United States Patent [19]

Benkowski

[11] **3,782,790**

[45] **Jan. 1, 1974**

[54] **BOOM SLIDER ASSEMBLY**

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[73] Assignee: **The Warner & Swasey Company,** Cleveland, Ohio

[22] Filed: **Apr. 3, 1972**

[21] Appl. No.: **240,759**

Related U.S. Application Data

[63] Continuation of Ser. No. 29,408, April 17, 1970, abandoned.

[52] **U.S. Cl.** ..... **308/3 R,** 212/55

[51] **Int. Cl.** **F16c 17/00**

[58] **Field of Search** ..... 308/3, 73, 160; 212/55, 55 X; 52/111, 115, 118

[56] **References Cited**

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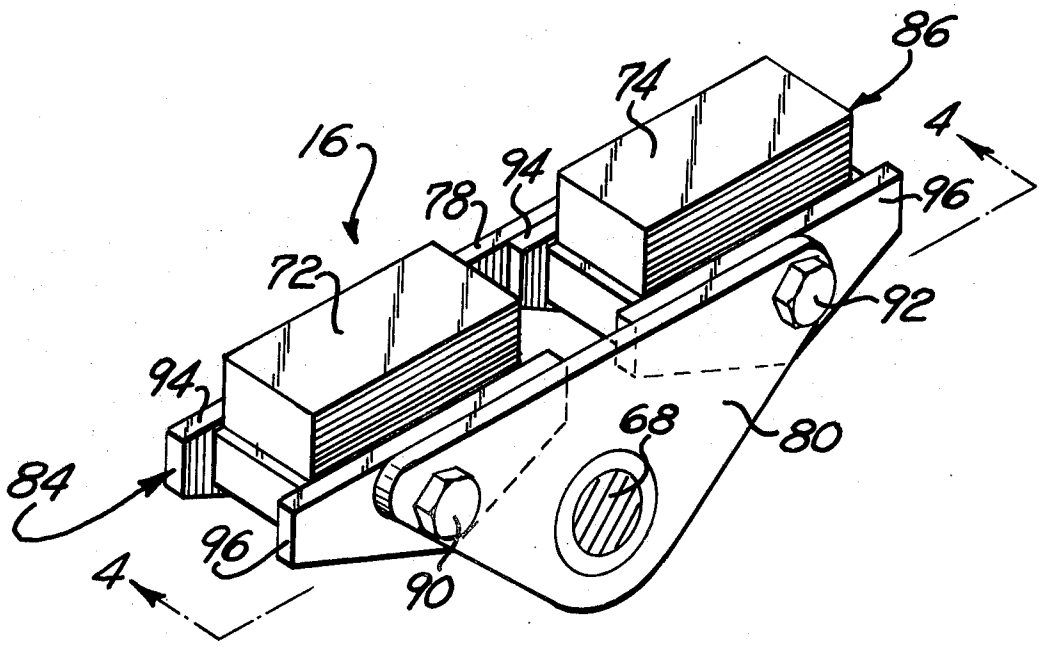
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Assistant Examiner—R. H. Lazarus
Attorney—Yount & Tarolli

[57] **ABSTRACT**

An improved boom includes a slider assembly for use in supporting telescoping sections of the boom for movement relative to each other. An articulated slider assembly embodying the invention includes a rocker member which is pivotally mounted on one section of the boom. A pair of slider block assemblies are pivotally mounted on the rocker member and slidably engage a supported section of the boom at spaced apart locations. Deflection of the supported boom section is compensated for by pivotal movement of the slider block assemblies relative to each other. A spring type slider assembly forms another embodiment of the invention and has a flexural rigidity such that the deflection of the spring type slider assembly matches the deflection of a supported section of the boom under the influence of an operating load to provide for the transmittal of a uniform bearing load between the supported boom section and slider assembly.

