July 9, 1957 J. F. OLIVER 2,798,501

COLLAPSIBLE HOUSING STRUCTURE

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FIG. 1.

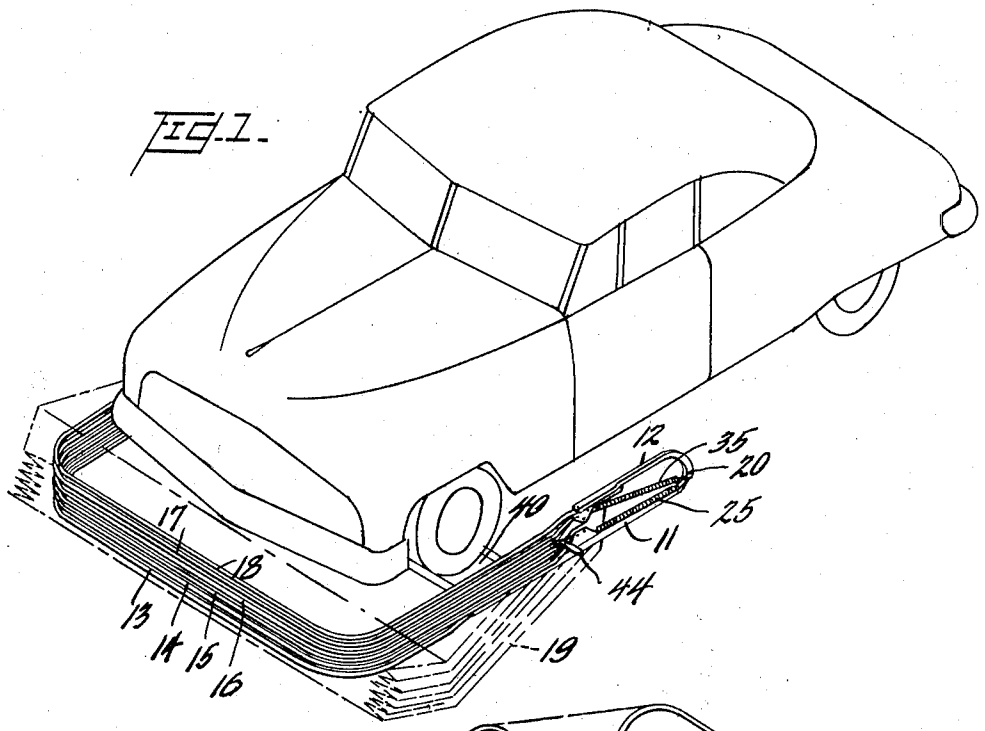
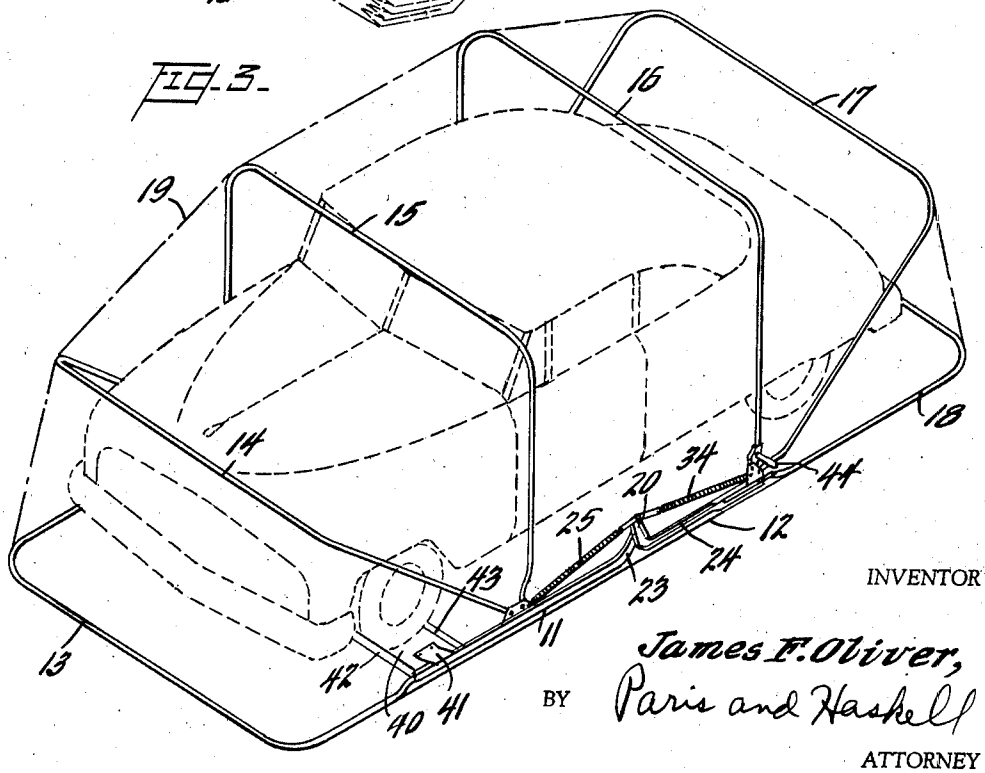


