

PATENT SPECIFICATION

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(19)



(54) CROSS-MEMBER ASSEMBLY

(71) We, CATERPILLAR TRACTOR CO., a corporation organized and existing under the laws of the State of California, United States of America, of 100 N.E. Adams Street, Peoria, Illinois 61629, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to cross-support assemblies, especially those that are useful in earthworking equipment such as track and tyre front loaders and the like.

Hollow tubular cross-members attached between parallel lateral supports are known to the art. It is also known to provide brackets which extend from such cross-members and which support pivot points at positions spaced laterally from the cross-members with the pivot support points serving to pivot a tilt lever or the like which controls the tilting of a bucket. Generally, such prior art cross-support assemblies have utilized a one-piece tubular cross-member and the brackets have been attached thereto by welding or otherwise attaching collars about the tubular member with the brackets extending outwardly from the collars. Thus, the prior art has not taught the use of internal gusseting, especially internal gusseting which is integral with the brackets which extend from the prior art cross-support assemblies.

The prior art collars which have attached the brackets to the cross-member have presented a serious problem in that they have extended significantly outwardly about the cross-support assembly and have thereby partially blocked the view of the bucket position as obtained by an operator of a construction vehicle. The prior art structures have also not exhibited sufficient resistance to buckling. Also, the prior art structures have generally required the production of a weld between the collar and the exterior of the

generally tubular member and the production of such welds take great skill. Further, even when a skilled operator is producing such welds they may be weak due to poor filling thereof. Yet further, forces exerted on the brackets have been applied to such welds in a tensional, rather than a compressive manner thus increasing the likelihood of weld failure. Any solution to these prior art problems must take into account the fact that the generally tubular cross-member must be hollow in order to be sufficiently twistable to bucket forces which correspond to corner loading of the bucket or the like. In such circumstances the tubular cross-member acts as a torsion member.

According to the present invention a cross-support assembly comprises first and second generally parallel, spaced apart, lateral supports; a generally tubular cross-member extending between and attached to the supports; a bracket extending laterally outward from a side of the cross-member; and bulkhead means extending within the cross-member substantially coplanar with the bracket and into contact with the adjacent portion of the interior of the cross-member.

Also in accordance with the present invention a method for assembling a cross-support assembly comprises the steps of affixing a channel structure between first and second generally parallel spaced apart, lateral supports; affixing the bulkhead portion of a bulkhead-bracket structure to the concave surface of the channel structure with a bracket portion of the bulkhead-bracket structure extending laterally outward from the channel structure; affixing a first channel section to the first lateral support, the channel structure and a first side of the bulkhead-bracket structure; and affixing a second channel section to the second lateral support, the channel structure and a second side of the bulkhead-bracket structure.

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An example of a cross-support assembly constructed in accordance with the present invention is illustrated in the accompanying drawings, in which:-

Figure 1 is a partial perspective view of a front loader with a cross-support assembly;

Figure 2 is a partial plan view of the assembly shown in Figure 1;

Figure 3 is a partially broken away side view of the assembly illustrated in Figure 2;

Figure 4 is an enlarged, diagrammatic section taken on the line IV-IV in Figure 2; and,

Figure 5 is an enlarged diagrammatic section taken on the line V-V in Figure 2.

Referring to the drawings, a cross support assembly 10 is shown attached between a pair of generally parallel lateral vertical supports 12, 12'. In the example illustrated the lateral supports 12, 12' are aligned generally vertically and comprise lateral structural members of an earthworking vehicle 14 such as a front loader or the like. The lateral supports 12 and 12' would, for example, comprise the loader arms of the front loader vehicle 14, which loader arms would support a bucket 16 forward of the cross-support assembly 10. In such an assembly expansion and contraction of a first hydraulic motor 18 and a pair of hydraulic motors 20 cause the bucket tilt lever 22 to pivot about the cross-support assembly 10. Briefly, the motor 18 is pivotally attached at a pivot 24 to one end of the tilt lever 22 while the motors 20 act through the lateral supports 12, 12' and thereby upon the other end of the tilt lever 22. Meanwhile, the tilt lever 22 is intermediately pivoted at a generally horizontal pivot 26 to each of a pair of brackets 28, 28' which form a part of and extend laterally from the cross-support assembly 10.

