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(54) A canopy.

(57) A canopy comprising a plurality of ribs (10) extending from a hub (12) of the canopy and a membrane (14) attached to those ribs (10). The ribs (10) extend radially outwardly from the hub (12) when the canopy is in use so that the membrane (14) is stretched outwardly from the hub (12). The ribs (10) are held securely in their radially extending positions, against collapse towards one another, at their inner ends to avoid the need for a central pole and rib-supporting struts such as are present in a conventional umbrella.

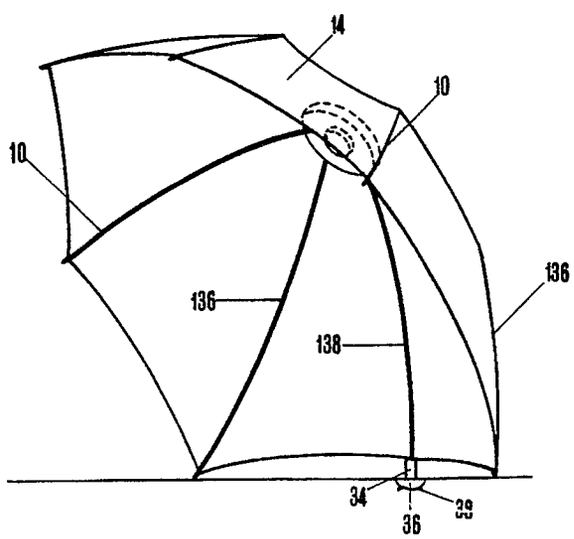

FIG.29

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A CANOPY

The present invention relates to a canopy comprising a plurality of ribs extending from a hub of the canopy and a membrane attached to those ribs, the ribs extending radially outwardly from the hub when the canopy is in use so that the membrane is stretched outwardly from the hub.

One such prior construction is shown in Figures 1 and 2, in which:

Figure 1 is a perspective underneath view of the canopy; and

Figure 2 is a diagrammatic side view of that canopy with a membrane thereof removed to show the supporting structure thereunder.

The canopy shown in Figures 1 and 2 has the construction of a conventional umbrella having a plurality of ribs 10 extending radially outwardly from a hub 12 and a membrane 14 attached to those ribs 10 and stretched outwardly from the hub 12 when the canopy is in the open position shown in Figures 1 and 2. To retain the membrane 14 in this open condition, a central pole 16 of the umbrella is provided with a tubular portion 18 which is slidable up and down the pole 16 and to which are attached a plurality of supporting struts 20 extending from the tubular portion 18 to respective ribs 10 at roughly central positions thereon. The tubular portion 18 is restrained from movement away from the hub 12 by a detent 22. As a result the inner ends of the struts 20 are also restained from movement away from the hub 12 and therefore their outer ends restrain the ribs 10 from collapsing towards one another under the tension of the membrane 14. A disadvantage of such a construction is the obstruction caused by the pole 16 and the struts 20. This is particularly noticeable in some sport and outdoor activities such as angling where the user spends long periods of time under the canopy and would benefit from the availability of the space occupied by the pole 16 and struts 20, particularly for head room.

The present invention seeks to provide a remedy.

Accordingly, the present invention is directed to a canopy as set out in the opening paragraph of the present specification in which the ribs are held securely in their radially extending positions, against collapse towards one another, at their inner ends to avoid the need for a central pole and rib-supporting struts such as are present in a conventional umbrella.

The present invention extends to a device for holding two pieces of fabric or other sheet material together, comprising a plurality of resilient clips and means for retaining those clips at positions spaced apart along an edge of a first piece of such material, so that an edge of a second piece of such material can be releasably retained by means of the clips.

An example of a canopy embodying the present invention is shown in Figures 3 to 41 in which:-

Figure 3 shows a perspective underneath view of the canopy;

Figure 4 shows a diagrammatic side view of the canopy with a membrane thereof removed to show more clearly the support structure, with an additional optional position of insertion of a pole thereof;

Figure 5 shows a perspective underneath view of a canopy in a partially collapsed condition;

Figure 6 shows, on a larger scale, a perspective underneath view of inner parts of the canopy in a subsequent stage of assembly thereof;

Figure 7 shows an axial sectional exploded view of parts of a joint provided in some of the ribs of the canopy shown in Figures 3 to 6;

Figures 8 and 9 show axial sectional views of such a joint in different respective positions;

Figure 10 shows a modified form of such a joint with different possible positions of a limb of the rib shown in ghosted outline;

Figures 11 and 12 show axial sectional views of an end of a rib of the canopy in different respective positions;

Figure 13 shows a further axial sectional view of such a rib end with a membrane attachment portion secured thereto;

Figure 14 shows an axial sectional view of a pivot block of a hub of the canopy shown in Figures 3 to 6;

Figure 15 shows a plan view of the pivot block shown in Figure 14;

Figures 16 to 19 show a rib-retaining member of the hub, shown in side view, underneath view and opposite end views respectively;

Figures 20 and 21 show an axial sectional view and a plan view of an upper cap of the hub;

Figure 22 shows an underneath view of a pressure plate of the hub;

Figure 23 shows an axial section of the plate shown in Figure 22 taken along the line XXIII-XXIII;

Figure 24 shows a further section of the plate shown in Figure 22 taken along the line XXIV-XXIV;

Figure 25 shows an underneath view of a fixing nut of the hub;

Figure 26 shows an axial sectional view of the nut shown in Figure 25 taken along the line XXVI-XXVI shown therein;

Figure 27 shows an axial sectional view of the assembled hub of the canopy in an open condition, with a removeable pole attached to the centre thereof;

Figure 28 shows a diagrammatic side view of parts of the hub with the pole removed;

Figure 29 shows a perspective view of a modification of the canopy;

Figures 30a, 30b and 30c show respective persepective views of three different assemblies for attaching the canopy to a ground spike;

Figure 31 shows an axial cross-section through the hub of the canopy shown in Figure 29;

Figure 32a shows a view from below of an upper half of the hub illustrated in Figure 31;

Figure 32b shows an axial cross-section of the of the hub illustrated in Figure 31;

Figure 33a shows a view from above of a lower half of the hub illustrated in Figure 31;

Figure 33b shows an axial cross-section of the lower half of the hub illustrated in Figure 31;

Figures 34a and 34b show, respectively, a view from above and an axial section of the lower half of a modified hub;

Figures 35a and 35b show, respectively, a view from below and an axial section of the upper half of the modified hub of Figures 34a and 34b;

Figure 36 shows a persective view of a canopy provided with an overwrap;

Figure 37 shows a perspective view of part of the canopy of Figure 3 or Figure 29, provided with a device for holding the canopy material and the material of the overwrap, shown in Figure 36, together;

Figure 38 shows a respective view of an end of a track of the device illustrated in Figure 37;

Figure 39 shows a cross-section through a clip of the device illustrated in Figure 37;

Figure 40 shows a perspective view of an end clip of the device illustrated in Figure 37; and

Figure 41 shows a diagrammatic view of a storm side provided with further parts of the device illustrated in Figure 37.

The canopy shown in Figure 3 has a plurality of ribs 10 extending radially outwardly from a hub 12 when the canopy is in an open condition, a membrane 14 being attached to those ribs 10 and being stretched outwardly from the hub 12 as in the conventional umbrella shown in Figures 1 and 2. However, the canopy shown in Figure 3 differs from a conventional umbrella in that the ribs 10 are held securely in the illustrated position, against collapse towards one another under the tension of the membrane 14 by being held securely at their inner ends where they meet the hub, and by being relatively resistant to bending forces along an inner portion thereof.

One way such resistance may be achieved is by having each rib made thicker along an inner portion 24 thereof, and tapering along an outer portion 26 thereof. This thickening and tapering is shown greatly exaggerated for one rib only in Figure 3 for the sake of clarity.

The pole 28 is rigidly secured to the hub 12 at a connecting portion 30 thereof, which is to one side of the hub 12, the pole 28 extending radially outwardly from the hub 12 but angled thereto so that the far end of the pole does not quite obstruct the membrane 14. The pole 28 may be hollow, and its far end 32 may be slid over an upwardly extending spigot 34 of a mounting pad 36 having spikes 38 driven into the ground.

Figure 4 shows how the pole 28 may alternatively be attached to the centre of the hub 12 so that it extends downwardly along an axis of the canopy in the manner of the central pole 16 of a conventional umbrella. To this end, the connecting portion 30 of the hub 12 and also a central underneath portion thereof, are provided with internal screw-threads selectively engagable by a screw-threaded portion 40 at the upper end of the pole 28.

Figure 5 shows the canopy of Figure 3 in a semi-collapsed condition. Prior to assembly of the canopy, the ribs 10 are pivotable relative to the hub 12, and three of the ribs 10 are provided with joints 42 to enable their outer portions 26 to be folded back on their inner portions 24. A pressure plate 44 which is provided with a central aperture 46 is then slid on to an externally screw-threaded portion 48 of the hub 12. A fastening nut is then screwed on to the portion 48 to hold the pressure plate 44 in position, which in turn now restrains the ribs 10 from pivoting towards one another at the hub 12. The three ribs 10 which are provided with joints 42 are now straightened to stretch the membrane 14 and so complete the assembly of the canopy shown in Figure 3. The fact that the outer portions 26 of the ribs 10 are tapered enables them to yield under the tension of the membrane and so allow the membrane to adopt the shape of a conch.

Figures 7 to 9 show one of the joints 42 in greater detail. Thus, the joint is provided with two tubular rib retaining members 52 and 54 which receive respective ends of the inner portion 24 and the outer portion 26 of a rib 10. Those ends are received in the members 52 and 54 and form a tight fit therein. Respective adjacent ends of the members 52 and 54 are provided with slots 56 across which extend pins 58. A pivot plate 60 is provided with holes 62 through which extend the pins 58 to enable the members 52 and 54 to pivot relative to one another in the plane of the plate 60. The sleeve 64 fits around the outside of the members 52 and 54 and is slidable therealong. The member 52 is provided with an abutment 66 with

prevents movement of the sleeve 64 beyond that abutment in a direction away from the linkage between the members 52 and 54, and the other member 54 is provided with a helical compression spring 68 extending between the sleeve 64 and a further abutment 70 provided at the far end of the member 54.

