April 16, 1968 C. E. GREELEY 3,377,765

SECTIONAL POLE ANTENNA AND PARTS THEREFOR

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Fig. 1

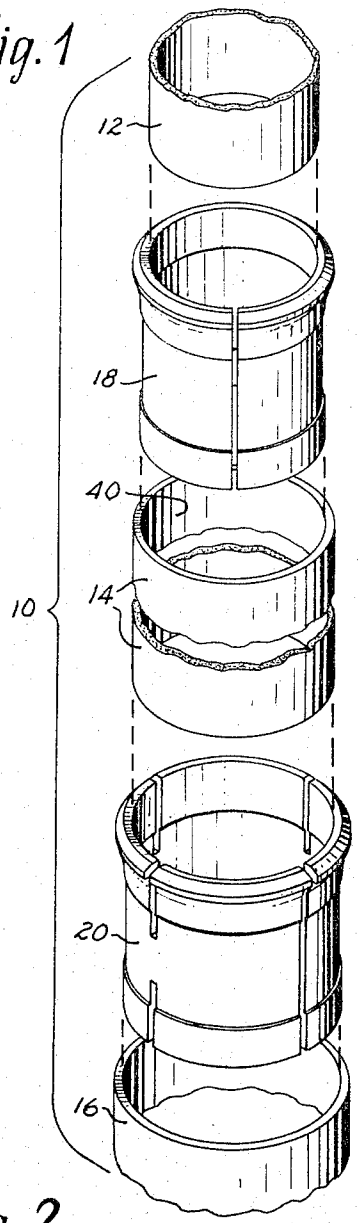


Fig. 4

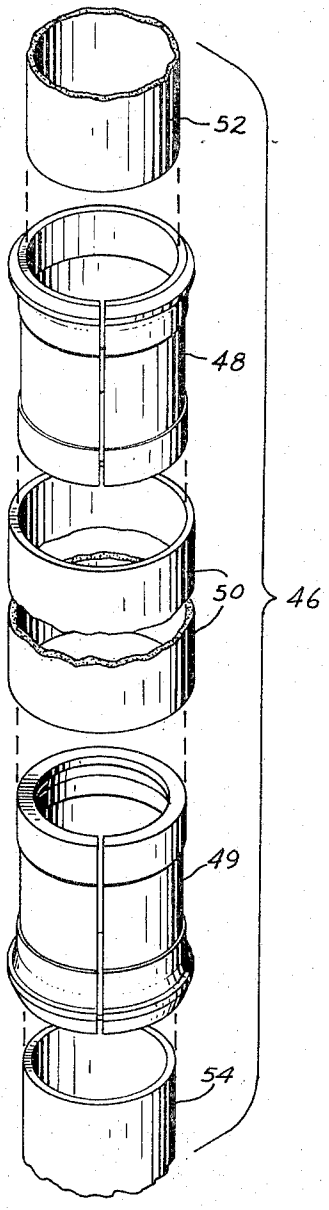
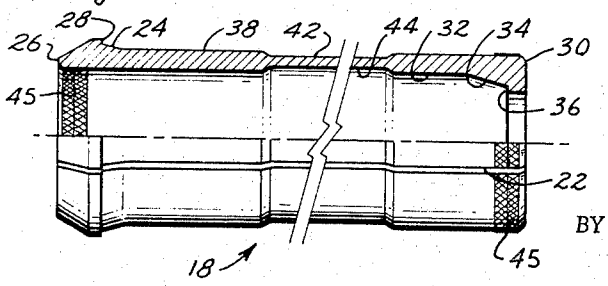


