

[54] QUICK-ACTING RELEASABLE TUBE
CONNECTORS

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403/328, 248/188 J, 248/354 P, 248/423

[51] Int. Cl. F16b 7/10

[58] Field of Search 403/324, 325, 326, 327,
403/328, 107, 108, 4, 13, 14; 248/188.5, 354
P, 408, 423; 108/146; 135/46 T, 50; 285/4

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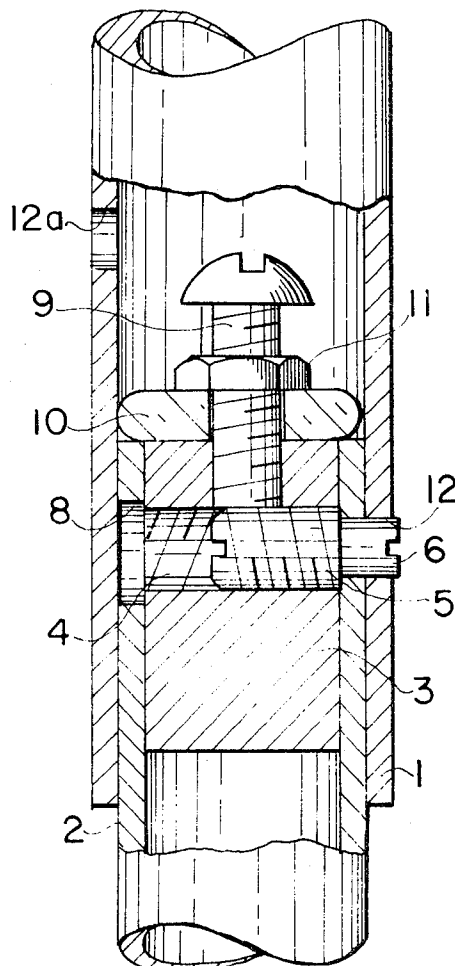
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[57]

ABSTRACT

A positive, reliable, quickly connectable and disconnectable means of connecting lengths of telescoping tubing in a selected one of a large number of relatively axial adjustment positions. While capable of a very wide range of uses, the invention is of particular value for take-down walking aids such as canes, crutches and walkers constructed of aluminum or magnesium tubing.

