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T. F. ZIEGLER

2,661,082

MULTIPART RETRACTABLE STRUCTURE

Filed April 23, 1951

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Fig. 1

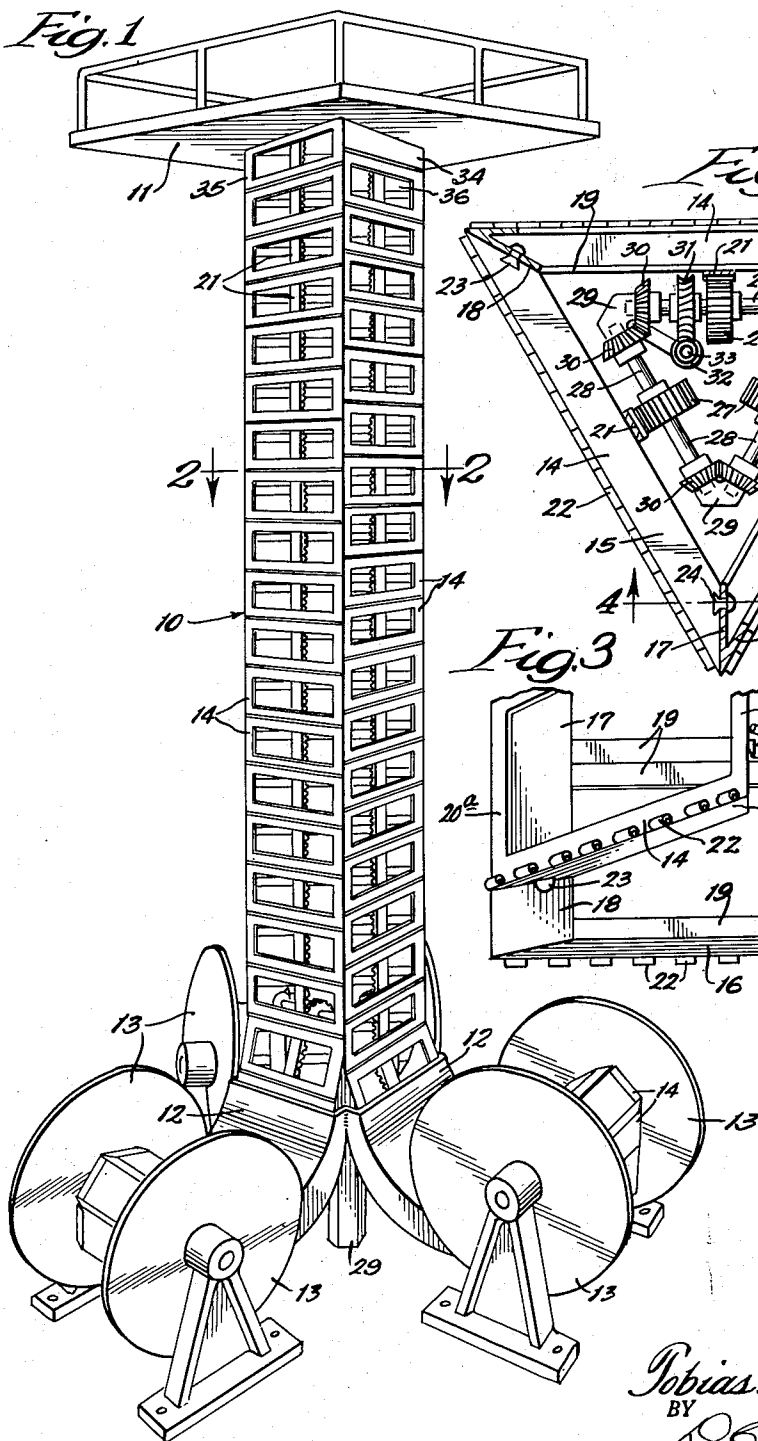


Fig. 2