Fig. 2



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SECTIONAL POLE ANTENNA AND PARTS THEREFOR

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Fig. 5

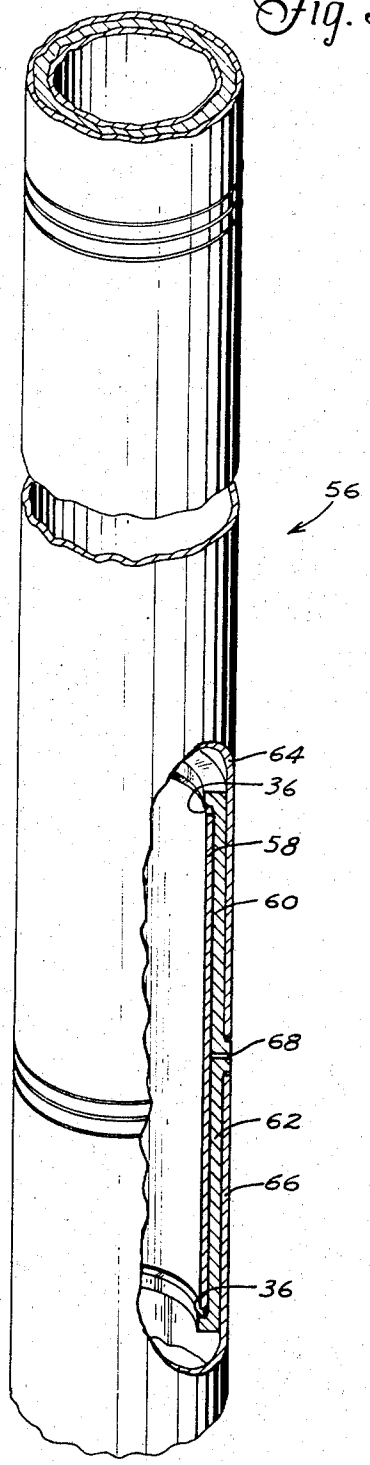


Fig. 6

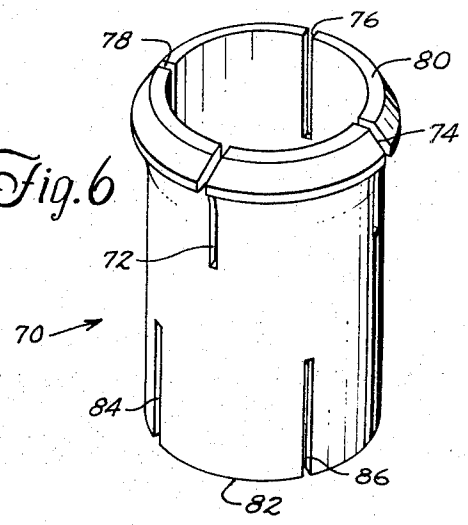


Fig. 3a

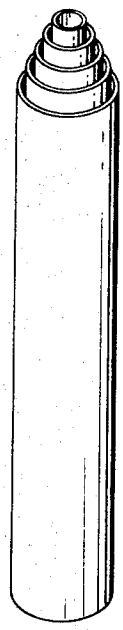
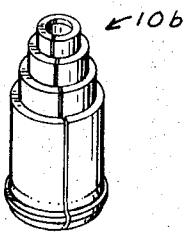


Fig. 3b



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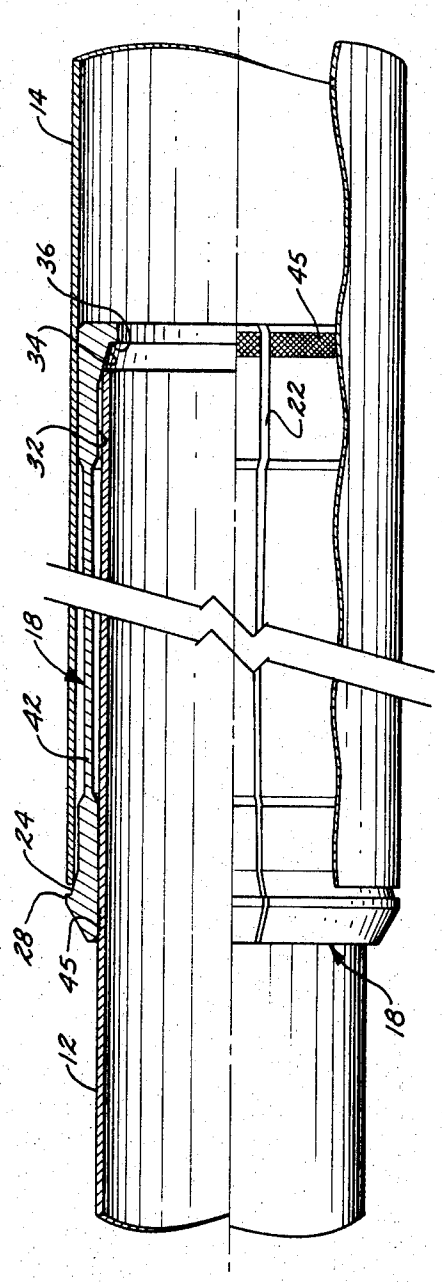
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Fig. 7



