April 13, 1965 V. MILITANO 3,177,882

PLASTIC UMBRELLA FRAMES

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FIG. 2

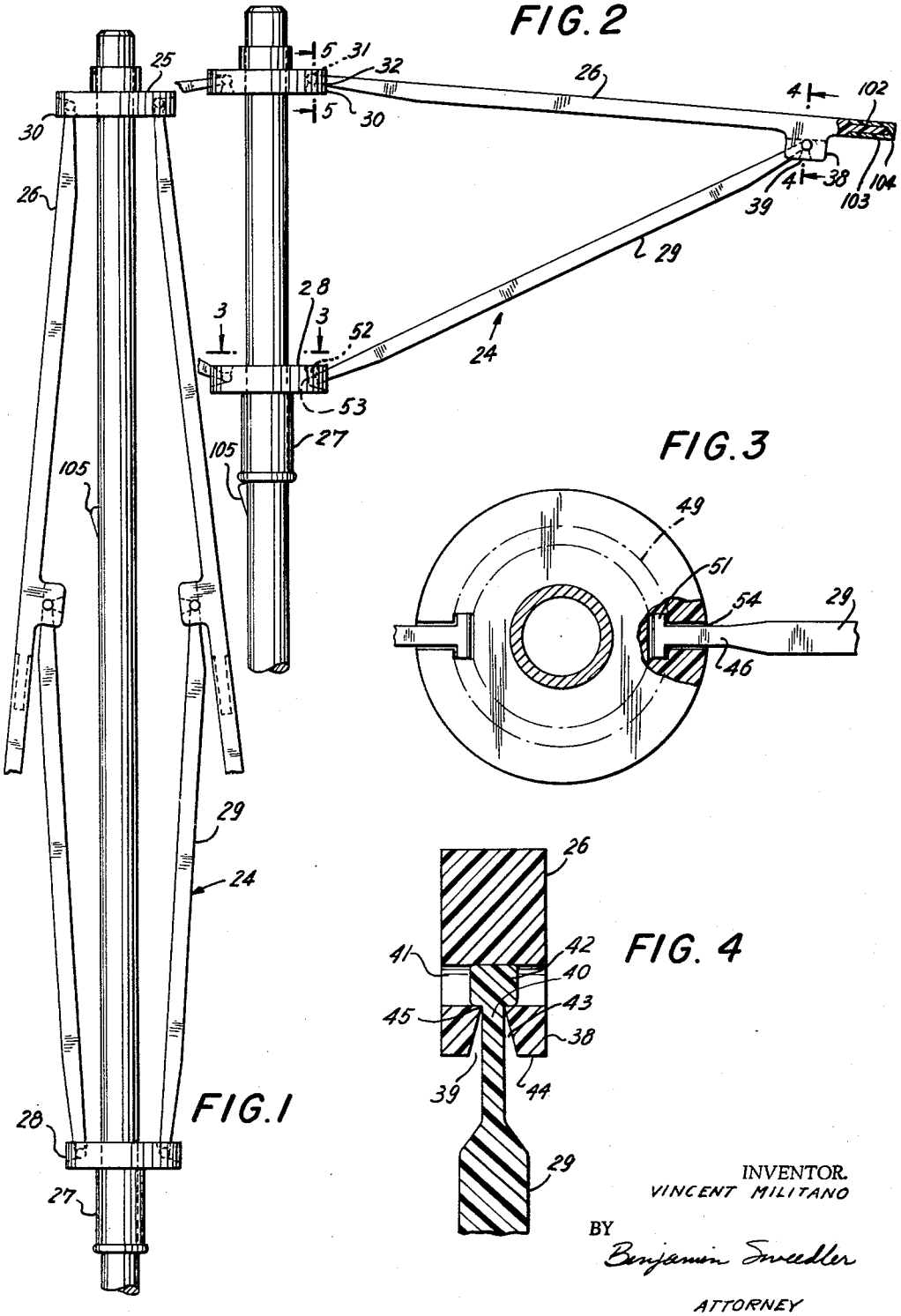


FIG. 1

FIG. 3

FIG. 4