When the joint 42 is in the folded condition, as shown in Figures 5 and 9, the compression spring 68 is in a compressed condition and the sleeve 64 extends only along the member 54. When the joint is straightened the compression spring 68 urges the sleeve 64 towards the abutment 66 until its stopped thereby, so that the sleeve 64 extends over both members 52 and 54, and restrains the joint 42 from bending. When it is desired to collapse the canopy, the sleeve 64 is pushed towards the abutment 70 against the force of the spring 68, until the sleeve 64 is wholly over the member 54. The joint 42 can then be bent to bring the outer part 26 of the rib 10 against the inner part 24.

Figures 11 to 13 show how the ends of the ribs 10 are each provided with resilient means to reduce the likelihood of tearing of the membrane 14 thereat. Thus, a flap 72 provided with eyelets 74 is attached to a tubular portion 76 which has been slid on to the far end of a rib 10. The tubular portion 76 is blind at its outer end and a helical compression spring 78 extends between the tip of the rib 10 and the inside of the blind end of the tube 76. The membrane 14 is attached to the flap 72 by means of the eyelets 74.

The detailed construction of the hub 12 will now be described with reference to Figures 14 to 28.

Figures 14 and 15 show a pivot block 80 of the hub 12 which is generally tubular, has an internal screw-thread 82 at an upper end thereof and both internal and external screw-threads 84 and 86 at a lower end 48 thereof. Extending radially outwardly from a central region of the block, and spaced apart therearound are a plurality of fingers 88. Respective spigots 90 extend through the ends of the fingers 88, each spigot 90 being generally at right angles to its finger 88.

Figures 16 to 19 show a rib-retainer 92 having a forked hook 94 at one end thereof and a tubular portion 96 at the other end which receives an inner end of a rib 10 as a tight fit.

Figures 20 and 21 show a top cap 98 of a hub 12 which has the general shape of a hat and is provided with a circular aperture 100 at an upper end thereof.

Figures 22 to 24 show the pressure plate 44 in greater detail. It has a generally circular shape and on one side thereof has a plurality of studs 102 each formed with semi-circular notches 104 which receive and locate a respective rib retainer 92 when the hub 12 is assembled. Recesses 106 are formed on the other side of the plate 44 in between the studs 102 to reduce the total amount of material required to make the hub. Figure 24 shows the connecting portion 30 of the pressure plate 44 provided with an internal screw-thread 108.

The fastening nut 50 is shown in greater detail in Figures 25 and 26. It is tubular in form, and has a plurality of readily outwardly extending fingers 110 spaced apart around its outside to provide a knurled knob which is easily grasped by a user's hand. It is provided with an internal screw-thread 112 which mates with the external screw-thread 86 of the pivot block 80.

The various parts of the hub 12 are assembled as shown in Figure 27. Thus, the inner end of each rib 10 is inserted into a respective rod-retainer 92 which in turn has its forked hook 94 engaging a respective spigot 90 on one of the fingers 88 of the pivot block 80. The upper cap 98 is secured to the upper end of the pivot block 80 by means of a bolt 114, the shank 116 of which engages the inner screw-thread 82 The pressure plate 44 is fastened to the underside of the hub 12 by means of the fastening nut 50 which engages the external screw-thread 86 of the pivot block 80.

Figure 27 shows a pole 28 with its screw-threaded end engaging the inner screw-thread 84 of the lower end of the pivot block 80. This enables the canopy to be used as a conventional umbrella. However, to gain the advantage of the present invention, the rod 28 is secured to the connecting portion 30.

Figure 28 shows a diagrammatical side view of parts of the assembled hub 12 with the rod 28 removed.

Each rib 10 is preferably made of fibreglass or carbon fibre, or alternatively a plastics composite could be used. The inner parts of the ribs are preferably about 6-10mm in diameter. For ease of manufacture, they are of circular section, but they do not have to be. They may be solid or tubular in section.

The number and individual lengths of the ribs 10 may be varied to alter the shape of the canopy. It would be possible for the rod 28 to constitute one of the ribs of the canopy. Alternatively, one of the ribs may be made substantially the same as the others but tubular and substantially 20mm in diameter, capable of sliding over another tube, pushed into the ground to hold the canopy in position.

The membrane 14 may comprise a plurality of triangular segments stitched or otherwise held together. The diameter of the membrane 14 is less than twice the length of one of the rods 10 to ensure that the latter is well stretched when the canopy is unfolded, and adopts the shape of a

conch. The centre of the membrane 14 is fastened to the hub 12 by being sandwiched between the upper cap 98 and the upper end of the pivot block 80.

The various parts of the hub 12 comprise mouldings, either of synthetic plastics material or of a metal or metal alloy in which case those parts are die pressure castings.

It will be appreciated that the manner in which ribs are secured to the hub 12 avoid the need for any wire which, in conventional umbrellas, tends to corrode, break away from the central boss and tear the fabric of the umbrella.

It will be appreciated that the top cap 98 prevents the rib retainers 92 from being moved upwardly away from the spigots 90. It further forms a water tight seal with the membrane 14.

The head of the bolt 114 may be provided with an eyelet 117, as shown in Figure 27, to which can be attached a guy rope to teather the umbrella in place when high winds are encountered.

The pressure plate 44 may be clamped to the pivot block 80 rather than screwed thereto, and other methods of fixing it in position will readily occur to the reader familiar with the art.

The pressure plate 44 may be made of pressed metal or of synthetic plastics material. Preferably it is about 120mm in diameter.

Instead of the pole 28, stability can be afforded to the canopy by having, for example, two of the higher ribs formed with telescopic ends which can be extended outwardly until they meet the ground, instead of the use of joints 42. Some of the ribs 10 of the canopy may be telescopically adjustable in length in order to slacken tension of the membrane during the erection of the canopy.

Advantages of the illustrated construction are:

(a) that supporting struts for the ribs are avoided as is the necessity of a central rod or tube;

(b) a pressure plate is used to hold the ribs in an open position;

(c) the canopy has substantially no internal projections other than the fastening nut 50;

(d) the use of tapering ribs as described provides substantial variation in rigidity and flexibility to create the desired conch shape for the membrane;

(e) each rib can be readily removed from the hub by unscrewing the bolt 114, removing the upper cap 98 and unhooking the appropriate rib retainer 92 from its spigot 90;

(f) the use of a resilient tip for each rib reduces the likelihood of tearing of the membrane 14; and

(g) the joint 42 (or alternative telescoping referred to herein) enables the tension in the membrane 14 to be reduced during erection or dismantling of the canopy.

The canopy illustrated in Figures 29 and 30a is provided with an alternative method of securing the canopy to the ground where the mounting pad 36 has a female connector 118 adapted to receive the end of one of the ribs 138 of the canopy itself, rather than having a male connector which is received by an end of the pole 28 as illustrated in Figure 3. The rib 138 is strengthened relative to the other ribs of the canopy for this purpose. The canopy has an odd number of ribs supporting the membrane 14 so that there is webbing rather than a rib diametrically opposite the strengthened rib 138. This facilitates entry into the underside of the canopy. The two ribs 136 which are immediately adjacent to the strengthened rib 138 are longer than that rib so that they too also may extend to the ground. All the ribs 136 and 138 which extend to the ground have the membrane material secured to them at a position inwards from their ends to avoid damage by the ground.

In the modification shown in Figure 30b a spigot 34 extends upwardly from the mounting pad 36, into a tubular end portion of the rib 138. In Figure 30c the mounting pad 36 is an integral part of the end of the rib 138. Alternatively, the outer end of the rib 138 may simply be extended in the form of a spike (not shown).

The collapse of the canopy as illustrated in Figure 5, where the ribs 10 are broken at joints 42, can alternatively be achieved by removing the membrane 14 from the end of at least one of the ribs 10, 136 or 138. Thus the canopy can be readily reassembled for use by hooking the membrane 14 back over the or each such end. The membrane may be reinforced with caps (not shown) of plastics or other material at the positions where it is hooked over.

An advantageous modification of the hub 12 is illustrated in Figures 31, 32a, 32b, 33a and 33b in which the hub comprises an upper half 120 and lower half 122. Each half is provided with part hemi-spherical recesses 121 and 123 (only one pair of which is shown in Figure 31). The recesses 121 in the upper half 120 are in registration with the recesses 123 in the lower half, so that each pair of recesses 121 and 123 form a socket. Each rib 10 has a ball shaped end 124 at its end which fits in a corresponding socket provided by the hub 12, to form a ball and socket joint. Each rib 10 is provided with a neck portion 149 immediately adjacent to its ball shaped end 124. The modified construction still has the pressure plate 44 to hold the ribs 10 in radially outwardly extending positions, and hand wheel 50 to retain the pressure plate 44 in position. Thus, it will be seen that a stepped bolt 142 has a head which engages a recess in the outer face of the upper half 120 of the hub 12, a shank which extends through holes 132

in the centres of the two hub halves, a nut 143 abutting the underside of the lower half 122 and threaded onto the shank of the bolt 142 to secure the two halves 120 and 122 together, and a narrowed shank portion 145 onto which is threaded the hand wheel 50. The latter retains the centre of the pressure plate 44, around its central hole 46, against a spacer member 147 which is between that plate 44 and the half 122.

Figures 32a and 32b show the upper half 120 of the hub 12 illustrated in Figure 31 in greater detail. Thus, the upper half 120 of the hub 12 comprises an injection-moulded disc preferably made from aluminium which has seven socket recesses 134 for the ball ends of seven ribs. Seven slots 126 and 128 extend respectively radially outwardly from the recesses 134, to accommodate the neck portions 149 of the ribs. Three of the slots 126 have sides as viewed in Figure 32a, which are substantially parallel to one another, to restrain any lateral pivoting of the ribs 136 and 138, whereas the sides of the other slots 128, as viewed in Figure 32a, are flared diverging away from one another at an angle of substantially 20°, as opposed to being parallel. This facilitates lateral pivoting of the ribs 10, to ease collapse of the canopy when it is being dismantled. The upper half 120 of the hub 12 has three downwardly extending protrusions 130 which mate with corresponding holes 140 (see Figures 33a and 33b) on the lower half 122 of the hub 12 when the two halves are joined together.

Figures 33a and 33b show the lower half 122 of the hub 12 illustrated in Figure 31 in a similar fashion.

Four slots 128 extending from respective part-hemispherical recesses 134, when viewed as in Figure 33a, have diverging sides to allow lateral pivoting of the ribs 10, and three slots 128 have substantially parallel sides. These are for the ribs 136 and 138 of canopy which extend to the ground, and because their sides are substantially parallel, they provide a rigid hold on the ribs 136 and 138 which extend to the ground. The slots 126 and 128 extend right the way through the lower half of the hub 12 to enable all the ribs to be brought parallel to one another when the canopy is folded up for storage.