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3,377,765

SECTIONAL POLE ANTENNA AND PARTS THEREFOR

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12 Claims. (Cl. 52—726)

ABSTRACT OF THE DISCLOSURE

A sectional pole comprising tubular sections that are frictionally joined together by pole couplers, each of which includes a resilient sleeve having one or more slots adjacent its ends to permit expansion or contraction thereof. One end of each sleeve has an outwardly tapered portion on the outer surface thereof, and the other end of each sleeve has an inwardly tapered portion on the inner surface thereof. The sleeve is adapted to receive externally a first tubular pole section at the one end and to receive internally a second tubular pole section at the other end, whereby the contraction of the one sleeve end by the external tubular pole section and the expansion of the other sleeve end by the internal pole section serve to frictionally interlock the pole sections and the coupler.

This invention relates to sectional poles and parts therefor and, more particularly, to extensible and retractable poles and a member for coupling adjacent pole sections.

There are many applications for extensible and retractable poles which can be rapidly and easily extended and retracted over a wide range of heights. Portability of such poles is also very desirable and, to provide satisfactory portability, it is necessary that the pole be sufficiently strong and durable to withstand its intended use and, in its retracted position, be compact and light in weight. Possible uses for such a pole are numerous, a few examples of which are: antenna masts, boat masts, sailboat spinnaker booms, masts and booms for cranes, flagpoles, lamp posts, and large tent poles.

Accordingly, it is one object of this invention to provide an improved sectional pole which may be rapidly and easily erected, extended, and retracted.

It is another object of this invention to provide an improved sectional pole which is compact, portable, durable, light in weight, and has sufficient strength to support intended applied loads.

It is a further object of this invention to provide a coupler for joining adjacent pole sections which coupler need not be precision-formed and which effectively interlocks adjacent poles without any play between the poles and the coupling member.

These and other advantages will be apparent and better understood from the below specification and accompanying drawings in which:

FIGURE 1 is an exploded perspective view of a plurality of sections of a pole formed in accordance with a first embodiment of this invention;

FIGURE 2 is a quarter section of a pole coupler formed in accordance with this invention;

FIGURES 3*a* and 3*b* are perspective views of the pole of FIGURE 1 shown disassembled with the pole sections and adapter sleeves, respectively, stacked for storage;

FIGURE 4 is an exploded perspective view of a plurality of sections of a pole formed in accordance with a second embodiment of this invention;

FIGURE 5 is a cutaway perspective view of a constant diameter sectional pole formed in accordance with a third embodiment of this invention;

FIGURE 6 is a perspective view of a modified pole coupler formed in accordance with this invention; and

FIGURE 7 is a quarter section of an assembled pole coupler and frictionally interlocked internal and external pole sections in accordance with a first embodiment of this invention.

Briefly stated, this invention, in one form, comprises a sectional pole formed of a plurality of interlocking, tubular sections frictionally joined together such that the pole can be easily assembled and disassembled. The pole coupler or adapter sleeve serves to frictionally interlock two adjacent pole sections or tubular members having different diameters, the coupler fitting within the annular space defined by the pole members when they are placed in an overlapping, telescoping position. The external surface of one end of the coupler and the internal surface of the other end of the coupler are provided with a tapered collar. Slots extending through the coupler wall are provided at each end of coupler to permit expansion and contraction of the ends of the coupler.

To assemble the sectional pole, a pole member of smaller diameter is inserted within the coupler such that it is received by almost the entire length of the coupler whereupon the end of the pole member abuts against the internal tapered collar effecting partial expansion of that end of the coupler. Another pole member of larger diameter is fitted over the coupler completely enveloping almost the entire length of the coupler and abutting against the end having the tapered collar on the external surface thus effecting partial contraction of that end of the coupler. The expansion of one end caused by the internal pole forces the coupler against the external pole while the contraction of the other end caused by the external pole forces the coupler to frictionally engage the inner pole thus providing a frictional interlock between the two pole members. The number of such sections assembled is determined by the length of pole required.