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FIG. 6

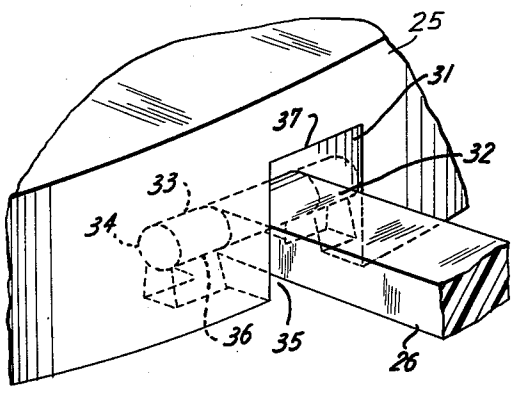
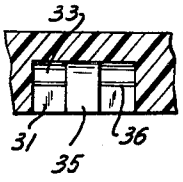


FIG. 5



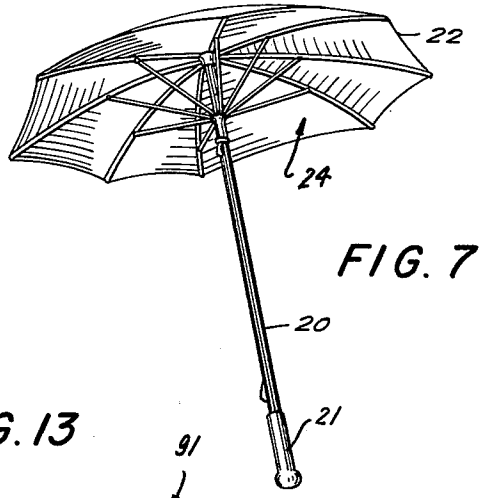
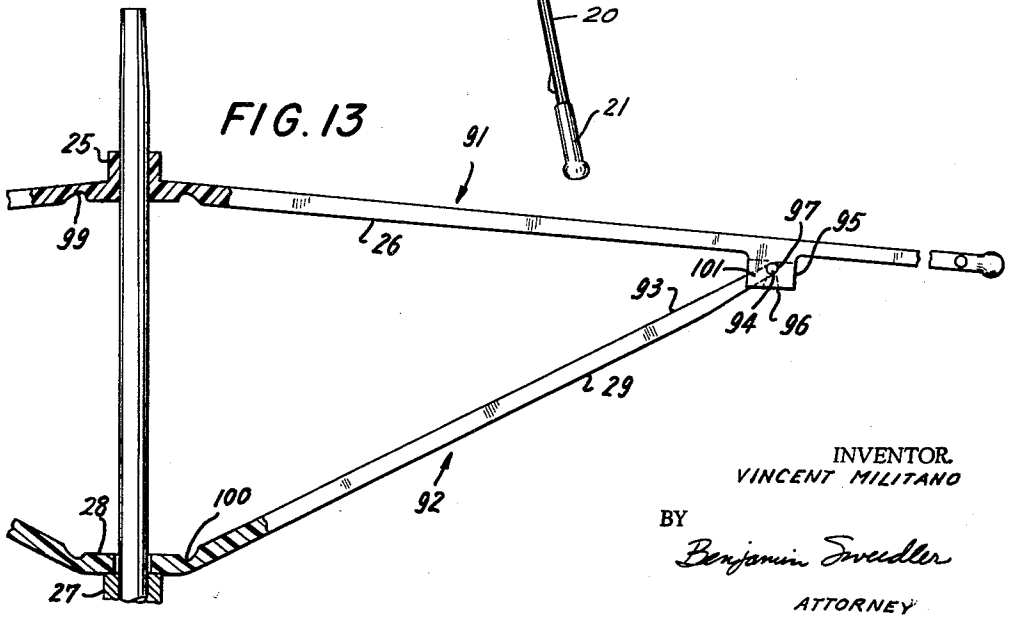


