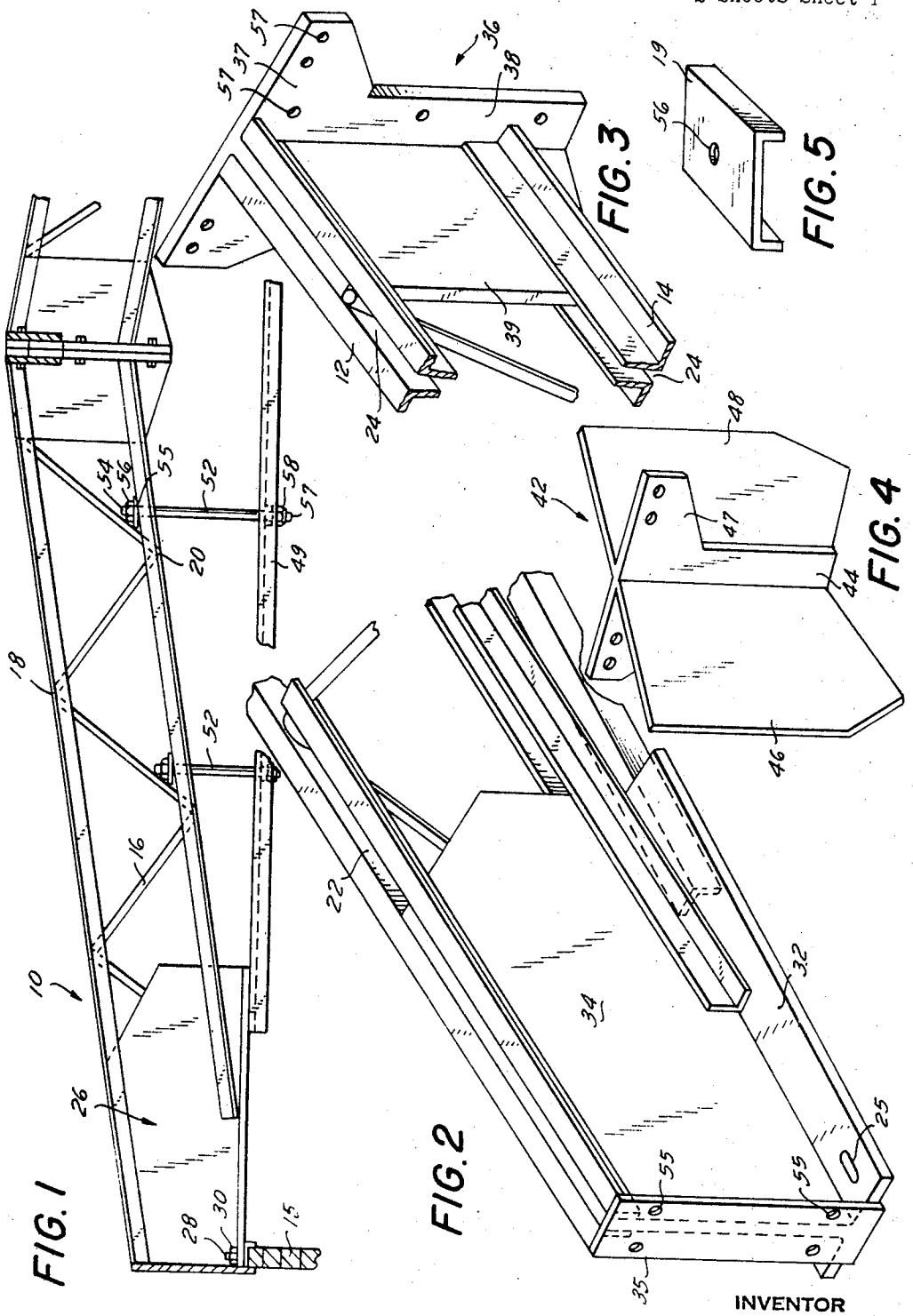
Oct. 28, 1969 U. H. WIPPERMANN 3,474,578