As will be explained in greater detail below, the pole can be designed so that the diameter fits the need. For example, the diameter is continually reduced from one end toward the other or it can be constant throughout the length of the pole or it can taper from the center toward both ends. Furthermore, by the proper choice of materials, the pole can be rendered electrically conductive or electrically nonconductive, as desired.

Adverting now to the drawings and, more particularly to FIGURES 1 and 2, there is illustrated an exploded view of a portion of a sectional pole 10 and the parts thereof. The sectional pole 10 is formed of a plurality of individual pole sections, only three of which are shown at 12, 14, 16, and a plurality of pole couplers or adapter sleeves, only two of which are shown at 18, 20, and one (18) of which is shown in quarter section in FIGURE 2. The adapter sleeve serves to frictionally interlock two adjacent pole sections in a manner which can be easily assembled and disassembled. It is understood that the number of individual pole sections and sleeves employed is dependent upon the length of the assembled pole desired and upon the length of the individual pole sections, such as pole sections 12, 14, 16.

FIGURE 2 illustrates one adapter sleeve 18. Since the adapter sleeves, for example sleeves 18 and 20, are identical except for dimensions, the description of adapter sleeve 18 will suffice to describe all of the adapter sleeves used in sectional pole 10. The adapter sleeve 18 is formed as a generally tubular member having a longitudinal slot 22 through the wall 23 thereof and extending the full length of the sleeve 18. A collar 24 is integrally formed on one end 26 of the sleeve 18 and is tapered in the direction toward the longitudinal center of the sleeve 18. The tapered collar 24 provides a surface against which a pole

section, such as pole section 14 which is externally received by the sleeve 18, abuts and tends to ride up on. Because the sleeve 18 is slotted, the radially inwardly directed force of the pole section 14 on the collar effects contraction of that end 26 of the sleeve 18. A limiting flange or abutment 28 is provided at the maximum diameter end of the tapered collar 24 to serve as a stop for longitudinal movement of the pole section 14 with respect to the sleeve 18 to prevent the pole section 14 from sliding completely over the sleeve 18 when excessive forces are applied to the pole 14.

At the other end 30 of the sleeve 18, the sleeve's inner surface 32 is formed with a portion or collar 34 tapered toward the longitudinal center of the sleeve 18. The tapered collar 34 serves as a ramp to effect expansion of the end 30 of the sleeve 18 when a pole section, such as pole section 12, is received internally by the sleeve 18 and rides up on the tapered collar 34. A limiting flange or abutment 36 is provided at the minimum inside diameter end of the collar 34 to limit the longitudinal movement of the internally received pole 12 for the same reason as discussed above.

In order to reduce interference between the outer surface 38 of the sleeve 18 and the inner surface 40 of the pole section 14, when the sleeve 18 is inserted into the pole section 14, the sleeve 18 is provided with a reduced outside diameter or relief in the central region of the sleeve 18 for a major portion of its length, as is illustrated at 42. This reduced diameter will minimize the tendency for the externally fitting pole section 14 to bind with the outer surface 38 of the sleeve 18. For the same reason, the internal diameter of the central portion of the sleeve 18 is enlarged as shown at 44, thus minimizing the friction between the internally fitting pole member 12 and the inner surface 32 of the sleeve 18.

As shown in FIGURES 1 and 7, the sleeve 18 is used in the following manner to couple together two hollow pole sections 12, 14. The inside diameter of one of the pole sections, in this case pole section 14, is less than the diameter of the collar 24 and greater than the outside diameter of the sleeve 18 in the central region thereof. The adapter sleeve 18 is fitted within the pole section 14 by inserting the end 30 remote from the externally tapered end 26 into the pole section 14 until the end of the pole section abuts against the tapered collar 24. A second pole, 12, having an outside diameter greater than the diameter of the tapered collar 34 and less than the inside diameter of the sleeve 18 in the central region thereof, is then inserted into the sleeve 18 commencing at the end 26 remote from the internally tapered end 30. The internally received pole section 12 is inserted until the end of the pole abuts against the internal collar 34. Force is now applied on both pole sections 12, 14 in a direction toward the sleeve 18 causing the outer pole section 14 to ride up on the outside collar 24 effecting partial contraction of the sleeve end 26 and causing the inner pole section 12 to ride upon the inside collar 34 effecting partial expansion of the sleeve end 30 (see FIGURE 7). Applying the force after both pole sections 12, 14 are in place will minimize the friction between the pole sections and the sleeve 18 during assembly. Since the end 30 is adjacent to the internal surface of pole section 14 and the end 20 is adjacent to the external surface of pole section 12, the pole sections 12 and 14 are held together by the frictional gripping of the sleeve 18 caused by the expansion of the one end 30 and contraction of the other end 26 of the sleeve. In the event the assembled pole sections 14, 12 are overloaded, the ends of the pole sections will be refrained from sliding over or through the sleeve 18 by the limiting flanges 28, 36, respectively.