FIG. 3.



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FIG. 2.

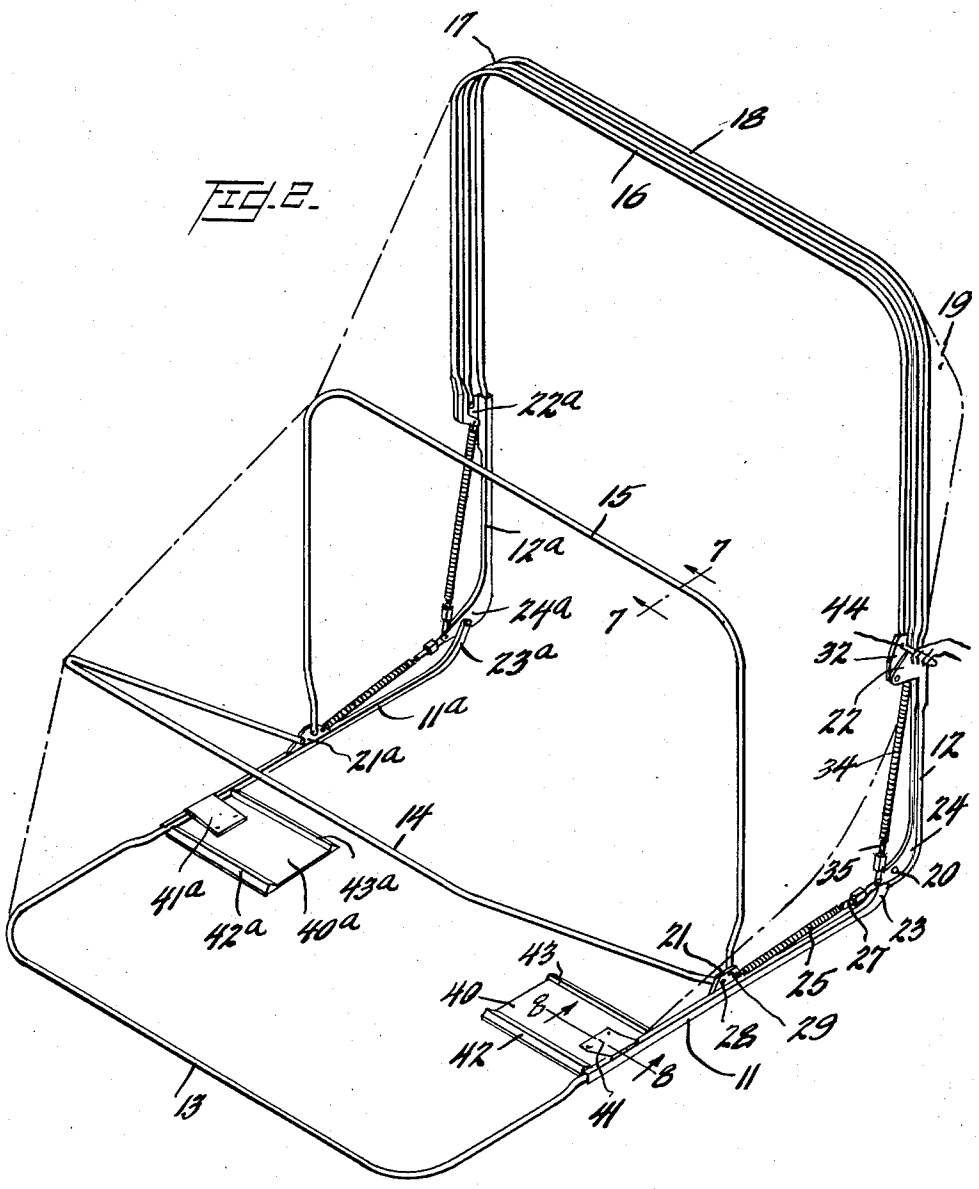
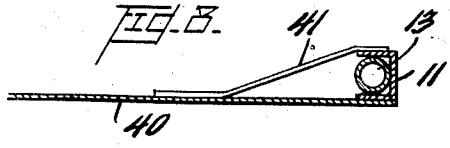