ROOF GIRDER CONSTRUCTION

Filed Aug. 9, 1968 2 Sheets-Sheet 1



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ROOF GIRDER CONSTRUCTION

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FIG. 6

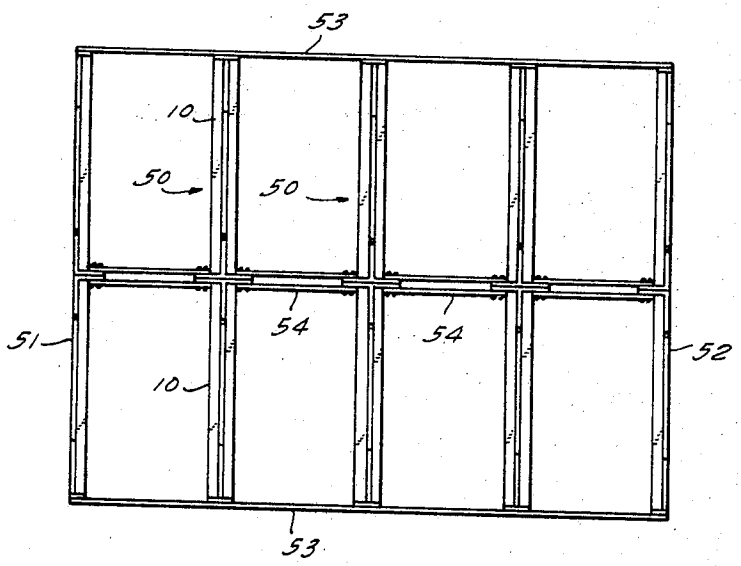


FIG. 7

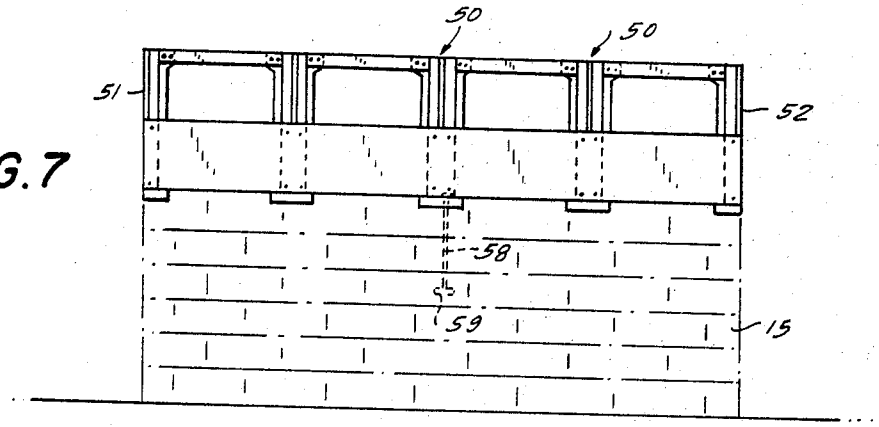
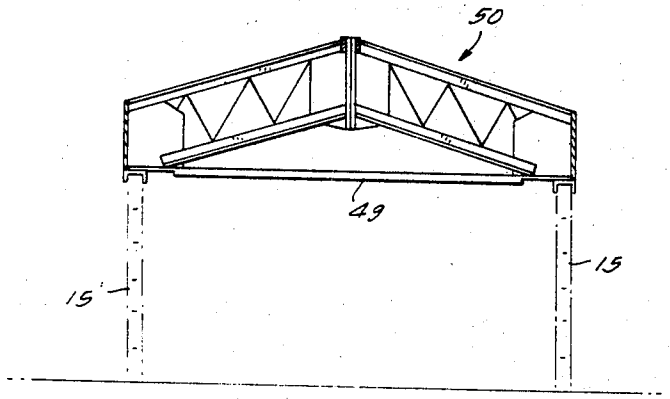


