

- [5] **THREE-STAGE COLLAPSIBLE DOME-RIB UMBRELLA** 3,457,931 7/1969 Yoshio Shimizu ..... 135/36  
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 [73] Assignee: **Telesco Brophey Limited, Montreal, Canada** 3,705,593 12/1972 Weber..... 135/20 R  
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[22] Filed: **Jan. 30, 1974**

[21] Appl. No.: **437,825**

[30] **Foreign Application Priority Data**

Feb. 16, 1973 Germany..... 2307679  
 Mar. 29, 1973 Germany..... 2315624

[52] U.S. Cl..... **135/25 R; 135/27; 135/32**

[51] Int. Cl.<sup>2</sup>..... **A45B 19/10**

[58] Field of Search..... 135/20 R, 25 R, 25 A, 26, 135/29, 31, 33 R, 36 F

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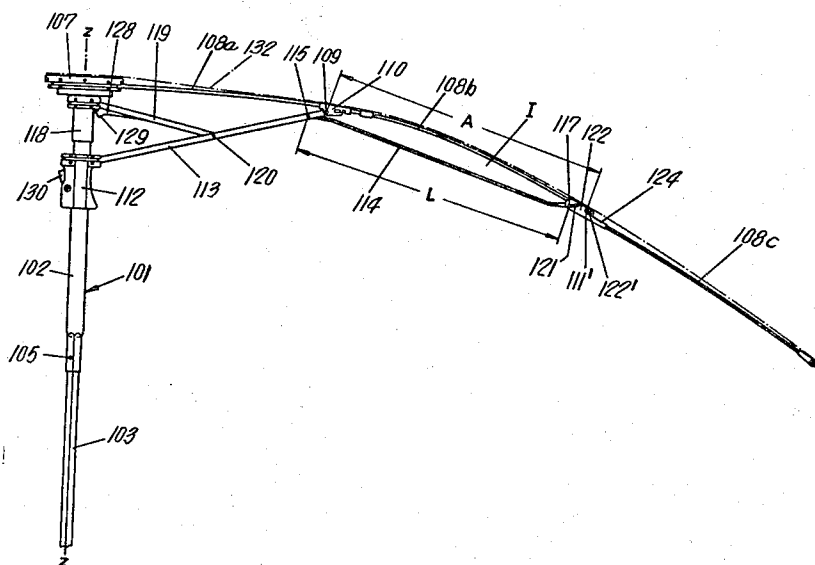
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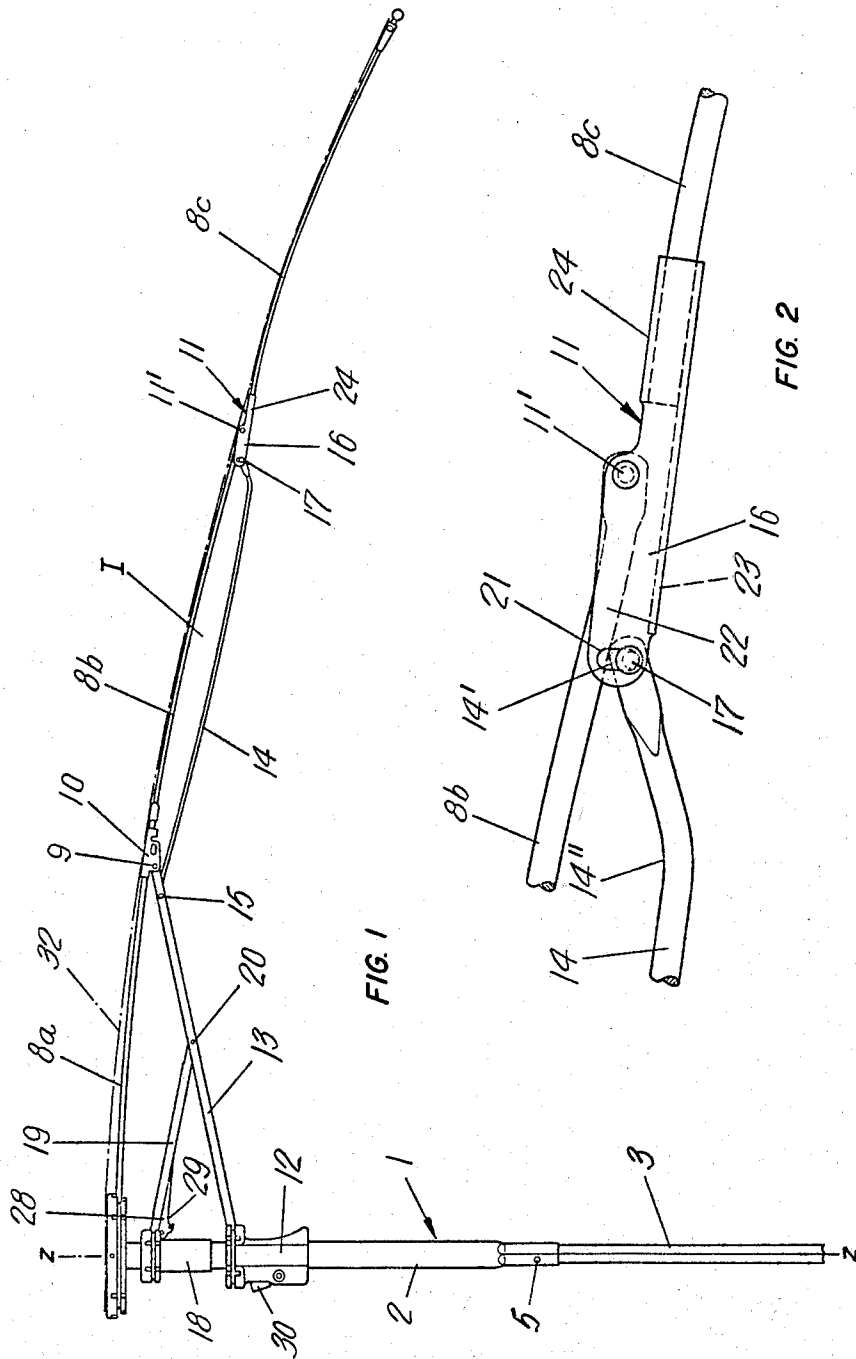
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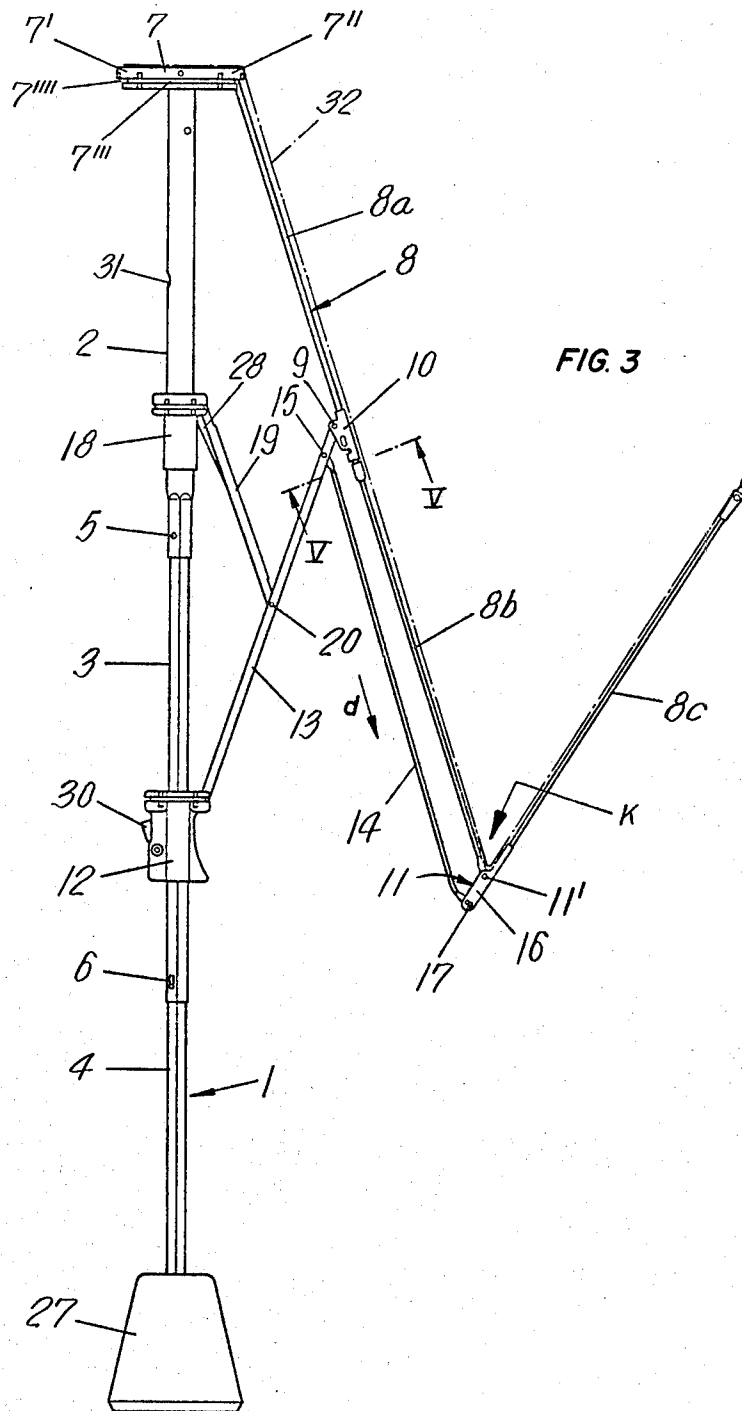
**ABSTRACT**

