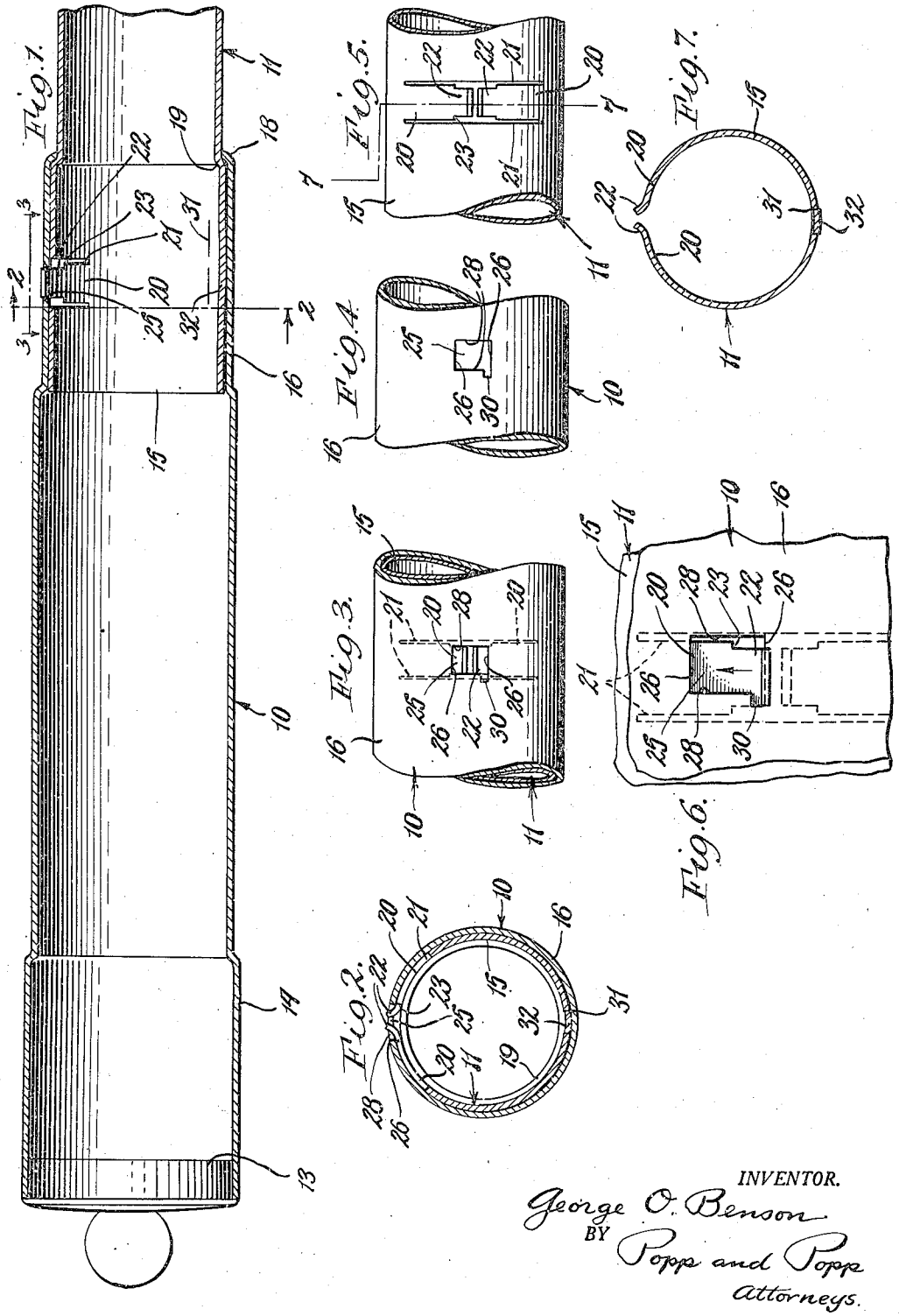
Feb. 15, 1949. G. O. BENSON 2,461,625

TELESCOPIC STRUCTURE

Filed July 26, 1945 2 Sheets-Sheet 1



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TELESCOPIC STRUCTURE

Filed July 26, 1945 2 Sheets-Sheet 2