FIG. 8



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ROOF GIRDER CONSTRUCTION

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Continuation-in-part of application Ser. No. 605,438, Dec. 28, 1966. This application Aug. 9, 1968, Ser. No. 751,471

Int. Cl. E04b 7/04; E04c 3/38

U.S. Cl. 52—92 8 Claims

ABSTRACT OF THE DISCLOSURE

Roof girder construction of the type having a pair of truss joists and bracket assemblies to be mounted on the vertical walls of a structure. The assemblies include a truss joist having a pair of upper and lower laterally spaced elongated angular members extending between the ridge of the roof and the vertical wall of the structure. The upper and lower members are transversely aligned and have interposed therebetween a continuous serpentine formed rod welded at alternating spaced points between each pair of said upper and lower members so that the ends of the upper and lower members are formed with a slot in between to provide means for positioning the truss assembly at any given angle with respect to the ridge of the roof and the vertical wall of the structure. A base bearing bracket extends inwardly of and is adapted to be mounted on the vertical wall structure. The base bearing bracket has a base portion and an upright member integrally formed therewith. A portion of the upright member has a width substantially equal to the slot formed in one end of the truss assembly and is welded in position at a desired angle relative to the vertical wall of the structure so as to obtain the desired slope of the roof. A ridge bracket which has a vertically disposed ridge plate positioned substantially parallel to the vertical wall of the structure and has a laterally extending member formed integrally with the vertically disposed ridge plate with the laterally extending member having a width substantially equal to the slot formed in the other end of the truss assembly is welded in position at an angle complementary to the angle formed by the truss with respect to the vertical wall of the structure. The base bearing bracket and the ridge bracket have means thereon and are of sufficient dimensional characteristics to facilitate the formation of a self-supporting roof girder construction without the aid of additional reinforcing members from means other than the roof girder construction.

REFERENCE TO CROSS RELATED APPLICATIONS

This application is a continuation-in-part of my previously filed application Ser. No. 605,438, filed on Dec. 28, 1966, and now abandoned, for Roof Girder Construction, and the contents thereof are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Where structures are to be erected employing a roof girder type of construction, particularly where the span of the roof is to be of considerable length, it is generally necessary to provide additional vertical supporting columns to those normally employed for simple roof construction and also additionally often to provide cross bracing in the walls of the structure itself or adjacent thereto. This additional column support or cross bracing is employed to sufficiently anchor the roof girder construction in position in order to furnish sufficient reinforcement to alleviate the danger of having the roof collapse. This problem is particularly existent in large buildings where the roof structure has to span a distance of 80 feet or more. With present known construction procedures considerable support is necessary in order to prevent the

roof structure from collapsing under unusual stress and therefore to meet building construction requirements.

Also, when additional supporting columns are not employed, the columns which are necessary under normal structural requirements have to be formed with such dimensions that they exceed the width of the finished wall thereby forming protrusions when the interior walls are finished. Naturally, these protrusions result in unusable space within the structure and difficulties are encountered with respect to placement of fixtures therein, for example, cabinets, benches, or the like, or difficulty in dividing the structure into equal work areas. Furthermore, the placement of windows and doors is also limited due to the presence of these expanded columns. Furthermore, if cross bracing is employed rather than the expanded and enlarged column structure, once again there is extreme difficulty in placing windows and doors in desirable locations in the wall structure.

Therefore, it would be extremely advantageous if a roof girder construction could be provided which is essentially self-supporting and which may merely be mounted on a building having common structural features without the necessity of any additional reinforcements being applied to the roof girder construction itself outside of the basic structure. A most advantageous structure is envisioned whereby an all-steel roof construction is provided in true gable form and is entirely independent of any wall reinforcement construction whatsoever. It is reasonable to envision such a structure being employed on roof spans of 80 feet or more and would certainly be fit for a barn as well for a millionaire's mansion.

