Dec. 28, 1954 P. E. BRONER 2,697,845

LINK STRUCTURE

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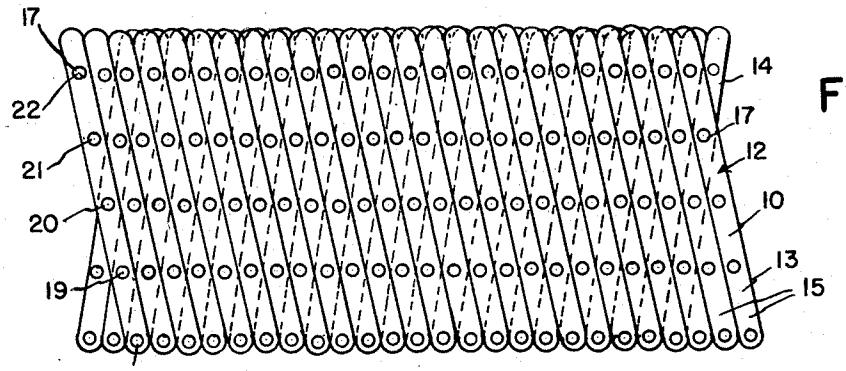


FIG.1.

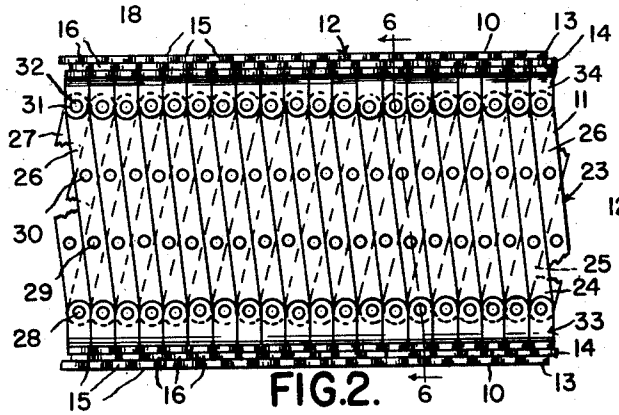


FIG.2.

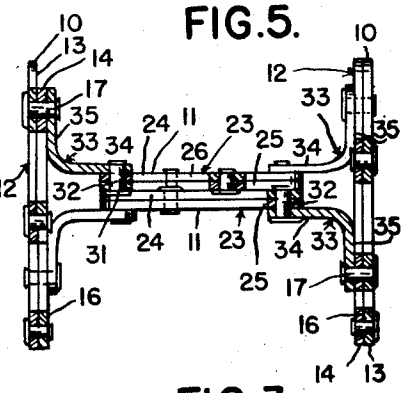


FIG.5.

FIG.3.

