Feb. 3, 1970 W. D. BEHLEN 3,492,765

CORRUGATED BUILDING STRUCTURE WITH ROOF AND WALL CORNER REINFORCING PANEL

Filed May 8, 1968

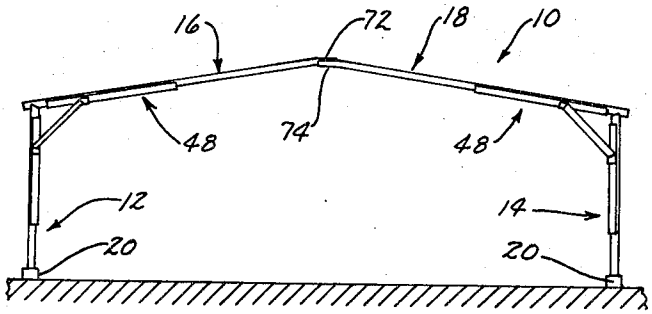
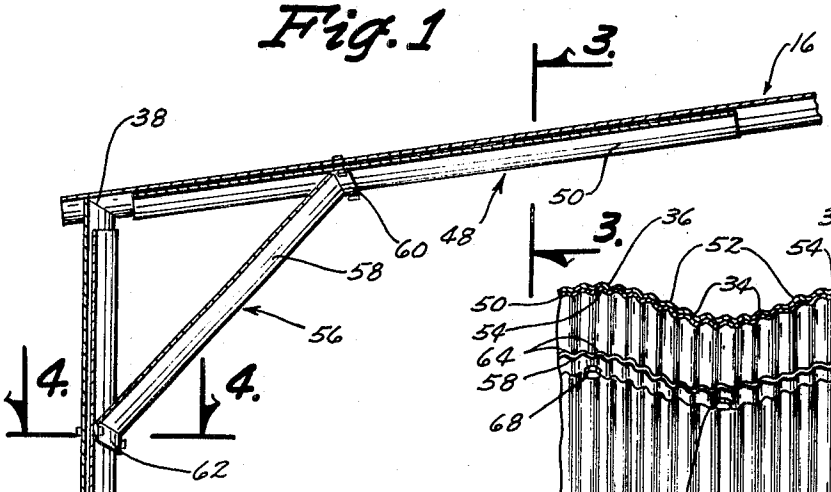


Fig. 1



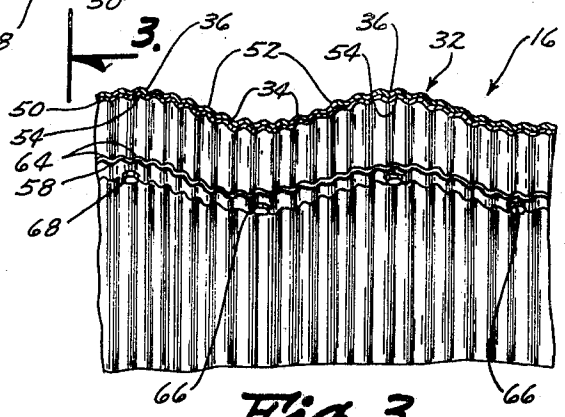


Fig. 3

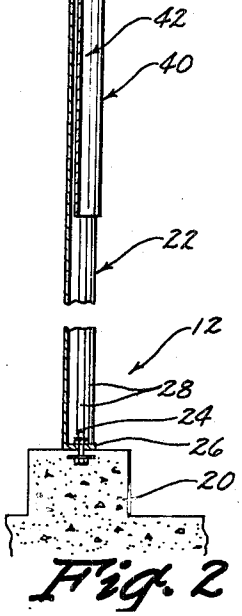


Fig. 2

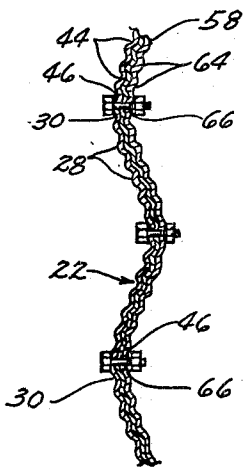


Fig. 4

INVENTOR
WALTER D. BEHLEN
BY
Zarley, McKee & Thomte
ATTORNEYS

United States Patent Office

3,492,765

Patented Feb. 3, 1970

3,492,765

CORRUGATED BUILDING STRUCTURE WITH ROOF AND WALL CORNER REINFORCING PANEL

Walter D. Behlen, Columbus, Nebr., assignor to Behlen Manufacturing Company, Inc., Columbus, Nebr., a corporation of Nebraska