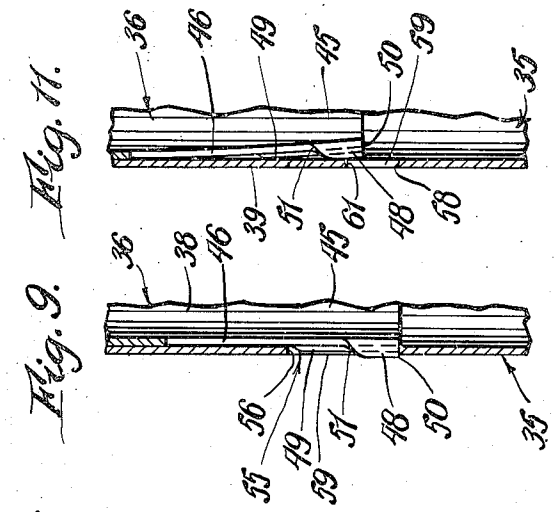


Fig. 11.

Fig. 9.

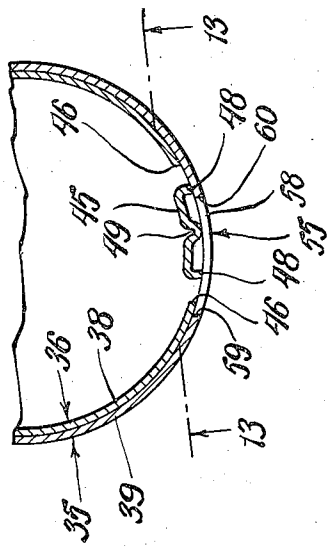


Fig. 12.

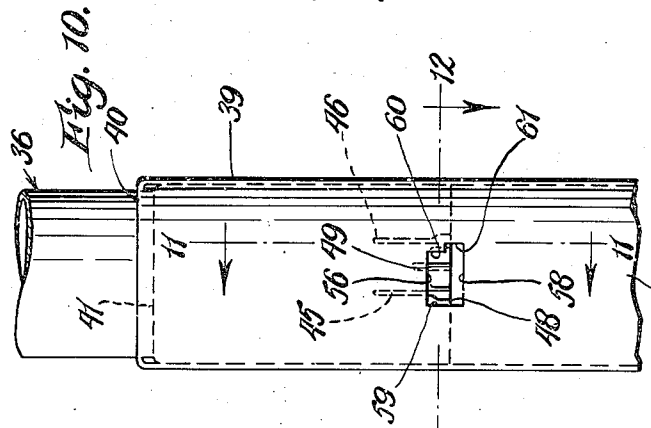


Fig. 10.

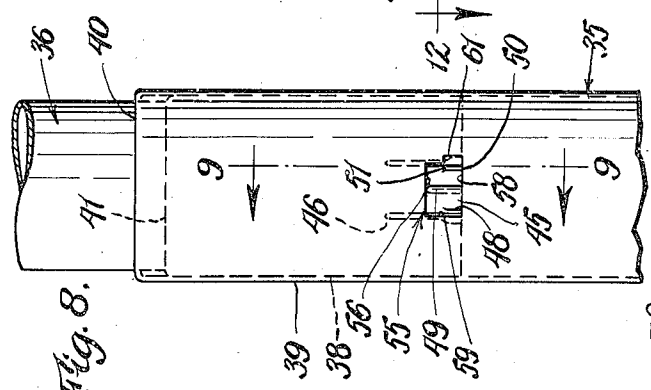


Fig. 8.

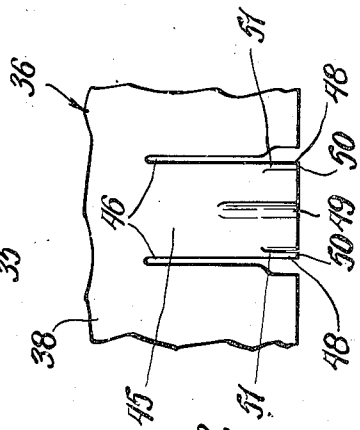


Fig. 13.