It will be readily understood from the foregoing description that, by providing the adapter sleeve 18 with an outside diameter adjacent one end gradually decreasing toward the longitudinal center thereof and an inside diameter adjacent the other end gradually increasing toward the longitudinal center thereof, the sleeve 18 will be contracted at the one end by the external pole section 14 and expanded at the other end by the internal pole section 12, thereby frictionally interlocking the pole sections and the sleeve.

To increase the gripping effect of the adapter sleeve 18 the inner surface at the end 26 and the outer surface at the end 30 can be provided with a roughened or knurled surface 45 which will firmly grip the surface of the pole adjacent thereto.

The materials employed for the pole sections and sleeves will vary depending upon the intended use of the assembled sectional pole 10. For example, if the sectional pole is intended for use as an antenna mast it is desirable to electrically isolate the mast from the antenna. This can be accomplished by fabricating the upper portion of the mast, the base portion of the mast, the sleeves, or other portions from an electrically nonconductive material such as a natural or synthetic resin. The use of such materials is attractive from the weight and economic point of view since each of the parts involved can be easily molded by either extrusion or injection molding processes. Examples of various types of synthetic resins which can be used are polyvinyl chloride, polypropylene, acrylo butadiene styrene, to name only a few. It is necessary that the sleeve 18 be resilient in order to permit the ends 26, 30 to return to their original size when disassembled. All of the above materials provide this resiliency.

If the sectional pole is intended for use as an antenna, it is necessary that the poles and sleeves are fabricated from a conductive material such as aluminum tubing. Because of the manner of interlocking provided by the sleeve 18, the sleeve, in addition to serving as a pole coupler, also serves as an electrical coupler or connector between adjacent poles.

The length of the individual pole sections 12, 14, 16, and sleeves 18, 20, depend upon the storage and portability requirements, the material from which they are fabricated, and intended or foreseeable applied loads. Therefore, these dimensions are tailored to specific applications of the sectional pole 10.

It can be seen that by constructing a sectional pole 10 in this manner, the pole will continually taper from one end to the other since the outside diameter of one section is less than that of the adjacent section by the amount of the combined wall thickness of a pole and adapter sleeve. The assembled structure will, therefore, resemble a truncated slender cone (not shown). By constructing a pole in this tapered fashion, it will tend to be more stable than a pole of constant diameter since the center of gravity is located approximately one-third the height of the pole measured from the larger end rather than at the longitudinal center of the pole. Another advantage is that a sectional pole of tapered form permits telescopic storage of the individual members, as may be seen in FIGURES 3*a* and 3*b*, where the several poles, indicated as group 10*a*, are stored concentrically within one another and where the adapter sleeves, indicated as group 10*b*, are similarly located concentrically within one another. This permits compact storage of the sectional pole 10 and facilitates the portability thereof.

A modification or second embodiment of this invention is illustrated in FIGURE 4 wherein a sectional pole 46 is formed from a set of uniformly sized adapter sleeves and two sets of pole sections, one set having an inside diameter corresponding to the outside diameter of the sleeves and the other set having an outside diameter corresponding to the inside diameter of the sleeves. The adapter sleeves, two of which are shown at 48 and 49, are structurally identical to that described in the first embodiment and illustrated in FIGURE 2. The diameter of the set of larger pole sections, represented by pole section 50, is slightly larger than the outside diameter of the sleeves to permit inserting the sleeves in the pole sections, however, it is smaller than the diameter of the external

tapered collar 24 to effect the sleeve contraction discussed above. The outside diameter of the set of smaller pole sections, represented by pole sections 52, 54 is slightly smaller than the inside diameter of the sleeves and larger than the diameter of the internal collar to effect the sleeve expansion discussed above.