10 Claims, 11 Drawing Figures



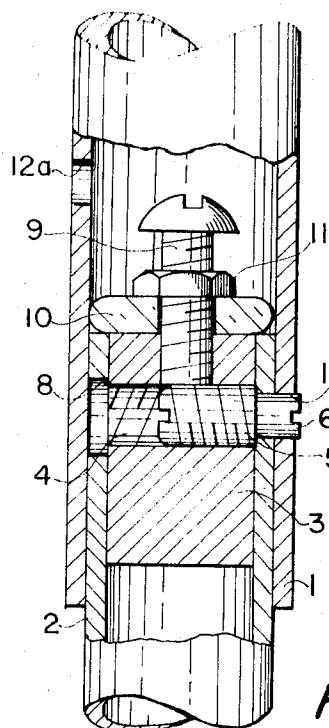


FIG. 1

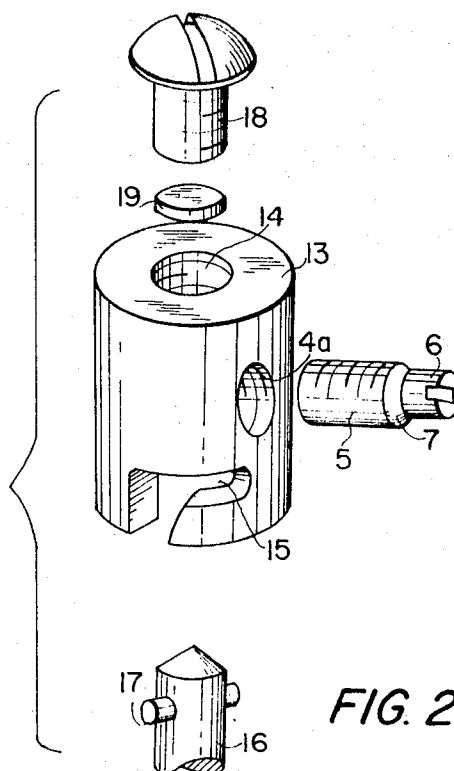


FIG. 2

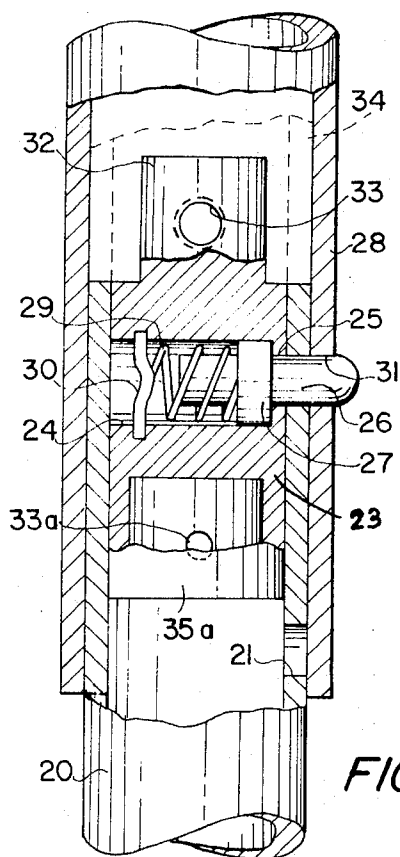


FIG. 3

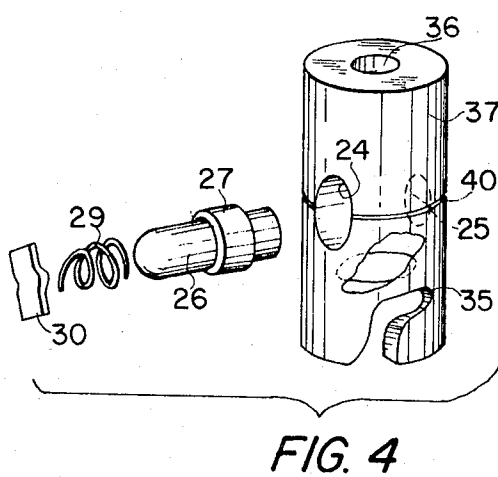


FIG. 4

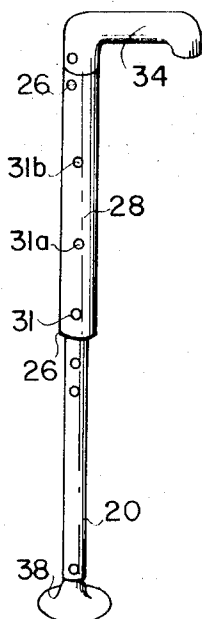


FIG. 5

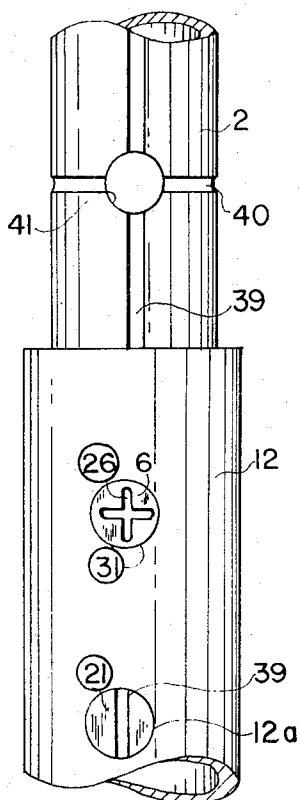


FIG. 6

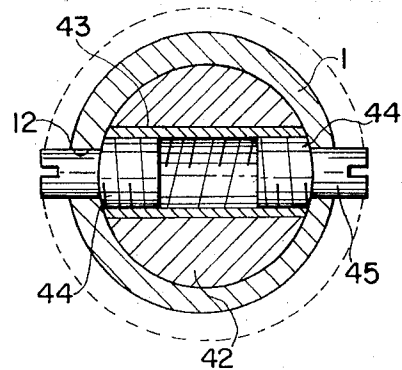


FIG. 7

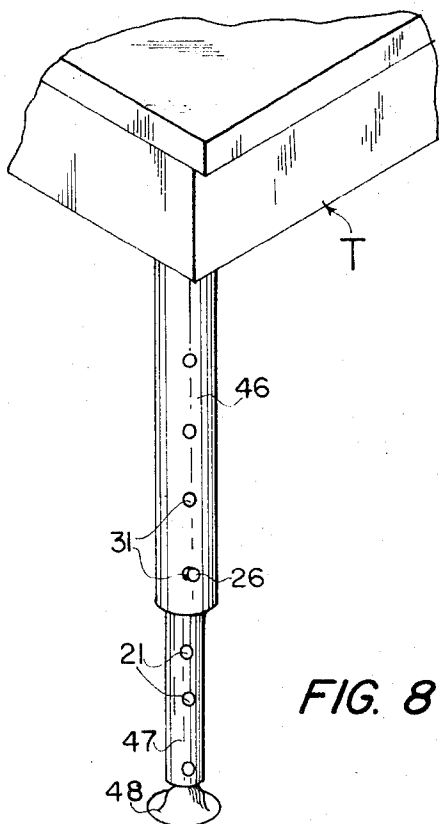


FIG. 8

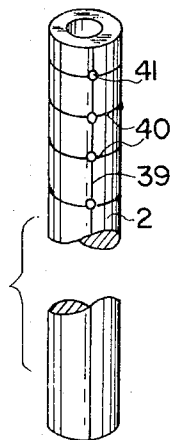


FIG. 9

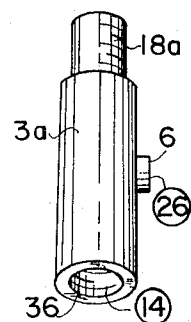


FIG. 10

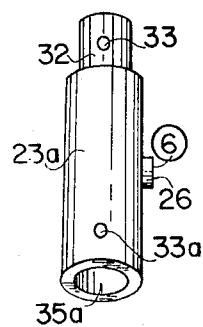


FIG. 11

QUICK-ACTING RELEASABLE TUBE CONNECTORS

BACKGROUND OF THE INVENTION

At the present time there is a great need for a connector for telescoping tubes which can be rapidly and reliably interconnected and disconnected, for use in building up items such as those commonly transported by automobile. Among these may be mentioned bicycles, tricycles, invalid chairs, walking aids, ski poles and other athletic devices, tripods, and like items. While attempts have been made to provide reliable connector means of the type stated, by which such articles may be quickly taken down into a number of easily-loaded transportable parts, and rapidly re-assembled for use, without special tools, such means have heretofore been either excessively complicated and costly to manufacture, or unreliable in operation by reason of parts becoming loose or disconnected during use, and permitting undesired and perhaps dangerous collapse.

SUMMARY OF THE INVENTION

It is the basic purpose of this invention to provide connecting means for telescoping tubes, in particular tubes of aluminum or magnesium, and which are quickly and easily operated to interconnect relatively short lengths of tubing in axial alignment, to form or build up articles of common use.

While as will subsequently appear, the invention is readily adapted to the formation or building up of take-down articles over a wide range of use, it is of particular utility in connection with canes, crutches and similar items.