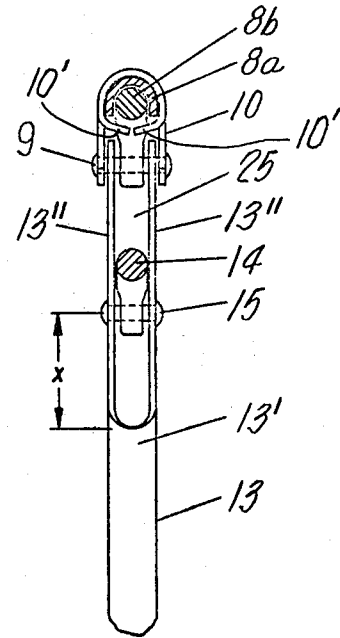
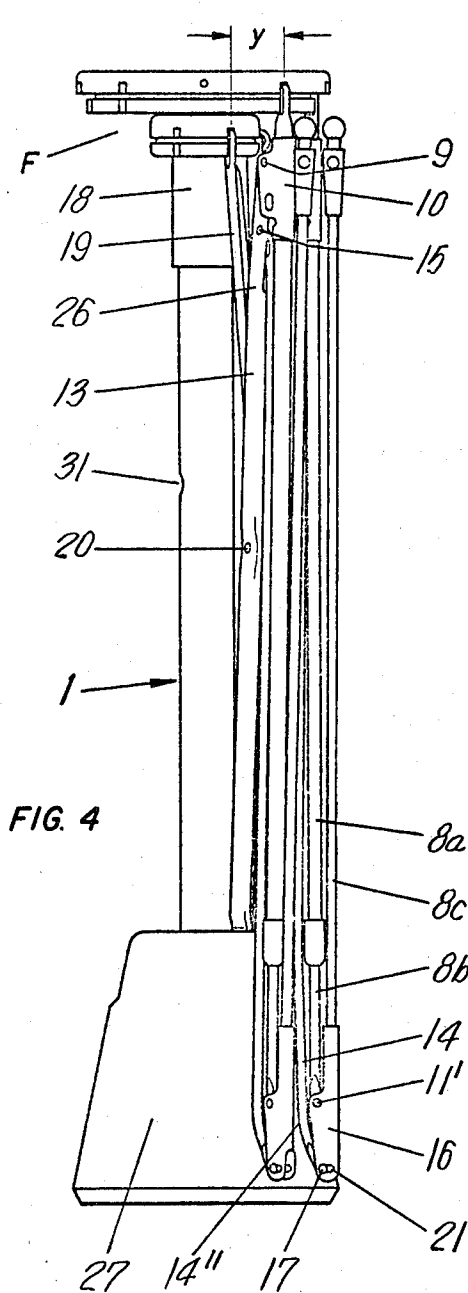
A collapsible umbrella or umbrella frame having a telescopic stick and dome ribs pivotably attached to the top of the stick. Each dome rib is made in sections with the outer section being foldable relative to the other sections. Means are provided for automatically and positively folding or unfolding the outer dome rib sections as the umbrella frame is closed or opened.