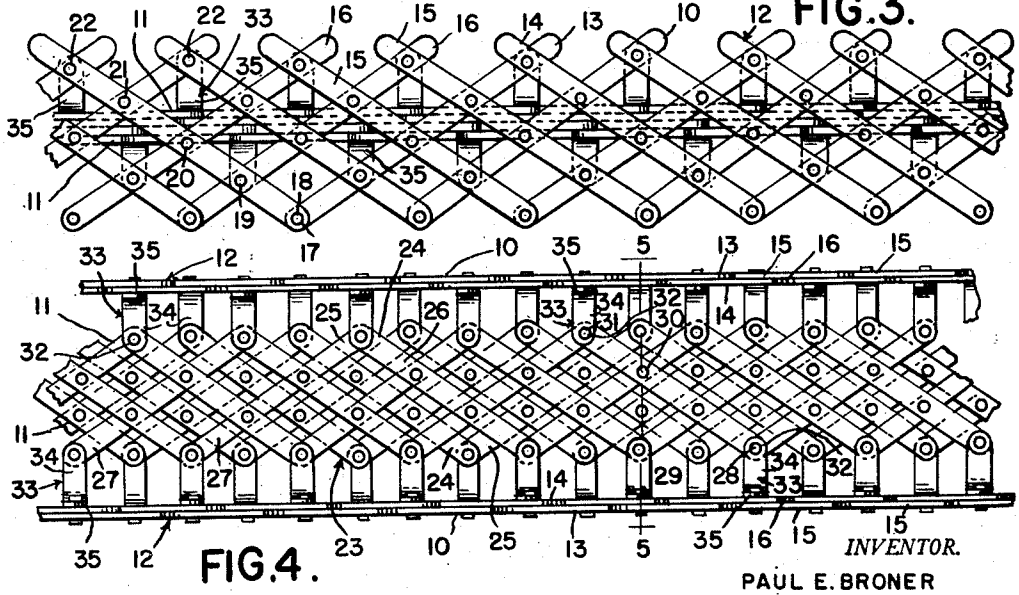


FIG.4.

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FIG.7.

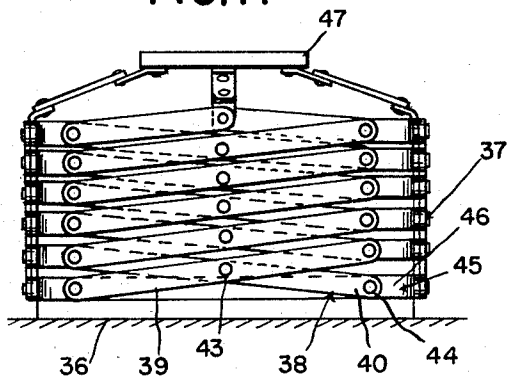


FIG.8.

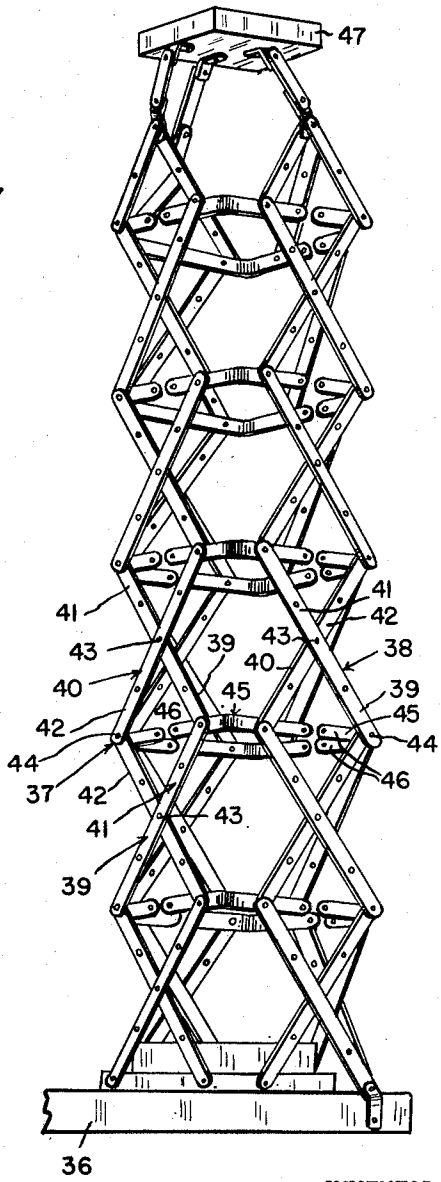
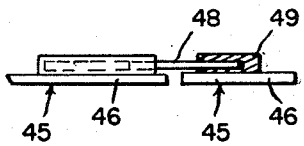


FIG.9.



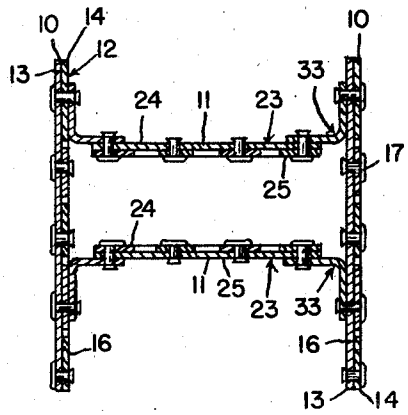


FIG.6.

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LINK STRUCTURE

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Application June 18, 1951, Serial No. 232,112

4 Claims. (Cl. 14—45)

This invention relates to extensible and contractable structures.