Thus a principal object of the invention is to provide coupling or connector means by which relatively short tubular and telescoping parts may be readily, positively and reliably interconnected and formed into attractive and useful articles.

Another object is to provide tube connecting means as aforesaid, which can be assembled and taken down, as desired, without tools or with only a simple tool such as a screwdriver and which, once assembled into a unitary instrument, can be relied upon to hold but, at the same time can when desired be as easily taken down into a compact and readily-transportable group of parts or elements.

A further object is to provide a tube or rod connection in which the assembled elements form a utility such as a crutch, a table, chair or the like, having a strength and rigidity comparable to a prior art utility made by welding, screw threading, soldering, sweating and like well known means of permanent connections.

Another object is to provide means for axially and positively interconnecting two tubular telescoping sections or objects, in any selected one of a large number of relative positions.

Still another object is to provide tube or rod connecting means as aforesaid, which can be made up from simple and readily-obtainable tubing, rods, screws and springs, and which can be produced with a minimum of machining, tapping, threading, or like mechanical procedures.

A further object is to provide a connection for tubular or rod-like elements which can be interchanged and assembled for different uses or purposes such as table and chair legs, bar stools, curtain rods, clothes rods, flag poles, handles, and wherever an elongated item is

required of variable and extensible lengths, and positively held in the selected length adjustment and arrangement of parts until manually released.