SUMMARY OF THE INVENTION

This invention provides a roof girder construction of the type having a pair of truss joists and bracket assemblies which are mounted on the vertical walls of a structure. The assemblies include a truss joist having a pair of upper and lower laterally spaced elongated angular members extending between the ridge of the roof and the vertical wall of the structure. The upper and lower members are transversely aligned and have interposed therebetween a continuous sepentine formed rod welded at alternating spaced points between each pair of said upper and lower members so that the ends of the upper and lower members are formed having a slot therebetween to provide means for positioning the truss assembly at any given angle with respect to the ridge of the roof and the vertical wall structure. A base bearing bracket extends inwardly of the vertical wall structure and is adapted to be mounted thereon. The base bearing bracket has a base portion and an upright member integrally formed therewith. A portion of the upright member has a width substantially equal to the slot formed in one end of the truss assembly and is mounted in position at a desired angle relative to the vertical wall of the structure so as to obtain the desired slope of the roof. A ridge bracket which has a vertically disposed ridge plate positioned substantially parallel to the vertical wall of the structure and a laterally extending member formed integrally with the vertically disposed ridge plate having a width substantially equal to the slot formed in the other end of the truss assembly is mounted in position at an angle complementary to the angle formed by the truss with respect to the vertical wall of the structure. The base bearing bracket and the ridge bracket have means thereon and are of sufficient dimensional characteristics to facilitate the formation of a self-supporting roof girder construction without the aid of additional reinforcing members from means other than the roof girder construction.

Among the primary objectives of the invention is to provide roof girder construction of the truss joist, bracket assembly type in which no supporting columns or cross bracing for reinforcing the roof construction is required

by means other than that employed in the roof construction itself. A roof girder construction is provided which may be merely fastened to the upper surface of the vertical walls of the structure being constructed. The invention provides a roof girder construction for assembling a roof having any desired pitch and of extreme span of 80 feet and longer without the necessity of additional supporting means in the wall structure or bracing means other than that included in the roof girder construction itself. The roof girder construction contemplated is one of uniformity of construction materials for the bracket assemblies with only variation in length of the truss joist required, thus obviating many construction details required in roof design and providing a roof girder construction which is substantially inexpensive to manufacture and resulting in economy in the cost of the structure. Furthermore, this invention provides a structure which will alleviate the above mentioned problems and which will provide a roof girder construction having the advantageous features as those discussed above.

With these objectives, among others, in mind reference is had to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an elevational view showing a truss joist mounted between a ridge bracket and a base bearing bracket mounted at the top of a vertical wall of a structure shown broken away;

FIG. 2 is a perspective view of a base bearing bracket and truss joist shown partly broken away;

FIG. 3 is a perspective view of one half of the ridge bracket assembly showing the trust joist mounted thereto and partially broken away;

FIG. 4 is a modified form of a ridge bracket assembly;

FIG. 5 is a perspective view of a bearing plate for mounting on the upper surface of a vertical wall;

FIG. 6 is a top plan view of a completed roof girder construction for an entire building shown positioned on the vertical wall structure of the building and exaggerated in scale for illustrative purposes;

FIG. 7 is a side elevational view of the assembly of FIG. 6; and

FIG. 8 is an end elevational view thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, particularly to FIGS. 1–3 and 5, truss joist assembly **10** includes a pair of upper and lower elongated angular members **12** and **14** which extend between the vertical wall **15** of the structure being constructed and the ridge of the roof to be constructed. Upper and lower members **12** and **14** are laterally spaced apart and transversely aligned by a continuous serpentine formed rod **16** which is disposed therebetween and welded at alternating spaced points **18** and **20** so that slots **22** and **24** are formed at the ends of upper and lower members **12** and **14**. Bearing plate **19**, which may be of a steel material, neoprene or other common material well known in the art is shown in detail in FIG. 5, and is mounted on vertical wall **15** and is held in place by a bolt **28** or a similar fastening device as depicted in FIG. 1. Base bearing bracket **26** is positioned over bolts **28** and the bolts pass through suitable openings **25** formed in bracket **26**. Base bearing bracket **26**, bearing bracket **19** and wall **15** are held in position by nuts **30** as shown in FIG. 1. In this manner, the truss joist assembly **10** can be easily mounted and removed from the wall portion of a structure being constructed. Naturally, other forms of construction may be employed for mounting base bearing bracket **26** at the end of a steel column either by welding or similar means.