FIG. 7

FIG. 13



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FIG. 8

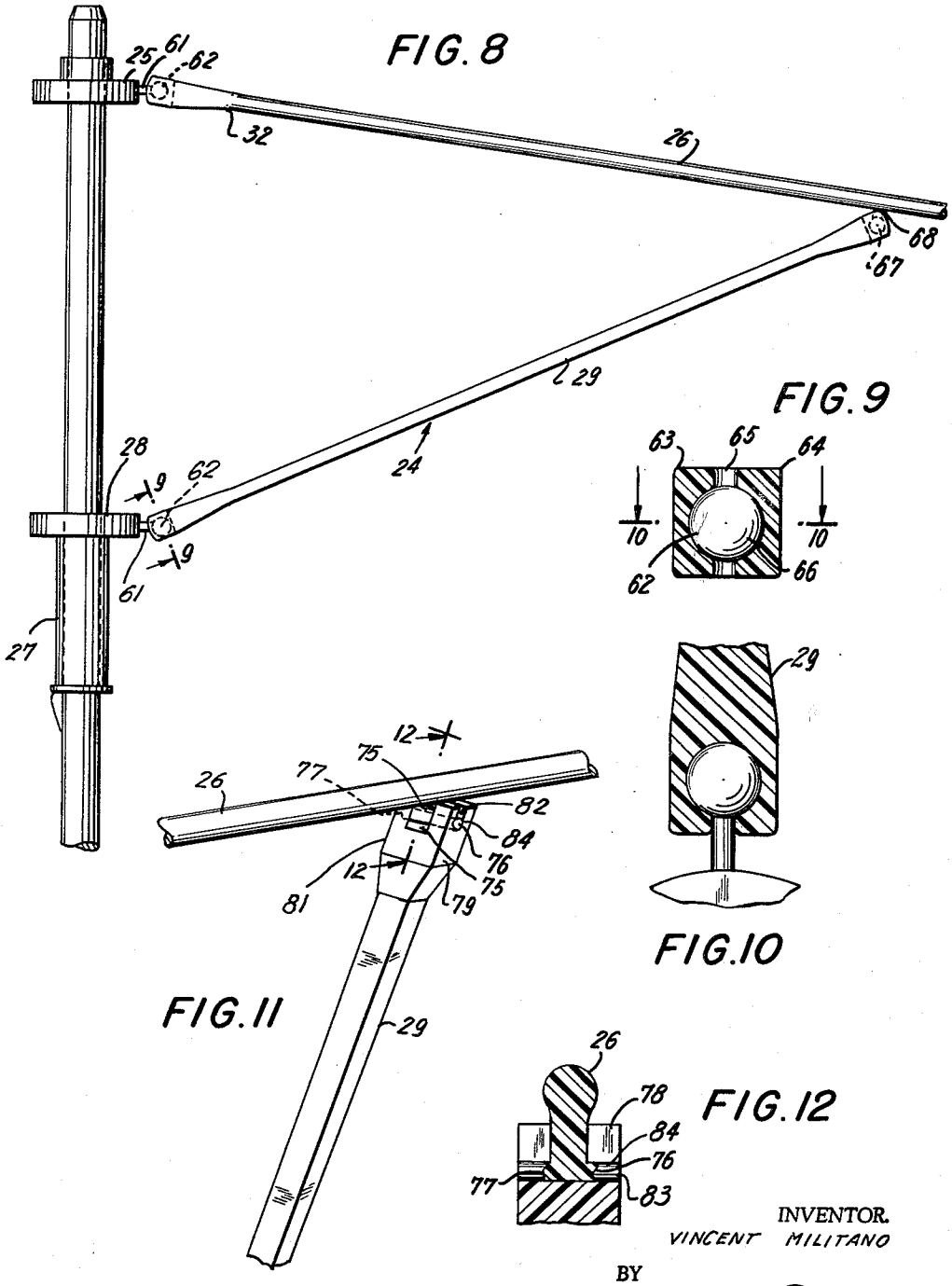


FIG. 9

FIG. 10

FIG. 11

FIG. 12

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United States Patent Office 3,177,882 Patented Apr. 13, 1965

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PLASTIC UMBRELLA FRAMES

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4 Claims. (Cl. 135—20)

This invention relates to umbrella frames.