It is an object of this invention to provide a structure having two or more sides disposed at an angle to each other and wherein each side is composed of articulated linkage of the lazy tong type. The adjacent sides are pivotally connected by angle members in a manner such that all of the sides extend and contract as a unit.

It is another object of this invention to provide a structure of the above type having laterally spaced sides and having opposed sides interposed between the laterally spaced sides. The angle members pivotally connect adjacent sides so that all of the sides extend or contract as a unit and the opposed sides contact one another in the extended position to impart rigidity to the structure. This construction is important especially in military operations where the structure is employed as a temporary bridge or ramp over which vehicles may be transported.

It is still another object of this invention to stagger the linkage forming one opposed wall with respect to the linkage forming the other opposed wall so that in the extended position of the structure, the links of one side respectively lie between adjacent links of the other opposed wall and provide a substantially continuous supporting surface.

It is a further object of this invention to extend the ends of the links forming the laterally spaced sides beyond at least one of the opposed sides. These ends of the links provide guide rails at opposite sides of the structure when it is used as a ramp or bridge.

It is another object of this invention to provide an extensible and contractable tower wherein each side is formed of articulated linkage of the lazy tong type, and wherein the linkage forming one side is pivotally connected to the linkage forming an adjacent side so that all of the sides extend and contract as a unit.

It is a still further object of this invention to provide a structure of the type set forth in the preceding paragraph wherein the articulated linkage forming adjacent sides of the structure is pivotally connected by angle members, and wherein means is provided for coupling adjacent members to hold the sides in their extended positions.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a fragmentary side elevational view of an extensible and contractable multisided structure forming the subject matter of this invention, and showing the same in a contracted position;

Figure 2 is a top plan view of the structure shown in Figure 1;

Figure 3 is a fragmentary side elevational view of the structure showing the same extended;

Figure 4 is a top plan view of the structure shown in Figure 3;

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 4;

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 2;

Figure 7 is a side elevational view of a modified construction;

Figure 8 is a perspective view of the structure in Figure 7 showing the same in an extended position; and

Figure 9 is a semidiagrammatic sectional view of a part of the structure shown in Figure 7.

The structure shown in the several figures of the drawings has many and diversified uses, which are not all specifically illustrated herein; but which will become apparent as this description proceeds. The structure shown in Figures 1 to 4 inclusive of the drawings comprises laterally spaced sides 10 and opposed sides 11 positioned between the sides 10. In general each side is composed of articulated linkage of the lazy tong type, and each side

is pivotally connected to an adjacent side in a manner such that all of the sides are compelled to extend and contract as a unit.

Specifically the sides 10 are identical in construction and a description of one will suffice for both. The numeral 12 designates linkage of the lazy tong type and for the purpose of illustration, this linkage is shown as having two groups 13 and 14 of links. The links 15 of the group 13 extend parallel to one another and lie in a common plane in side by side relationship. The links 16 of the group 14 also extend parallel to one another and are arranged in side by side relationship in a common plane parallel to the plane of the group 13 of links 15. The links of one group cross links in the other group; and in the specific embodiment of the invention shown in Figures 1 to 6 inclusive, each link of one group crosses five links of the other group. It will of course be understood that the specific number of links arranged in crossing relationship may be varied to suit structures of different designs and should not be construed as limiting the scope of the present invention. With this in view it will be noted from Figures 1 and 3 of the drawings that the links of one group are pivoted to the links of the other group by pins 17 at the points of crossing indicated by the reference numerals 18, 19, 20, 21, and 22. These points are spaced equal distances from each other lengthwise of the respective links, and the arrangement is such as to impart a lazy tong type action to the sides 10.

Referring now to Figures 2 and 4 of the drawings, it will be noted that the opposed sides 11 are also identical in construction, so that a description of one side 11 will suffice for both. The numeral 23 indicates generally linkage of the lazy tong type, and in the present instance, comprises two groups 24 and 25 of links. The links 26 of the group 24 extend parallel to one another in side by side relationship, and are arranged in a common plane. The links 27 of the group 25 also extend parallel to one another in side by side relationship and are arranged in a common plane parallel to the plane of the group 24 of links 26.