FIG. 3.



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COLLAPSIBLE HOUSING STRUCTURE

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FIG. 4.

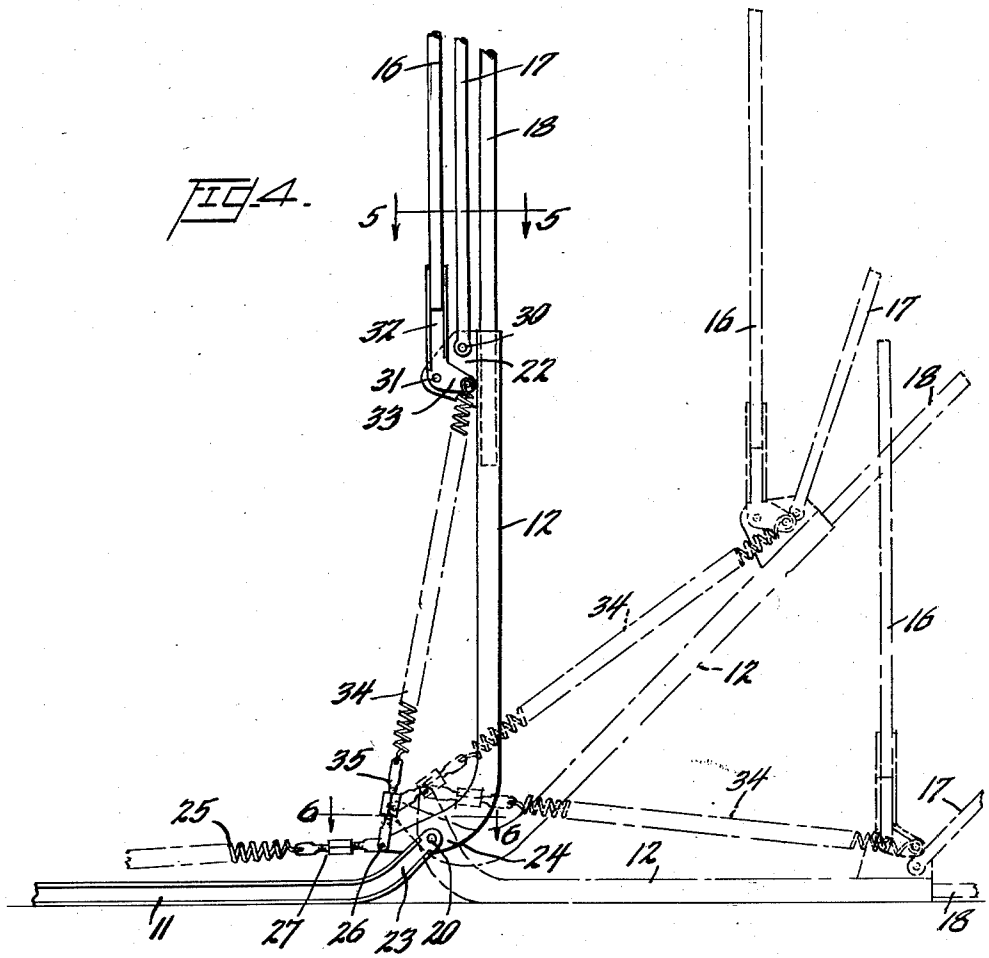


FIG. 5.