It will be appreciated that the locating protrusions 130 could be provided instead on the lower half 122 of the hub 12, and the corresponding recesses 140 on the upper half 120.

It is possible to construct a larger hub which will hold more ribs, for example, nine ribs, as illustrated in Figures 34a, 34b, 35a and 35b. Still only three of the slots 126 would have parallel sides, with six of the slots being flared.

As illustrated in Figure 36, storm rods 144 may be added on sides of the canopy. The rods 144 may hold storm sides 142 to give further protection to the user. The storm sides 142 may be made of polyurethane coated nylon. The storm sides 142 are joined to the membrane of the main canopy along an edge 146 of the latter using fastening means described hereinafter.

Further storm rods 148 may be added extending downwardly to the ground from the uppermost ribs 10, and an overwrap 150 stretched over them. The overwrap 150 may be provided with clear panels to afford a clear view from inside the canopy and may incorporate a door 151 which is opened by a zip or velcro fastening 152. The whole structure may be held down with the aid of storm guys 154 which are secured to the canopy and pegs 156 inserted into the ground.

The storm sides 142 may be an integral part of the canopy or the overwrap thus reducing the amount of fastening they require.

The storm sides 142, if not integral with the membrane 14 of the canopy, may be fixed thereto using fastening means as will now be described.

Figures 37 to 41 show how the canopy and the overwrap, and/or the storm sides, may be held together. Along and slightly inwardly of an edge of the membrane 14 of the canopy there is held an extruded aluminium track 160. Its cross-section is of channel form as illustrated in Figure 38. Into and along this track 160 are slid two or more polypropylene clips 152, the cross-section of each of which is shown in Figure 39. Thus, it will be seen that the clips 152 are generally each U-shaped with a T-form end 153 which is received by the channel of the track 160, and another end 155 which is urged towards the track 160 by the resilience of the clip. This system avoids the need for zips, velcro or stitching of the overwrap and/or the storm sides to the canopy. Polypropylene end clips 158, each having a generally hook shape, are then inserted into the two ends of the track 160, and may be snapped onto respective rib ends to secure the track in position along the membrane edge concerned.

As shown in Figure 41, an upper edge or hem 160 of an overwrap and/or storm side has an elongate member, for example, a further track 162 extending along it. In that case, the track 162 may be enclosed by the hem. The track 162 is also provided with clips 158, which may be snapped onto storm rods instead of ribs 10. Cut-outs 164 from the hem 160 expose the track 162 at positions corresponding to those of the clips 152, to enable the track 162 to be inserted into those clips 152, and so to hold the upper edge or hem 160 of the overwrap or storm side tightly against an edge of the canopy membrane 14.

Preferably the membrane 14 is made of bond

weave semi-flexible woven material imprinted (that is to say sandwiched) between sheets of PVC plastics material. Sections of the membrane may be welded together to improve its water resistance.

Numerous variations and modifications to the illustrated canopy will readily occur to a reader familiar with the art, in addition to those already described herein, without taking the canopy outside the scope of the present invention. For example a connecting portion 30, similar to the one shown in Figure 24, may be provided on pressure plate 44, the latter in this case being relatively thick and injection moulded in synthetic plastics material with the connecting portion 30 having an inner part which is in-moulded into the plate. Alternatively, such a connecting portion 30 may be provided on the hub 12 illustrated in Figure 31, either as a separate part which is clamped in an appropriate recesses formed in the upper and lower hub halves 120 and 122, or as an integral part of one of those halves. This enables a support rod like the one labelled 28 in Figure 3 to be used with the ball and socket construction shown in Figure 31 to avoid the need for any strengthened rib or elongated ribs, and also to avoid the need for differently shaped slots in the hub 12.

The hand wheel illustrated in Figure 6, which is used to tighten the pressure plate 44 against the ribs 10 at the hub 12, may be of narrower cross-section on its inside to fit into a corresponding recess in the pressure plate 44 so as to reduce the cross-section of the whole assembly.

The ribs and rods in any of the illustrated canopies may be made of fibre-glass which provides a resilience and strength needed to cope with windy conditions. Some climates may dictate that another construction for the ribs, and possibly also the storm rods, is used, for example acetate or other plastics, coated aluminium.

Two rib portions of different uniform cross-section connected by fusing, welding or other joint means rather than a tapered rib referred to earlier, may involve a saving in production costs.

The connecting portion 30 is shown in Figure 22 as a female connector. Instead, it may be a simple spigot which is received in the end of the pole 28, which is in this case tubular. The latter may be provided with an elbow joint (not shown), for example at a mid-way position along its length, which may be of a fixed angle for a less expensive construction, or it may be continuously variable angle if it comprises two generally circular members respectively connected to the inner ends of the two pole halves, and each with inwardly directed interengaging teeth so that the circular members can be clamped together at substantially any selected relative angular position. Such an adjustable elbow joint is described, for example, with reference to Figures 16 and 17 of GB-A-2,129,288. Such an elbow joint enables the lower half of the pole 28 to be vertical whilst enabling the upper half to be on a selected angle of slant, and leaves more space under the canopy available to the user. Such a pole may be made so that it constitutes one of the ribs of the canopy, the membrane thereof then accommodating, and conforming to, the bend in the pole.

Claims

1. A canopy comprising a plurality of ribs (10) extending from a hub (l_2) of the canopy and a membrane (14) attached to those ribs (10), the ribs (10) extending radially outwardly from the hub (12) when the canopy is in use so that the membrane (14) is stretched outwardly from the hub (12), characterised in that the ribs (10) are held securely in their radially extending positions, against collapse towards one another, at their inner ends to avoid the need for a central pole and rib-supporting struts such as are present in a conventional umbrella.

2. A canopy according to claim 1, characterised in that the plurality of ribs (10) are held securely in their said radially extending positions by a pressure member (44) attached to the hub (12).

3. A canopy according to claim 2, characterised in that the pressure member (44) is substantially in the form of a plate (44).

4. A canopy according to any preceding claim, characterised in that the inner ends of the ribs (10) are pivotably attached to the hub (12), and the means (44) by which the ribs (10) are held securely in their radially extending positions is releasable so that, upon release of those means (44), the ribs (10) can be brought together for ease of stowage.

5. A canopy according to claim 4, characterised in that the inner ends of the ribs (10) are attached to the hub (12) by means of ball and socket joints.

6. A canopy according to claim 5, characterised in that the inner ends of the ribs (10) are formed as the balls (124) of the joints, and in tha t the hub (12) Comprises two halves (120 and 122) each formed with respective halves (121 and 123) of the sockets, to enable the rib ends (124) to be inserted into the sockets during assembly.

7. A canopy according to claim 5 or claim 6, characterised in that the hub (12) is provided with slots (126 and 128) extending respectively from the sockets (121 and 123) in a radially outward direction and also in an intended downward direction, each to accommodate a portion (149) of the associated rib (10) immediately adjacent to and extending from the ball (124), to allow the ribs (10) to

pivot downwardly, and so be brought together for ease of stowage.

8. A canopy according to any preceding claim, characterised in that the canopy is supported on the ground when in used by an elongate member (28 or 138) attached to the hub (12) and extending to the ground.

9. A canopy according to claim 8, characterised in that the elongate member is a strengthened rib (138).

10. A device for holding two pieces of fabric or other sheet material together, characterised in that it comprises a plurality of resilient clips (152) and means (160) for retaining those clips at positions spaced apart along an edge of a first piece of such material (14), so that an edge of a second piece of such material (150) can be releasably retained by means of the clips (152).