The sectional pole 46 is assembled by inserting adapter sleeves 48, 49 within each end of the pole section 50. As can be seen in FIGURE 4, the sleeves 48, 49 are oriented in opposite directions in order to permit insertion in each end of the pole section 50. Pole sections 52, 54 of smaller diameter are then inserted within the adapter sleeves 48, 49, respectively. To lengthen the sectional pole 46, another adapter sleeve (not shown) is externally mounted over the exposed end of one of the smaller pole sections 52, 54 and another larger pole section (not shown) is then slipped over the adapter sleeve. This series arrangement is continued until a sectional pole of proper length is constructed. It can be seen that the diameter of the pole will alternate in series arrangement between two diameters, i.e., the diameter of the larger pole 50 and the diameter of the smaller poles 52, 54.

This second embodiment simplifies the manufacture of the several parts that comprise the sectional pole 46 as contrasted with the first embodiment of FIGURE 1 since, in the second embodiment, only two pole section sizes and only one sleeve size need be produced.

FIGURE 5 illustrates a third embodiment of this invention which comprises a constant diameter sectional pole 56. The sectional pole 56 is identical to the sectional pole 46 illustrated in FIGURE 4 with the exception that the smaller diameter pole section, identified as 58 in FIGURE 5, has a length twice the distance from the inner surface of the interior limiting flange 36 to the end face 59 of the adapter sleeve remote from the interior limiting flange 36. As may be seen in FIGURE 5, by restricting the length of the smaller pole section 58 in such a manner, the oppositely directed adapter sleeves 60, 62 which are externally mounted over each end of the pole section 58, approach each other and, when sufficient load is placed upon the sleeves such that the inner pole section 58 abuts against the limiting flange 36, the adapter sleeves 60, 62 will actually abut against each other. The larger pole sections 64, 66 are fitted externally over the adapter sleeves 60, 62, respectively, thus establishing the outside diameter of the sectional pole 56 except for the annular space 68 formed between the adjacent sleeves 60, 62 when the force applied to the pole section is insufficient to cause the inner pole 58 from abutting the interior limiting flanges 36. The width of the annular space 68, however, is so small it can be considered insignificant.

Referring now to FIGURE 6, there is illustrated a modification of the adapter sleeve. Instead of providing the adapter sleeve with a slot that extends the entire length of the sleeve, for example, the slot 22 in sleeve 18 illustrated in FIGURE 2, it is also acceptable to provide the sleeve with a plurality of slots at each end which extend only partially along the length of the sleeve. The adapter sleeve 70 illustrated in FIGURE 6 is provided with four equally spaced apart slots 72, 74, 76, 78 at one end 80 thereof which extend only partially along the length of the sleeve 70. The other end 82 of the sleeve 70 is also provided with four evenly spaced apart slots, only two of which are shown at 84, 86. The two sets of slots can be longitudinally aligned (not shown); however, for greater strength, it is advisable to shift one of the sets with respect to the other, as is illustrated in FIGURE 6 wherein the slots at the end 82 of the sleeve 70 are offset 45° from the slots 72, 74, 76, 78 provided at the other end 80 of the sleeve 70.

Another adapter sleeve modification is shown in FIGURE 6, wherein the longitudinal central portion is not reduced in thickness to provide the reliefs 42, 44 incorporated in sleeve 18 and illustrated in FIGURE 2. The relief is not needed for the sleeve to properly function, however, it is advisable to provide the relief in order to minimize the sliding friction and to prevent binding between the poles and the sleeve when assembling the sectional poles.

The sleeves illustrated in FIGURES 2 and 6 represent suggested specific designs, however, it should be noted that other modifications of these sleeves which are obvious to one skilled in the art are also encompassed by this invention. For example, the combination of the sleeves illustrated in FIGURES 2 and 6 can be employed, that is, a sleeve can be formed with a plurality of slots at each end which extend only partially along the length of the sleeve and another slot, which extends the full length of the sleeve, can be combined therewith. The full length slot allows nonprecision formation of the sleeve since the slot permits sufficient expansion or contraction of the sleeve to enable it to conform to its respective adjacent individual poles sections. The important feature of the sleeve is that the force applied by the individual pole sections to the sleeve effects combined expansion and contraction of the sleeve in order to provide the desired frictional interlock.