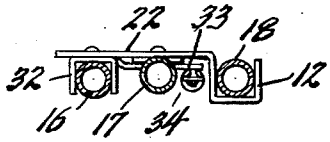


FIG. 6.

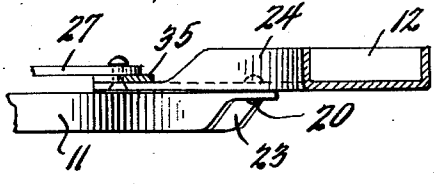
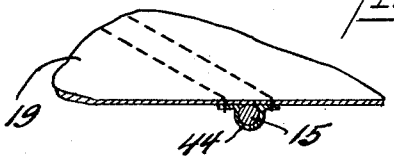


FIG. 7.



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2,798,501

COLLAPSIBLE HOUSING STRUCTURE

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Application January 25, 1955, Serial No. 483,963

9 Claims. (Cl. 135—4)

The present invention relates generally to collapsible housing structures, such as are characterized by tents, canopies, and other collapsible and portable protective structures.

Although it is contemplated that the present invention as herein described has its principal utility as a collapsible and portable protective covering for automobiles, in the form of a collapsible garage, it is to be understood that the principles of the present invention as exemplified in the specific embodiment to be described are likewise applicable to other uses. For example, by appropriate design of the structure within the scope of the present invention, it may be utilized as a beach canopy, a patio covering, a tent, or a utility storage hut. Basically, the collapsible housing structure of the present invention is provided with a structural framework formed from a plurality of hinged parts which may be readily operated between a compact collapsed condition, and a fully expanded open condition, or intermediate stages of expansion, wherein it functions as a protective housing. In order that the device may function as a protective housing as intended, the aforementioned structural framework supports and carries a fabric cover, which may be made of any suitable material depending upon the purpose for which the device is intended to be used. The fabric cover may be formed from plastic sheet material, convas, a reticulate screen material, or other sheet material as desired, and by the term "fabric" herein it is intended to encompass all such materials and other analogous materials.

Collapsible protective structures of the general type above referred to are known in the prior art. By the present invention, however, there are provided certain improvements over the prior art structures which render the present device more practical and useful, and more easily employed. For example, as will become more apparent from the following detailed description of a preferred embodiment of the present device, by the present invention: there is provided a novel anchoring means for devices of this general character; there is provided a novel counter-balancing system therefor, whereby the collapsing and expanding of the device may be accomplished with a minimum of effort and the device is afforded a stable state intermediate its fully expanded and collapsed states; there is provided a novel linkage between certain hinged parts of the aforementioned framework, whereby certain hinged parts are restrained in relation to others, in order that the collapsing and expanding of the device may be accomplished with an orderly array of the hinged parts; and by the combination of the foregoing novel features there is provided a collapsible protective housing structure which may be quickly and efficiently manipulated from a collapsed to an expanded position, and vice versa, by one continuous movement of one hand of the operator.

Accordingly, it is one object of the present invention to provide a collapsible protective housing structure wherein the device may be effectively and readily anchored in such a manner as to facilitate the ready expanding and collapsing of the structure.

Another object of the present invention is to provide a collapsible protective housing structure wherein the framework is appropriately counterbalanced to facilitate the expanding and collapsing of the structure.

Another object of the present invention is to provide a collapsible protective housing structure wherein certain hinged parts are restrained to an appropriate degree with regard to relative movement therebetween, so as to effect an orderly array of the parts during the expanding and collapsing of the structure.

A further object of the present invention is to provide a collapsible protective housing structure which may be readily expanded and collapsed, and wherein the several hinged parts are always retained in orderly array during the expanding and collapsing of the structure to facilitate these operations.

A still further object of the present invention is to provide a collapsible protective housing structure which may be readily expanded and collapsed, and which has a stable state intermediate its fully collapsed and fully expanded states.