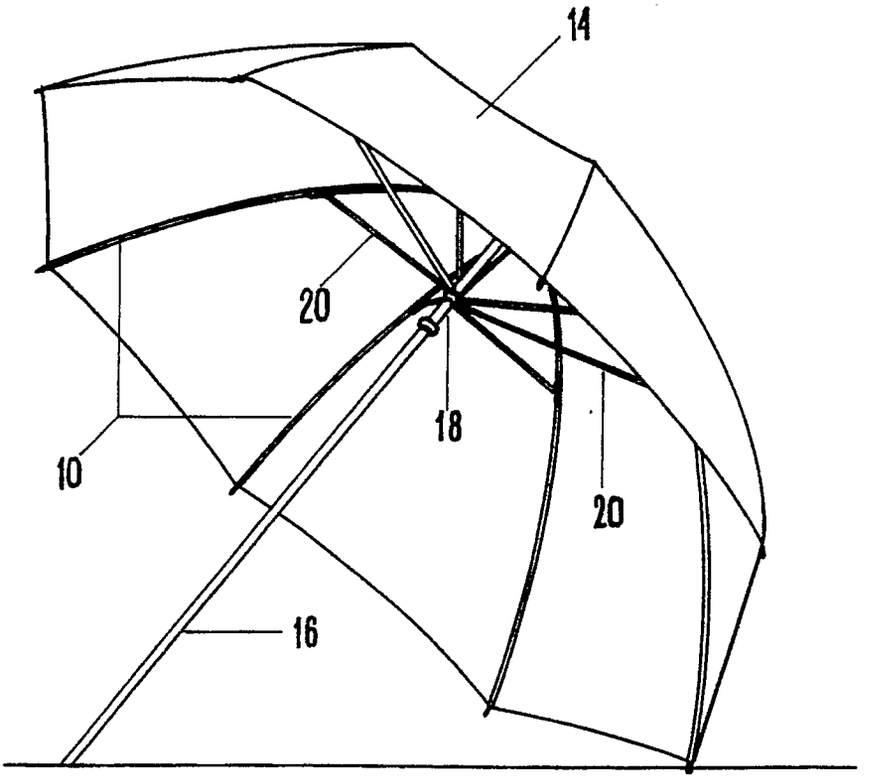

FIG. 1

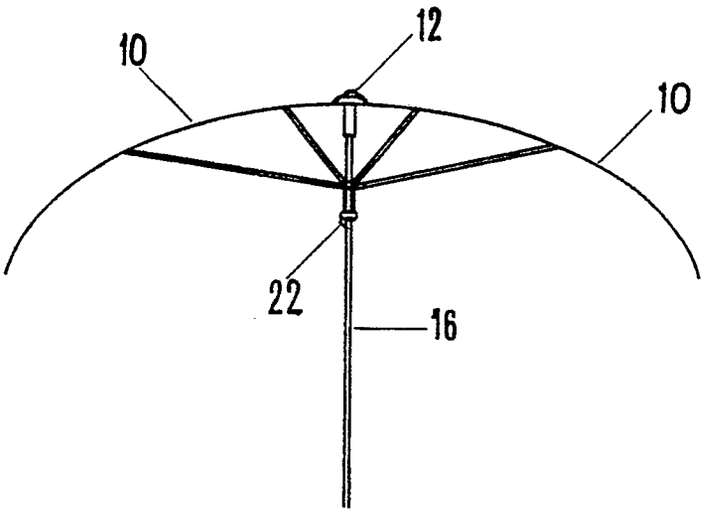

FIG. 2

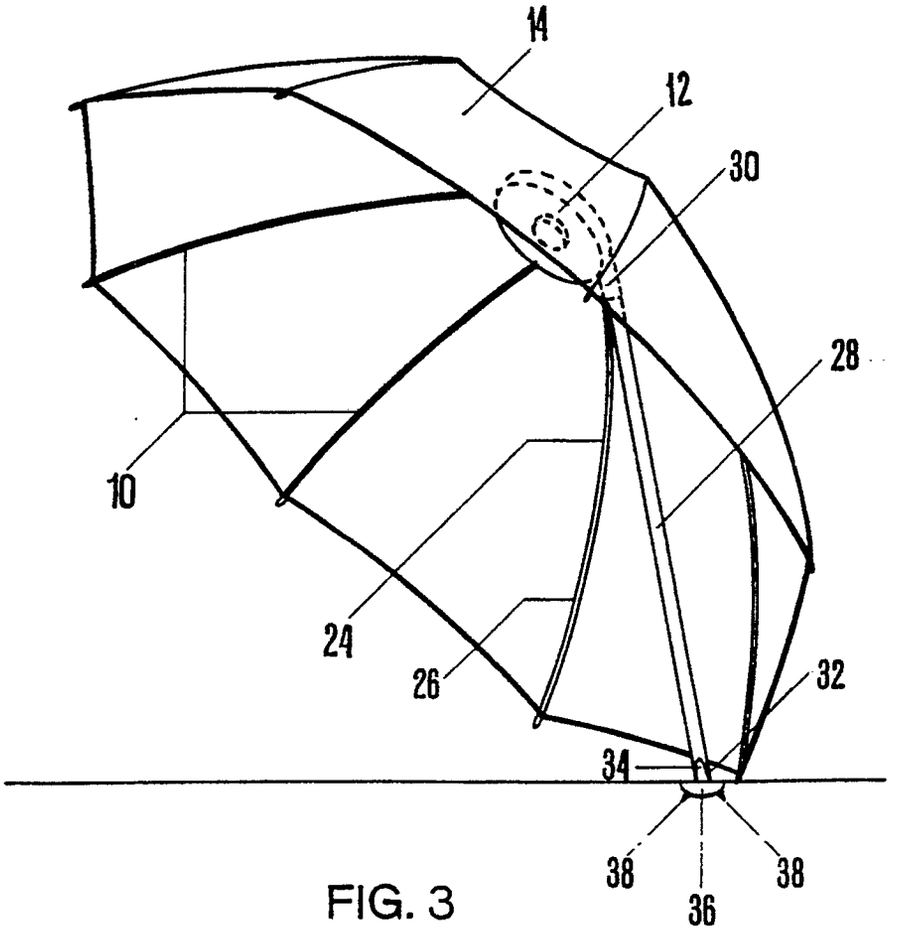

FIG. 3

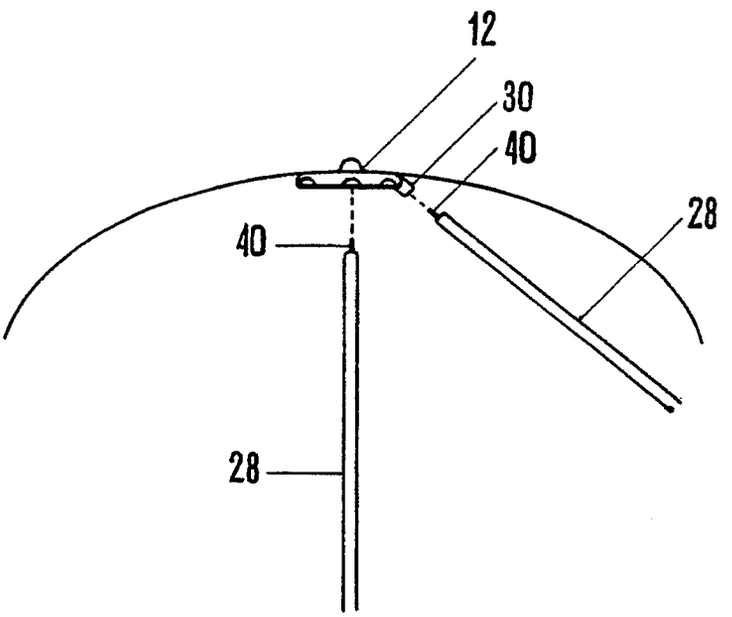

FIG. 4

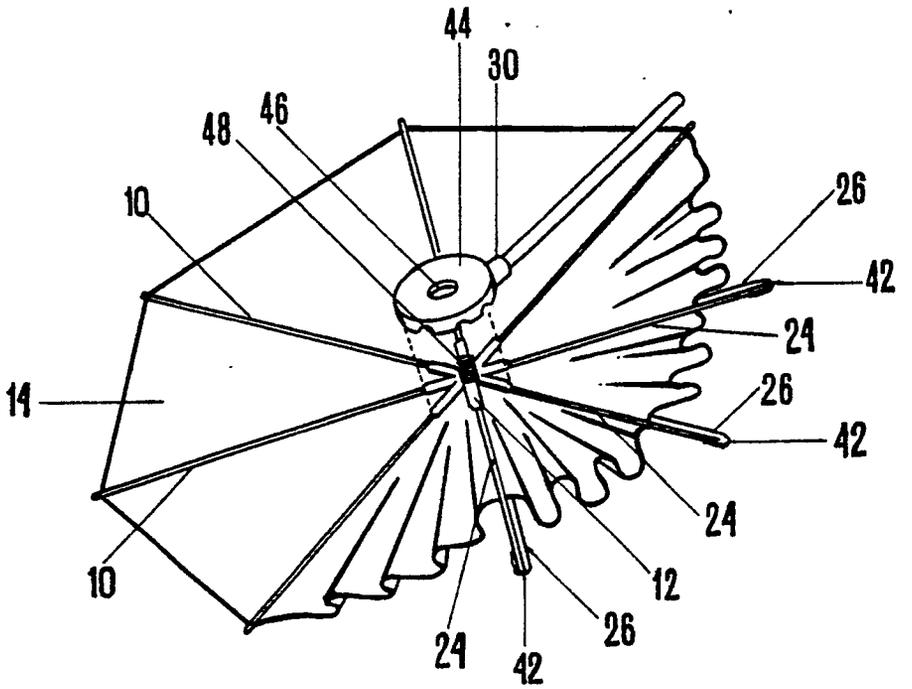

FIG. 5

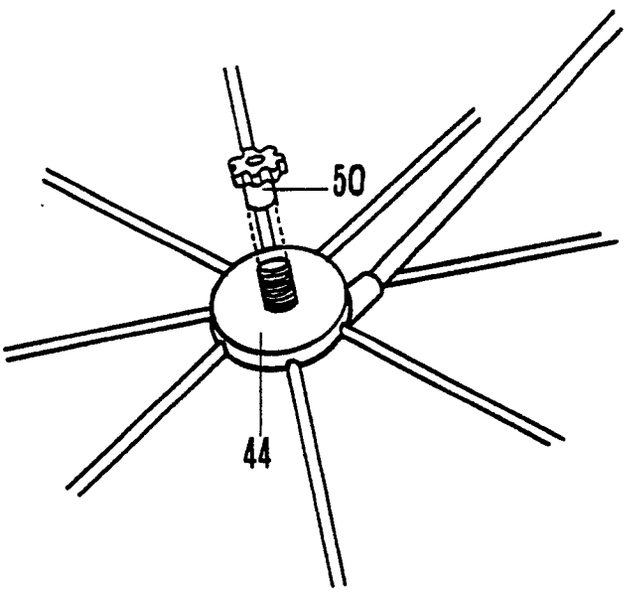

FIG. 6

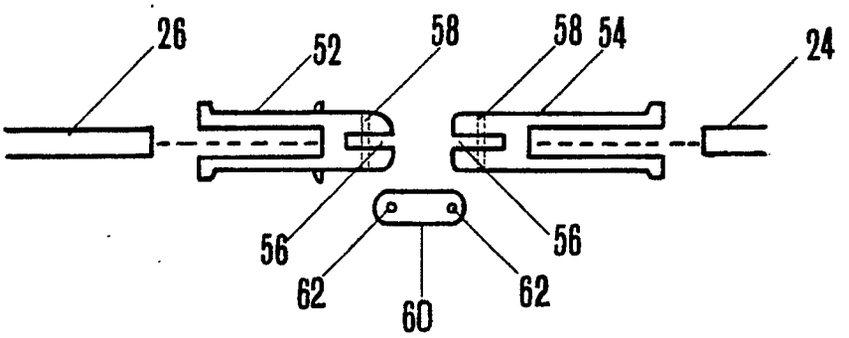

FIG. 7

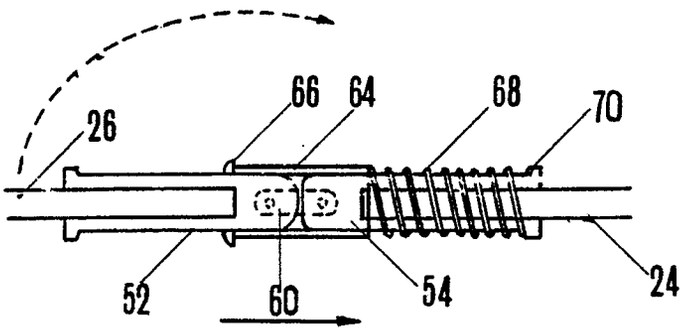

FIG. 8

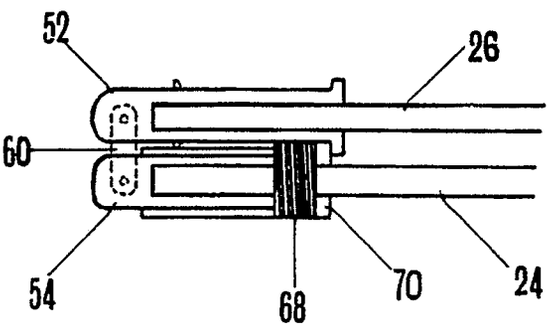

FIG. 9

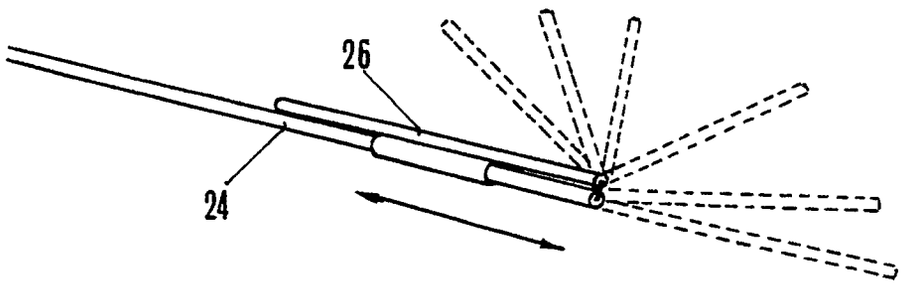

FIG. 10

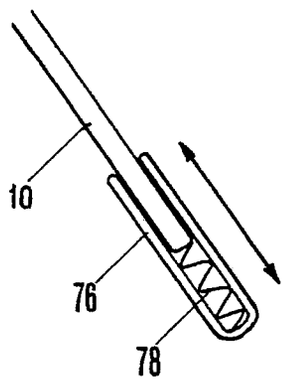

FIG. 11

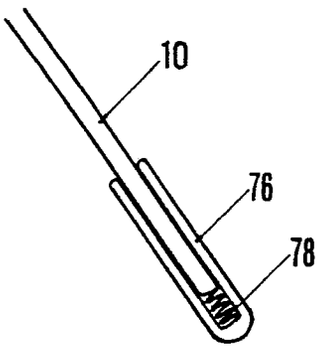

FIG. 12