Base bearing bracket **26** is formed having a base portion **32** and an upright member **34** formed integrally therewith. Also fastened on the end of bracket **26** is an upright rectangular plate **35**, the purpose of which will be discussed in detail at a later point in this disclosure. Plate **35** is of a wider diameter than upright member **34** and therefore may be fastened either to the end of upright member **34**, the end of base portion **32**, the end of angular member **12** or a combination of any of these. Furthermore, plate **35** may be welded or bolted in position, fastened by any other common means or cast as part of bracket **26** itself.

The width of upright member **34** is substantially equal to slot **22** formed at the ends of truss joist **10** so that truss joist **10** may be mounted thereon and held in fixed position by welding the ends of upper and lower members **12** and **14** to upright member **34** as readily depicted in FIG. 2. Other common fastening means may be employed alternatively or in addition to welding such as by a bolting arrangement. Also, it should be noted that by positioning members **12** and **14** at various angles but in the same relative alignment, various slopes may be obtained by positioning truss joist **10** at any desired angle prior to fastening to bracket **26**. Naturally, bracket **26** will be positioned in substantial perpendicular relationship to the upright wall **15** of the structure to which it is to be applied.

As previously discussed, when mounting base bearing bracket **26** to vertical wall **15** it is advantageous to have openings **25** longitudinally slotted in shape in a direction parallel to the longitudinal length of bracket **26**. This is to compensate for any expansion and contraction of the roof structure after it has been completed. It is well known in girder construction of this type that under extreme conditions of heat or cold particularly long lengths of structure have a tendency to be subject to considerable expansion or contraction. Slotted opening **25** permits this to occur without the danger of buckling of the truss structure. To alleviate the danger of the bolt or nut rusting to the steel structure and a resultant deleterious effect on the movement of the bolt in the slot, a protective coating of common material may be applied to the surface of the bracket adjacent the slotted opening.

At the ridge end of truss joist **10** is a ridge bracket **36** which is similar in construction to base bearing bracket **26**. Thus, the ridge mounting flange **38** is disposed vertically and substantially parallel to the vertical wall **15** of the structure. Extending laterally from ridge mounting flange **38** is member **39** which is formed integrally therewith and is of a width substantially equal to slots **24** formed at the ridge end of truss joist **10**. Ridge plate **36** is then mounted in a similar manner as base bearing bracket **26** so that it is held in position by welding, or other similar fastening means, upper and lower members **12** and **14** to laterally extending member **39**. It should be noted that ridge mounting flange **38** has an upper portion **37** which extends laterally beyond the vertical surface extremities of plate **38**. The purpose of these extensions **37** will be discussed in greater detail at a further point in this disclosure.

It is apparent from the foregoing that a like assembly such as shown in FIG. 1 is mounted to ridge bracket **36** and to a base bearing bracket **26**, not shown, which is mounted to the wall opposed to wall **15** of the structure. In this manner, two joined truss joists **10** in alignment form a span for the structure from one wall **15** to the opposing parallel wall of the structure. The base bearing brackets **26** are thereby positioned and located at the eave of the roof structure and the ridge brackets **36** are located at the ridge of the roof structure.