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TELESCOPIC STRUCTURE

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Application July 26, 1945, Serial No. 607,213

6 Claims. (Cl. 287—58)

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This invention relates to a telescopic structure and more particularly to such a structure, such as a portable radio antenna, composed of telescoping sections which are nested together and which can rapidly be extended to provide a mast capable of being set up on any mobile or stationary support and used for sending or receiving radio messages. However, the invention is not confined to any particular use and can also be used as a telescopic support to carry signal lights or the like and for other like uses, such as tent poles.

One of the principal objects of the present invention is to provide such a telescopic structure in which the sections can be quickly extended and the several sections quickly latched in their extended positions so that the structure is reliably held in its extended position.

A further object of the invention is to provide such a telescopic section in which the latching means holding the structure extended can be readily released and the several sections nested together without the use of tools.

Another object is to provide such a releasable latch for a telescopic structure in which there is no danger of the accidental release of the latch between any of the sections, the release of the latch requiring an unusual manipulation of the sections which is not liable to occur accidentally.

A further object is to provide such a latch which is strong and reliably holds the sections in an extended position.

Another aim is to provide such a latch which is not liable to be broken in setting up the structure, particularly if the operator uses excessive force in turning the sections relative to one another in effecting either the latching or release of the several sections.

Another aim is to provide such a latch which does not require the addition of any parts to the telescopic structure, the latch being provided by stamping sections out of the ends of the tubes so that the latch is integral with the tubes.

Another aim is to provide such a latch located at a point remote from the zone of greatest strain on the telescopic joint, when the sections are extended, so as to impair the strength of the telescopic joint and structure to the least degree.

Another aim is to provide such a latch which does not require the use of tools to unlatch the telescopic sections.

Another aim is to provide such a structure in which the form of the latch does not interfere with the complete nesting of the several sections

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completely inside thereby to insure that the nested structure is in its most compact form.

Another aim is to provide such a telescopic structure composed of metal tubes in which good electrical contact is insured between the several tubes so that it can be employed as a radio antenna.

Another purpose is to provide such a tubular telescopic structure in which the opposite ends of each section can be brought to the exact diameter required to fit the succeeding sections, thereby to permit of the use of standard tubing in which the tolerances are not maintained sufficiently close to insure a good telescopic fit.

Another aim is to provide such a telescopic structure which is simple and inexpensive in construction and which can be repeatedly extended and nested without objectionable wear or deterioration.

Other objects will appear from the following description and drawings, in which

Fig. 1 is a fragmentary longitudinal section through the base section and next succeeding section of a mast antenna embodying the present invention.

Fig. 2 is a transverse section, taken on line 2—2, Fig. 1.

Fig. 3 is a fragmentary side elevation viewed from line 3—3, Fig. 1.

Figs. 4 and 5 are fragmentary side elevations of the tube ends which are interfitted to form the structure shown in Fig. 3.

Fig. 6 is an enlarged view similar to Fig. 3 and showing another position of the parts to illustrate the particular manipulation required to release the sections from one another.

Fig. 7 is a section, taken on line 7—7, Fig. 5.

Fig. 8 is a view similar to Fig. 3 showing a modified form of the invention.

Fig. 9 is a fragmentary longitudinal section, taken on line 9—9, Fig. 8.

Fig. 10 is a view similar to Fig. 8 showing the parts manipulated to release the latching tongue.

Fig. 11 is a fragmentary longitudinal section, taken on line 11—11, Fig. 10.

Fig. 12 is an enlarged fragmentary cross section, taken on line 12—12, Fig. 10.

Fig. 13 is a fragmentary enlarged side elevational view of the inner end of one of the telescopic sections, this view being taken on line 13—13, Fig. 12.

While the invention is not confined to any particular use, it is shown in the form of the invention illustrated in Figs. 1–7 as embodied in a metal antenna mast which has a tubular base

or enclosing section 10 and which may have a dozen or more tubular metal sections 11 which telescope into one another and into the base section 10 so that in the nested condition of the parts the entire mast is contained within the base section 10. The base section 10 is shown as having a plug 13 for mounting it on any suitable support, this plug being fitted into an enlargement 14 of this base section.