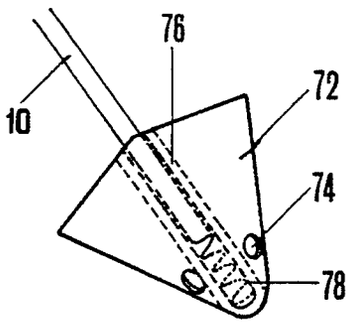

FIG.13

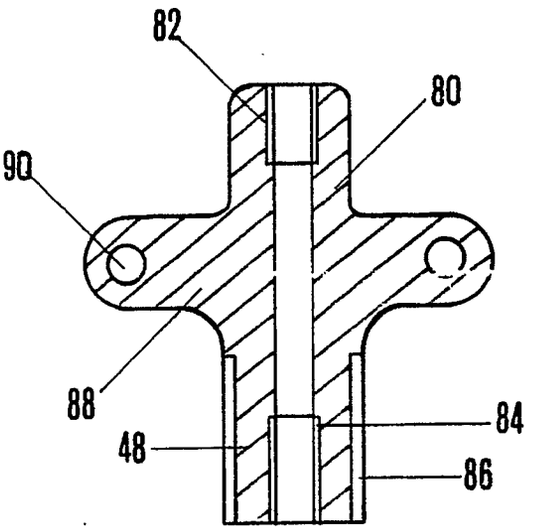

FIG.14

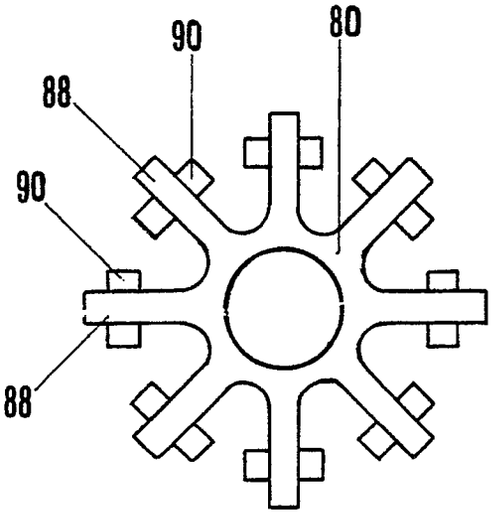

FIG.15

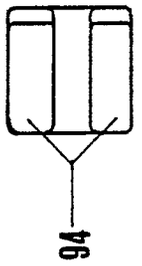

FIG.18

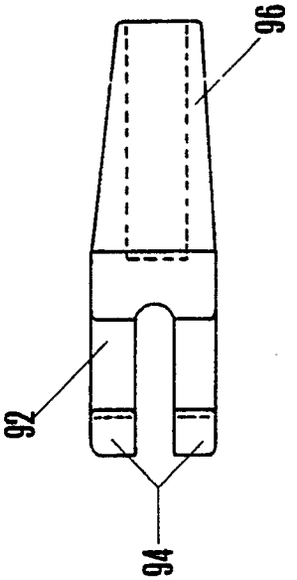

FIG.17

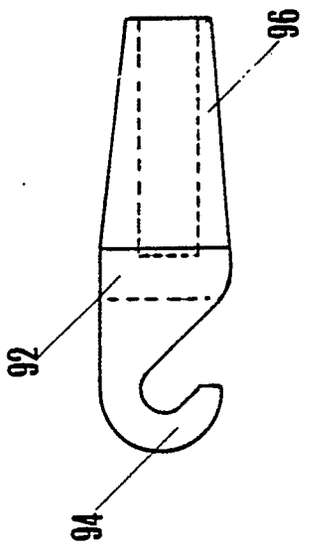

FIG.16

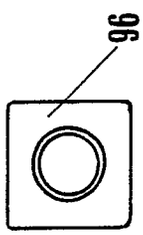

FIG. 19

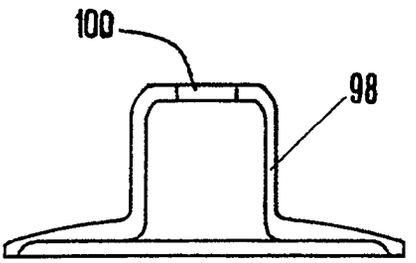

FIG. 20

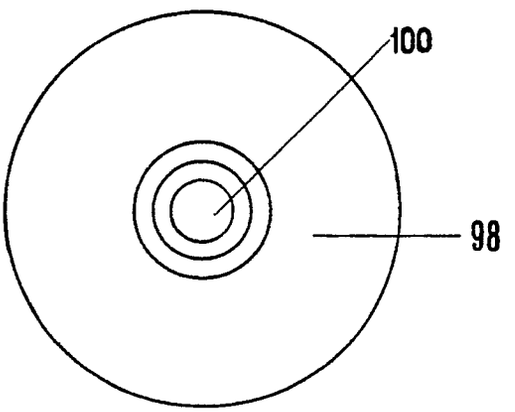

FIG. 21

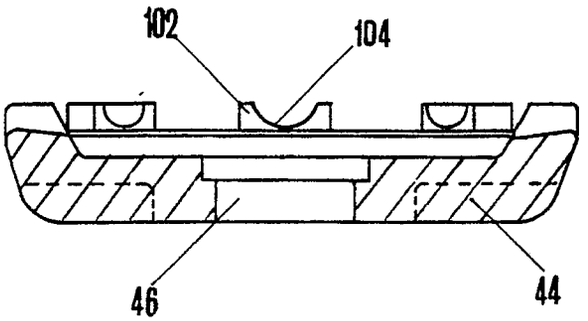
102
104
46
44

FIG. 23

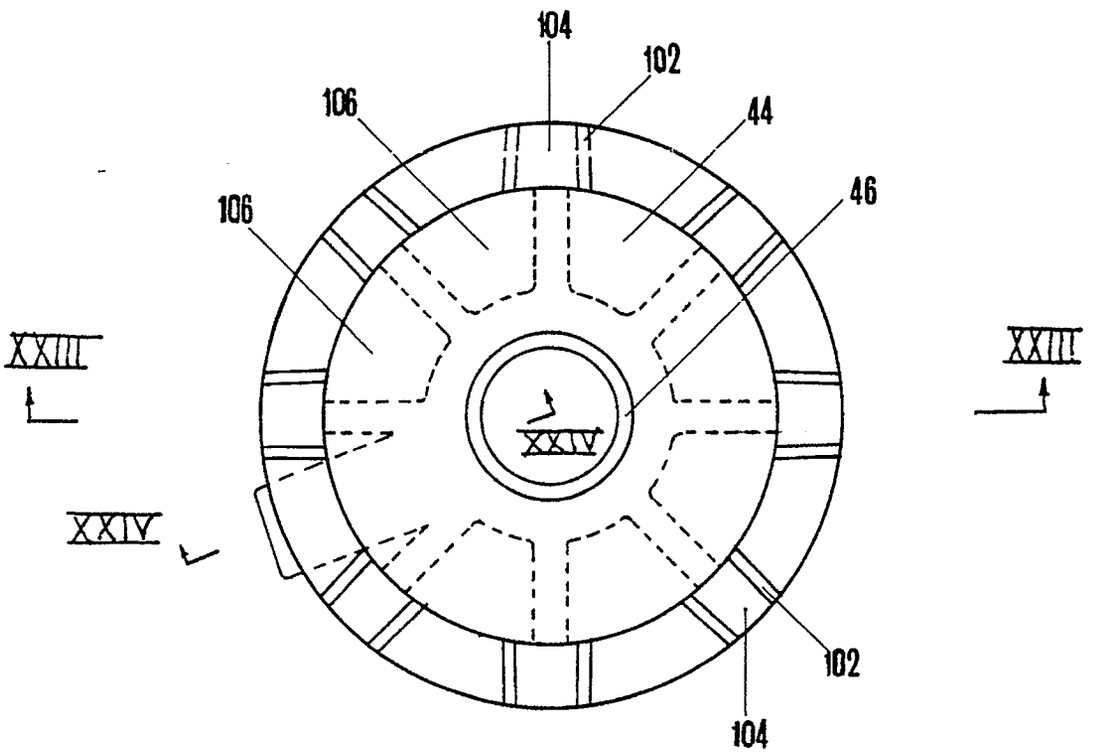
104
102
106
44
106
46
XXIII
XXIII
XXIV
XXIV
102
104