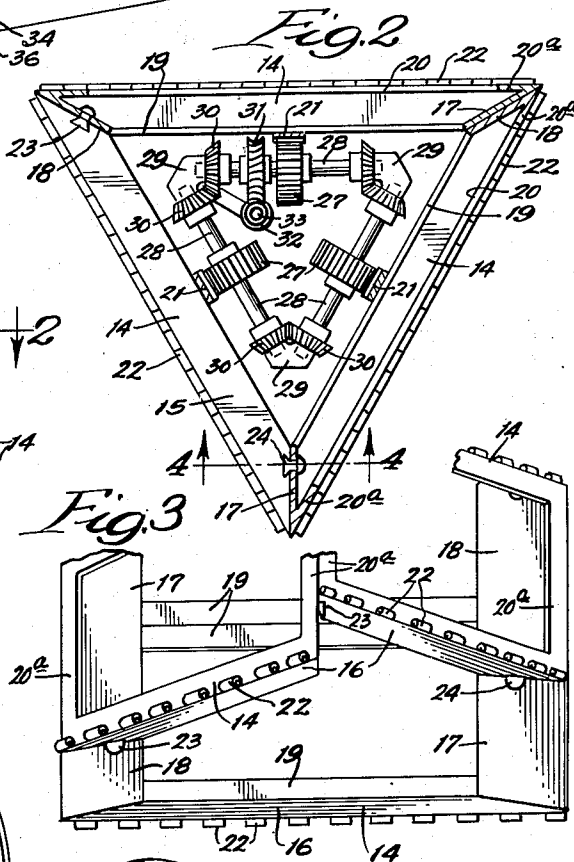
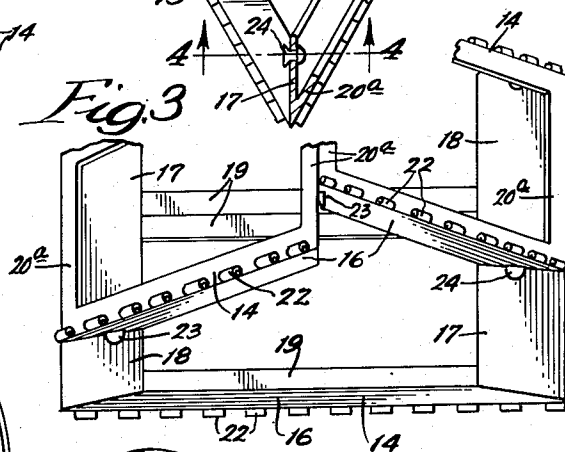


Fig. 3



INVENTOR:
Tobias F. Ziegler,
BY *D. C. Snyder*
K. W. Donnell
ATTORNEYS

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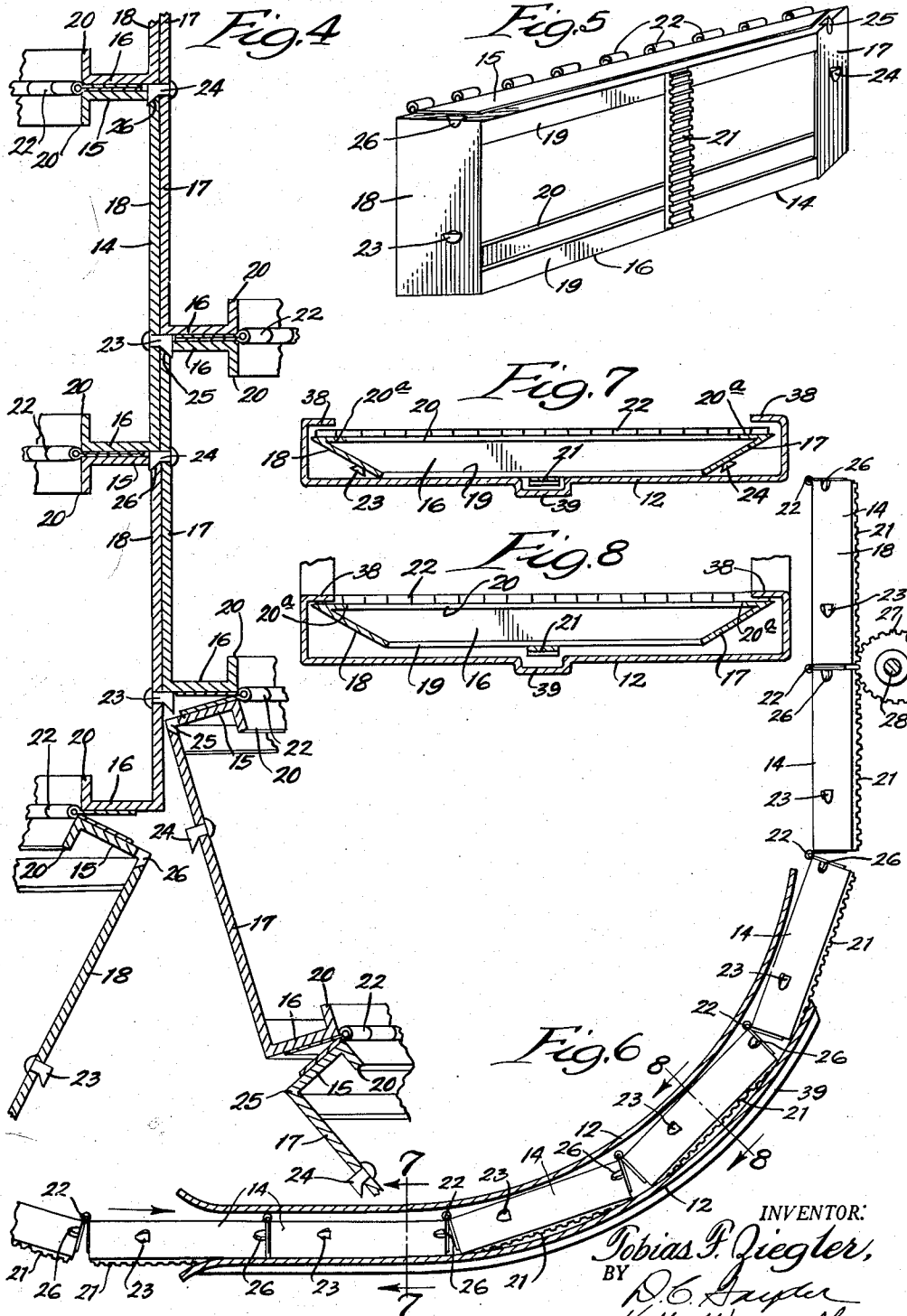
T. F. ZIEGLER