The construction of the joint and latch between each of the several sections 11 is identical to the joint and latch shown between the first section 11 and the base section 10 and hence the description of the joint and latch shown will be deemed to apply to the successive joints of the mast. As shown in the drawings each of the sections 11 is provided with an enlarged end 15 and each of the sections 10 and 11 is provided with a reduced end 16, the enlarged end of each section being fitted in the reduced end of the next succeeding section. By forming the several tubular members 11 with the enlarged and reduced ends 15 and 16, these ends can be brought to the exact tolerances required for snug interfitting in the extended position of the mast regardless of minor variations in the original size of the tubing used. Thus, standard commercial tubing varies in inside and outside diameter to an extent greater than the permissible tolerances for a telescopic mast.

To overcome this variation in the size of a commercial tubing, the enlarged end 15 of each section is expanded into a surrounding die to the exact outside diameter required and the opposite reduced end 16 of each section is contracted around an internal die to provide the exact inside diameter required. The standard tubing used therefore vary substantially in inside or outside diameter but the opposite ends thereof are brought to the exact inside and outside diameter required to secure the necessary snug fit between the several sections when the mast is extended so as to interfit the ends of the several sections, as illustrated in Fig. 1. In this figure, while the enlargements 14, 15 must be substantially greater than the tubing from which they are formed, for a purpose which will presently appear, the contractions 16 at the opposite ends of the tubes are exaggerated and may not even be perceptible, the sole function of these contractions 16 being to bring the tubes to a definite inside diameter regardless of variations in the tube size.

The outer extremity of the reduced end 16 of each section 10 and 11 is rolled over to provide an inwardly extending bead or flange 18, this inwardly projecting bead or flange engaging the annular external shoulder 19 between the body and enlargement 15 of the corresponding section 11 slidingly fitted therein thereby to provide a stop to limit the outward movement of each section relative to its enclosing section. These stops 18, 19 further serve to accurately locate the latch in each section axially with reference to the opening provided in the succeeding section so that no difficulty is experienced in interlatching the several sections. To insure free telescoping of each expanded end 15 through the length of the next outer section and also to permit rolling over the beads 18 to engage the shoulder 19, the adjacent tube sizes should vary by at least four times the wall thickness of the tubes, although the invention is not, of course, limited to these proportions.

The principal object of both forms of the present invention is to provide a simple and sturdy latch at the joint between the several sections which holds the mast extended and which can readily be released so as to permit of nesting the several sections in transporting the mast to another place. A further feature of both forms of the invention resides in the latch being of such character that the sections cannot become accidentally released, the release of each latch requiring a special manipulation of the two connected sections which manipulation is not liable to occur accidentally. A further feature of both forms of the invention is to locate the latch of each telescopic joint remote from the zone of greatest strain where it does not materially reduce the strength of the telescopic joint.

For this purpose, in the form of the invention shown in Figs. 1–7, the enlarged end 15 of each of the sections 11 of the mast has a pair of opposed tongues 20 cut or stamped therein, these tongues being bounded at their sides by spaced slits or slots 21 which are arranged in planes at right angles to the axis of the mast so that the tongues project circumferentially in opposed relation to each other. Each of these tongues is provided with an end 22 of less axial extent than the body portion of each tongue so that each tongue is provided with a square shoulder 23 at each side of its reduced end 22. Also, the reduced end 22 of each tongue is deformed or bent so as to curve outwardly, as best shown in Figs. 2 and 7, and thereby provide an outwardly facing cam face opposing the outer tube.