Other objects and advantages of the present invention will become apparent from a consideration of the following detailed description of a preferred exemplary embodiment of the present invention and in conjunction with the accompanying drawings, in which like numerals refer to like or corresponding parts, and wherein:

Fig. 1 shows the collapsible housing structure in fully collapsed state;

Fig. 2 shows said structure in a state intermediate the fully collapsed and fully expanded states;

Fig. 3 shows said structure in fully expanded state;

Fig. 4 is an enlarged detailed view of the middle hinge and related parts of the structure taken from the interior of the housing to show the attachment and relationship of parts, illustrating the structure in semi-expanded state, and illustrating in phantom lines the operation of the structure in moving between semi-expanded and fully expanded states;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken along line 6—6 of Fig. 4;

Fig. 7 is a sectional view taken along line 7—7 of Fig. 2, and showing a means for securing the fabric cover to the struts of the frame; and

Fig. 8 is a sectional view taken along line 8—8 of Fig. 2.

Referring to the drawings, the collapsible housing structure comprises the basic frame members **11** and **12** hinged at **20** on one side, and the corresponding members **11***a* and **12***a* on the opposite side therefrom. Extending from and interconnecting the basic frame members are a plurality of fabric supporting hoops **13**, **14**, **15**, **16**, **17**, and **18**, which carry and support the fabric material **19**. The fabric **19** may be secured to the respective hoops by the formation of pockets, as provided by the application of strips **44** to the main portion of the fabric, as shown in Fig. 7.

Considering the foregoing basic components in greater detail, the basic frame elements **11**, **11***a*, **12** and **12***a* are shown as channel members into which the ends of ground hoops or struts **13** and **18** are fitted and secured. As is readily apparent, frame members **11**, **11***a* may be formed as a unitary piece with hoop **13**, and similarly for members **12**, **12***a* and **18**, so that in substance these two combinations of elements may be looked upon as the basic frame elements. Between the ends of frame members **11** and **11***a*, and at one end of the frame members **12** and **12***a*, there are formed the plates **21** and **22** on members **11** and **12**, and corresponding plates **21***a* and **22***a* on members **11***a* and **12***a*, for pivotally supporting the several aerial hoops or struts **14**, **15**, **16**, and **17**, as will be more fully described hereinafter. As stated above, the adjacent ends of members **11** and **12** are hinged at

20, and their hinged ends are angularly upturned at 23 and 24, in order to enable effective counterbalancing action by spring 25 connected between plate 21 on member 11 and the tip 26 of the upturned end 24 of member 12. It can thus be seen that if members 12, 12*a* and appurtenant hoops are swung about the pivot 20 between the collapsed position of the structure, as shown in Fig. 1, and the expanded or extended position, as shown in Fig. 3, the spring 25 acts as a counterbalance, in that its most contracted position is obtained when the member 12 is substantially in a vertical position, or at substantially a right angle to element 11, as shown in Fig. 2. Thus, further movement of element 12 to either direction from the vertical is against the resistance of spring 25 to further expansion, and as the effective force of the falling member 12 becomes greater, the further expansion of spring 25 affords a greater resistance thereto. If desired, a turnbuckle or like structure 27 may be provided at one end of spring 25, so that its counterbalance force may be accurately adjusted. In addition to affording an effective counterbalance pivot by locating pivot 20 intermediate the ends of upturned portion 24, the upturned ends 23 and 24 of members 11 and 12 provide for spacing between members 11 and 12 when the structure is in collapsed position, as shown in Fig. 1, with members 11 and 12 lying in substantially parallel relationship. This spacing is designed to accommodate the hoops 14, 15, 16, and 17 and the fabric 19 sandwiched therebetween, and thereby form a neat and compact package for the collapsed structure. It is understood that the structure and relationship of parts herein described with respect to members 11 and 12 find their counterparts in members 11*a* and 12*a*, and, if desired, a second counterbalance spring may be connected between elements 11*a* and 12*a* in the same manner as described for spring 25.