It can be seen from the above description and the accompanying drawings that this invention provides a sectional pole which is extendible to any desired length, easily assembled and disassembled and, when disassembled, is compact for storage and conveniently portable. Furthermore, while the pole is light in weight, it has the necessary strength to support the intended applied loads. Another feature of the subject sectional poles is that it may also serve as a conduit since each of the members which comprise the pole is hollow, thereby defining a generally cylindrical passageway along the length of the assembled sectional pole.

In addition to the above advantages, the coupler or adapter sleeve provides sufficient frictional interlock between the adjacent poles as to permit the transmission of torque where desired. For example, when the sectional pole of this invention is used as an antenna mast, it is often desirable to be able to rotate the antenna for directional transmitting or receiving. Use of the knurled surface 45 increases the ability of the sectional pole to transmit torque. Because the sleeve interlocks the adjacent pole sections without any play between the pole sections and the sleeve, the sectional pole has another advantage since it does not generate acoustical or electrical noise often caused by the rattling of the various parts which comprise the assembled sectional pole. An additional advantage of the sectional pole of this invention is the characteristic which permits simple repair in the field. For example, if the pole should fall and any of the sections are damaged, the damaged section can be easily replaced. If one of the individual pole sections is damaged, the pole can be sawed to remove the damaged portion and the remainder of the pole can be used.

While several specific embodiments have been shown and described above, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the invention in its broader aspects. Therefore, it is intended to cover in the appended claims, all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A resilient pole coupler comprising a tubular sleeve having an elongated slot extending radially therethrough adjacent each end of said sleeve, said sleeve having an outside diameter adjacent one end thereof gradually decreasing toward the longitudinal center of said sleeve and an inside diameter adjacent the other end thereof gradually increasing toward the longitudinal center of said sleeve, said coupler being adapted to frictionally receive internally at said one end a first tubular pole section to effect expansion of said one end and to frictionally

receive externally at said other end a second tubular pole section to effect contraction of said other end, whereby said coupler serves to frictionally interlock said pole sections.

2. A pole coupler as defined in claim 1 wherein said one end of said sleeve has a projection extending radially outwardly from the outer surface thereof and wherein said other end has a projection extending radially inwardly from the inner surface thereof, said projections being tapered from a point adjacent said ends toward the longitudinal center of said sleeve and being adapted to be frictionally engaged by said pole sections.

3. A sectional pole comprising a plurality of interlocking sections, each section including

(a) a coupler comprising a tubular sleeve having an elongated slot extending radially therethrough adjacent each end of said sleeve, said coupler having an outside diameter gradually decreasing from a point adjacent one end thereof toward the longitudinal center of said sleeve and an inside diameter gradually increasing from a point adjacent the other end thereof toward the longitudinal center of said sleeve,

(b) a first tubular pole having a first and second end, said first end having an outside diameter larger than the minimum inside diameter of said sleeve, said first end being received internally by said sleeve through said one end thereof and abutting the inner surface of said sleeve near said other end thereof thereby effecting expansion of said other end, said second end of said first pole extending longitudinally away from said one end of said sleeve, and

(c) a second tubular pole having a first and second end, said first end of said second pole having an inside diameter smaller than the maximum outside diameter of said sleeve, said first end of said second pole being received externally by said sleeve initially at said other end and abutting the external surface of said sleeve near said one end thereof effecting contraction of said one end, said second end of said second pole extending longitudinally away from said other end of said sleeve,

said expansion of said other end and said contraction of said one end of said sleeve providing a frictional engagement between said sleeve and said first and said second poles.

4. A sectional pole as defined in claim 3 wherein the wall thickness of said sleeve tapers from a point adjacent each of said ends toward the longitudinal center of said sleeve.

5. A sectional pole as defined in claim 3 including an abutment contiguous to the poiint of maximum outside diameter of said sleeve extending radially outwardly from the external surface thereof to limit the movement of said second pole relative to said sleeve and an abutment contiguous to the point of minimum inside diameter of said sleeve extending radially inwardly from the inner surface thereof to limit the movement of said first pole relative to said sleeve.

6. A sectional pole as defined in claim 3 wherein said slot extends the full length of said sleeve.

7. A sectional pole as defined in claim 3 wherein said sleeve has a plurality of elongated slots extending radially therethrough adjacent each end of said sleeve.