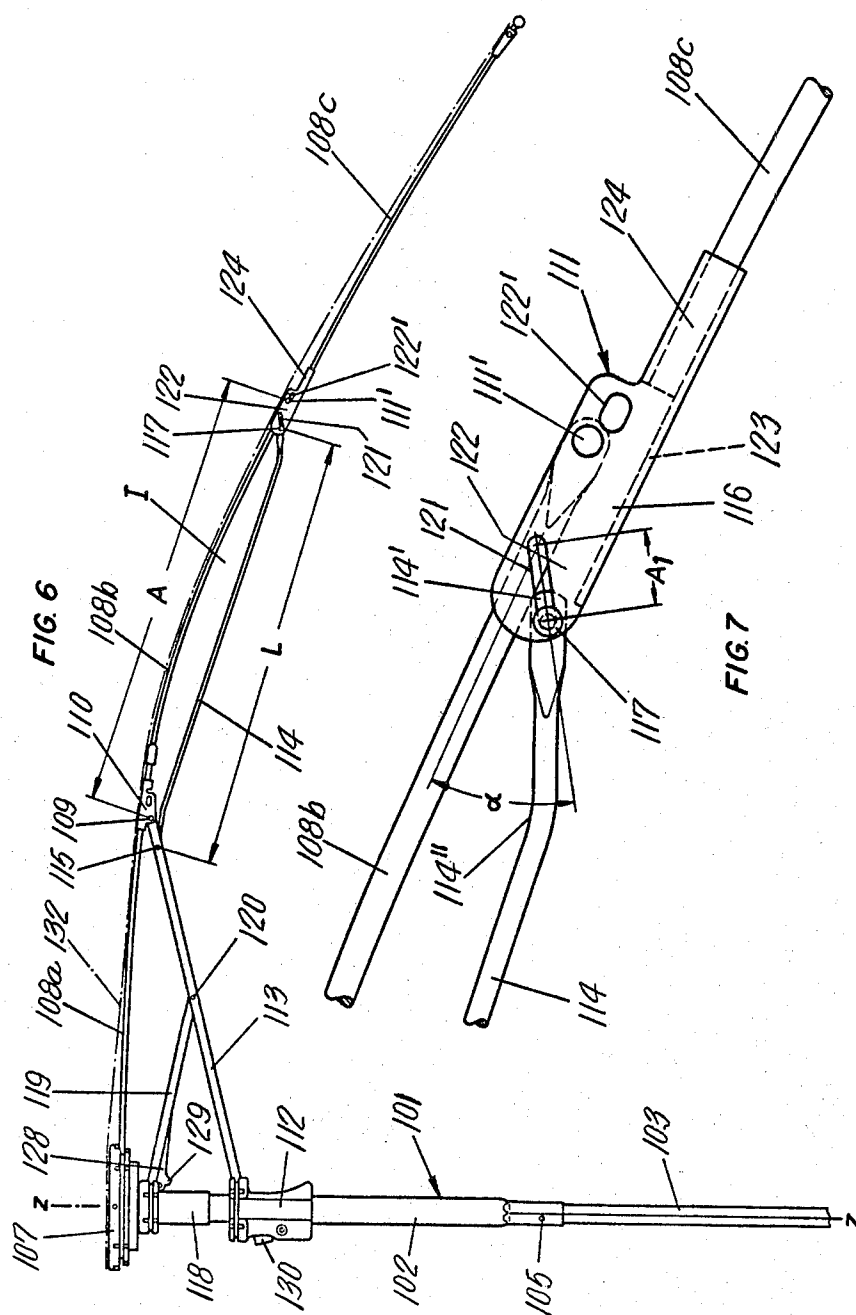
**9 Claims, 10 Drawing Figures**

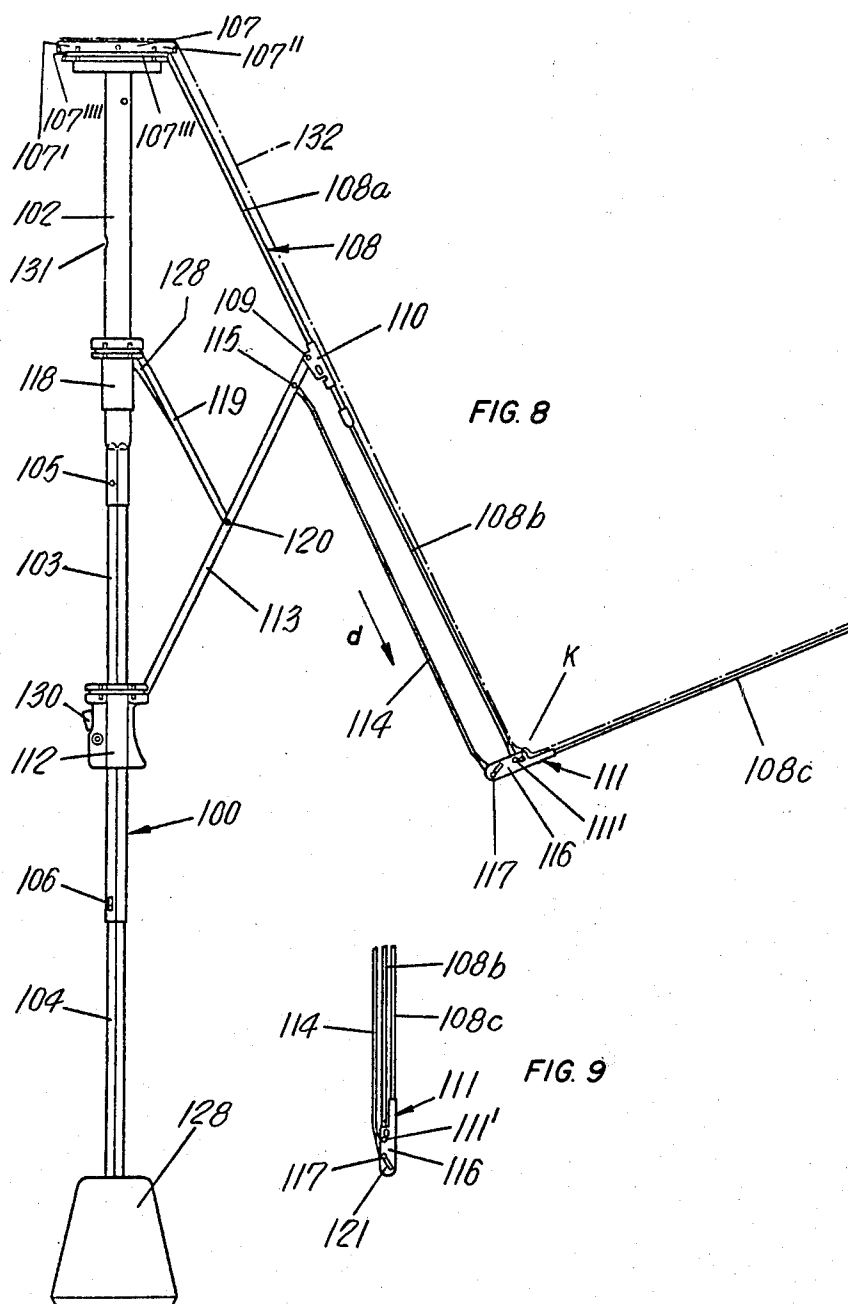


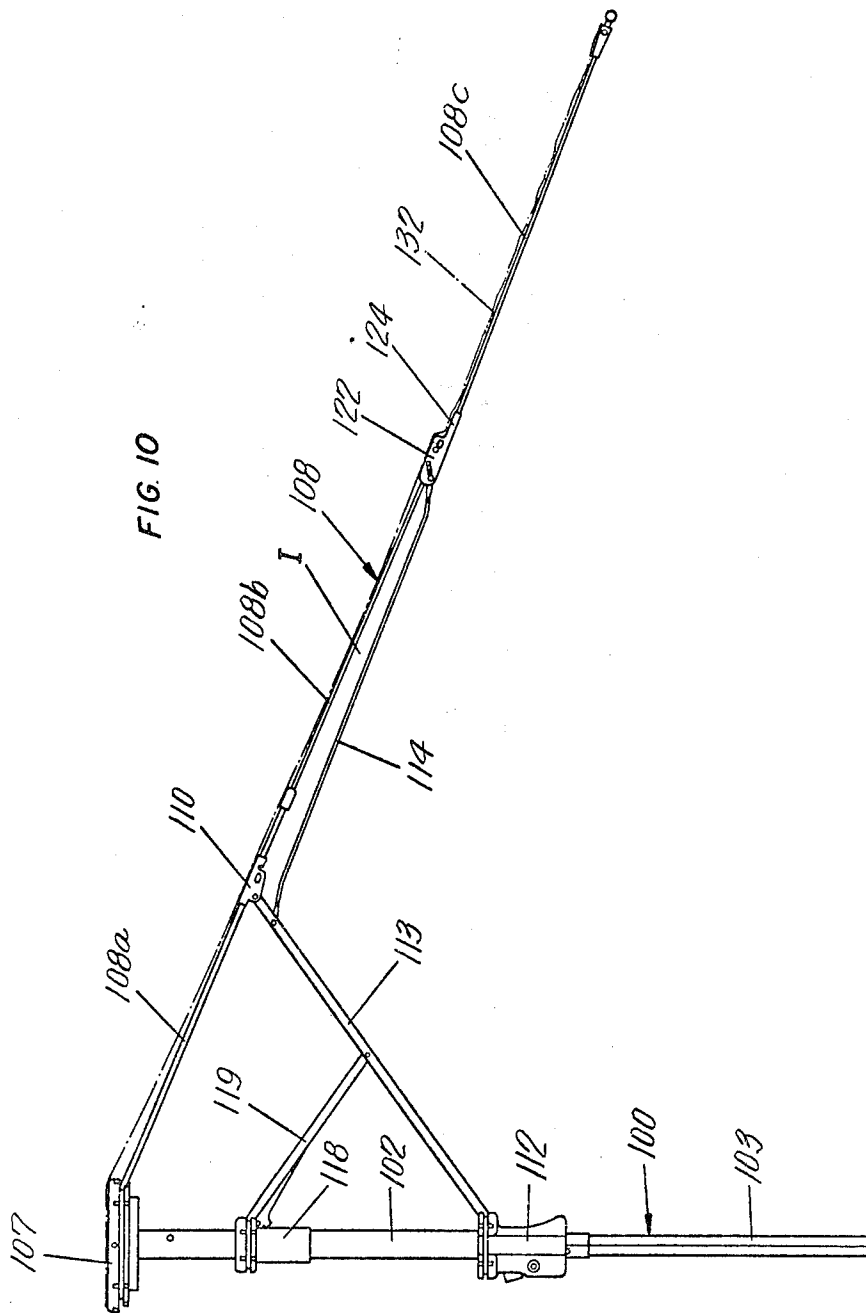












# THREE-STAGE COLLAPSIBLE DOME-RIB UMBRELLA

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to improvements in umbrella frames and umbrellas and more particularly to umbrella frames and umbrellas of the type which can be collapsed to form a relatively small package when not in use.

### 2. Description of the Prior Art

One type of collapsible umbrella frame, and umbrella, employs a handle, and dome ribs, each made in three sections. In collapsing the umbrella, the two sections of each rib adjacent the umbrella stick are adapted to be telescoped. The third outer section is then adapted to be manually folded toward the umbrella crown against the telescoped sections. The handle is then telescoped completing collapsing of the umbrella. To open the umbrella, the handle is extended and the outer rib sections are manually unfolded, opening is then completed by operating a runner on the stick which extends and opens out the other rib sections.

Difficulty is encountered in manually unfolding the outer rib sections. The umbrella covering material hinders this unfolding operation, and may prevent complete opening until further manual unfolding, against force exerted by the cover, is completed. It is also a bother to manually fold up all the outer rib sections in closing the umbrella.

## SUMMARY OF THE INVENTION

It is the purpose of the present invention to provide a collapsible umbrella frame, employing dome ribs each having three rib sections, which will automatically and positively fold and unfold the outer rib sections as the umbrella frame is closed or opened.

The improved umbrella frame, as described immediately above, is of simple, relatively inexpensive construction. In addition, providing for the automatic folding and unfolding of the outer dome rib section is accomplished in a manner which does not appreciably reduce the head room beneath the opened umbrella, and which does not increase the cross-section area of the collapsed umbrella.

A problem in the operation of the improved umbrella frame construction may still be encountered if the umbrella cover, due to shrinkage after installation, or improper installation, exerts excess tension on the frame. In opening the umbrella frame, the excess cover tension may outwardly bow the rib sections, particularly the outer section, before the outer section is fully unfolded by the automatic folding and unfolding means. Increased stress is thus exerted on the frame parts as the automatic folding and unfolding means completes unfolding against the excess tension.