Umbrella frames, from the inception of the umbrella industry, have comprised a notch, runner, ribs and stretchers, formed as separate members and joined together with the inner ends of the ribs pivoted to the periphery of the notch and with one end of the stretchers pivoted to an intermediate point of the ribs and the other end pivotally secured to the runner. The latter slides up and down the umbrella pole or stick and is held in its upper or umbrella open position by a spring catch and usually locked in its lower or umbrella closed position by a spring detent or catch. Universally, the ribs and stretchers are made of metal, usually steel. Customary practice is to stamp these parts from suitable stock. The notch and runner are also usually of metal, commonly steel. To produce the frame it is necessary to pivotaly secure the ends of the ribs to the notch and the opposite ends of the stretchers to the laps on the ribs and the runner, respectively. Usually, the ribs are secured to the notches by wiring small eyes or openings on the ends of the ribs to the notch, with the ribs radially positioned relative to the notch. The ends of the stretchers are invariably pinned to the laps on the ribs and to the periphery of the runner, respectively, to provide pivoted joints at the points of jointure. The securing of the ribs to the notch and of the stretcher to the ribs and runner is a laborious and time-consuming operation, requiring considerable manual labor.

It is among the objects of the present invention to provide an umbrella frame which can be produced simply and relatively inexpensively, with the ribs or the stretchers so constructed in the localities where they join the notch and runner, respectively, or where the stretchers join the ribs, as to provide snap-fit joints between some or all of the joining members, which snap-fit joints permit pivoted or hinge movement of one member relative to the other.

Another object of this invention is to provide an umbrella frame in which the notch, the runner, the ribs and the stretchers are molded of plastic, particularly the ribs and stretchers are molded of plastic, and the parts are so designed that they can readily be assembled by a snap-fit which permits pivoted or hinged movement of one part relative to another.

These and other objects and advantages of the present invention will be apparent from the following detailed description of preferred embodiments of this invention taken in connection with the accompanying drawings showing same for purposes of exemplification, and in which:

FIGURE 1 is a fragmentary side elevational view of an umbrella frame embodying this invention showing the frame in the closed condition;

FIGURE 2 is a fragmentary side elevational view of this frame in the open position of the umbrella;

FIGURE 3 is a fragmentary plan view showing a pivotal joint between a stretcher and the runner and taken in a direction indicated by the arrows 3—3 on FIGURE 2;

FIGURE 4 is a vertical section on an enlarged scale, as compared with the scale of FIGURE 2, passing through a pivotal joint between a lap on a rib and a stretcher, taken in a plane passing through line 4—4 on FIGURE 2;

FIGURE 5 is a vertical section on an enlarged scale, as compared with the scale of FIGURE 2, passing through a pivotal joint between a rib and the notch, taken in a plane passing through line 5—5 on FIGURE 2;

FIGURE 6 is a fragmentary perspective view on an enlarged scale as compared with the scale of FIGURE 2, showing the pivotal joint between a rib and the notch;

FIGURE 7 is a perspective view of an umbrella in the open position embodying the frame of this invention;

FIGURE 8 is a side elevational view of an umbrella frame embodying a modified form of this invention showing the frame in the open position;

FIGURE 9 is a vertical section, partly in elevation, taken in a plane passing through line 9—9 on FIGURE 8;

FIGURE 10 is a section taken in a plane passing through line 10—10 on FIGURE 9;

FIGURE 11 is a side elevational view on an enlarged scale showing another form of pivotal joint between a rib and a stretcher;

FIGURE 12 is a sectional view taken in a plane passing through line 12—12 on FIGURE 11; and

FIGURE 13 is a view, partly in section and partly in elevation, showing still another modified form of the present invention.