Filed May 8, 1968, Ser. No. 727,514

Int. Cl. E04b 7/06

U.S. Cl. 52—18 5 Claims

ABSTRACT OF THE DISCLOSURE

A building structure including oppositely disposed side walls with a roof section secured thereto and extending therebetween. The side walls and roof section are comprised of a plurality of panels having major and minor corrugations formed therein. The major and minor corrugations of the roof panels are in alignment with the major and minor corrugations in the wall panels. An angularly disposed support means is secured to each of the side walls and the roof section and is comprised of a plurality of support panels having major and minor corrugations formed therein which are in alignment with the major and minor corrugations of the wall and roof panels. A reinforcing panel means is positioned between the support panels and the roof panels and between the support panels and the wall panels. The reinforcing panels are provided with major and minor corrugations formed therein which are in alignment with the major and minor corrugations in the wall, roof and support panels.

Conventional metal buildings usually consist of oppositely disposed wall sections having a roof section secured thereto and extending thereacross. The wall sections and the roof section are commonly constructed of a plurality of panels having some form of arcuate configuration provided therein such as corrugations or the like. The roof panels are usually secured to the upper ends of the wall panels by bolts or the like extending therethrough. However, these conventional building structures are less than satisfactory in that the roof sections will not support any appreciable load imposed thereon. The portion of the load which is imposed on the roof is transferred to the bolted point of connection between it and the wall thereby creating a great stress on the connection. This point of connection is not as rigid as required and in fact acts somewhat like a hinge connection. The stress which is imposed in the point of connection between the roof section and the wall section sometimes causes structural failure thereof. The possibility of such structural failure creates a serious limitation in the design of any building under consideration.

Therefore, it is a principal object of this invention to provide a building structure which is extremely strong.

A further object of this invention is to provide a building structure including an angularly disposed support means extending between the roof section and the wall section thereof.

A further object of this invention is to provide a building structure wherein major and minor corrugations of wall panels, roof panels, support panels and reinforcing panels are in alignment with each other.

A further object of this invention is to provide a building structure which prevents structural failures.

A further object of this invention is to provide a building structure including a unique means for securing the roof section to the wall section.

A further object of this invention is to provide a building structure including a pair of angularly disposed roof sections which are secured together at their inner ends, the inner ends of the roof sections being bent and secured together.

A further object of this invention is to provide a building structure which is economical of manufacture, durable in use and refined in appearance.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is an end view of the building structure;

FIG. 2 is a fragmentary section view of a portion of the building structure;

FIG. 3 is an enlarged sectional view as seen along lines 3—3 of FIG. 2; and

FIG. 4 is an enlarged sectional view as seen along lines 4—4 of FIG. 2.

The building structure of this invention is generally designated by the reference numeral **10** and includes oppositely disposed wall sections **12**, **14** and angularly disposed roof sections **16** and **18**. Inasmuch as wall sections **12** and **14** are identical and inasmuch as roof sections **16** and **18** are identical, only wall section **12** and roof section **16** will be described in detail.

The numeral **20** generally designates a footing which is provided on the supporting surface **22** and which is designed to support the wall section **12** as illustrated in the drawings. Wall section **12** is comprised of a plurality of wall panels **22** which are secured at their lower ends to the footing **20** by bolts **24** extending through the flange **26** provided at the lower end of the wall panels **22**. Wall panels **22** are vertically disposed and are secured at their side edges to the adjacent wall panels by any conventional means such as bolts or the like extending therethrough. As seen in FIGS. 2 and 4, each of the wall panels **22** have a plurality of alternately disposed arcuate corrugations **28** formed therein which extend in continuous and uninterrupted fashion from one end of the panel to the other. As seen in FIG. 4, each of the wall panels **22** are bent into a plurality of alternately disposed larger arcuate corrugations **30** which are co-extensive with the corrugations **28** and which also extend in continuous and uninterrupted fashion from one end of the panels to the other. As seen in FIG. 4, the arcuate neutral axis of the corrugations **28** form a trigonometric sine wave with respect to the straight neutral axis of the larger corrugations **30**.