The links of the group 24 cross links in the group 25; and in the present instance, each link of one group crosses four links of the other group, although this arrangement may be varied in accordance with variations in the fabrication of the sides 10. As shown particularly in Figure 2 of the drawings, the links 26 of the group 24 are pivoted to the links 27 of the group 25 at the points of crossing indicated by the reference characters 28, 29, 30 and 31 by pins 32. The points 28, 29, 30 and 31 of the pivotal connections between the links of the two groups are spaced equal distances from each other lengthwise of the links in order to impart a lazy tong action to the opposed sides 11 of the structure.

It has been stated above that the opposed sides 11 are pivotally connected to the sides 10 in order to compel all of the sides to extend and contract as a unit. For accomplishing this result a multiplicity of connectors or angle members 33 are provided, having angularly disposed arms 34 and 35. As shown particularly in Figures 4 and 5 of the drawings, the arms 34 of the connectors 33 are respectively pivotally connected to the pins 32 at the points 28 and 31 associated with both the opposed sides 11. The arms 35 of the connectors are respectively pivotally supported on the pins 17 embodied in the laterally spaced sides 10. In the specific embodiment of the invention selected herein for the purpose of illustration, the arms 35 of the connectors 33 on the bottom side 11 are respectively mounted on the pivot pins 17 at the points 19. On the other hand the arms 35 of the connectors 33 on the top side 11 are respectively mounted on the pins 17 at the points 22 of the side walls 10. It will of course be understood that this arrangement may be varied, depending upon the degree of extension of the structure required.

In connection with the above it will be noted that when the structure is extended to its fullest extent, the opposed walls 11 contact one another. As a result further extension of the structure is definitely prevented, and the opposed walls coact to increase the rigidity of the structure. When the structure is to be used as a bridge or a ramp, the contacting opposed walls 11 act as a tread

or road surface of the vehicles, and hence rigidity is an important consideration.

In order to substantially close the spaces existing between the links of the top side **11** in the extended position of the structure, the bottom side may be staggered or shifted slightly relative to the top side **11** in the direction of length of the structure. As shown in Figure 4 of the drawings, the sides **11** are offset to such an extent that the links of the bottom side **11** assume positions between the adjacent links of the top side **11**. Such a construction provides what may be considered a substantially continuous surface along which vehicles may be transported in the extended position of the structure. It will further be noted that the ends of the links forming the sides **10** project upwardly beyond the plane of the top side **11**, and this is desirable in that the projecting portions of the links form in effect guide rails along the length of the structure.

It will be understood from the foregoing that the structure described is especially suitable for use as a transportable ramp or bridge. However by rearranging the disposition of the sides **10**, **11**, many other uses for the structure are possible. For example the structure may be readily employed in the manufacture of an extensible truck or trailer body, and by varying the angular relation of the sides, it is possible to use the structure as framework for temporary buildings.

With the above in view reference is now made more in detail to the embodiment of the invention shown in Figures 7 to 9 inclusive. In this embodiment the structure has been modified for use as an extensible and contractable tower for supporting radar, telegraphy or similar equipment, or for supporting an observation platform on mobile equipment. In detail the numeral **36** designates a support which may be in the form of a truck platform, for example, and the numeral **37** indicates an extensible and contractable tower having the bottom thereof suitably mounted on the support **36**.

The tower structure **37** comprises four sides, and each side is composed of articulated linkage **38** of the lazy tong type. In detail each side of the tower comprises two groups **39** and **40** of links. The links **41** of the group **39** respectively cross the links **42** of the group **40** intermediate the ends, and are pivoted at the points of crossing by pins **43**. The extremities of the links **41** and **42** are also pivotally connected in the manner shown in Figure 8 by pins **44**, so that each of the four sides of the tower possesses a lazy tong type linkage action.

Each side of the tower is connected to an adjacent side at the points of pivotal connection between the extremities of the links by angle members or connectors **45**. The angularly disposed arms of the connectors **45** are respectively pivoted to the pins **44** of adjacent sides and are provided with extensions **46**. These extensions project toward one another as shown in Figure 8 of the drawings, and are adapted to be coupled together in order to retain the tower in any desired extended position. Thus the connectors **45** not only effect uniform extension and contraction of the tower, but also serve as a means for holding the tower in any desired extended position.