The reduced end 16 of each of the sections 10 and 11 is provided with a generally rectangular slot 25, this slot having axially extending parallel edges 26 and circumferentially extending parallel edges 28. The circumferentially extending edges 28 are spaced from each other a distance slightly greater than the width of the reduced ends 22 of the tongues but are spaced closer than the enlarged body portions of these tongues. Each of these slots 25 is arranged to register with the tongue 20 of the next succeeding inner section 11 when the corresponding stop bead 18 engages its companion shoulder 19. It will therefore be seen that when any pair of the sections is fully extended so that the enlarged end 15 of one section is fitted in the reduced end 16 of the other section with its shoulder 19 in engagement with the stop bead 18 of this other section, the sections can be rotated relative to each other until the reduced ends 22 of the corresponding pair of opposed tongues 20 snap out into the corresponding slot 25, this position of the parts being illustrated in Figs. 1–3. When this occurs the parts are latched together. Thus, the axial inward movement of the two sections is prevented by the engagement of the corresponding sides of the reduced portions 22 of the pair of opposed tongues with the corresponding circumferentially extending edge 28 of the slot 25, the axial outward movement being prevented by the stop bead 18. Further, if either section is turned in one direction relative to the other section, the extremity of the outwardly curved reduced end 22 of one of the pair of tongues comes into engagement with the corresponding axially extending edge 26 of the slot 25 so as to prevent further turning of the parts relative to each other in that direction. If the two sections are twisted relative to each other in the opposite direction the outwardly curved reduced end 22 of the opposite tongue comes into engagement with the opposite axially extending edge 26 of the

slot 25 so as to prevent further turning in that direction. It will therefore be seen that the several sections of the mast, when so latched by the presence of the outwardly curved ends 22 of the opposed tongues 20 in the slot 25, prevent axial movement of the sections inwardly relative to each other and also permit only a very limited rotative movement of the sections relative to each other so that the several sections are reliably latched together.

It will further be seen that the provision of the pair of shoulders 23 on each tongue by providing the ends 22 of less width than the bodies of the tongues permits the entry of only the reduced ends 22 of the pair of opposed tongues into the slot 25. By this means the operator is prevented from twisting the tongues off in applying too much force in rotating the sections relative to each other either when setting up the mast or when taking it down as hereinafter described. Thus, if the tongues 20 were of uniform width throughout their entire length the sections could be turned until the base of each tongue would engage the opposing axially extending edge 26 of the slot 25 and in this condition the tongue would be extended to a substantial degree and could readily be torn off if an excessive rotative pressure were exerted in the same direction against the two sections. Since only the tips of the tongues are permitted to project into the slot 25, the danger of tearing the tongues off by the application of too great a rotative force is avoided.

As previously indicated, the several sections of the mast are capable of being unlatched and again nested. For this purpose the rectangular opening 25 is provided in one of its corners opposite the stop bead 18 with an axially extending notch 30. This notch can be in either of the corners remote from the stop bead 18 and is of comparatively slight depth and width, it being only necessary that it be capable of receiving the upturned extremity of that tongue 20 which is rotated toward the notch. In unlatching the several sections from the latched condition shown in Figs. 1–3, the operator rotates the two sections so that the outer section rotates in the direction of the arrow shown in Fig. 6 and the inner section rotates in the opposite direction. This draws the advanced tongue 22 out of the opening 25, the curved end of this advanced tongue being drawn into the outer section, as illustrated by dotted lines in Fig. 6, and the extremity of the other tongue 20 being brought against that axial edge 26 of the slot 25 which bounds the notch 30. In this condition the latch is effective, as previously described. However, it will be seen that the notch 30 now permits the two sections to be moved axially relative to each other to the extent permitted by the notch 30. The position of the parts with the outwardly curved extremity of one of the tongues 20 in the notch 30 is illustrated in Fig. 6. In the position of the parts illustrated in Fig. 6, it will be seen that upon rotating the two sections in the reverse direction the tongue extremity caught in the notch 30 will be drawn under the shoulder provided by this notch and hence into the outer section and out of latching engagement with the opening 25. At the same time a slight axial movement is imparted to the two sections so that the extremity of the other tongue does not enter the notch 30 when such rotation of the parts is effected.

It will therefore be seen that the joint between each of the sections is readily unlatched but that this requires a special manipulation of the two sections, this comprising rotating the sections relative to each other so that one of the tongues is brought against that edge 26 of the opening 25 which bounds the notch 30; then moving the two sections axially so as to cause the extremity of the tongue so engaged to enter the notch 30; and then effecting a reverse rotation of the parts with a slight axial movement thereof, so that the tongue extremity so caught in the notch 30 is withdrawn into the outer section and out of latching engagement with the opening 25 therein.