It is therefore also a purpose of the present invention to provide means in the automatic folding and unfolding means which will reduce or eliminate any tendency for the umbrella cover to hinder unfolding of the outer rib section during umbrella opening.

More particularly, the invention is directed toward a collapsible umbrella frame having a telescopic stick and dome ribs pivotably attached to the stick at the top. The dome ribs are each made in three sections. The inner and middle sections are telescopic. The outer section is pivoted to the middle section. First means are provided for moving the ribs toward or away from the

stick during closing or opening of the frame. Second means are provided, operated by the first means, for folding or unfolding the outer rib section, relative to the other sections, during closing or opening of the frame.

The first means includes a main runner slidable on the stick, and a stretcher member extending between, and pivotably connected to, each rib at the middle section and the main runner.

The second means comprises a control link, extending between, and pivotably connected to, each stretcher member and its associated outer rib section. The control link is substantially parallel to the middle rib section and is located closely adjacent to it.

The control links are automatically and positively actuated to fold or unfold the outer sections by pivoting them as the main runner moves down or up along the umbrella stick. To minimize the adverse effects of any excess cover tension, the control link can be made to have a length, between its pivot connections, which is less than the length of the middle rib section between its pivot connections.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in detail having reference to the accompanying drawings in which:

FIG. 1 is a partial front elevation view of the umbrella in its open position;

FIG. 2 is a detail view of the hinge connection between the middle and outer dome rib sections;

FIG. 3 is a partial front elevation view of the umbrella in a partly closed position;

FIG. 4 is a partial front elevation view of the umbrella in its closed and shortened position;

FIG. 5 is a cross-sectional view taken along line V-V in FIG. 3;

FIG. 6 is a partial front elevation view of a modified version of the umbrella of FIG. 1;

FIG. 7 is a detail view of the hinge connection between the middle and outer dome rib sections of the modified umbrella;

FIG. 8 is a partial front elevation view of the modified umbrella in a partly closed position;

FIG. 9 is a detail view of the hinge of FIG. 7 in a closed position; and

FIG. 10 is a partial front elevation view of the modified umbrella in a partly open position.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The umbrella, as shown in FIGS. 1 and 3, comprises a frame having a stick 1. The stick 1 consists of three telescoping sections 2, 3 and 4. Catches 5 and 6, on sections 2 and 3 respectively, are provided to lock the sections in their extended position as shown in FIG. 3. Section 2, at the top, has the largest cross-sectional area while section 4, at the bottom, has the smallest cross-sectional area. Preferably, sections 3 and 4 are of hexagonal cross-section while section 2 is of circular cross-section except for a portion of its lower end which is drawn down to a hexagonal cross-section in order to receive section 3.

A crown 7 is provided at the upper end of the umbrella stick. The crown 7 in the present instance is rectangular in shape, although it could also be circular or oval. A pot-shaped handle 27 is provided at the bottom of the umbrella stick.

The umbrella frame includes dome ribs 8 hinged to opposing wings 7', 7'' of the crown. The dome ribs are hinged by means of a tie-wire 7''' mounted in an annular groove 7'''' in the crown as is well known. Each dome rib 8 is made up of three sections; an inner section 8a 5 adjacent the crown 7, a middle section 8b, and a folding outer section 8c. Sections 8a and 8b are mutually telescopic with section 8a made from a member having a U-shaped cross-section and with the opening facing stick 1, and section 8b made from a member, such as 10 steel wire, having a circular cross-section. Section 8b slides into section 8a when the sections are telescoped. An umbrella cover sewing clip 10 is slidably mounted on section 8a and one end of section 8b is attached to clip 10 by inwardly bent portions 10' of the clip 10; see FIG. 5. The outer section 8c is connected at its inner end to a bushing 24 on a bracket 11. Middle section 8b is pivotably connected to bracket 11, intermediate its ends, by pin 11' so that outer section 8c will pivot upwardly relative to the other sections, from the plane of rib 8; see FIG. 3; this permits the outer section 8c to fold toward the crown 7 as the umbrella is closed as will be described.

The umbrella frame includes a main runner 12 slidable on stick 1. The main runner 12 has a push-button 30 which operates a locking pawl engaging a catch 31 in stick part 2 when the umbrella is open. A stretcher member 13 is provided for each dome rib 8, and the stretcher member extends between runner 12 and sewing clip 10. Each stretcher member 13 is pivotably connected to runner 12 by tie wires as is well known, and to the sewing clip 10 by a pivot pin 9 extending transversely through clip 10; see FIG. 5. An auxiliary runner 18 is slidably mounted on stick section 2 between crown 7 and main runner 12. A strut 19 extends between each stretcher member 13 and auxiliary runner 18. The strut 19 is pivotably connected to runner 18 by tie wires as is well known, and to stretcher member 13 by a pivot pin 20, which pin 20 is preferably located approximately midway along the length of member 13. The struts 19 preferably have a U-shaped cross-section, and one of the struts can be provided with means 28 for aiding in opening the umbrella. This means 28 can comprise a pawl device 29 biased outwardly by a spring, not shown, mounted in the strut.