FIG. 22

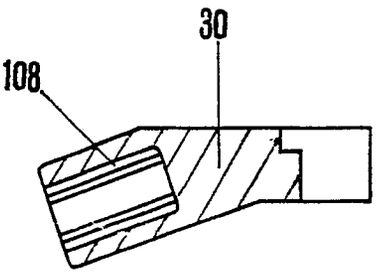

FIG. 24

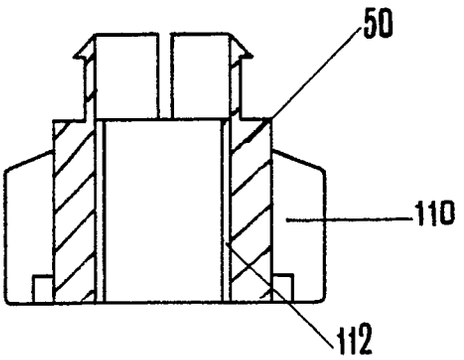

FIG. 26

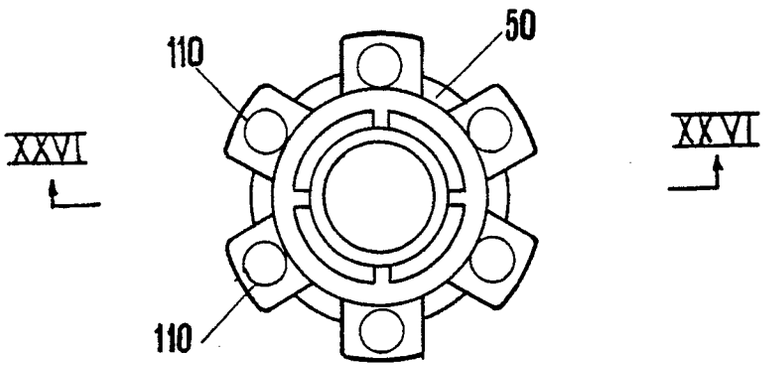

FIG. 25

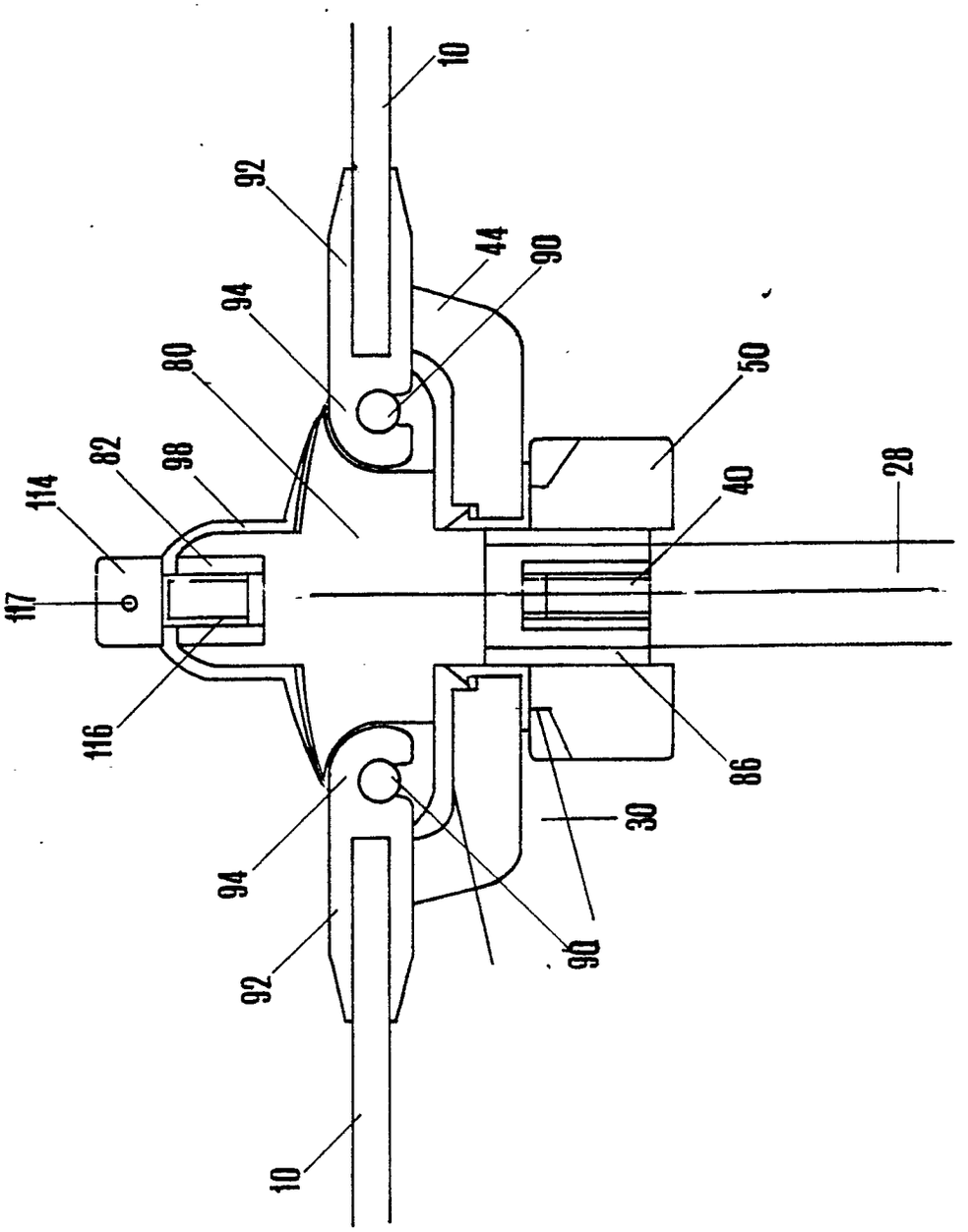

FIG. 27

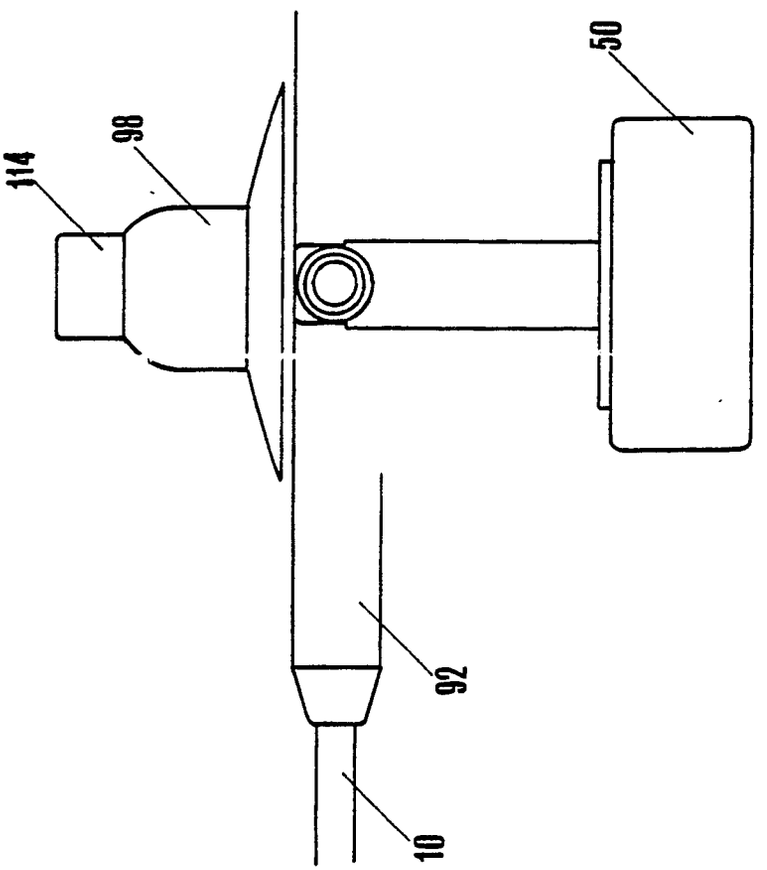

FIG. 28

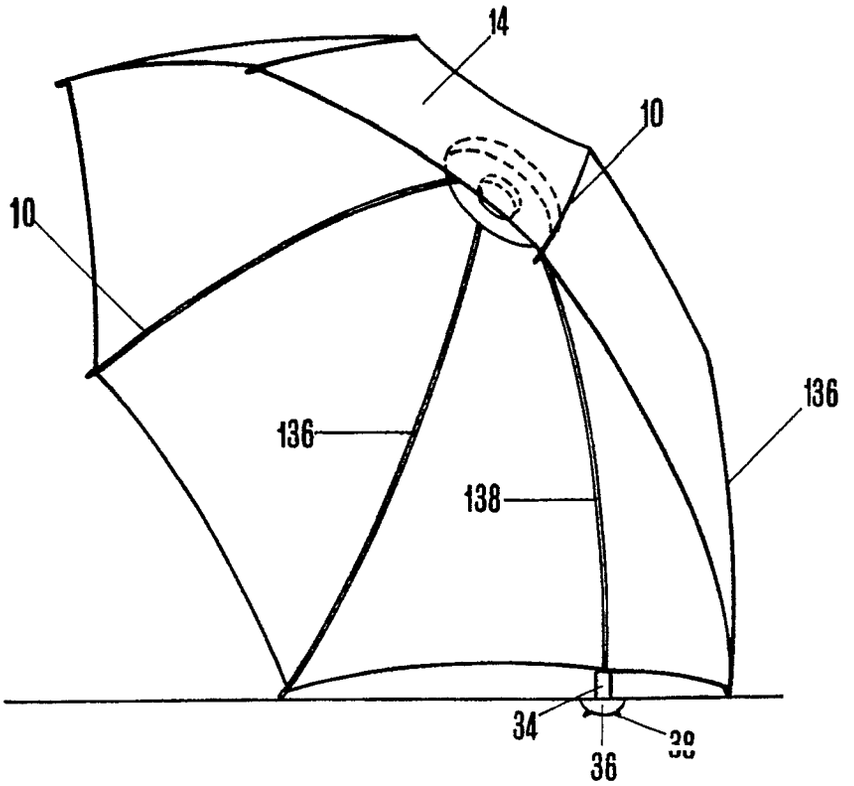

FIG.29

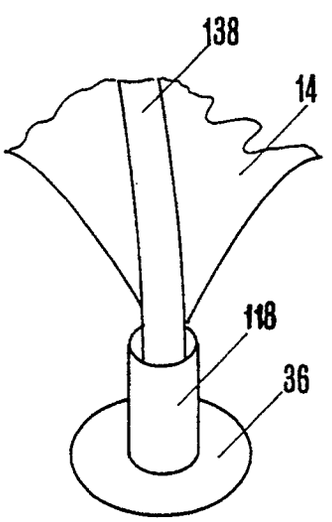

FIG. 30a

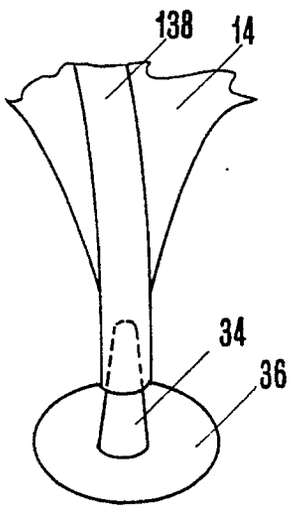