It will be seen that the notch 30 permits of unlatching the sections without the use of tools, this being an important feature of the invention. However, it will be seen that the unlatching could be effected without the notch 30 by pressing that tongue 20 which is effective as a latch inwardly by hand or by a tool such as a knife or screw driver so as to release it from the opening 25. Further, it will be seen that the latch would be effective with only one tongue 20 in which case the sections would be latched against axial movement but could be released by turning the sections relative to each other in one direction but not in the other.

When used as an antenna mast, it is essential that there be good electrical contact between the several sections. To this end the enlarged end 15 of each of the sections 11 can be provided with a pair of parallel slits 31 which form between them a strip 32. This strip is preferably deformed so as to bulge outwardly to a slight extent and it will therefore be seen that when the sections are extended each of the strips presses against the adjacent section to provide good electrical contact between the sections. At the same time this electrical contact strip does not interfere with the manipulation of the sections in erecting or nesting the telescopic structure as previously described. This strip could also, of course, be provided in each contracted end 16 to bulge inwardly and establish electrical contact.

The outwardly curved ends 22 of each pair of tongues 20 project beyond the outside circumference of the tube from which they are formed, and the space provided by the end enlargement of the next succeeding larger tube accommodates this projection of these tongues. This space is provided by the enlargement 14 of the base section 10 and by the enlargements 15 of the other sections 11. When the sections are nested, the curved ends of all of the tongues 20 are arranged in these enlargements 14 and 15 which are sufficiently oversize, as compared with the diameter of the tube sections, to accommodate the same. Hence the provision of the enlargements 14 and 15 in the sections serves the definite function of accommodating the tongues when nested, whereas the contractions 16 provided at the opposite ends of these sections are merely provided so that each section can be brought to the exact inside diameter required for proper interfit with the next succeeding section.

It will also be noted that each latch provided by the tongues 20 and opening 25 is approximately at the axial center of the telescopic joint, that is, at the approximate axial centers of the enlargements 15 and contractions 16. This centered arrangement weakens the telescopic joints to the least degree since the points of greatest bending stress on the telescopic joint are at the ends

thereof where weakening the walls of the tubes by the removal of metal to provide the tongues 29 and openings 25 would materially reduce the strength of the telescopic joint as a whole.

In the form of the invention shown in Figs. 8–13, the larger of the two tubular telescopic sections illustrated is designated at 35 and the smaller at 36. Each of the sections is provided with an enlarged end 38 similar to the enlarged ends 15 in the form of the invention shown in Figs. 1–7, and the opposite ends 39 can be reduced, similar to the reduced ends 16 in the form of the invention shown in Figs. 1–7 so that the opposite ends of the several sections can be brought to the exact tolerances required for snug interfitting in the extended position of the mast regardless of minor variations in the original size of the tubing used, as previously described.

As with the form of the invention shown in Figs. 1–7, the outer extremity of the reduced end 39 of each section is rolled over to provide an inwardly extending bead or flange 40, this inwardly extending bead or flange engaging the annular external shoulder 41 between the body and enlargement 38 of each section thereby to provide stops to limit the outward movement of the sections relative to one another. These stops 40 and 41 are located to facilitate the latching and unlatching of the sections as hereinafter described.

In the form of the invention shown in Figs. 8–13, the latch between each pair of the sections 35 and 36 includes a tongue 45 which is formed by providing a pair of spaced slits or notches 46 extending inwardly from the inner or enlarged end 38 of each of the tubular sections with the exception of the base section. At the free end of the tongue 45 and along its longitudinal sides, it is provided with a pair of ears 48 which project radially outward and extend axially a short distance along the sides of the tongue. These ears are formed from the metal displaced from the outer ends of the notches 46. Each of the tongues 45 can also be strengthened by a central axially extending corrugation 49 if desired.