As an alternative use to extending between the loader arms of the front loader vehicle 14, a similar cross-support assembly 29 is affixed between a pair of generally parallel lateral supports, one of which, 31, is seen in Figure 1. In this use, the cross support assembly 29 supports one end of the first hydraulic motor 18.

Turning now to the structure of the cross-support assembly 10 (which is the same as that of assembly 29), it will be noted that in addition to the pair of generally parallel lateral supports 12, 12', the cross-support assembly 10 comprises a generally tubular cross-member 30 which is attached between the lateral supports 12, 12'. The pivot means 26 is supported by the pair of brackets 28, 28' and has an axis generally parallel to the axis of the tubular member 30. Thus, forces exerted upon the pivot means 26 are transmitted as torsion and bending forces to the tubular member 30.

In the example illustrated in Figure 2 bulkheads 34, 34', are integrally formed with and extend from the brackets 28, 28'. The

bulkheads 34, 34' serve as gussets and extend within the tubular member 30 (as best seen in Figure 5) from the side 32 therefore and into contact with a portion 36 of the interior of the tubular cross-member 30 which is located laterally adjacent to the respective brackets 28, 28'. The bulkhead 34 is generally welded to the portion 36 of the interior of the tubular member 30 to provide a strong and rigid but torsionable structure. The bulkhead 34 provides significant resistance to buckling of the cross-member 30. It is relatively easy to form a weld having good fill with such a structure. Also, forces exerted upon the brackets 28, 28' or elsewhere upon the assembly 10 will be transmitted generally as compressive forces upon such welds whereby the welds are not subjected to heavy tensional loading as might lead to failure thereof.

The tubular cross-member 30 generally comprises a channel structure 38 which extends generally fully between the lateral supports 12 and 12'. A first channel section 40 extends from the first of the lateral supports 12 to the first of the bulkheads 34. A second channel section 42 extends from the second of the lateral supports 12' to the second of the bulkheads 34'. An intermediate channel section 44 extends from the first to the second bulkhead, namely from 34 to 34'. Each of the channel sections 40, 42 and 44, and the channel structure 38, are generally of a hemitubular shape with the understanding that the word hemitubular is used very broadly and is not meant to imply one-half of a tube but rather only a fraction generally thereof. Welds are generally used to affix the channel structure 38 to the first section 40, the second section 42 and the intermediate section 44. Welding is also generally used for affixing the first bulkhead means 34 and the second bulkhead means 34' to the portion 36 of the interior of the tubular cross-member 30. The channel structure 38 when joined with the channel sections 40, 42 and 44 thus form the tubular member 30. Welding is further generally used for affixing the first bulkhead means 34 to the first section 40 and intermediate section 44 and also for affixing the second bulkhead means 34' to the second section 42 and the intermediate section 44. Thus, an overall rigid welded structure results having sufficient torsion for the uneven loads typically encountered with a front bucket loader vehicle or the like. Further, the forces exerted on the welds of the bulkhead means 34 to the portion 36 of the interior of the tubular cross-member 30 are exerted in generally a compressive direction leading to reduced weld failure.

The cross-support assembly 10 is assembled by affixing, generally by welding, the channel structure 38 to extend generally fully from the first to the second lateral support, 12 to 12'. Then, the bulkhead portions 34,

34' of bulkhead-bracket structures 34-28, 34'-28' are affixed by welding to the concave surface of the channel structure 38 with the bracket 28, 28' portion of the respective bulkhead-bracket structure extending laterally from the channel structure 38. The first channel section 40 is affixed to the first lateral support 12, to the channel structure 38 and to a first side 46 of the bulkhead-bracket structure. Then the second channel section 42 is affixed generally by welding to the second lateral support 12', the channel structure 38 and a first side of the bulkhead-bracket structure 34'; and the intermediate section 44 is welded between a second side of bulkhead bracket structure 34' and a second side 48 of bulkhead-bracket structure 34. Obviously in the case of the construction of a cross-support assembly 10 having only a single bulkhead-bracket structure, channel sections 42 and 44 will be integral, also the steps of the method may be carried out in producing a three or more bulkhead-bracket type cross-support assembly 10. Where each bulkhead - bracket structure is integrally formed, the bulkhead portions 34, 34' of respective structures 34-28, 34'-28' may be threaded onto the channel structures 38 before it is welded to the lateral supports 12, 12'; or the bulkhead portions 34, 34' may be chamfered so that they can be slotted into the structure 38 after it has been welded between lateral supports 12, 12'.