In the drawings, in which like parts in the several views are indicated by the same reference characters, an umbrella frame is shown particularly designed for use in producing umbrellas, such as the so-called hand, rain or sun umbrellas, comprising a rod, pole or shank 20, having a handle 21 and a cover 22 of fabric, plastic or other suitable material which is maintained in the open or extended position shown in FIGURE 7 by a frame 24 to which the cover is secured.

The umbrella frame 24 comprises a notch 25, ribs 26 radiating from the periphery of the notch 25, and a runner 27 having a collar 28 from which radiates stretchers 29. These parts can be of any desired shape, those shown in the drawings representing typical exemplifications of shapes for these parts.

In the embodiment of the invention shown in FIGURES 1 to 4, inclusive, the notch 25 is provided, at spaced points along the periphery of its base cylindrical flange 30, with a series of openings 31 for receiving the inner ends 32 of the ribs 26 to provide a snap-fit between each such opening and a rib, which snap-fit permits pivotal movement of the rib relative to the notch 25. The number of openings 31 are equal to the number of ribs 26; preferably they are equi-spaced about the periphery of the flange 30. For hand umbrellas, an umbrella frame having from about 8 to 16 radiating ribs spaced approximately 45 degrees to 22.5 degrees apart, respectively, can be used. The number of ribs and, hence, openings 31, and stretchers 29, can be varied as desired since the invention is not limited to any particular number of ribs and cooperating stretchers. For an umbrella having from 8 to 16 radiating ribs, the transverse median (the median extending radially of the axis of the pole 20) of the openings 31 are spaced apart in the periphery of the flange 30 approximately 45 to 22.5 degrees respectively. There is, of course, one stretcher for each rib.

Each opening 31, as best shown in FIGURE 5, consists of a cylindrical bearing dimensioned to snugly receive the cylindrical or pin-like member 34 on the end of each rib. Cylindrical bearing 33 has downwardly diverging walls shown in dotted lines in FIGURE 6 extending therefrom connected with bearing 33 through a restricted neck 36 and leading into the base of notch 25. Extending radially from the mid-portion of bearing 33 is a lateral opening 35.

As shown in FIGURE 6, each rib 26 has at its inner end 32 a cylindrical or pin-like member 34, the axis of which extends at right angles to the axis of the rib. In assembling each inner end 32 of each rib 26 with its opening 31, member 34 on the rib is forced through the restricted neck 36 to seat the member 34 in the bearing 33, with end 32 positioned in the lateral opening 35. This simple

action of seating end 32 of each rib in its opening 31 is all that is required to assemble the ribs and the notch. The ribs 26 are thus pivotally mounted on the notch 25, the lateral opening 35 of each opening 31 permitting the necessary pivotal movement of the rib in effecting the opening and closing of the umbrella while the pin-like member pivots within its bearing 33. The wall 37 of each opening 31 acts as a stop to prevent movement of the ribs beyond the desired umbrella open position.

In the embodiment of the invention shown in FIGURES 1 to 4, each rib has a stretcher connecting member 38 integral with rib 26, which member 38 corresponds to a lap of a conventional umbrella frame, positioned between the ends of the rib. Member or lap 38 is formed with an opening 39 for receiving end 40 of a stretcher 29 in a snap-fit, automatically forming a pivotal joint between the lap and the stretcher. Each opening 39, as shown in FIGURE 4, is constituted of a cylindrical bearing portion 41 extending from one side to the other of the lap, desirably at a point just below where the lap joins the rib 26. This bearing portion provides a bearing for pivotal movement of the cylindrical or pin-like end 42 of the stretcher 29. Bearing portion 41 leads into the opening 43 which, as shown in FIGURE 4, leads into the base 44 of the lap 38. A restricted neck 45 connects the base of bearing portion 41 with the upper end of opening 43. The portion of each stretcher contiguous to the pin-like end 42 thereof is of reduced thickness and this reduced thickness portion is positioned in opening 43.