Other objects and advantages of the invention will become apparent to those skilled in the art, after a study of the following disclosure in connection with the accompanying drawing. While the invention will be described as for the interconnecting of tubular parts, it is also useful for connecting an outer tube with a rod of wood or metal telescopically fitting therein, or as a coupling uniting the ends of two tubes.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a view in longitudinal section, of one form of tubular connecting means embodying the invention;

FIG. 2 is an exploded perspective showing a plug connector of the type used in FIG. 1, provided with means by which it may be readily axially adjusted within its tube, to any selected one of a number of positions axially therealong, then positively but releasably locked in such position;

FIG. 3 is a view in longitudinal axial section of another form of tubular connecting means embodying the invention;

FIG. 4 is an exploded perspective view of a connector plug using the form shown at FIG. 3 and provided with means by which it may be adjusted within its tube to a selected one of a number of axial locations;

FIG. 5 is a perspective view of a walking aid such as a cane equipped with the invention;

FIG. 6 is a side elevation showing two telescoping tubes embodying the invention, with the inner one provided with guide markings or lines which facilitate relocation thereof into a different position of selected adjustment;

FIG. 7 is a transverse sectional view showing how two tubes may be interconnected by two holding screws to afford greater strength in tension or compression when that is needed;

FIG. 8 is a perspective view showing a chair seat or table provided with legs embodying the invention;

FIG. 9 is a perspective view of an inner tube showing in greater detail the locating lines or markings thereon as in FIG. 6;

FIG. 10 is a perspective view of a connector plug for coupling together the ends of two tubes by means of externally and internally threaded ends, respectively; and

FIG. 11 is a view corresponding to FIG. 10 showing a similar plug utilizing pinned ends.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, an outer tube 1 shown as cylindrical but which may have other regular geometrical cross sectional form such as square, hexagonal or elliptical, slidable and telescopically fits about an inner tube 2. The tubes are shown as metallic such as aluminum or magnesium. Within inner tube 2 slidably fits a plug or plunger 3 shown as a section of solid rod and having a diametrically extending threaded hole 4 within which a holding screw 5 engages. See also FIG. 2. The screw has a smooth coaxial outer end 6 of reduced diameter provided with a slot which may receive an ordinary screw driver, a Phillips head driver or an Allen wrench.

The axial dimension of the reduced end 6 is at least equal to the combined radial wall thicknesses of tubes 1 and 2. Further, it forms with the body of the screw,

an annular shoulder as indicated at 7, FIG. 2. It will also be noted from FIG. 1 that the lengths of holding screw 5 and threaded hole 4 are so related that when the screw is fully turned into plug 3 from the position shown, head 6 clears or is flush with the right end of hole 4 or, if desired, inset a short distance inside the hole. Although not indispensable when as shown, plug 3 is discrete from inner tube 2, a hole 8 is disposed in the wall of tube 2 diametrically opposite the one occupied by head 6, and is enlarged to allow screw 6 to freely pass or slide therethrough. This is a convenience in assembly.

Plug 3 has an axially-extending tapped bore receiving a set screw 9, the end of which may engage and fix holding screw 5 against turning. A fiber, plastic or neoprene washer 10 is sized for a frictional fit within outer tube 1 and acts to afford a degree of resistance to sliding of tube 2 and plug 3 in and along tube 1, as well as to prevent loose play of tube 2 within tube 1. A lock nut 11 threaded on screw 9 holds the washer or disk in position and also provides frictional resistance to turning of screw 9.

FIG. 1 shows the two tubes 1 and 2 adjusted to have a minimum overlap. Outer tube 1 has a number of axially-spaced radial holes in and through its walls, each sized to receive head 6 with a smooth accurate fit as shown at 12. A second one of these holes is identified at 12a. The number and spacing of the holes is a matter of choice and selection depending upon the intended purpose of the instrument with which the invention is related. Preferably as subsequently explained, the spacing of holes 12, 12a, etc., bears a certain relation to the spacing of the locating holes in tube 2.