8. A sectional pole as defined in claim 3 wherein the outer and inner surfaces of said sleeve are each provided with a circumferential recess in the longitudinal central portion thereof.

9. A sectional pole as defined in claim 3 wherein the inner surface adjacent to said one end and the outer surface adjacent said other end of said sleeve are each provided with a gripping surface.

10. A sectional pole comprising a plurality of interlocking sections, each section including

(a) a coupler comprising a tubular sleeve having an elongated slot extending radially therethrough adjacent each end of said sleeve, said coupler having an outside diameter gradually decreasing from a point adjacent one end thereof toward the longitudinal center of said sleeve and an inside diameter gradually increasing from a point adjacent the other end thereof toward the longitudinal center of said sleeve,

(b) a first tubular pole having a first and second end, said first end having an outside diameter larger than the minimum inside diameter of said sleeve, said first end being received internally by said sleeve through said one end thereof and abutting the inner surface of said sleeve near said other end thereof, thereby effecting expansion of said other end, said second end of said first pole extending longitudinally away from said one end of said sleeve, and

(c) a second tubular pole having a first and second end, said first end of said second pole having an inside diameter smaller than the maximum outside diameter of said sleeve, said first end of said second pole being received externally by said sleeve initially at said other end and abutting the external surface of said sleeve near said one end thereof effecting contraction of said one end, said second end of said second pole extending longitudinally away from said other end of said sleeve,

said expansion of said other end and said contraction of said one end of said sleeve providing a frictional engagement between said sleeve and said first and said second poles, and

a second and third coupler each as defined in claim 1 wherein said second end of said first pole has an inside diameter smaller than the maximum outside diameter of said second coupler, said second end of said first pole being received externally by said second coupler and abutting the external surface of said second coupler near the point of maximum outside diameter of said second coupler effecting contraction of said second coupler, and wherein said second end of said second pole has an outside diameter larger than the minimum inside diameter of said third coupler, said second end of said second pole being received internally by said third coupler and abutting the inner surface of said third coupler near the point of minimum inside diameter of said third coupler effecting expansion of said third coupler.

11. A sectional pole comprising a plurality of interlocking sections, each section including

(a) a coupler comprising a tubular sleeve having an elongated slot extending radially therethrough adjacent each end of said sleeve, said coupler having an outside diameter gradually decreasing from a point adjacent one end thereof toward the longitudinal center of said sleeve and an inside diameter gradually increasing from a point adjacent the other end thereof toward the longitudinal center of said sleeve,

(b) a first tubular pole having a first and second end, said first end having an outside diameter larger than the minimum inside diameter of said sleeve, said first end being received internally by said sleeve through said one end thereof and abutting the inner surface of said sleeve near said other end thereof, thereby effecting expansion of said other end, said second end of said first pole extending longitudinally away from said one end of said sleeve, and

(c) a second tubular pole having a first and second end, said first end of said second pole having an inside diameter smaller than the maximum outside diameter of said sleeve, said first end of said second pole being received externally by said sleeve initially at said other end and abutting the external surface of said sleeve near said one end thereof effecting contraction of said one end, said second end of said second pole extending longitudinally away from said other end of said sleeve,

said expansion of said other end and said contraction of said one end of said sleeve providing a frictional engage-

ment between said sleeve and said first and said second poles, and

a second and third coupler each as defined in claim **1** wherein said second end of said first pole has an outside diameter larger than the minimum inside diameter of said second coupler, said second end of said first pole being received internally by said second coupler and abutting the inner surface of said second coupler near the point of minimum inside diameter of said second coupler effecting expansion of said second coupler, and wherein said second end of said second pole has an inside diameter smaller than the maximum outside diameter of said third coupler, said second end of second pole being received externally by said third coupler and abutting the external surface of said third coupler near the point of maximum outside diameter of said third coupler effecting contraction of said third coupler.

12. A sectional pole as defined in claim **11** wherein the length of said first pole is substantially equal to twice the length of the distance between said one end of said sleeve to the point of minimum inside diameter of said sleeve and wherein a first end of a third pole is received externally by said second coupler, said third pole enclosing said second coupler and longitudinally projecting beyond said second coupler to provide a sectional pole of essentially constant outside diameter throughout the length thereof.

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