Considering the mounting of the aerial hoops or struts 14, 15, 16, and 17 upon the plates 21, 21*a* and 22, 22*a* in greater detail, hoops 14, 15 and 17 are mounted to their respective plates 21 and 22 by any conventional and simple pivot union, such as rivets or bolts, and similarly at their opposite ends to their respective plates 21*a* and 22*a*. A special mounting is provided, however, for hoop 16, as best shown in Fig. 4. One end of hoop 16 is pivotally mounted to plate 22 at 31 through the intermediate of bell crank member 32. The pivot union 31 per se may be any conventional means, such as a rivet or bolt. To the free end 33 of bell crank 32 is affixed a spring 34 which extends to and is affixed at its other end to the end 26 of upturned portion 24 of member 12. Spring 34 is affixed to these two points under tension, and if desired, a turnbuckle or like device 35 may be interposed between one end of the spring and its anchor, as at 26, to adjust the tension of this spring. The immediate effect of tensioned spring 34 is to tend to pivot hoop 16 about 31 in the direction of hoop 18. If desired, a similar spring and bell crank combination may be provided at the opposite end of hoop 16 in conjunction with plate 22*a*.

To further explain the function of spring 34 and lever 32, its operation will be here described with particular reference to Fig. 4 in the process of collapsing the housing structure from a fully extended position as shown in Fig. 3, to a fully collapsed position as shown in Fig. 1. As the assembly carried by basic frame members 12, 12*a* is pivoted about 20 toward collapsed position, the fabric between hoops 15 and 16 tends to slacken as hoop 16 approaches toward hoop 15. However, by the action of spring 34 on lever 32, the slack is initially taken up by resultant rotation of hoop 16 and lever 32 about pivot 31 toward hoop 18. This action continues as members 12, 12*a* are pivoted, until members 12, 12*a* are in a substantially vertical position, as shown in Fig. 2. At that time, hoop 16 is in substantially parallel alignment with hoop 18 and members 12, 12*a*, and it is to be noted that hoop 16 has picked up hoop 17 in the process of pivoting

under the action of spring 34. Upon the further folding of the structure to bring members 12, 12*a* past the vertical position to fully collapsed state, the tension remaining in spring 34 continues to hold hoop 16, and hoop 17 therewith, against hoop 18. On unfolding or extending the collapsed structure, the action of spring 34 and bell crank 32 is the same, functioning to hold hoops 16 and 17 against hoop 18 until members 12, 12*a* have passed the vertical position and until the fabric between hoops 15 and 16 becomes taut and restrains hoop 16 against further movement with hoop 18 and members 12, 12*a*. If it were not for the foregoing action of spring 34, there would exist the tendency of hoops 16 and 17 to fall away from hoop 18 as members 12, 12*a* passed the vertical position on collapsing the housing structure, and similarly on unfolding the collapsed structure. Such action would likely damage an automobile housed within the structure, and would result in such a disarray of hoops during the collapsing operation that it would become difficult to fully collapse or fold the structure. As is apparent from the foregoing description of the action of spring 34, it further functions in assisting spring 25 to counterbalance the weight of the half of the structure associated with members 12 and 12*a*, between the vertical position of members 12 and 12*a* and the fully extended position of the structure.

A further feature of the present invention resides in the provision of anchoring pad structures 40, 40*a* affixed to the two main frame members 11 and 11*a*, as by welding to the bottom of the frame members; and if desired additional structure such as plates 41, 41*a* may be welded to the tops of members 11 and 11*a* and to the tops of pads 40, 40*a*. If desired, the pads 40, 40*a* may themselves be made of sufficient weight to anchor the structure, but since this would add considerably to the weight of the structure, it is preferred not to employ such construction. Rather it is contemplated that the pads 40, 40*a* be designed to receive an auxiliary weight thereupon for anchoring purposes. In the case of the present specific embodiment which is designed and primarily intended to house an automobile, as a collapsible and portable garage therefor, the pads 40, 40*a* are designed to receive a pair of wheels (front or rear) of the automobile, the weight of the automobile thereby functioning to anchor the structure. To this end, wheel pads 40, 40*a* are provided with front and rear wheel stops 42, 42*a* and 43, 43*a* to guide the proper positioning of the wheels upon the pads. If desired, the pads 40 and 40*a* may be made as a single cross piece, instead of the two piece construction shown.