It will be noted that the cross-support assembly 10 of the present invention is non-solid or hollow by being formed of the generally tubular member 30 and hence can act as a torsion member with sufficient capacity for twisting to handle forces upon the bucket 16. Also, the bulkheads 34, 34' provide significant resistance to buckling of the cross-member 30. Further, it is noted that the welds made in formulating the cross-support assembly 10 of the present invention are easily accessible and are made against surfaces which clearly and easily abut one another whereby weld fill can be adequately attained. Still further, it is clear that the bulkhead-bracket assemblies 34-38, 34'-28', do not extend far out about the generally tubular cross-member 30 and, hence, do not obstruct the operator's view of the bucket 16. Also, the forces exerted on the welds which fasten the bulkheads 34, 34' to the portion 36 of the interior of the tubular cross-member 30 are exerted in generally a compressive direction leading to reduced weld failure.

WHAT WE CLAIM IS:-

1. A cross-support assembly comprising first and second generally parallel, spaced apart, lateral supports; a generally tubular cross-member extending between and attached to the supports; a bracket extending laterally outward from a side of the cross-member; and bulkhead means extending

within the cross-member substantially coplanar with the bracket and into contact with the adjacent portion of the interior of the cross-member.

2. An assembly according to claim 1, wherein the generally tubular cross-member comprises a channel structure extending generally fully between the lateral supports; a first channel section extending from the first lateral support to a position intermediate the lateral supports; a second channel section extending from the second lateral support to a position adjacent but short of the intermediate position; and means for affixing the structure to the first and second sections.

3. An assembly according to claim 1 or claim 2, further comprising a second bracket spaced apart from the first bracket, and extending parallel to and in the same direction as the first bracket; and a second bulkhead means extending substantially coplanar with the second bracket and within the cross-member and into contact with the adjacent portion of the interior of the cross-member.

4. An assembly according to claim 3, further comprising an intermediate channel section extending from the first to the second bulkhead means; and means for affixing the structure to the intermediate section.

5. An assembly according to any one of claims 2 to 4, wherein the or each bulkhead means passes between the first and second sections and wherein the assembly further includes means to the respective portion of the interior of the cross-member; and means for affixing the or each bulkhead means to the channel sections adjacent to it.

6. An assembly according to any one of the preceding claims, wherein each of the affixing means comprise welds.

7. An assembly according to any one of the preceding claims, further including pivot means supported by the or each bracket and having an axis generally parallel to the cross-member.

8. An assembly according to any one of the preceding claims, wherein the or each bulkhead and corresponding bracket are integrally formed.

9. An assembly according to any one of the preceding claims, wherein the lateral supports are aligned generally vertically and comprise lateral structural members of an earthworking vehicle.

10. An assembly according to claim 9, wherein the lateral supports comprise loader arms of a front loader having a bucket forward of the generally tubular member, the assembly further including bucket tilt lever means pivotally affixed to the pivot means; and motor means for pivoting the tilt lever means about the pivot means.

11. A cross-support assembly according



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34' of bulkhead-bracket structures 34-28, 34'-28' are affixed by welding to the concave surface of the channel structure 38 with the bracket 28, 28' portion of the respective bulkhead-bracket structure extending laterally from the channel structure 38. The first channel section 40 is affixed to the first lateral support 12, to the channel structure 38 and to a first side 46 of the bulkhead-bracket structure. Then the second channel section 42 is affixed generally by welding to the second lateral support 12', the channel structure 38 and a first side of the bulkhead-bracket structure 34'; and the intermediate section 44 is welded between a second side of bulkhead bracket structure 34' and a second side 48 of bulkhead-bracket structure 34. Obviously in the case of the construction of a cross-support assembly 10 having only a single bulkhead-bracket structure, channel sections 42 and 44 will be integral, also the steps of the method may be carried out in producing a three or more bulkhead-bracket type cross-support assembly 10. Where each bulkhead - bracket structure is integrally formed, the bulkhead portions 34, 34' of respective structures 34-28, 34'-28' may be threaded onto the channel structures 38 before it is welded to the lateral supports 12, 12'; or the bulkhead portions 34, 34' may be chamfered so that they can be slotted into the structure 38 after it has been welded between lateral supports 12, 12'.