The lower ends of the bottom links associated with the respective sides of the tower are pivoted on the support **36**, and the upper ends of the top links of the tower may be connected to a support **47**. This support may serve as an observation platform or may serve as a mounting for any equipment it is desired to project to an elevated position.

Any suitable means may be employed for coupling the extension **46** on the connectors. It is preferred to use coupling devices capable of being operated electrically from ground elevation. In Figure 9 a typical device is shown diagrammatically for coupling the extension **46** of the connectors. Briefly the device comprises a bolt **48** supported on one extension **46** and a keeper **49** mounted on the adjacent extension **46** in a position to engage the bolt **48**. The electrical control means for operating the bolt forms no part of the present invention, and is not shown herein.

What I claim as my invention is:

1. An extensible and contractible structure having laterally spaced parallel sides and having parallel opposed sides interposed between the laterally spaced sides, said opposed sides being at right angles to said laterally spaced sides, each side comprising first and second groups of links respectively arranged in parallel planes with the links of each group extending parallel to one another in side by side relationship, the links of the first group crossing adjacent links of the second group and pivoted to the latter links at points of crossing to impart a lazy tong action to adjacent sides of the structure, means for connecting the opposed sides to the laterally spaced sides for extending and contracting all of said sides as a unit, said means comprising spaced rows of connectors on each of the laterally spaced sides respectively pivotally connected to links of said laterally spaced sides at points of crossing thereof which lie in lines parallel to the opposed sides, the connectors of said spaced rows also being respectively pivotally connected to adjacent links of the opposed sides at the end points of crossing thereof, the connectors of one row on each of the laterally spaced sides being staggered with respect to the connectors of the other row, the first and second groups of links of one opposed side being staggered with respect to the first and second groups of links of the other opposed side in a manner such that the links of the first and second groups of said one opposed side respectively lie between adacent links of the first and second groups of said other opposed side in the extended position of the structure.

2. An extensible and contractible structure having laterally spaced parallel sides and having parallel opposed sides interposed between the laterally spaced sides, said opposed sides extending at right angles to said laterally spaced sides, each side comprising first and second groups of links respectively arranged in parallel planes with the links of each group extending parallel to one another in side by side relationship, the links of the first group crossing adjacent links of the second group and pivoted to the latter links at points of crossing to impart a lazy tong action to adjacent sides of the structure, means for connecting the opposed sides to the laterally spaced sides for extending and contracting all of said sides as a unit, said means comprising spaced rows of connectors on each of the laterally spaced sides respectively pivotally connected to links of said laterally spaced sides at points of crossing thereof which lie in lines parallel to the opposed sides, the connectors of said spaced rows also being respectively pivotally connected to adjacent links of the opposed sides at the end points of crossing thereof, the connectors of one row on each of the laterally spaced sides being staggered with respect to the connectors of the other row, said opposed sides contacting one another in the extended position of the structure to limit the degree of extension and to impart substantial rigidity to the structure in its extended position.

3. The structure as set forth in claim 2, the links of the laterally spaced sides extending beyond one opposed side and coacting with the latter to form guide rails.

4. An extensible and contractible structure having parallel opposed sides and having an adjacent side connecting the opposed sides and disposed at right angles thereto, each side comprising first and second groups of links respectively arranged in parallel planes with the links of each group extending parallel to one another in side by side relationship, the links of the first group crossing adjacent links of the second group and pivoted to the latter links at points of crossing to impart a lazy tong action to adjacent sides of the structure, means for connecting the opposed sides of the adjacent side for extending and contracting all of said sides as a unit, said means comprising spaced rows of connectors respectively pivotally connected to links of said adjacent side at points of crossing thereof which lie in lines parallel to the opposed sides, the connectors of said rows also being respectively pivotally connected to adjacent links of said opposed sides at the end points of crossing thereof, the connectors of one row being staggered with respect to the connectors of the other row, and said opposed sides being movable into contact with one another upon extending the structure to limit the degree of extension and to impart substantial rigidity to the structure in its extended position.

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