The roof section **16** is comprised of a plurality of roof panels **32** which are secured at their side edges to the adjacent roof panels by any conventional means such as bolts or the like. Each of the roof panels **32** are provided with a plurality of alternately disposed arcuate corrugations **34** formed therein which extend in continuous and uninterrupted fashion from one end of the panel to the other. As seen in FIG. 3, each of the panels **32** are bent into a plurality of alternately disposed larger arcuate corrugations **36** which are co-extensive with the corrugations **34** and which also extend in continuous and uninterrupted fashion from one end of the panels to the other. The panels **32** are identical to the panels **22** and it can be seen that the arcuate neutral axis of the corrugations **34** form a trigonometric sine wave with respect to the straight neutral axis of the corrugations **36**. The roof panels **32** extend over the upper end of the wall panels **22** and may be secured at their point of connection **38** if desired by extending bolts through the same. The corrugations **34** of the roof panels **32** are in alignment with the corrugations **28** and the wall panels **22** and the corrugations **36** and the roof panels **32** are in alignment with the corrugations **30** in the wall panels **22**.

The numeral **40** generally designates a reinforcing panel means which is comprised of a plurality of reinforcing panels **42** which are positioned adjacent the inside surface of the wall panels **22**. The reinforcing panels **42** are identical to the wall panels **22** and viewed in section (FIG. 4) except that the length of the panels **42** is less than the panels **22**. As seen in FIG. 4, each of the reinforcing panels **42** are provided with a plurality of alternately disposed arcuate corrugations **44** formed therein as well as a plurality of alternately disposed larger arcuate corrugations **46** which are co-extensive with the corrugations **44**. Each of the corrugations **44** and **46** extend in continuous and uninterrupted fashion from one end of the panel **42** to the other. As seen in FIG. 4, the corrugations **44** are in alignment with the corrugations **28** and the corrugations **46** are in alignment with the corrugations **30**. The numeral **48** generally designates a reinforcing panel means which is comprised of a plurality of reinforcing panels **50** positioned adjacent the underside of the roof panels **32** as illustrated in FIGS. 2 and 3. The reinforcing panels **50** are identical to the roof panels **32** when viewed in section and include a plurality of alternately disposed arcuate corrugations **52** formed therein and a plurality of alternately disposed larger arcuate corrugations **54** which are co-extensive with the corrugations **52**. The corrugations **52** and **54** extend in continuous and uninterrupted fashion from one end of the panels **50** to the other and the corrugations **52** are in alignment with the corrugations **34** in roof panels **32** and the corrugations **54** are in alignment with the corrugations **36** in the roof panels **32**.

A supporting panel means **56** is secured to the roof section **16** and wall section **12** and extends therebetween as illustrated in FIG. 2. Panel means **56** is comprised of a plurality of supporting panels **58** having a flange **60** provided at their upper ends and a flange **62** provided at their lower ends. Each of the panels **58** have a plurality of alternately disposed arcuate corrugations **64** formed therein as well as a plurality of alternately disposed larger arcuate corrugations **66** which are co-extensive with the corrugations **64**. The corrugations **64** and **66** extend in a continuous and uninterrupted fashion from one end of the panels **58** to the other. A plurality of bolts **68** extend through the flange **60** of supporting panels **58**, reinforcing panels **50** and roof panels **32** as best illustrated in FIG. 2. A plurality of bolts **70** extend through flange **62** of the supporting panels **58**, reinforcing panels **42** and wall panels **22** as also best illustrated in FIG. 2. The corrugations **64** in panels **58** are in alignment with the corrugations **44** in reinforcing panels **42** and are in alignment with the corrugations **28** of the wall panels **22**. Likewise, the corrugations **66** of supporting panels **58** are in alignment with the corrugations **46** of the reinforcing panels **42** and the corrugations **30** in the wall panels **22**. The corrugations **64** of the supporting panels **58** are in alignment with the corrugations **52** of the reinforcing panels **50** and are in alignment with the corrugations **34** in the roof panels **32**. Likewise, the corrugations **66** in the supporting panels **58** are in alignment with the corrugations **64** in the reinforcing panels **50** and are in alignment with the corrugations **36** in the roof panels **32**. Thus, the large corrugations in the building structure are in alignment from the roof panels **32**, reinforcing panels **50**, supporting panels **58**, reinforcing panels **42** and wall panels **22**. Further, the small corrugations are also in alignment through the roof panels **32**, reinforcing panels **50**, supporting panels **58**, reinforcing panels **42** and wall panels **22**.