To assemble each stretcher 29 with its lap 38, it is only necessary to force the pin-like end 42 of the stretcher through the restricted neck 45 to seat the pin-like end 42 in the bearing portion 41. When thus seated, the portion of the stretcher contiguous to the pin-like end 42 is free to move in the opening 43. In the showing of FIGURE 4, this movement is at right angles to the plane of the paper bearing this view.

The opposite end 46 of each stretcher 29 makes a similar snap-fit pivotal joint with the collar 28 of the runner 27. In the embodiment of the invention shown in FIGURES 2 and 3, collar 28 has an annular groove 49, circular in cross-section, the diameter of the circle being such that this groove snugly receives the pin-like end 51 of the stretcher 29. Extending upwardly from the groove 49 at equi-spaced points are openings 52, each of which communicates with the groove 49 through a restricted neck 53 (FIGURE 2) and each of which is of a length slightly greater than the length of the pin-like end 51, so that the pin-like end can pass through the opening 52 to be pivotally seated in groove 49. Extending radially of each opening 52 is a passage 54 (FIGURE 3) in which the inner end 46 of a stretcher is positioned for pivotal movement. To assembly each stretcher 29 with the runner 27, it is only necessary to force the pin-like end 51 of each stretcher into its opening 49 through the restricted neck 53. When thus positioned, the portion of each stretcher contiguous to end 51 is positioned for pivotal movement in its opening 54.

In the modification shown in FIGURES 8, 9 and 10, the notch 25 is provided with a plurality of equi-spaced extensions 61 each having an integral, substantially spherical bearing member 62 thereon. The runner 27 has extending from the collar 28 thereof a similar series of extensions 61 each having a spherical member 62 thereon. The inner end 32 of each rib and the opposite ends of each stretcher 29 are each bifurcated, and thus formed with two spaced arms 63 and 64 separated by space 65. While FIGURES 9 and 10 show the structure for one end of a stretcher, it will be understood the structure of end 32 of the rib and that of the other end of the stretcher in the modification of FIGURES 8, 9 and 10 are alike. The arms 63 and 64 are each formed with a semi-spherical bearing surface 66. These semi-spherical bearing surfaces on each rib receive a spherical bearing member 62 on the notch 25; the spherical bearing surfaces on the inner end

of each stretcher 29 receive a spherical bearing member 62 on the runner 27, and the spherical bearing surfaces on the opposite end of each stretcher receive a spherical member 67 carried by a pin or supporting member 68 on the under-side of each rib. The bifurcated arms 63 and 64 have sufficient resiliency to separate enough to permit the spherical member 62 or 67, as the case may be, to be snugly seated for pivotal movement in the bearing surfaces carried by these arms. When thus seated, snap-fit pivotal joints, which will not come apart under normal use of the umbrella, are automatically produced between the ribs and the notch, between one end of the stretchers and the runner and between the other end of the stretchers and the ribs. The ease and simplicity of assembling the parts, particularly as compared with the heretofore known procedures of laboriously threading a wire through the edges of the ribs to secure them to the notch, doing likewise to secure the stretchers to the runner and pinning the other end of the stretchers to the laps on the ribs, is readily apparent.

In the modification of FIGURE 11, each rib 26 has an integral downwardly extending lap 75 provided with pin-like extensions 76 and 77 extending from the opposite ends thereof as shown in this figure. The outer end of each stretcher 29 is provided with an opening 78 arranged to snugly receive the lap or member 75 on the rib. The walls 79 and 81 are each provided with a slot 82 for receiving the extensions 76 and 77. Each slot 82 diverges outwardly towards the free end of the stretcher and has at its inner ends a cylindrical bearing 83 connected with the slot through a restricted neck 84. By forcing the pin extensions 76 and 77 of each stretcher through the restricted neck 84 so that these extensions are positioned for pivotal movement of the cylindrical bearings 83, a snap-fit joint between the stretcher and the rib results.