If desired, a suitable angle iron **49** may be fastened between the opposed base bearing brackets **26** to add strength to the roof section as well as forming a base from which to hang a ceiling on the interior of the completed structure. Hangers **52**, of suitable length and of a size substantially equal to the webbing **16** of the truss

joist, are passed between the lower members **14** and fixed in position as shown in FIG. 1. Each hanger **52** comprises threads **54** and **57** formed at each end and a pair of nuts **56** and **58** for engagement thereon. A washer **55** is utilized for maintaining one end of hanger **52** a spaced distance from web **16**. A sufficient number of hangers are employed so as to maintain angle iron **49** in a substantially horizontal plane and to provide additional supporting means for angle iron **49** other than its being fastened to base bearing brackets **26**. As previously stated, angle iron or cross beam **49** also is employed to provide an anchoring means for maintaining a ceiling within the structure. The amount of support that beam **49** adds to the roof will naturally depend on the width of the building and the cross sectional area of beam **49**.

Where upright member **34** or laterally extending member **39** extends above upper members **12** after truss joist **10** is welded in position, the excess portion is cut away suitably by an acetylene torch so that a substantially smooth upper surface is formed. As can be readily seen in FIG. 2, upper member **12** could extend below the upper edge of upright member **34** thus necessitating the removal of that portion extending above member **12**. Naturally, the amount to be removed from bracket **26** is principally determined by the angle at which truss joist **10** rises between the eave of the roof structure and the ridge of the roof.

FIG. 4 illustrates another modified form of a ridge bracket **42** which includes a vertically disposed flange **44**, is formed having complementary laterally extending members **46** and **48** and may be cast as a single unit. Extensions **47** are also present and function similar to extension **37** of ridge bracket **36**. In the modified form of FIG. 4, it is not necessary to provide either bolts or welding to hold a complementary ridge bracket such as used in form of ridge bracket **36**. Ridge bracket **42** functions as a unit similarly to two ridge brackets **36** bolted or fastened together in some manner as previously discussed. Once again, ridge bracket **42** as well as ridge bracket **36** has portions of laterally extending plates **46** and **48** cut away to the desired extent depending upon the pitch formed by the roof construction as previously discussed in regard to base bracket **26**. Once again, the angle would depend upon the pitch at which the roof girder construction is to be constructed with the result being to provide a smooth continuous surface to the upper surface area of truss joist **10**. The ridge bracket may be cut by an acetylene torch or may be cast to the desired shape and configuration in accordance with the structure to be constructed.

In practice, it has been found that the roof pitch formed by the roof construction as described herein may be varied at least between 180 degrees and 36 degrees. The span or overall length of a truss joist of the type contemplated herein may vary up to 75 feet or more. Thus, the overall span of the structure may be up to 150 feet or more. Obviously, shorter spans may be employed by using truss joist and bracket assemblies of the type disclosed herein to permit column-free construction for roof structures. The size and dimensions of the materials employed herein may vary for any desired structure in accordance with the load the roof is to carry. The size and construction of the ridge brackets and base brackets may also vary considerably according to the requirements for a particular structure. The truss joint may be fabricated on the job site or prefabricated with the base bearing brackets and ridge brackets assembled prior to erection.

Turning to FIGS. 6–8, the truss joint assembly **10** discussed above in detail is shown in combination with other truss joist assemblies **10** to form a roof girder construction of extensive size to form the framework for the roof of a large building. In fact, the roof girder construction is shown assembled to a structure having vertical side walls **15**. It should be noted at the outset, that the assembled roof girder construction consisting of the multiplicity of interconnected truss joist assemblies forms a structure which is completely self-supporting in that no other outside braces or supports need be used to prevent collapse of the roof. The roof girder construction may be entirely removed from the walls as a unit and attached thereto as a unit with the only connection to the walls being through bearing plates **19** which naturally as previously described is mounted on the wall **15** and to base bearing plate **26** by means of bolt **28**. No additional column supports or enlarged columns are necessary in wall **15** as shown nor are there any cross bracing required within the wall or from the roof girder construction to the ground either outside of or inside of the wall to additionally support the roof structure.