As viewed in FIG. 1, the inner ends of the roof sections **16** and **18** are bent to form a horizontal portion **72** and **74** respectively which are positioned adjacent each other in a superimposed condition and wherein the corrugations in the roof panels of the roof section **16** would be in alignment with the corrugations in the roof panels of the roof section **18**. It is possible that the reinforcing panels **42** and **50** can be omitted from some building structures if necessary but the preferred building structure includes these reinforcing panels. It can be seen that any load imposed on the roof of the building causes the load to be dissipated over a larger area due to the fact that some of the load will be transferred to the reinforcing panel means **48**, supporting panel means **56**, reinforcing panel means **40** and the wall panels **22**. The load which would normally be transferred to the connection point **38** is thus dissipated or transferred to a much greater area thereby eliminating any possibility of structural failure in the building. The reinforcing panels **42** and **50** can be of any desired length and which would depend upon the anticipated load which will be imposed on the roof structure. The supporting panel means **56** provides a more rigid connection between the roof section and the wall section and eliminates the hinge type connection which is normally provided at point **38** in conventional building structures. It has been found that the building structure of this invention is able to withstand sufficiently greater loads than that which is possible with conventional building structures. The fact that the small or minor corrugations and large or major corrugations are in alignment from the roof structure through the reinforcing panels, supporting panels to the wall panels insures that the load imposed on the roof section will be transferred over a broad area without any possibility of the load being transferred to an undesirable small area.

Thus it can be seen that the building structure accomplishes at least all of its stated objectives.

Some changes may be made in the construction and arrangement of my building structure without departing from the real spirt and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a building structure:

at least one wall section comprised of a plurality of upstanding wall panels, each of said wall panels having a plurality of alternately disposed arcuate corrugations extending in continuous and uninterrupted fashion from one end of the panel to the other,

a roof section secured to said wall section and extending therefrom, said roof section being comprised of a plurality of roof panels having a plurality of alternately disposed arcuate corrugations extending in continuous and uninterrupted fashion from one end to the other,

said corrugations in said wall panels being in alignment with said corrugations in said roof panels,

a support means secured to said wall section and said roof section and extending therebetween, said support means being comprised of a plurality of support panels having a plurality of corrugations extending in continuous and uninterrupted fashion from one end to the other, said corrugations in said support panels being in alignment with said corrugations in said wall panels and said roof panels,

a first reinforcing panels means positioned between the upper ends of said support panels and said roof panels, a second reinforcing panel means positioned between the lower end of said support panels and said wall panels, said first and second reinforcing panel means being comprised of a plurality of reinforcing panels each having a plurality of alternately disposed arcuate corrugations extending in continuous and uninterrupted fashion from one end to the other, said corrugations in said reinforcing panels being in alignment with the corrugations in said support panels, said roof panels and said wall panels,

each of the panels of said first and second reinforcing panel means having upper and lower ends,

the upper ends of said support panels being secured to said first reinforcing panel means intermediate the lengths of the panels of said first reinforcing panel means, the lower ends of said support panels being secured to said second reinforcing panel means intermediate the lengths of the panels of said second reinforcing means.

2. The structure of claim 1 wherein said support panels have arcuate flanges at their lower ends which are secured to said wall panels and said second reinforcing panel means in overlying engagement therewith and wherein said support panels have arcuate flanges at their upper ends which are secured to said roof panels and said first reinforcing panel means in overlying engagement therewith.

3. The structure of claim 1 wherein each of said panels are bent into a plurality of alternately disposed larger arcuate corrugations which are co-extensive with said first mentioned corrugations and which also extend in continuous and uninterrupted fashion from one end of said panels to the other, the arcuate neutral axis of said first mentioned corrugations forming a trigonometric sine wave with respect to the straight neutral axis of said larger corrugations, said large corrugations in said wall panels, said roof panels, said reinforcing panels and said support panels all being in alignment.

4. The structure of claim 1 wherein said roof section is inclined with respect to said wall section and wherein said roof panels have a horizontal inner end portion adapted to be secured to a horizontal inner end portion of a second roof section.

5. The structure of claim 4 wherein said building structure includes oppositely disposed wall sections having said roof sections extending therebetween.

References Cited

UNITED STATES PATENTS

2,330,819	10/1943	Faure et al.	52—90
2,742,114	4/1956	Behlen	52—630 X

FOREIGN PATENTS

214,576	7/1956	Australia.
1,238,732	7/1960	France.
540,925	11/1941	Great Britain.
50,008	9/1921	Sweden.

ALFRED C. PERHAM, Primary Examiner

U.S. Cl. X.R.

52—90, 630