In the modification of FIGURE 13, the umbrella frame is constituted of an upper spider 91 consisting of a notch 25 having the ribs 26 integral therewith and radiating therefrom and molded in one piece. A lower spider 92 consists of the runner 27 having a collar 28 integral therewith and the stretchers 29 radiating from collar 28. The ends 93 of the stretchers are formed with a pin-like or a cylindrical bearing member 94. The lower spider 92 consisting of the runner 27 and the stretchers 29 radiating from the collar 28 is molded in one piece.

Each of the ribs 26 of the upper spider 91 has a member or lap 95 formed integral therewith, which lap has on its under side an opening 96 which leads into a bearing area 97 connected with the opening 96 through a restricted neck. The structure and shape of the lap opening are substantially the same as the opening 39 in lap 38 hereinabove described.

The spider 91 has a self-hinge 99 formed by molding the rib portion contiguous to the notch so that it is markedly thinner than the thickness of the remainder of the rib; the thickness of the self-hinge 99 when the ribs are formed of polypropylene is of the order of $\frac{1}{16}$ inch to $\frac{1}{32}$ inch or less. Polypropylene of this thickness has remarkable fatigue characteristics upon flexing, and forms an effective self-hinge for the umbrella frame. The inner end of each stretcher is molded with a similar self-hinge 100.

Two spiders 91 and 92 are joined by forcing the cylindrical or pin-like bearing 94 of each stretcher through a restricted neck of its opening 96 in the lap of the rib individual to that stretcher so that the cylindrical portion 94 is seated for pivotal movement in the bearing area 97. Pivotal movement of the stretchers relative to the ribs thus takes place with the ends of the stretchers adjacent the laps moving in the openings 101 of each lap; opening 101 corresponds to opening 35 shown in FIGURE 6. Pivotal movement of the ribs relative to the notch takes place at the self-hinge 99, and pivotal movement of the opposite end of the stretchers relative to the runner takes place at the self-hinges 100 in the stretcher.

The ribs and stretchers may be shaped as desired. For example, they may be substantially polygonal in cross-section, rectangular, square, circular or other shape, the ends being provided with pivotal members such as the pin-like or spherical members shown in FIGURES 1, 2 and 6, or with spherical bearing members shown in FIGURES 8 and 9, or with spherical or ball-like ends, in which case the notch, runner or lap, as the case may be, is provided with a congruent spherical bearing member. The ribs can be substantially straight for the full length and of uniform thickness, except for the pin-like or spherical bearing members, or ball-like ends. The stretchers and/or one end of the ribs, as shown in FIGURES 3 and 4 of the drawings, can have the portion contiguous to the pivoted ends of reduced thickness. The ribs can have the free extremities arced or bent downwardly to produce any desired shape of umbrella canopy when the umbrella is open or, as shown in FIGURE 2, can be made of two-piece construction consisting of an inner portion having an end extension **102** of reduced diameter arranged to seat in an end opening **103** in the outer section **104** of the rib.

For illustrative purposes a conventional spring-like catch **105** is shown to maintain the runner **27** in the umbrella open position. In frames not having self-hinges corresponding to **99** and **100** of FIGURE 13, the ribs and stretchers can be molded of any suitable plastic, such as nylon, polyolefins including polypropylene and polyethylene, styrene, the acrylic resins, hard rubbers and other resins, with the cylindrical or pin-like members, which seat in congruent bearing areas to form the pivotal joints, made of a plastic material having sufficient resiliency to permit compression thereof to the extent necessary for the pin-like member to be forced through the restricted neck of the cylindrical bearing member to seat in this bearing member. Employing for the body portion of the rib or stretcher a rigid plastic, then the pin-like socket or bearing member on the extremity of the rib or the extremities of the stretcher is formed of a different material, such as hard rubber, polypropylene, polyethylene or a resilient nylon resin which has the desired compressibility and expansibility to permit assembly of the parts, with the pin-like member in question seated in its bearing surface through a snap-fit to produce the desired pivotal joint. One advantage in using a plastic material having such compressibility and expansibility characteristics is that the ribs and stretchers can be molded of one and the same material, thus enabling production on a mass basis at relatively low cost for the individual units of the frame.