The rigidity and strength of each truss joist assembly **10** has been discussed in detail previously in this disclosure and as stated provides extreme rigidity and strength in the vertical and horizontal direction. However, when a multiplicity of these truss joist assemblies are assembled to form an entire roof girder construction for a building of extensive length, each span **50** of two aligned truss joist assemblies **10** is again parallel aligned with another span **50** with the number of similarly aligned parallel spans depending upon the entire length of the building to be constructed. Therefore, it is necessary to alleviate the danger of possible collapse of these spans **50** due to extreme forces from the direction of wall **51** toward wall **52** or vice versa. Although there is virtually no danger of spans **50** collapsing from forces in other directions, this problem is alleviated in the case of a building requiring a number of spans as that shown in FIGS. 6–8 by the presence of an eave girder **53** located at each eave of the roof and connected to each span along the length of the building and by the presence of at least one tie rod **54** which is connected to each adjacent span **50** along the ridge of the roof girder construction. With the presence of eave girders **53** and tie rods **54**, the danger of collapse of the roof structure in the longitudinal direction is virtually eliminated. This is true even for winds up to and greater than 80 miles per hour. The number of tie rods **54** used to connect each pair of adjacent spans naturally depends on the length of the building. In FIGS. 6–8, two tie rods are shown connecting each pair of adjacent spans.

Eave girders **53** are mounted on base bearing brackets **26** by means of end plates **35**. As previously discussed, end plates **35** are mounted on base bearing brackets **26**. A multiplicity of holes **55** are present in plate **35** to which eave girder **53** is connected by means of bolts or other convenient fastening means. It should be noted that each set of bolts on each end plate **35** are vertically aligned so as to provide at least two bolts to prevent twisting of the eave girder and the possible shearing off of engagement thereof with end plates **35**. In this manner, each long eave girder **53** is connected to the series of parallel aligned spans **50** to provide support for the extensive roof girder construction for the entire structure.

An additional aid in this regard is the fastening of tie rods **54** to extensions **37** of ridge brackets **36** as shown in FIGS. 6 and 7. These tie rods connect each adjacent ridge bracket and provide the same type of support as eave girders **53**. This gives additional support in the longitudinal direction and alleviates the danger of collapsing of the entire roof structure in the direction perpendicular to spans **50**. In this manner, with the natural rigid construction of spans **50** and the additional supports of girders **53** and tie rods **54**, no additional supports are needed to provide a roof girder construction to cover an extremely large building and support the roof thereof. The structure as discussed, is merely mounted on the walls **15** of the structure by means of a bolt extending through hole **56** in bearing bracket **19** and hole **25** in base bearing bracket **26**. Returning to a discussion of the tie rods, it is readily apparent that a series of holes **57** are present in each ex-

tension 37 of the ridge bracket 36 through which a bolt may be placed to fasten tie rods 54 properly and permanently in position. Once again, a series of at least two holes are provided at each location to alleviate the danger of twisting of the tie rods and possible shearing of the tie rods from engagement with the ridge brackets.

When the entire roof is assembled to the wall structure, an additional safeguard may be employed in the form of an elongated bolt 58 which extends through holes 25 and 56 in the base bearing bracket 26 and bearing bracket 19 and into the wall a considerable distance. By placing this bolt a considerable distance into the wall the danger of the whole roof girder construction being displaced from the wall structure is virtually eliminated. Naturally, many other anchoring structures may be added to facilitate this end such as a plate 59 on the end of elongated bolt 58 to further anchor the roof structure to the wall structure. Plate 59 would have a threaded opening to receive the threaded end of elongated bolt 58 and provide a solid interengagement therebetween.

When the entire extensive roof girder construction as described is placed upon a wall structure as shown in FIG. 8, and tie beam 49 is hung from each span 50, a ceiling may be attached to this alined parallel set of angle irons or tie beams 49 when the interior of the building is constructed. As is readily apparent, without the necessity of reinforced columns in side walls 15 of the structure nor additional cross bracing to support the longer and more extensive span roof constructions, there is no problem in the positioning of windows and doors in the structure itself, and therefore the architectural features of the completed structure is adaptable to many different types of buildings and design features.