FIG.30b

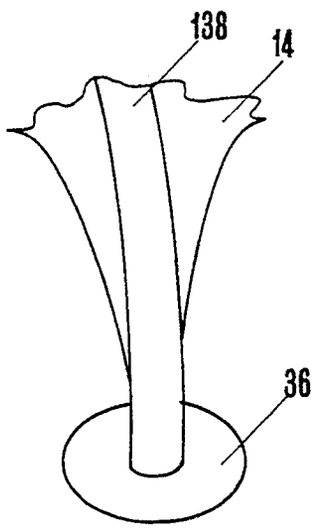

FIG.30c

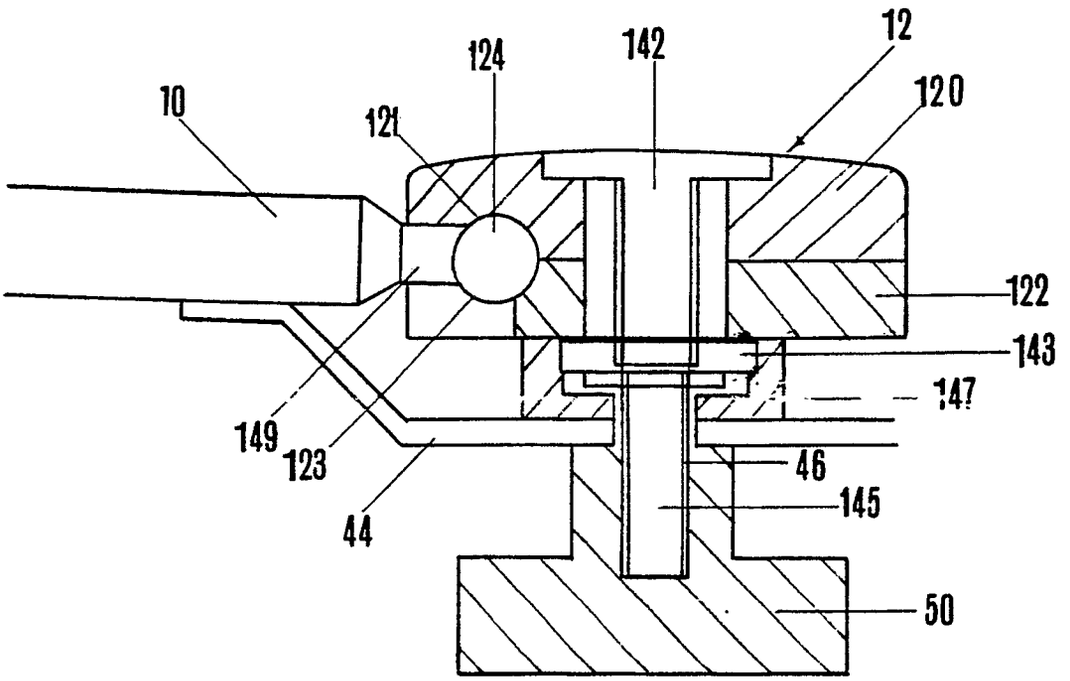

FIG. 31

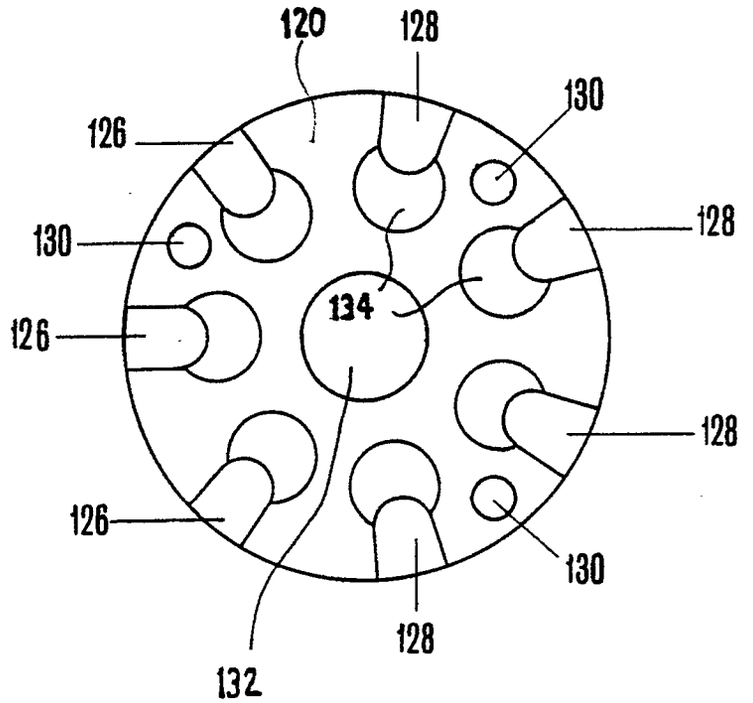

FIG.32a

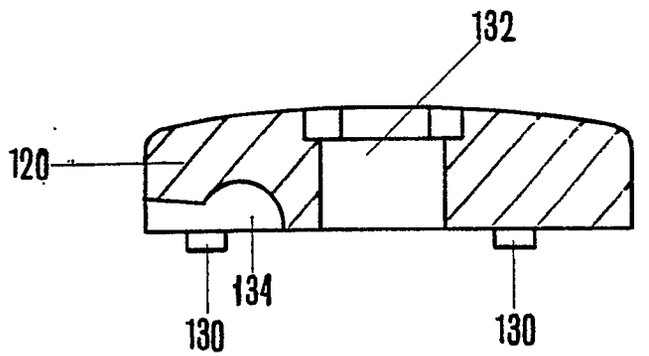

FIG.32b

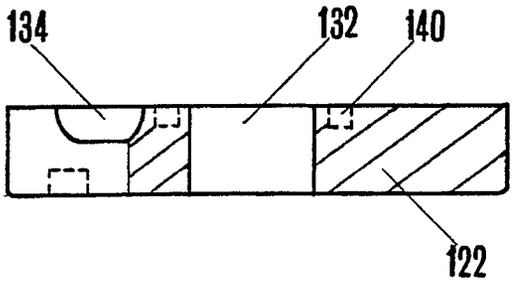

FIG. 33b

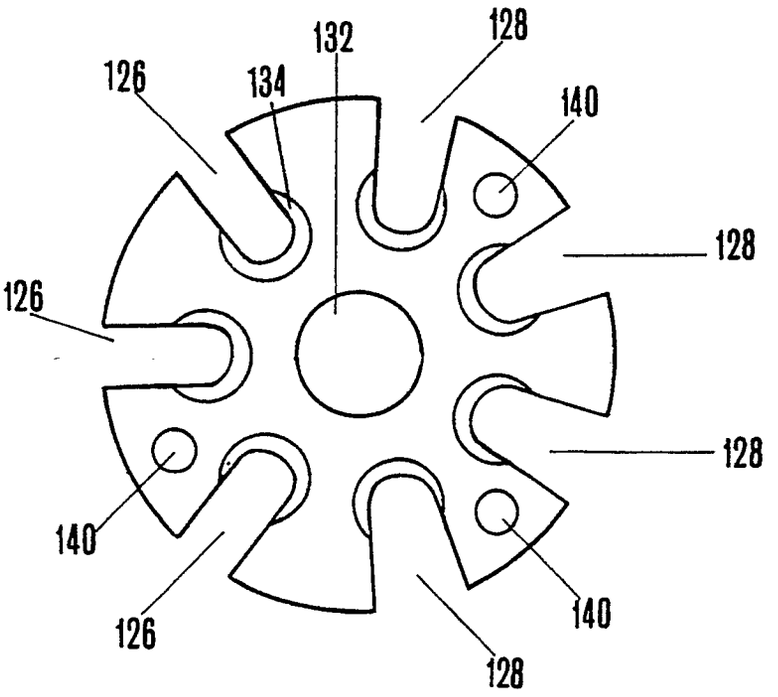

FIG. 33a

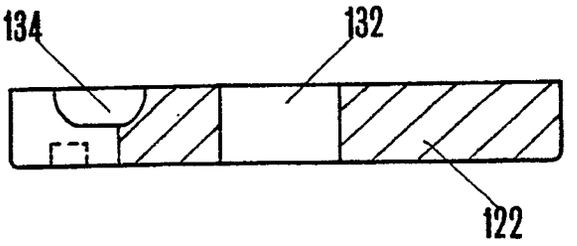

FIG. 34b

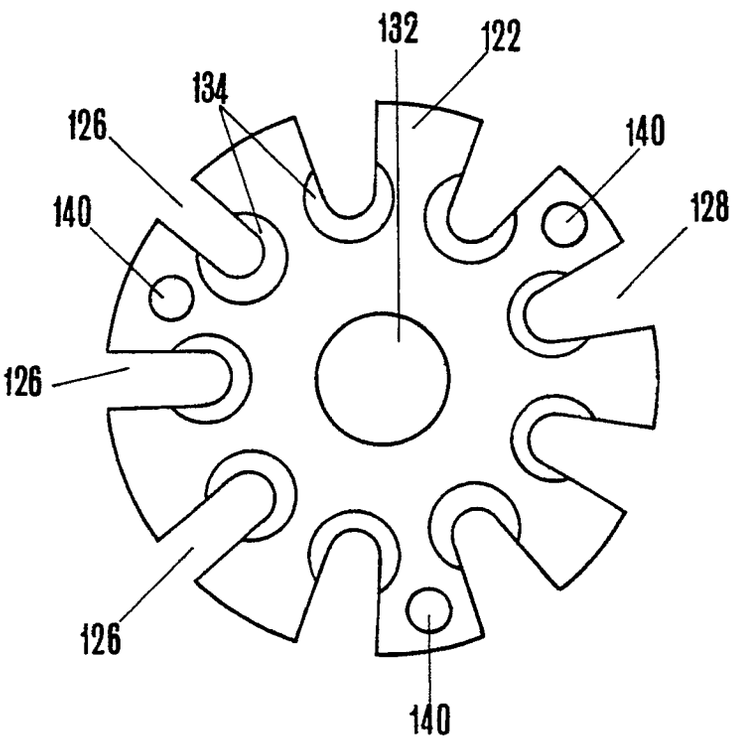

FIG. 34a