Of all the plastic materials now available, polypropylene is considered the best because it has the desired rigidity properties when formed of suitable thickness, for example, about ¼ inch, to produce ribs and stretchers, and has the desired compressibility and expansibility characteristics for the formation of the cylindrical or pin-like ends of the stretchers and the pin-like ends of the ribs, and in the modification of FIGURE 13, the desired flexibility and response to fatigue upon repeated flexing when formed of reduced thickness, for example, about 1/16 inch or less, to produce the self-hinges **99** and **100**. Polypropylene is also preferred because it is light in weight, resistant to microorganisms, has exceptionally good tensile properties, is water repellent, is readily available and is comparatively inexpensive.

Polypropylene, commercially available, having molecular weights in range of from about 150,000 to 500,000 and melt indices of from about 1 to 5, can be used, but the invention is not limited to such plastics as the material of construction.

It will be noted the present invention provides an umbrella frame which can be produced simply and relatively inexpensively with the ribs, or the stretchers, or both, so constructed in the localities where the ribs join the notch or the stretchers join the runner and/or the ribs through a snap-fit joint which permits pivotal or hinged movement of one member relative to the other. In that the ribs and stretchers and also, if desired, the notch and runner can be molded of plastic material with the parts so designed that they can be readily assembled by snap-fit joints permitting pivoted or hinged movement of the stretchers relative to the ribs and runner, and the ribs relative to the stretchers and notch, the umbrella frame embodying this invention can be mass produced with marked economy, not only in making the parts, but in the labor required in assembling these parts to produce the frame.

It will be understood that the snap-fit joints between the ribs and the notch, between the ribs and the stretchers and between the stretchers and the runner can all be of the same type or can be of different types such as the varied types shown for exemplification in FIGURE 2, or FIGURE 8 or FIGURE 11 of the drawings.

While a rain umbrella is shown in FIGURE 7, the umbrella frames of this invention can be used in producing garden, beach, and other umbrellas, with or without handles.

Since different embodiments of the umbrella frames hereinabove described can be made without departing from the scope of this invention, it is intended that all matter contained in the above description or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An umbrella frame comprising a notch and ribs radiating therefrom, said notch and ribs being integrally molded of plastic material to produce relatively rigid ribs except at the ends thereof where the ribs join the notch, which ends are formed of reduced thickness producing self-hinge joints between the notch and said ribs; a runner and stretchers radiating therefrom, said runner and stretchers being integrally molded from plastic material to produce relatively rigid stretchers except at the ends thereof where the stretchers are joined to the runner, which ends are molded of reduced thickness to form self-hinge joints between the runner and said stretchers, each of said ribs being molded intermediate the ends thereof with a lap having an interior bearing portion and an opening leading from said bearing portion to the exterior of said lap; and the end of each of said stretchers remote from the runner being molded to provide a bearing member adapted to make a snap fit joint with said bearing portion of said lap of a rib.

2. The umbrella frame of claim 1, in which the notch and ribs and the runner and stretchers are molded of polypropylene.

3. An umbrella frame comprising a notch and ribs radiating therefrom, said notch and ribs being integrally molded of plastic material to produce relatively rigid ribs except at the ends thereof where the ribs join the notch, which ends are formed of reduced thickness producing self-hinge joints between the notch and said ribs; each of said ribs being molded with a lap intermediate the ends thereof having a bearing portion and an opening leading from said bearing portion to the exterior of said lap, a runner, stretchers molded of plastic material pivotally secured at one end to said runner and each having the opposite end molded with a bearing member, the bearing member of each stretcher making a snap fit joint with the bearing portion of said lap.

4. The umbrella frame of claim 3, in which said notch, ribs and stretchers are molded of polypropylene.

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