Thus, in operation of the present structure, with the structure in collapsed position as shown in Fig. 1, an automobile may be driven to place its front wheels in position upon the wheel pads 40, 40*a*. With the structure thus anchored, one may grasp a handle 44, conveniently freely pivotally secured to bell crank 32, and by one continuous arcuate motion swing the structure into the fully extended position shown in Fig. 3. Due to the action of counterbalance spring 25, this may be done with a minimum of effort. Also, due to the effect of spring 34, the hoops are retained in orderly array and are restrained from falling upon and damaging the automobile during the unfolding operation. The collapsing or folding operation is similarly effected, with springs 25 and 34 functioning for the same purposes.

Also, because of the particular arrangement of angularly turned ends 23, 23*a* and 24, 24*a* of members 11, 11*a* and 12, 12*a*, it is apparent that the tension exerted by counterbalancing spring or springs 25 is least when the structure is approximately one-half unfolded, or when members 12, 12*a* are in a substantially vertical position as shown in Figs. 2 and 4. Consequently, the structure has a stable position when half-way unfolded with members 12, 12*a* in substantially vertical position; and because of the action of spring or springs 34, the hoops in

this position of the structure are in orderly array. In view of this feature of the present invention, the structure is well suited for purposes other than a portable garage or the like, as earlier stated, and may advantageously serve for such purposes as a patio cover, a beach canopy tent, or the like. For canopy or tent use, legs may be provided for the structure, if desired, to afford greater height to the overall structure, as is readily apparent to those skilled in the art.

Having by the foregoing description described in detail one specific embodiment of the present invention, it is not intended to limit the scope of the present invention thereto, for many modifications thereof will be apparent to those skilled in the art. Accordingly, such modifications as are within the spirit and scope of the appended claims are contemplated by the present invention.

What is claimed is:

1. A collapsible cover for automobiles comprising a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, said interconnected ends of the basic frame parts being turned up and intersecting at a point removed from the plane of the remainder of the basic frame parts with the pivotal interconnection located at the intersection; a counterbalance spring connected between said two parts, and extending from a point on the turned up portion of one frame part spaced from the pivotal interconnection in the direction of the end of the turned up portion thereof to a point on the other frame part spaced from the pivotal interconnection in the direction opposite from the end of the turned up portion thereof, whereby the movement of one frame part between superposed position and in-line position with respect to the other frame part is counterbalanced with the minimum counterbalance force existing at a position intermediate said two positions and increasing with pivotal movement of said one frame part in either direction from said intermediate position; a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, a free end of at least one hoop on a first of said frame parts extending beyond the point of pivotal connection thereof with its respective frame part, a spring connected at one end to said free end of the hoop and at its other end to the frame at a point removed from its first connection generally in the direction of said pivotal connection between said frame parts to urge said hoop to pivot toward superposed relation with its frame part away from said pivotal interconnection of said frame parts; an anchoring pad secured to a second of the frame parts and adapted to receive an automobile wheel thereupon for anchoring the cover; a pliant material secured to said hoops and adapted to cover substantially the expanse of the frame and hoops when the frame parts are in in-line position; and a freely pivotable handle associated with said first frame part for pivoting the same between superposed and in-line relationship with the second frame part.

2. In a collapsible cover for automobiles a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, said interconnected ends of the basic frame parts being angularly turned and intersecting, the pivotal interconnection being located at the intersection; a counterbalance spring means connected between said two parts, and extending from a point on the angularly turned portion of one frame part spaced from the pivotal interconnection in the direction of the end of the angularly turned portion thereof to a point on the other frame part spaced from the pivotal interconnection in the direction opposite from the end of the turned up portion thereof, whereby the movement of one frame part between superposed position and in-line position with respect to the other frame part is counterbalanced with the minimum counterbalance force existing at a position intermediate said two positions and increasing with

pivotal movement of said one frame part in either direction from said intermediate position; a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, a second resilient means cooperating with at least one hoop urging the same to pivot toward superposed relation with its frame part away from said pivotal interconnection of said frame parts; and an anchoring pad secured to a second of the frame parts and adapted to receive an automobile wheel thereupon for anchoring the cover.