The ears 48 are specially shaped to coact in holding the sectoins 35, 36 extended and to permit the release or unlatching of the sections when it is desired to nest the same. To this end the end edge 50 of each ear is in the form of a square shoulder extending parallel with the extremity of the tubular section from which the ear is formed. The opposite extremity 51 of each ear is of curved form to provide a cam surface for a purpose which will presently appear. Each of the tongues 45 fits into a generally rectangular slot 55 provided in the reduced end 39 of the next larger section of the mast. This generally rectangular slot has circumferentially extending parallel sides 56 and 58 and has axially extending parallel edges 59 and 60 which are spaced from each other a distance slightly greater than the width of the tongue 45 received by this slot. Each of these slots 55 is arranged to register with the tongue 45 of the next succeeding smaller section immediately preceding the engagement of the stop shoulders 40 and 41 of these sections. It will therefore be seen that when any pair of the sections is extended just short of the engagement between its stop shoulders 40 and 41, the sections can be rotated relative to each other so that the ears 48 of the tongue 45 snap outwardly into the slot 55. When this occurs the sections are latched in their extended position. Thus, as best shown in Fig. 9, the engagement of the square end 50 of each ear 48 with the edge 58 of the slot 55 prevents axial collapse of the sections relative to each other. Rotation of the sections relative to each other is permitted only to the extent allowed by the circumferential width of the slot 55. Axial outward movement of the sections relative to each other is limited by engagement of the stop shoulders 40 and 41 of the sections.

In order to permit of unlatching the several sections the generally rectangular opening or slot 55 is provided in one of its corners with a circumferentially extending notch 61. This notch can be in either of the corners remote from the stop flange 40 of the section. This notch is of sufficient axial length to receive the adjacent ear 48 of the tongue 45 in the opening 55 and permits of unlatching the tongue from this opening by special manipulation of the two sections.

Thus, to unlatch the sections the operator rotates the sections relative to each other so as to bring the corresponding ear 48 into the notch 61. He then moves the two sections axially outward relative to each other, this movement being permitted by the clearance left between the stop shoulders 40 and 41 of the two sections. In so drawing the two sections axially apart with the corresponding ear 48 in the notch 61 the curving or cam edge 51 of this ear 48 rides under the edge of the notch so that this ear is pressed inwardly thereby to depress the tongue and move it out of the generally rectangular opening or slot 55. The two sections can then be rotated so as to move the tongue 45 completely free from the rectangular opening or slot 55 following which the two sections can be telescoped together. This manipulation of bringing the ear 48 into the notch 61, pulling the sections axially apart to depress the tongue, rotating the sections to bring the tongue away from the latching opening and then collapsing the sections is repeated for each joint and with little practice can be performed very quickly.

In the form of the invention shown in Figs. 8–13, the latch is provided at the extremity of each section and remote from the shoulder 41. This shoulder 41 is near the zone of the greatest strain of the mast when it is erected and hence by providing the tongue or latch 45 remote from this zone the mast is not materially weakened by the provision of the latching tongue. Further it will be seen that the tongue is sturdy and will reliably hold the mast in its extended position.

From the foregoing it will be seen that both forms of the present invention provide an extremely simple and rugged telescopic structure in which several sections are releasably interlatched by means which are merely cut or stamped out of the sections themselves so as to not appreciably add to the cost of the structure. Further, the structure can be rapidly erected and rapidly nested and at the same time the latching means reliably holds the structure in an erected condition without danger of accidental release of any of the latches. Further, when the sections are collapsed the length of the telescopic structure is reduced to a minimum.

I claim as my invention:

1. A telescopic structure, including inner and outer slidably and rotatably interfitted tubes, a tongue in the body of one of said tubes and having a small projection on its free end projecting radially toward the other of said tubes and having a cam face and an abrupt face each opposing

said other of said tubes, said other of said tubes having an opening through one side, said opening receiving said projection and having one edge arranged to engage said abrupt face and latch said tubes in their extended position, and means for releasing said tongue from said opening, comprising a small notch in one of the sides of said opening which extends lengthwise of said tongue, said notch receiving said projection and cooperating with said cam face, upon a corresponding manipulation of said tubes, to retract said tongue and projection from said opening and notch to permit nesting of said tubes.