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INVENTOR:
Tobias F. Ziegler,
BY *R. C. Taylor*
H. W. Wonnell
ATTORNEYS

UNITED STATES PATENT OFFICE

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MULTIPART RETRACTABLE STRUCTURE

Tobias F. Ziegler, Chicago, Ill.

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This invention relates to a structure formed of detachable sections. More specifically, it relates to the production of a retractable structure that owes its retractability to detachability of component parts of the structure.

An object of the present invention is to provide a retractable device formed of a plurality of parts. The parts are readily attachable to and detachable from one another and are flexible, whereby they may be detached and taken out of the way.

A further object is the provision of a vertically retractable support that may be used for military purposes. The support is formed of component parts that are flexible and can be rolled up when detached from one another and yet form a rigid assembly when attached to one another.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a perspective view showing the retractable structure of the present invention used as a supporting tower;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of a portion of the retractable structure;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of an individual section used in constructing the retractable support;

Fig. 6 is a schematic view partially in section showing the way in which a component part of the retractable support is guided;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 8; and

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 6.

The reference character 10 designates the retractable structure of the present invention as seen in Fig. 1. It carries a large platform 11 at its upper end. The structure 10 is hollow and is formed of three sections that are detachable from one another at the base of the structure and are led through three guides 12 positioned about the base of the structure to reels 13 upon which the sections are wound.

Each section of the structure 10 is formed of a plurality of like units 14, one of which is illustrated in detail in Fig. 5. The unit 14 is formed as a hollow framework having upper and lower ends 15 and 16 of channel shape. The ends are joined by side faces 17 and 18, which are angled

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toward one another and make an angle of 30 degrees with the inner and outer faces of the unit, which are formed, respectively, by flanges 19 on ends 15 and 16 and by flanges 20 on the ends and flanges 20^a on the side faces 17 and 18. The inner face of the unit carries a gear rack 21. The upper ends of each unit carries a plurality of hinge parts 22 at its outer face, which hinge parts are adapted to cooperate with corresponding hinge parts on the lower crosspiece 16 of the unit just above. A suitable pin extends through the mating hinge parts on the adjacent sections to provide a hinge joint between the units at their outer faces. The side face 18 carries a projection 23 which is approximately two-thirds of the way down from the upper end of the unit. The side face 17 carries a projection 24 which is approximately one-third of the way down from the upper end of the unit. As seen in Figs. 2 and 4, each projection 23 or 24 is an enlarged semi-circular head formed on a rivet attached to the side faces 17 or 18. Recesses 25 and 26 are formed at regions where the upper end 15 joins the side faces 17 and 18, respectively. Each recess is semi-circular when viewed from side face 17 or 18 and increases in width from the end plate when viewed from the upper end 15.

The units of the three sections fit together as illustrated in Fig. 2 to form a triangle, the side faces 17 and the side faces 18 of the units 14 of each section fit, respectively, against the side faces 18 of the units of one of the two remaining sections and the side faces 17 of the units of the other of the two remaining sections. The projections 23 of the units of one section fit in the recesses 25 of the units of one of the two remaining sections and the projections 24 of the units of the said one section fit in the recess 26 in the units of the other of the two remaining sections. Thus the sides comprise a stable triangular structure that can provide a support for something such as the platform 11 illustrated.