Means are provided for automatically and positively folding or unfolding the outer dome rib section 8c during closing or opening respectively of the umbrella. These means preferably comprise a control link 14 extending between bracket 11 and stretcher member 13 and being beneath, but substantially parallel to, dome rib section 8b.

The link 14 is pivotably connected to stretcher member 13 by a pivot pin 15 spaced from pivot pin 9 on clip 10. The connection of link 14 to stretcher member 13 is made in a manner to facilitate operation of the umbrella frame. The web 13' of the stretcher member 13, which is U-shaped in cross-section, is cut back from its end adjacent clip 10 to provide an opening 25 this opening extends for a distance X past pivot pin 15 as shown in FIG. 5. The legs 13'' form supports for pivot pins 9 and 15. These legs 13' are bent slightly at a point 26 adjacent where web 13' ends in a direction toward web 13' as shown in FIG. 4.

At its outer end 14', the link 14 is pivotably connected to an extension arm 16 forming part of bracket 11. The arm 16 has a U-shaped cross-section and the

web 23 is cut back slightly from legs 22 (only one shown) at the free end of arm 16. The U-shaped arm 16 provides a stable hinge point 11' between dome rib sections 8b and 8c when the ribs are extended, with the legs 22 providing good lateral support for the sections. An elongated slot 21 is provided in each leg 22 near the free end of arm 16, each slot 21, extending approximately transversely to rib 8. Pivot pin 17, mounted in slots 21, connects link 14 to arm 16 and thus to outer dome rib section 8c. The elongated slots 21 and pin 17 provide a lost-motion, pivot connection between link 14 and bracket 11. The link 14 has a bend 14'' near end 14' so that the link bends toward section 8b. The bend 14'' permits a more compactly folded umbrella as will be described.

The link 14 and dome rib section 8b form the long sides of a substantially parallelogram (quadrilateral) linkage I. The short sides of the parallelogram (quadrilateral) linkage I comprise that portion of stretcher member 13 between pivot pins 15 and 9 and that portion of arm 16 of bracket 11 between pivot pins 11' and 17. The parallelogram linkage I controls positive pivotal movement of outer dome rib section 8c.

#### OPERATION

If the umbrella frame is to be closed from the position shown in FIG. 1, the main runner 12 is unlatched and moved down stick 1 toward handle 27. As the runner 12 moves down, stretcher member 13 is pivotably moved toward the stick as shown in FIG. 3, and auxiliary runner 18 is moved down via strut 19. At the same time control link 14 (which is placed under compression) is moved in the direction shown by arrow d in FIG. 3 thus pivoting bracket 11 about pin 11' through arm 16, and attached dome rib section 8c, about pivot 11' so as to automatically and positively fold section 8c against section 8b. When the folding has been substantially completed, with members 13, and sections 8a, 8b and 8c lying nearly parallel to stick axis z-z, the umbrella frame is shortened by applying a suitable compressive force between crown 7 and handle 27; this produces the position shown in FIG. 4. In this position, the main runner 12 has entered an annular groove (not shown) in handle 27 and auxiliary runner 18 lies adjacent crown 7.

The bend 14'' in the control link 14 provides room for a compact arrangement at the bottom between the ends of link 14, sections 8b and 8c and bracket 11. The bend 26, in stretcher member 13, at the top also provides room for a compact arrangement between the ends of link 14, member 13, sections 8a and 8b, and clip 10. In addition, the cross-sectional area of auxiliary runner 18 may be reduced to provide ample room F under top plate 7. Also in flat umbrellas, employing a rectangular crown 7, the hinge locations on the top plate and auxiliary runner of each rib can be displaced to distance Y as shown in FIG. 4 to provide further room. These arrangements all result in eliminating or minimizing any increase in cross-sectional area of the folded umbrella frame.

To open the umbrella frame, the stick 1 is first extended to have the umbrella assume a position approximating that shown in FIG. 3. The outer dome rib sections 8c, due to the lost-motion connection provided by slots 21 in bracket 11, moves away from the outer dome rib sections. The main runner 12 is then moved toward crown 7. As this happens, control link 14 un-

folds section 8c by moving in a direction opposite to arrow *d* (now under tension) and pivoting section 8c away from crown 7 about pin 11'. Opening is aided by having opening aid means 28 on auxiliary runner 18 temporarily arrest upward movement of runner 18 thus facilitating outward movement of the dome ribs. The opening movement continues until the rib sections are extended and substantially aligned. In this position, unfolding of section 8c is stopped by having end 14' of control link 14 bear against the bottom of section 8b as shown in FIG. 2.

The umbrella frame is provided with a cover 32 which is attached to the crown 7, and to the ribs at sewing clips 10, pivot location K (FIG. 3) and the free ends of sections 8c. The cover assumes a mushroom shape when the umbrella is collapsed due to its attachment to clips 10. The cover 32 also assists somewhat in moving sections 8c outwardly of the other sections as the umbrella is opened.

In this embodiment, the control link 14 will bow outwardly slightly in a direction opposite to the curvature of dome rib section 8c when the frame is opened; see FIG. 1. The link 14 and section 8c act together to provide resistance against any tendency to turn the umbrella inside out. The link 14 provides added strength and positively controls movement of rib section 8c without substantially reducing head room in the umbrella.

