **29** of plate **24** and slide to the left and engage in the locking recess **30** to maintain tube **17** in its extended position.

To unlock tubes **16** and **17** for collapsing, the tubes are first pulled apart. Each pin **35** will slide to the left and engage in pin stop recess **33**. Secondly, the tubes **16** and **17** are pushed together and each pin **35** will fol-

low the left hand edge of plate **24** until it engages edge **23** of triangular piece **21** and slide to the right and the tubes will then be permitted to collapse.

In FIG. **4**, the path of pin **35** is shown. In position A, the pin **35** is in the left hand side of slots **39** and **37**. Position B shows a median position in the slots and also the position reached when the collapsing cycle is finished. Position C shows the pin **35** in a right hand point in slots **39** and **37**. In the last named position, pin **35** will engage directly in pin stop recess **34**.

The progressive positions of pin **35** in the locking and unlocking cycles are labeled **1–14** as shown.

While only two sections of tubing are shown, several sections can be used, each operating in the same manner.

Only square tubes **16** and **17** have been shown, but other tubes having a triangular cross section, octagonal, etc., cross section could be used if desired. The invention could even be applied to round tubing if means for preventing rotation of the tubes were used, such as a keyway, not shown. Many applications to various uses are possible such as masts, furniture legs, shelter supports, etc.

What is claimed is:

1. In a telescopic tube locking and unlocking mechanism including a flat sided socket tube and a flat sided telescoping tube of smaller diameter slidable within said socket tube and comprising, a series of locking pattern cams fixed on at least one side of said telescoping section, at least one laterally sliding locking pin carried by said socket tube and cooperating with said locking cams whereby said telescoping tube may be locked or unlocked in said socket tube by vertical pull-push motions thereof and means fixed on at least one side of said socket tube for slidably supporting said pin thereon.

2. A mechanism as set forth in claim **1** wherein said socket tube and said telescoping tube are square in cross-section.

3. A mechanism as set forth in claim **1** wherein said series of locking pattern cams comprise three flat plates fixed to at least one side of said telescoping tube and disposed in vertical spaced arrangement thereon, said plates having a thickness substantially equal to the space between the outside perimeter of said telescoping tube and the inside perimeter of said socket tube, said plates being contoured to provide a path for guiding said pin into locking and unlocking positions by the alternate lifting and pushing of said telescoping tube to hold said tube in an extended position or to move into a collapsed position therein.

4. A mechanism as set forth in claim **3** wherein the uppermost plate defines downwardly and upwardly inclining edges, the middle plate downward and upper inclining edges at its upper end, a pair of vertical side edges and an undercut locking recess, and the lower plate defining a saw tooth contour at its upper edge to form a pair of pin stopping recesses, said upper plate acting to guide said pin into a position for downward travel into one of said pin stopping recesses when said telescoping tube is lifted from its collapsed position within said socket tube, and when said telescoping tube is pushed downward said pin will be positioned in said locking recess to maintain it in an extended position, and when said telescoping tube is lifted when in said extended position, said pin will be guided into the other pin stopping recess whereby upon a downward push on said telescoping tube said pin will be guided upward to the upward inclining edge of said uppermost plate and guided outward of said plates to permit collapse of said telescoping tube within said socket tube.

5. A mechanism as set forth in claim **1** wherein said means for slidably supporting said pin on said socket tube comprises a transverse slot in al least one of the walls thereof, a guideway plate having a transverse slot of the same size as said slot in said socket tube and adapted to be secured thereto whereby said slots are mated, a slide plate supporting said pin centrally thereon and adapted to slide laterally therein and a cover plate fixed to said guideway plate, said pin adapted to ride in said slots in said guideway and said socket tube and extend into said socket tube a distance whereby it will engage the edges of said locking pattern cams.

6. A mechanism as set forth in claim **1** wherein said telescoping tube may be moved and locked in an extended position from a collapsed position relative to said socket tube by a pull-push movement of said telescoping tube and to be collapsed into said socket tube by a repitition of said movements.

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