3. A collapsible housing structure comprising: a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, said interconnected end of one basic frame part extending beyond the pivotal interconnection and being there angularly turned; a counterbalance resilient means connected between said two parts, and extending from a point on the angularly turned portion spaced from the pivotal interconnection in the direction of the end of the angularly turned portion to a point on the other frame part spaced from the pivotal interconnection in a relation thereto that the movement of one frame part between superposed position and in-line position with respect to the other frame part is counterbalanced with the minimum counterbalance force existing at a position intermediate said two positions and increasing with pivotal movement of said one frame part in either direction from said intermediate position; a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, a second resilient means cooperating with at least one hoop urging the same to pivot toward superposed relation with its frame part away from said pivotal interconnection of same frame parts.

4. A collapsible housing structure comprising: a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, said interconnected end of one basic frame part extending beyond the pivotal interconnection and being there angularly turned; a counterbalance resilient means connected between said two parts, and extending from a point on the angularly turned portion spaced from the pivotal interconnection in the direction of the end of the angularly turned portion to a point on the other frame part spaced from the pivotal interconnection in a relation thereto that the movement of one frame part between superposed position and in-line position with respect to the other frame part is counterbalanced with the minimum counterbalance force existing at a position intermediate said two positions and increasing with pivotal movement of said one frame part in either direction from said intermediate position, thereby affording a stable state to the structure at said intermediate position, a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, and a pliant material secured to said hoops and adapted to cover substantially the expanse of the frame and hoops when the frame parts are in in-line position.

5. A collapsible housing structure comprising: a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, said interconnected end of one basic frame part extending beyond the pivotal interconnection and being there angularly turned; a counterbalance resilient means connected between said two parts, and acting between a point on the angularly turned portion spaced from the pivotal interconnection in the direction of the end of the angularly turned portion and a point on the other frame part spaced from the pivotal interconnection in a relation thereto that the movement of one frame part between superposed position and in-line position with respect to the other frame part is counterbalanced with the minimum counterbalance force existing at a position intermediate said two positions and increasing with pivotal movement of said one frame part in either direction from said intermediate position, there-

by affording a stable state to the structure at said intermediate position, and a plurality of hoops pivotally carried by said frame parts intermediate their respective ends and spanning the transverse extent of said frame parts.

6. A collapsible housing structure comprising: a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, counterbalance means cooperating with said frame parts to facilitate movement thereof between superposed and in-line position, a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, a resilient means cooperating with at least one hoop urging the same to pivot toward superposed relation with its frame part away from said pivotal interconnection of said frame parts, and a pliant material secured to said hoops and adapted to cover substantially the expanse of the frame and hoops when the frame parts are in in-line position.

7. A collapsible housing structure comprising: a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, and spring means connected at one end to one of said hoops and at its other end to the frame at a point removed from the connection of said one hoop to its frame part and in a relation to the first mentioned end of said spring means to urge said one hoop to pivot

toward superposed relation with its frame part away from said pivotal interconnection of said frame parts.

8. A collapsible housing structure comprising: a basic frame formed of two parts pivotally interconnected at one end for pivotal movement from a superposed position to a substantially in-line position, a plurality of hoops pivotally carried by said frame parts intermediate their respective ends, and resilient means acting between at least one hoop and the frame to urge said one hoop to pivot toward superposed relation with its respective frame part away from said pivotal interconnection of said frame parts.

9. In a collapsible housing structure, a basic frame formed of two pivotally interconnected parts for relative pivotal movement from a superposed to an in-line position, counterbalance means cooperating with said frame to facilitate said pivotal movement between said two positions, a plurality of struts transversely spanning said frame and being pivotally connected thereto at points intermediate the ends of the frame parts, and means acting between at least one strut and the frame to urge said strut into overlying relation with its respective frame part.

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