Assuming the two tubes 1 and 2 separated initially, the user takes a plug 3 and after turning its holding screw 5 to make sure that its reduced end 6 is at least flush with hole 4, inserts the plug into tube 2 and slides and turns it until end 6 registers with a hole through the wall thereof. Then he inserts a screw driver through the hole and turns the screw outwardly until its head fits but does not protrude from the hole. This locks together and unites tube 2 and plug 3. Next he inserts the parts into outer tube 1 and by sliding and rotation thereof, locates head 6 in registration with one of the holes such as 12, in the wall of tube 1. Then using the screwdriver he backs screw 5 out further until its head fits into the selected hole in the outer tube. Thus the parts are locked together positively and firmly. If desired, set screw 9 can be turned down to bind holding screw 5 in position.

In the final outward position of screw 5, its shoulder 7 abuts the annular area about the hole in the wall of tube 2. This not only forms a very convenient way of locating the screw in final desired locking position, it also creates friction between the screw and tube and thus frequently makes it unnecessary to resort to turning down of set screw 9. It also creates a thrust on the aforesaid area of the inner wall of tube 2 and thus slightly distorts it at that location and helps to assure a snug tight fit between the tubes, it being understood that when screw 5 is again turned in to release position, the natural resilience of the metal of the tube causes it to resume true circular cross section. In the locking position shown, the end of head 6 will be essentially flush with the outer wall of tube 1.

When a different relative axial adjustment of the tubes is desired as, for instance, to shorten or lengthen

the effective length of a ski pole embodying the invention, each leg of a chair or table, or a walking aid, it is merely necessary to turn screw 5 until its reduced end 6 clears the hole such as 12 in tube 1. Then the tubes may be adjusted axially until head 6 registers with a different and selected hole in the tube. Then the screw is backed out as previously described, to positively and firmly lock the tubes in the new position.

A further advantage of the construction just described, and one which is also present in the latch form of the invention presently to be described, is that by forming a number of axially-spaced holes in and through the wall of inner tube 2, a greatly increased number of relative positions of axial adjustment between the two tubes is made possible. For example, if the distance between holes 12, 12a, etc. in outer tube 1 is four inches, and there are a total of five such holes, then by providing only four holes in inner tube 2, with an axial spacing of one inch, a total of twenty (20) adjusted positions are made possible in one-inch steps or intervals. Of course, essentially the same result may be attained by spacing the holes in inner tube 2 by a distance equal to one or several times the distance between the holes in tube 1, plus a fractional distance equal to one such space divided by the pre-selected number of holes in tube 2. For instance where holes 12, 12a, etc. are spaced 4 inches apart, the holes in tube 2 may be spaced 5, 9 and 13 inches from the first one, thus affording a large number of adjustments in one-inch steps.

Thus by making plug 3 adjustable in and along tube 2 to a plurality of positions a total number of adjustments of the two tubes is made possible, equal to xy , where x is the number of holes in tube 1 and y is the number in tube 2.

FIG. 2 is an exploded view showing a modified construction wherein plug 13 may be readily adjusted to a selected location in and along a tube such as 2, FIG. 1. Plug 13 is per se generally similar in function and mode of operation as item 3, FIG. 1, so that it is only necessary to identify threaded diametral hole 4a and holding screw 5 with reduced end 6 and shoulder 7.

However, plug 13 has an axial threaded hole 14 in one end thereof while the other end is provided with a bore defining walls with bayonet joint slots 15 formed to receive the end of an elongated adjusting rod 16 on which only one end is shown. The rod has a transverse pin 17 and has a smooth fit in the bore in plug 13 so that it may be turned to cause the pin to ride in and along the slots thus forming a connection by which, when screw 5 is in the released position, the plug may be axially shifted to any selected position of adjustment. Rod 16 will be of a length suited to the length of the inner tube used.

Threaded hole 14 may be used to receive a set screw 18 with an interposed friction pad of fiber, plastic or neoprene 19 to thereby bind or fix screw 5 in its desired rotational position. Likewise it may be used to receive the threaded end of an adjusting rod 16a in substitution for rod 16.

FIG. 3 shows a second form embodying a quick-attachable connector which does not require a tool to make, break or adjust the connection between tubes. An inner tube 20 has one or a plurality of radial holes 21 spaced axially therealong. A plug 23 which is similar in purpose to item 3, FIG. 1, slidably fits the tube. The plug is diametrically bored as at 24. This bore stops

short of the right end as viewed upon FIG. 3 and is followed by a coaxial bore of smaller diameter thus forming an internal annular shoulder 25.