The three sections of the structure are progressively detached from one another at their base when the structure is to be retracted, as illustrated in Fig. 4. A unit 14 pivots outwardly on the hinged parts 22 with respect to the remaining units in the section above the particular unit, and the recesses 25 and 26 becomes disengaged from the projections 23 and 24, because the recesses are approximately opposite the hinged parts 22 and are inward therefrom. The guides 12 curve downwardly and outwardly from the base of the structure 10 to the reels 13 and thus bend the sides progressively outwardly and effect the aforesaid disengagement of projections and

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recesses. As previously stated, the sections are wound up on the reels 13 as they are disconnected from one another. When the process is reversed, the sections are unreeled and fed through the guides toward one another, the units moving progressively into line with one another as illustrated in Fig. 4, thereby causing engagement of the recesses 25 and 26 with the projections 23 and 24. The units of each section are staggered with respect to the units of the two remaining sections. Thus, as seen in Fig. 4 the tilted unit at the right straightens with respect to the sections above it, thereby moving the recess 25 into engagement with the projection 23 of the last straightened unit on the left. After the tilted unit on the right has straightened, the tilted unit on the left, being below the tilted unit on the right, straightens with respect to the other units of its section, moving the recess 26 into engagement with the projection 24. This action goes on progressively round and round the structure.

The structure is elevated by means of a driving mechanism shown in Fig. 2. The gear racks 21 are affixed to the inner faces of the units of the three sections are engaged by gears 27 secured to three jackshafts 28 journaled in three bearings 29. The shafts 28 are interconnected by beveled gears 30 and one shaft 28 is driven by a worm wheel 31 mounted thereon which is in turn driven by a worm 32 on a power take-off shaft 33 which extends from below the base of the structure 10. Fig. 1 shows a column 34 carrying a support for the driving mechanism just described. This mechanism may be employed to bring units of the sections of the structure progressively together and project the structure upwards; to separate the units of the sections from one another and retract the structure; and by a locking action, to hold the sides of the structure from disassembling by virtue of their own weight and the weight imposed upon them through the platform 11.

The upper ends of the structure 10 is formed of three permanently connected parts 34, 35 and 36 of three different heights, whereby their upper ends are at the same level to carry the platform 11, and the lower ends are staggered so as to be connected to the staggered rows of units 14 forming the sections of the structure.

As illustrated in Figs. 7 and 8, the guides 12 are formed as shallow wide channels with inwardly directed flanges 38 and a central depression 39 in the base providing room for the gear racks 21. At their upper inner ends the guides 12 are joined to one another and the sides of the channels disappear so that the end plates 17 and 18 of the sections of the three sides may be brought together. At the curved region shown in Fig. 8 the depth of the channel is greater than at the straight region of Fig. 7 to provide room for the units 14 to pivot with respect to one another.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A retractable support comprising three sections each formed of a row of units hinged to one another in joints transverse to the direction

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of the row, means permanently connecting the sections together at one end in a triangle with the joints in each row offset from the joints of each of the other rows and building up the end units even with one another, three reels spaced about the base of the structure from which the sections may be unwound while becoming progressively connected edge to edge so as to be projected as a triangle structure of increasing length and upon which the sections may be wound while becoming progressively disconnected so as to be retracted as a triangular structure of decreasing length, the sides of each unit of each row abutting at an acute angle at each corner having projections opposite the hinges of the adjacent row and recesses at the joints engageable with corresponding recesses and projections on the units of the other two rows, relative engagement and disengagement of the projections and recesses occurring upon the progressive hinging movement and interlocking of the units of each row during winding and unwinding of the rows; gear racks on the inside of the three rows, three shafts arranged in a triangle within the structure, gears secured to the shafts and meshing with the racks, means interconnecting the shafts, and means applying drive to one of the shafts whereby the structure may be retracted, projected, and held in any desired position.

2. A retractable support comprising a plurality of sections each formed of a row of units hinged to one another in joints transverse to the direction of the row, respective reels adapted to unwind the sections to progressively join said sections side by side so as to be projectable into an increasingly longer hollow structure while being unwound, means for holding the abutting units in adjacent rows together, the sides of said sections extending inwardly at an acute angle to provide wide abutting surfaces on each section which contact those of each other section over an appreciable area to improve the rigidity of the structure, and said means comprising semi-circular recesses in the surfaces which increase in width from the abutting surfaces of the units and projections from the surfaces to fit in the corresponding recesses and interlocking the sections together by the unwinding movement as the sections are progressively joined.

3. A retractable support in accordance with claim 2 comprising three sections in which there are gear rack portions on the inside of the units of the three rows which together provide a continuous rack on each section, three shafts arranged in a triangle within the structure parallel with the section, gears secured to the shafts and meshing respectively with the racks on the sections, means interconnecting the shafts for simultaneous movement, and means for applying drive to one of the shafts whereby the support may be retracted, projected, and held in any desired position.

TOBIAS F. ZIEGLER.

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