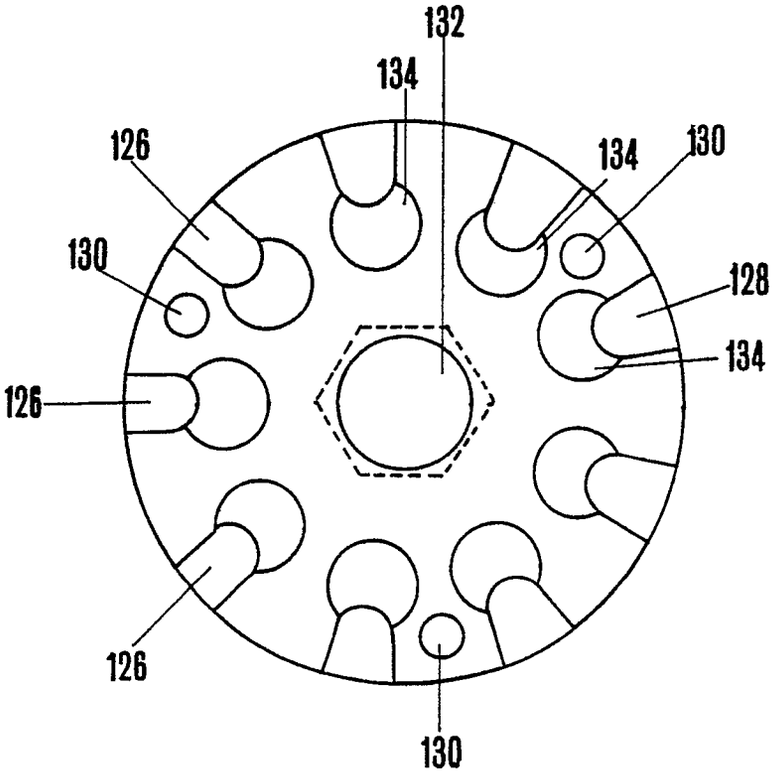

FIG. 35a

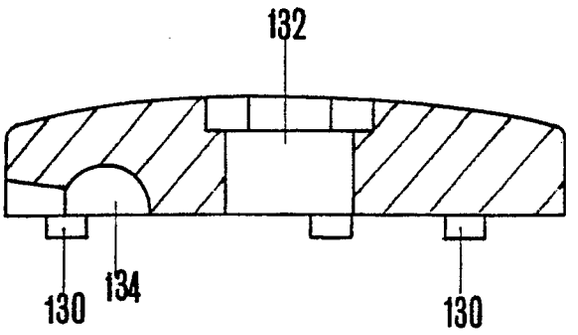

FIG. 35b

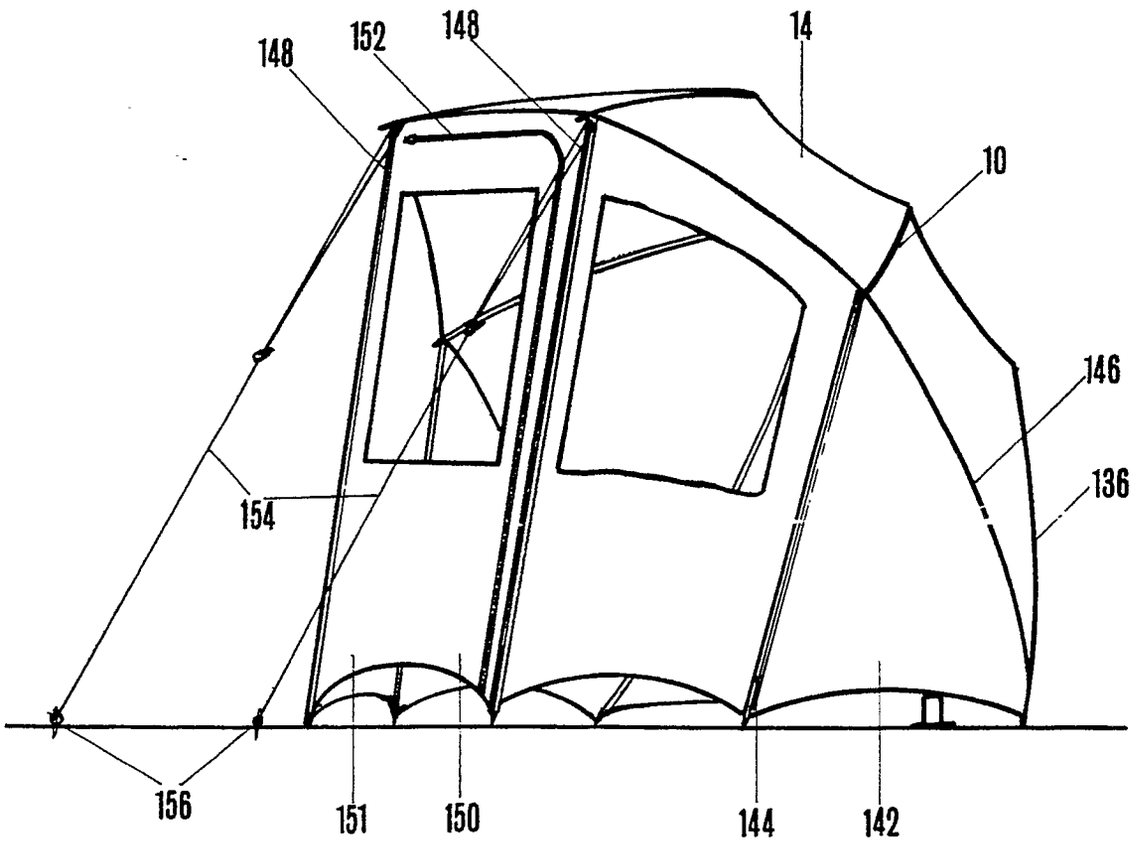

FIG. 36

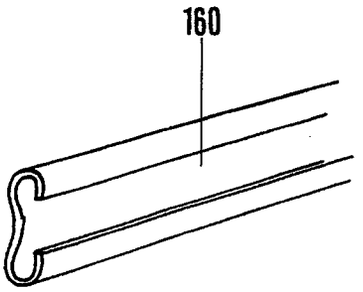

FIG. 38

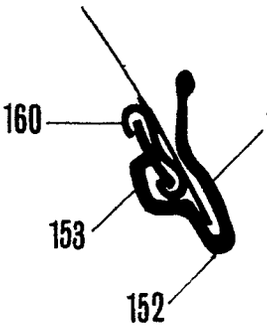

FIG. 39

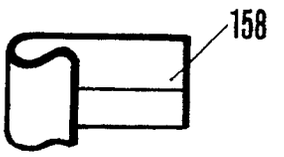

FIG. 40

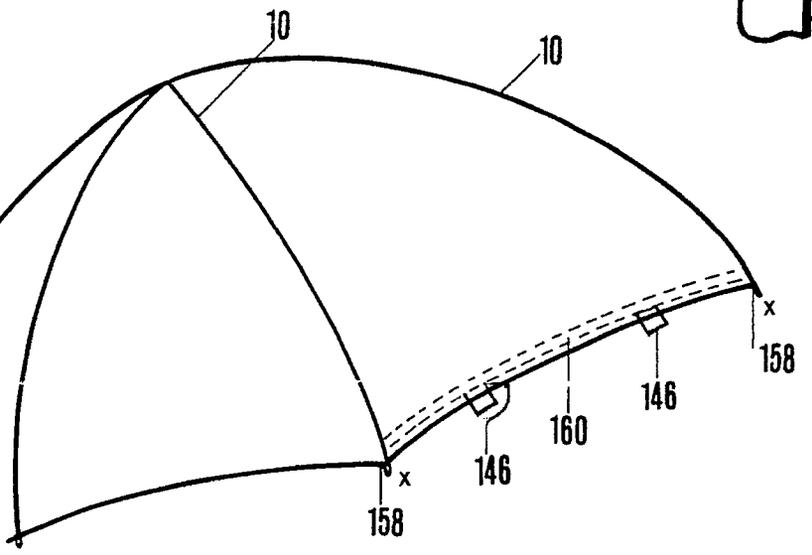

FIG. 37

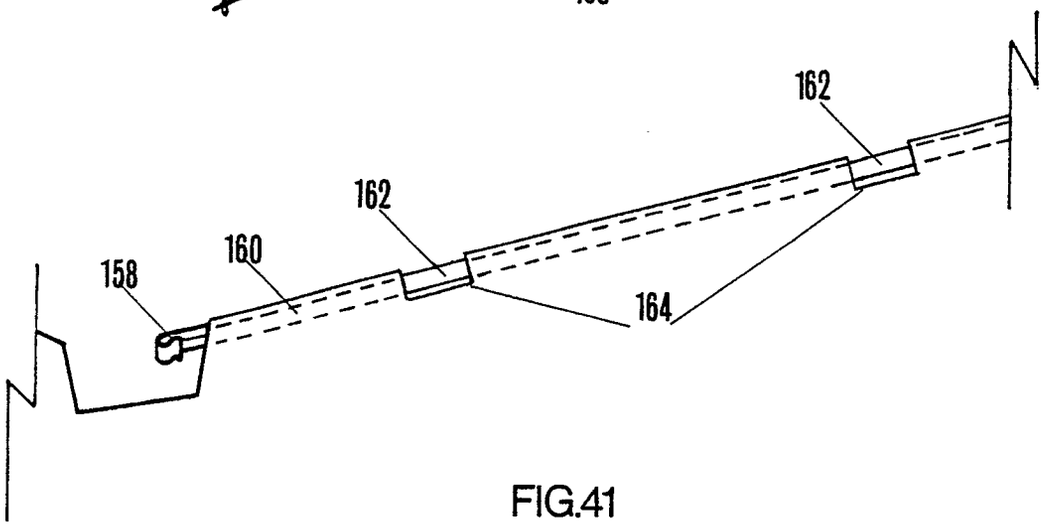

FIG. 41