A latch pin 26 is sized for a smooth fit within the smaller bore in plug 23 and is formed with a central flange 27 having an accurate fit in bore 24. The pin also has a smooth fit within the hole in inner tube 20 and one or more axially-spaced radial holes through the wall of an outer tube 28 which as shown, telescopically fits over and about tube 20. Within bore 24 there is a compression coil spring 29 loosely fitting over the contiguous end of pin 26 and at that end abutting flange 27. The left end of bore 24 is milled with a shallow inside channel or groove to receive the ends of an abutment metal strip 30 which may have a bulge in its central portion for a loose fit within the contiguous end of the spring. Thus the spring acts continuously to urge pin 26 to the right, into the position shown wherein flange 27 engages shoulder 25 and the free outer end of the pin fits registering holes in tubes 20, 28 and thus maintains them locked in a selected position of relative axial adjustment.

In assembly of the plug mechanism, the pin is inserted from the left, into bore 24 to the position shown. Then the spring is emplaced within the bore and the resilient abutment, slightly and temporarily bent, is pushed in until its ends snap into the groove in the walls of bore 24, while the spring is compressed.

The operation will be clear from the foregoing description and is functionally like the form depicted upon FIG. 1. With pin 26 pressed in, plug 23 is inserted into tube 20 and moved axially therein until the pin snaps out through a selected hole 21. Then outer tube 28 is moved over tube 20 and while pin 26 is pressed inwardly, moved axially until the pin snaps into a hole such as 31 therein. This locks the tubes in the selected position of axial adjustment. As in the case of FIG. 1, both tubes may be provided with radial holes through its walls, and their spacing may be coordinated as previously described to provide, for instance, a considerable number of adjustments in steps of one inch, one-half inch or other selected distance.

FIG. 3 also shows how plug 23 may be used to attach thereto an item of utility or decoration such as a handle, a wall bracket, a flange, a ball-and-socket joint, or a universal joint coupling, the foot of a chair or table leg, or other article of furniture, the foot and handgrip of a walking aid, and numerous other items. The plug is formed with an integrally connected axial extension 32 of regular geometrical form in cross section and is pierced with a diametral hole 33 which may be sized to receive a latch pin like 26, or tapped to take a holding screw like 5, FIG. 1. Thus an article such as a handgrip or foot, FIGS. 5 and 8, and having a bore to fit smoothly over the extension may be connected thereto by either the connection of FIG. 1 or that of FIG. 3. This construction also forms a convenient means by which two tubes such as 20 may be connected in axial relation, it being understood that in such case outer tube 28 may be omitted or a short section only employed for reinforcement.

FIG. 4 is an exploded view showing how the embodiment of FIG. 3 is assembled. Since parts thereof may be identical with like parts of FIG. 3, they have been identified by the same reference numerals. In this form the plug 37 is bored from one end to form walls provided with bayonet joint slots 35 similar in purpose to

those such as the one identified at 15, FIG. 2. A tapped axial hole 36 may be formed in the other end for connection to an article of utility or ornamentation, as aforesaid. Such tapped hole may also form a convenient way of adjusting the plug to a new position of adjustment in and along a tube. This is done simply by temporarily threading in one end of an elongated rod 16a.

FIG. 5 shows how the invention may be used in the formation of alternate types of a cane, crutch or like walking aid. One plug such as 23, FIG. 3, is located in the upper end of an outer tube such as 28. A second plug fits and is slidably adjustable along inner tube 20. Its latch pin 26 releasably fits in registering radial holes in the two tubes 20 and 28 to afford an effective and adjustable over-all length precisely suited to the user and his needs. A third plug may be used to detachably and replaceably connect a foot 38 in the lower end of tube 20. While it is contemplated that two diametral sizes of plugs may be provided, one to fit each outer tube and a second to fit each inner tube, this is not necessary because each plug sized to fit the inner tubes may be readily adapted for the inside of an outer tube, merely by a short section of an inner tube having a radial hole in its wall to receive a latchpin such as 26, FIG. 3, or a holding screw such as 5, FIG. 2. Thus only one size of plug is actually required to use in the separable connection of tubular sections of a very wide range of articles of utility. It will be noted from FIG. 3 that the outer end of pin 26 is slightly rounded. This end acts like a cam so that when slightly pressed in with the finger to essentially clear the hole in outer tube 28, the two tubes may be readily adjusted axially either to separate them or to move them to a new position of adjustment wherein the pin snaps into the selected hole in tube 28. After the tubes are separated, the pin may be further manually pressed in to clear the hole in tube 20 thus enabling the plug to be removed or shifted to a new selected position within the tube.