In some cases the umbrella covering material may interfere with the opening of the umbrella, thus unduly stressing the umbrella frame. Thus, if the umbrella cover is installed under too much initial tension, or if the cover shrinks during use and becomes unduly tensioned, the cover can make it quite difficult to complete unfolding of the outer dome rib section. A suitable arrangement can be provided for minimizing or preventing this interference. Such an arrangement is shown in the embodiment illustrated in FIGS. 6 and 10. In this embodiment, parts identical to those described in the embodiment illustrated in FIGS. 1 to 5 bear a similar reference character but increased by one hundred (100).

In this embodiment, as shown in FIG. 6, control link 114 is made to have a length *L*, between its pivot connections 115 and 117, which is shorter than the distance *A* of dome-rib section 108b between pivot pins 111' and 109. Thus after opening of the umbrella when main runner 112 has moved up and stretcher member 113 has acted to tension link 114 and compress dome rib 108b, link 114 forms a "chord" and section 108b is bent or bowed outwardly into an "arc". This structural arrangement provides the outward bowing or curvature of the dome ribs 108 rather than having the bowing provided by the umbrella cover 132 as before. As shown in FIG. 10, on opening the umbrella, the outer dome rib section 108c is unfolded and aligned with sections 108a and 108b while cover 132 is still loose. Continued opening then causes section 108b to bow, forming the curvature in the dome ribs and tightening the cover 132. This arrangement prevents the cover 132 from interfering with the unfolding of the outer dome-rib section 108c.

To provide more positive control in folding and unfolding of the outer dome rib section 108c, the slots 121 in bracket 111, provide pin 117 a lost-motion pivot connection for control link 114 to section 108c, can be disposed at an acute angle  $\alpha$  to the rib axis, as

shown in FIG. 7. The slots 121 extend down toward the stick 101, away from pivot pin 111', when the umbrella is in an open position. Preferably, the slots 121 have a length *A*, approximately equal to the difference between lengths *A* and *L* to provide a freely controllable parallelogram (quadrilateral) linkage *I* in intermediate umbrella opening or closing positions. The angular set or relationship of the slots 121 make it easier for the outer dome-rib sections 108c to move to an initial opening position from the closed position shown in FIG. 9. The outer sections 108c pivot readily about pivot pin 111', falling away from the other sections as pivot pin 117 slides down in slots 121 to the end of arm 116.

To provide a better cover attaching arrangement, a sewing eye 122' can be provided in the top of each bracket 111 between pivot pin 111' and bushing 124. Locating a sewing eye 122' at this point permits the cover 132 to arrange itself in the best possible manner during folding.

In both embodiments, the bend 14'', 114'' in control link 14, 114, provides means by which the length of the link can be slightly adjusted to compensate for hinge tolerances.

I claim:

1. A frame for a collapsible umbrella; the frame having a telescopic stick; dome ribs pivotably attached about the stick at the top; each dome rib comprising an inner, middle and outer section; the inner and middle rib sections being mutually telescopic; the outer rib section being pivoted to the middle section; a main runner slidable on the stick, and a stretcher member extending between, and pivotably connected to, the main runner and each middle rib section for moving all the rib sections toward or away from the stick when closing or opening the umbrella frame; and a control link extending between, and pivotably connected to, each stretcher member and outer rib section, operated by the main runner, and including means for positively pivoting each outer rib section between both a folded and unfolded position for folding or unfolding each outer rib section relative to each middle rib section when opening or closing the umbrella frame wherein  $A > L$ , when *A* represents the distance between the pivot of the stretcher member and the middle rib section and a pivot point between the middle rib section and the outer dome rib section, while *L* represents the length of the control link, such that, as the umbrella is being opened, the shorter length of the control link will cause the outer section to pivot to an unfolded position and the middle rib section to bow convexly when the umbrella frame is "opened".

2. A frame as claimed in claim 1 wherein the outer rib section includes a bracket through which it is pivotably connected to the control link and middle rib section, the bracket having a portion with U-shaped cross-section in which portion, a portion of the control link is received.

3. A frame as claimed in claim 1 wherein the stretcher member has a U-shaped cross-section, open toward the stick, and the web of the stretcher member is cut back, in a direction toward the main runner past the pivot connection of the control link to the legs of the stretcher member.

4. A frame as claimed in claim 1 wherein a sewing eye for umbrella covering material is provided adjacent the pivot connection of the outer rib section to the mid-

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dle rib section on the side of the pivot connection removed from the stick when the frame is open.

5. A frame as claimed in claim 1 wherein the pivotable connection between the control link and the outer rib section is a lost-motion pivotal connection.

6. A frame as claimed in claim 5 wherein the lost-motion pivotal connection includes at least one slot in one of the control link and outer rib sections.

7. A frame as claimed in claim 6 wherein the slot is substantially transverse to the outer rib section when

the frame is in an open position.

8. A frame as claimed in claim 6 wherein the slot is at an acute angle to the outer rib section when the frame is in an open position.

9. A frame as claimed in claim 4, wherein the slot extends at an acute angle to the rib when the frame is in an open position, the slot having a length substantially equal to the difference between said length A and L.

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