Thus, the above mentioned objects of this invention, among others, are achieved.

I claim:

1. Roof girder construction of the type having a pair of truss joists and bracket assemblies to be mounted on the vertical walls of a structure, said assemblies comprising a truss joist having a pair of upper and lower laterally spaced elongated angular members extending between the ridge of the roof and the vertical wall of the structure, said upper and lower members being transversely aligned and having interposed therebetween a continuous serpentine formed rod welded at alternating spaced points between each pair of said upper and lower members so that the ends of said upper and lower members are formed having a slot therebetween to provide means for positioning said truss assembly at any given angle with respect to the ridge of the roof and the vertical wall of the structure, a base bearing bracket extending inwardly of the vertical wall structure and having distal and proximal ends with respect to the wall and being adapted to be mounted thereon, said base bearing bracket having a base portion and an upright member integrally formed therewith, a portion of said upright member having a width substantially equal to the slot formed in one end of the truss assembly and mounted in position at a desired angle relative to the vertical wall of the structure so as to obtain the desired slope of the roof, the vertical portion of the proximal end of said base bearing bracket with respect to the wall extends beyond and is wider than the slot in the adjacent end of the truss assembly, a ridge bracket having a vertically disposed ridge plate positioned substantially parallel to the vertical wall of the structure and a laterally extending member formed integrally with the vertically disposed ridge plate having a width substantially equal to the slot formed in the other end of the truss assembly and mounted in position at a desired angle relative to the vertical wall of the structure so as to obtain the desired slope of the roof, and said base bearing plate and said ridge bracket having means thereon and being of sufficient dimensional characteristics to facilitate the formation of a self-supporting roof girder construction without the aid of additional reinforcing members from means other than said roof construction.

2. Roof girder construction as set forth in claim 1 wherein said ridge bracketing includes a second bracket formed complementary therewith and mounted on the vertical base plate thereof for mounting a complementary truss joist thereon thus forming a portion of the ridge of the roof.

3. Roof girder construction as set forth in claim 2 wherein a plurality of said portions of the ridge of the roof are arranged in substantially parallel relationship and an eave girder interconnects the adjacent ends of a plurality of adjacent pairs of truss and bracket assemblies to facilitate the formation of extensive roof girder construction without the necessity of additional support for means other than said roof girder construction.

4. Roof girder construction as set forth in claim 2 wherein a plurality of said portions of the ridge of the roof are arranged in substantially parallel relationship and a tie rod is mounted to each adjacent portion at the ridge of the roof so as to form a series of tie rods in aligned relationship across the ridge of the roof thereby tying said portions of the ridge of the roof together and facilitating the formation of extensive roof girder construction without the necessity of additional support from means other than said roof girder construction.

5. Roof girder construction as set forth in claim 1 wherein said ridge bracket comprises a base plate and integrally formed therewith a pair of laterally extending aligned members, each member having a width substantially equal to the slot formed at one end of the truss joist thereby providing means for mounting a pair of truss joist thereon.

6. Roof girder construction as set forth in claim 1 wherein said base bracket is formed having slotted openings therein for mounting on the vertical walls of said structure and providing means for expansion and contraction of said roof girder construction.

7. Roof girder construction as set forth in claim 1 wherein a cross beam is positioned between the vertical wall sections of the structure and mounted on the undersurface of the base portion of the base bearing bracket and held in a substantially horizontal plane by hanger means.

8. Roof girder construction as set forth in claim 1 wherein the vertical portion of the proximal end of said base bearing bracket with respect to the wall includes a rectangular plate mounted on the end of said roof girder construction.

References Cited

UNITED STATES PATENTS

1,258,408	3/1918	Hill	52—90
1,369,837	3/1921	Price	52—639 X
1,791,278	2/1931	Lucy	52—335 X
2,653,553	9/1953	Jacobs	52—641
2,713,924	7/1955	Tripp	52—90 X

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52—639, 694, 713