2. A telescopic structure comprising a cylindrical outer tube, an inner tube having an enlarged cylindrical end slidably and rotatably fitted in said outer tube, and a tongue integral with said enlarged cylindrical end of said inner tube and having an end offset radially outwardly from said enlarged cylindrical end of said inner tube, said outer tube having an opening through one side receiving the outwardly offset end of said tongue to limit the movement of said tubes relative to each other, and said enlarged end of said inner tube providing space for the reception of said tongue when said tubes are nested together.

3. A telescopic structure including inner and outer slidably and rotatably interfitted tubes, and a pair of circumferentially extending tongues integral with the body of one of said tubes and arranged in opposed relation to each other and having ends offset radially toward the other of said tubes, said other of said tubes having an opening through one side receiving the outwardly offset ends of said pair of tongues to limit the axial and circumferential movement of said tubes relative to each other.

4. A telescopic structure including inner and outer slidably and rotatably interfitted tubes, and a circumferentially extending tongue in the body of one of said tubes, the outer end of said tongue having parallel sides and being of reduced width as compared with the body of the tongue and said body of said tongue thereby having circumferentially facing shoulders on opposite sides of said tongue and said reduced outer end of said tongue being offset radially toward the other of said tubes, said other of said tubes having an opening through one side, said opening having parallel edges extending circumferentially of said other of said tubes and spaced from each other a distance greater than the width of the reduced outer end of said tongue but less than the width of the body portion of said tongue, said opening receiving the outwardly offset reduced end of said tongue with said parallel edges engaging said parallel sides of said reduced end of said tongue to prevent axial movement of said tubes relative to each other, the other edges of said opening engaging said shoulders of said tongue to limit the rotative movement of said tubes relative to each other in a corresponding direction.

5. A telescopic structure including inner and outer slidably and rotatably interfitted tubes, a pair of circumferentially extending tongues in the body of said inner tube in opposed relation to each other and each having its extremity curved to extend radially outwardly from the body of said inner tube, said outer tube having a generally rectangular opening through one side, said generally rectangular opening having generally parallel edges extending, respectively, axially and circumferentially of said outer tube and said opening receiving the outwardly curved extremities of said pair of tongues in which relation said parallel circumferentially extending edges of said opening limit the axial movement of said tubes relative to each other and each of said axially extending edges of said opening permits the curved extremity of the adjacent tongue to be drawn thereunder but forms a stop for the curved extremity of the opposing tongue when said tubes are rotated relative to one another in a corresponding direction, and means for releasing said tongues from said opening, comprising a small notch in one of the said circumferentially extending edges of said opening adjacent one of said axially extending edges thereof, said notch being adapted to receive the curved extremity stopped by said one of said axially extending edges when said tubes are moved axially relative to each other in a corresponding direction.

6. A telescopic structure including inner and outer slidably and rotatably interfitted tubes, a pair of circumferentially extending tongues in the body of said inner tube and arranged in opposed relation to each other, the outer end of each tongue having parallel sides and being of reduced width as compared with the body of the tongue and said body of said tongue thereby having circumferentially facing shoulders on opposite sides of said tongue, and said reduced outer end of each tongue curving to extend radially outwardly from the body of said inner tube, said outer tube having a generally rectangular opening through one side, said generally rectangular opening having generally parallel edges extending, respectively, axially and circumferentially of said outer tube, said circumferentially extending parallel edges of said opening being spaced from each other a distance greater than the width of the reduced outer ends of said tongues but less than the width of the body portions thereof, said opening receiving the outwardly curving reduced ends of said pair of tongues with said parallel edges engaging said parallel sides of said reduced ends to prevent axial movement of said tubes relative to each other, each of the axially extending edges of said opening permitting the curving reduced end of the adjacent tongue to be drawn thereunder but forming a stop for said shoulders of the opposing tongue when said tubes are rotated relative to each other in a corresponding direction, and means for releasing said tongues from said opening, comprising a small notch in one of the said circumferentially extending edges of said opening adjacent one of said axially extending edges thereof, said notch being adapted to receive the curving reduced end of that tongue stopped by said one of said axially extending edges when said tubes are moved axially relative to each other in a corresponding direction.

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