It will be noted that the cross-support assembly 10 of the present invention is non-solid or hollow by being formed of the generally tubular member 30 and hence can act as a torsion member with sufficient capacity for twisting to handle forces upon the bucket 16. Also, the bulkheads 34, 34' provide significant resistance to buckling of the cross-member 30. Further, it is noted that the welds made in formulating the cross-support assembly 10 of the present invention are easily accessible and are made against surfaces which clearly and easily abut one another whereby weld fill can be adequately attained. Still further, it is clear that the bulkhead-bracket assemblies 34-38, 34'-28', do not extend far out about the generally tubular cross-member 30 and, hence, do not obstruct the operator's view of the bucket 16. Also, the forces exerted on the welds which fasten the bulkheads 34, 34' to the portion 36 of the interior of the tubular cross-member 30 are exerted in generally a compressive direction leading to reduced weld failure.

WHAT WE CLAIM IS:-

1. A cross-support assembly comprising first and second generally parallel, spaced apart, lateral supports; a generally tubular cross-member extending between and attached to the supports; a bracket extending laterally outward from a side of the cross-member; and bulkhead means extending

within the cross-member substantially coplanar with the bracket and into contact with the adjacent portion of the interior of the cross-member.

2. An assembly according to claim 1, wherein the generally tubular cross-member comprises a channel structure extending generally fully between the lateral supports; a first channel section extending from the first lateral support to a position intermediate the lateral supports; a second channel section extending from the second lateral support to a position adjacent but short of the intermediate position; and means for affixing the structure to the first and second sections.

3. An assembly according to claim 1 or claim 2, further comprising a second bracket spaced apart from the first bracket, and extending parallel to and in the same direction as the first bracket; and a second bulkhead means extending substantially coplanar with the second bracket and within the cross-member and into contact with the adjacent portion of the interior of the cross-member.

4. An assembly according to claim 3, further comprising an intermediate channel section extending from the first to the second bulkhead means; and means for affixing the structure to the intermediate section.

5. An assembly according to any one of claims 2 to 4, wherein the or each bulkhead means passes between the first and second sections and wherein the assembly further includes means to the respective portion of the interior of the cross-member; and means for affixing the or each bulkhead means to the channel sections adjacent to it.

6. An assembly according to any one of the preceding claims, wherein each of the affixing means comprise welds.

7. An assembly according to any one of the preceding claims, further including pivot means supported by the or each bracket and having an axis generally parallel to the cross-member.

8. An assembly according to any one of the preceding claims, wherein the or each bulkhead and corresponding bracket are integrally formed.

9. An assembly according to any one of the preceding claims, wherein the lateral supports are aligned generally vertically and comprise lateral structural members of an earthworking vehicle.

10. An assembly according to claim 9, wherein the lateral supports comprise loader arms of a front loader having a bucket forward of the generally tubular member, the assembly further including bucket tilt lever means pivotally affixed to the pivot means; and motor means for pivoting the tilt lever means about the pivot means.

11. A cross-support assembly according

to claim 1, substantially as described with reference to the accompanying drawings.

12. A method of assembling a cross-support assembly, the method comprising, the steps of affixing a channel structure between first and second generally parallel spaced apart, lateral supports; affixing the bulkhead portion of a bulkhead-bracket structure to the concave surface of the channel structure with a bracket portion of the bulkhead-bracket structure extending laterally outward from the channel structure; affixing a first channel section to the first lateral support, the channel structure and a first side of the bulkhead-bracket structure; and affixing a second channel section to the second lateral support, the channel structure and a second side of the bulkhead-bracket structure.

13. A method according to claim 12, wherein each of the affixing steps comprise welding.

14. A method according to claim 12, substantially as described with reference to the accompanying drawings.

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