FIG. 6 shows a feature which makes adjustments easy. An inner tube or section such as 2 is milled or otherwise formed with a shallow linear channel 39 extending longitudinally and centrally of each hole therein, and also with a circumferential channel 40, one for each hole. The channels may be filled with a colored enamel to aid ready observation. Thus when the two tubes are to be adjusted to a new axial relative position, the head 6 of holding screw 5 is turned in to release the connection as previously described, and the tubes are moved until the longitudinal line 39 or a circumferential line 40 appears through a hole 12 in tube 1. This positively locates screw head 6 or pin 26, as the case may be, in registration with the selected hole in the outer tube.

The inner telescoping tube section or element shown in previous figures as a metal tube like 2, FIG. 1, may be of wood or plastic. Such a construction is shown upon FIG. 7. It also illustrates the use of two aligned and diametrically disposed holding screws in those cases where extra tensile or compressive strength of the united telescoping elements is desirable or required. In this figure, outer tube 1 may be the same as in FIG. 1. However the inner element 42 is shown as a rod of wood. It may also be of plastic or like material. At selected intervals along its length element 42 is drilled with diametrically-extending holes into each of which is pressed or adhesively secured an internally-threaded

metallic tube section or liner 43 preferably with its ends flush with the surface of the element. Two holding screws 45 are threaded from the respective ends of the liner until their reduced smooth ends 45 are flush with or slightly within the liner. Then the assembly is inserted into outer tube 1 until the ends of the screws register with a selected pair of aligned holes therein. Then a screwdriver is used to back out both screws to the position shown wherein the shoulder formed by the reduced end of each screw, abuts the contiguous inner wall of the tube. This not only provides friction effectively locking each screw in operating position, it also tends to slightly reduce the size of the outer tube along a diameter normal to the axis of the screws and thus prevents or absorbs any play which might otherwise be present between the elements 1 and 42. It will be understood that a selected number of liners 43 may be provided at spaced intervals axially along element 42. Also a number of pairs of holes in and axially spaced along tube 1, such as the one indicated at 12, 12a, FIG. 1, are contemplated, with spacings related to the spacing of liners 43, in accordance with the feature described in connection with FIG. 1.

FIG. 8 shows one leg of a table or chair T embodying the invention and utilizing outer and inner combined tubular parts 46, 47 interconnected by pin 26 for a selected effective length. A foot 48 may also be detachably connected with inner tube 47 by the releasable connection depicted upon FIGS. 1 or 3. Of course, while the choice of the connection shown upon those figures will depend upon the particular use or purpose of the article, both are eminently satisfactory and reliable. Each may be made as strong and rigid as the situation requires; and each is operative under adverse conditions of stress and vibrations.

FIG. 9 shows in greater detail the feature of locating and positioning lines 39, 40, as applied to an inner tube such as 2. While upon FIG. 8 the holes 21 and 31 are exposed for clarity of illustration, they will usually be located at 180° rotation from the position shown and thus be less conspicuous where improved appearance is a factor.

In FIG. 10 is shown a modification 3a applicable to the plugs 3, 13 and 23 wherein there is an integral threaded extension 18a at one end of the plug and an axial threaded bore 36 at the other end, serving thereby to connect two tubes together when they are installed in the ends of tubes by one of the latching means previously described.

FIG. 11 shows a modification similar to FIG. 10 but having a smooth integral reduced extension 32 at one end with diametral hole 33 for a locking pin, and a bore 35a at the other end with transverse hole 33a for a second locking pin. Since one form may be placed at one end of a tube and another plug reversed with the other form exposed at the opposite end of the tube, they serve to unite two, or a series of tubes in axially aligned connection. A second tube can be placed over the joint between the tubes thus connected, for reinforcement if desired.

The foregoing description is to be taken in an illustrative rather than a limiting sense, for the invention has a very wide range of usefulness, limited only by the skill and imagination of the designer.

I claim:

1. Apparatus comprising inner and outer telescopically interfitting tubular sections having a common lon-

gitudinal axis, said outer section having a plurality of regularly- and axially-spaced radial holes in and through its walls, said inner section also having a plurality of axially-spaced radial holes in and through its walls and spaced differently from the spacing of the holes in said outer section, all said holes being the same diametral size, a plug entirely fitting within and axially adjustable in and along said inner section, bayonet slot means formed on one end of said plug, said plug having a bore extending diametrically thereacross, generally cylindrical latch means movably fitting within said bore and having an outer end of reduced diametral size to smoothly fit within and extend through any selected registering pair of radial holes in and through said sections, said reduced outer end forming an annular shoulder with the body of said latch means, actuating means within said bore operable to move said latch means radially outwardly along said bore, from a first position entirely within said plug, outwardly to a second and latching position with its reduced end extending through any selected registering pair of holes in said sections and in registration with said bore, to thus releasably lock said sections in selected telescopic relation, and abutment means cooperating with said shoulder on said latch means, positively limiting radially outward movement thereof in said second position.

2. The apparatus of claim 1, said bore being reduced in diametral dimension at its end adjacent said first-named shoulder to thereby define a second annular shoulder abutment means, to contact said first-named shoulder when said latch means is in second position.

3. The apparatus of claim 1 said bore being threaded, said latch means being a holding screw engaging the threads of said bore and of larger diameter than the holes in said tubular sections, turning of said screw outwardly to second position causing said annular shoulder to abut the perimeter of the selected hole in said inner tubular section.

4. The apparatus of claim 1, said generally cylindrical latch means having an integral axial extension of reduced diameter within said bore, and extending oppositely from said reduced outer end thereof, and a coil spring within said bore encompassing said axial extension and urging said latch means radially outwardly to second and latching position.

5. In combination, a first tubular section, a second tubular section telescopically and axially slidably fitting about said first section, a plug discrete from and slidably fitting within said first section for axial adjustment to any selected position therealong, bayonet slot means formed on one end of said plug, latch means movable in and along a diametral bore formed in said plug, and operating means in said bore, operable to move said latch means in and along said bore, outwardly into any selected registering pair of a plurality of regularly and axially spaced apertures formed in and through the walls of said sections, to thereby releasably lock said sections together in a selected one of a plurality of axially-related positions, the axial spacing of the apertures in one section differing from the spacing of the apertures in the other said section.

6. The combination of claim 5 said latch means comprising a smooth cylinder having an outer end of reduced diametral size and forming with said cylinder a first annular shoulder, the contiguous end of said bore being of reduced diameter to form a second shoulder, said shoulders abutting when said reduced outer end of

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said cylinder projects into a selected registering pair of apertures in said tubular sections to thereby positively prevent further outward movement of said cylinder, said operating means comprising a coil spring engaging and urging said cylinder into outward limiting position wherein said shoulders abut.

7. The combination of claim 5, wherein said bayonet joint slot means formed on one end of said plug is adapted to engage with a rod to be inserted axially into said inner section from one end thereof and constructed and arranged for detachable connection with said bayonet joint slot means of said plug so as to adjust the same axially in and along said first section.

8. The combination of claim 5, said first section being formed with an indicating line extending longitudinally thereof and in registration with each aperture therein, and circumferential indicating lines in intersecting relation with each said aperture, respectively.

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9. The combination of claim 5, said latch means comprising a first screw having an outer end of reduced diameter sized for a smooth fit in and through any selected pair of said registering apertures in said first and second sections, said operating means comprising threads on the wall of said bore, and in engagement with the threads of said screw, there being slot means formed in the reduced-diameter outer end of said screw, for engagement with a screwdriver adapted to be inserted through the selected registering pair of apertures in said tubular sections.

10. The combination of claim 9, the reduced outer end of said first screw forming therewith an annular shoulder, said shoulder engaging the perimeter of any selected aperture in said first section, to thereby positively limit outward movement of said first screw relatively to said sections.

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