11 Claims, 15 Drawing Figures



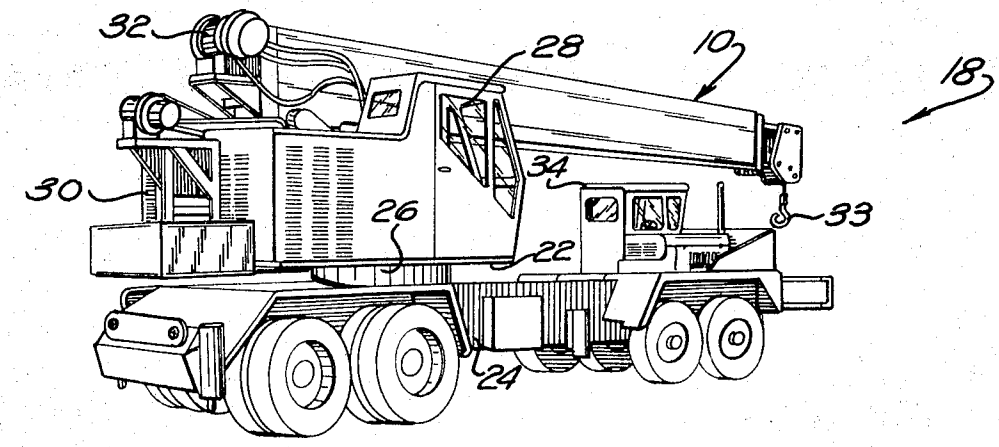


FIG. 1

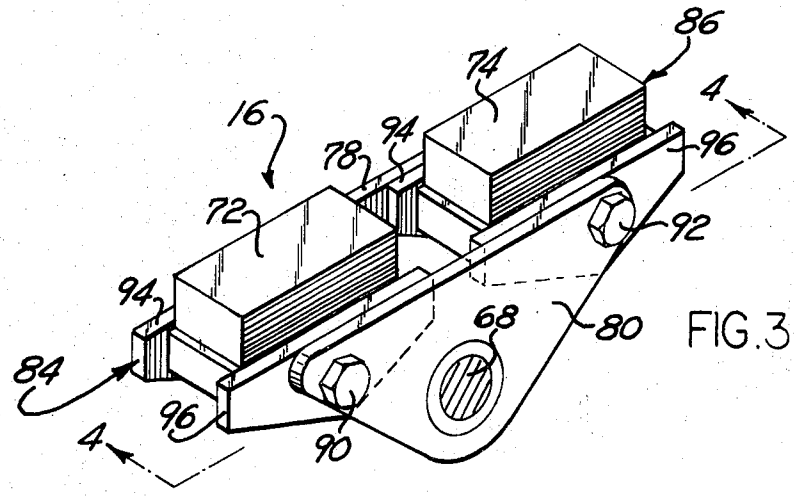


FIG. 3

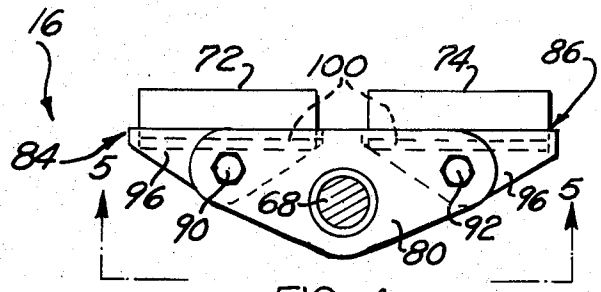


FIG. 4

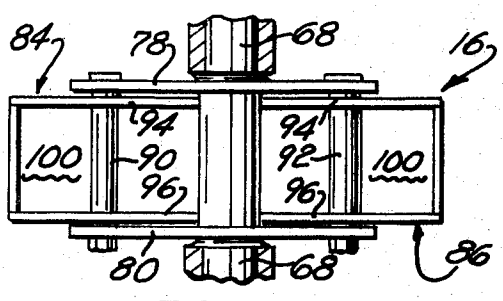


FIG. 5

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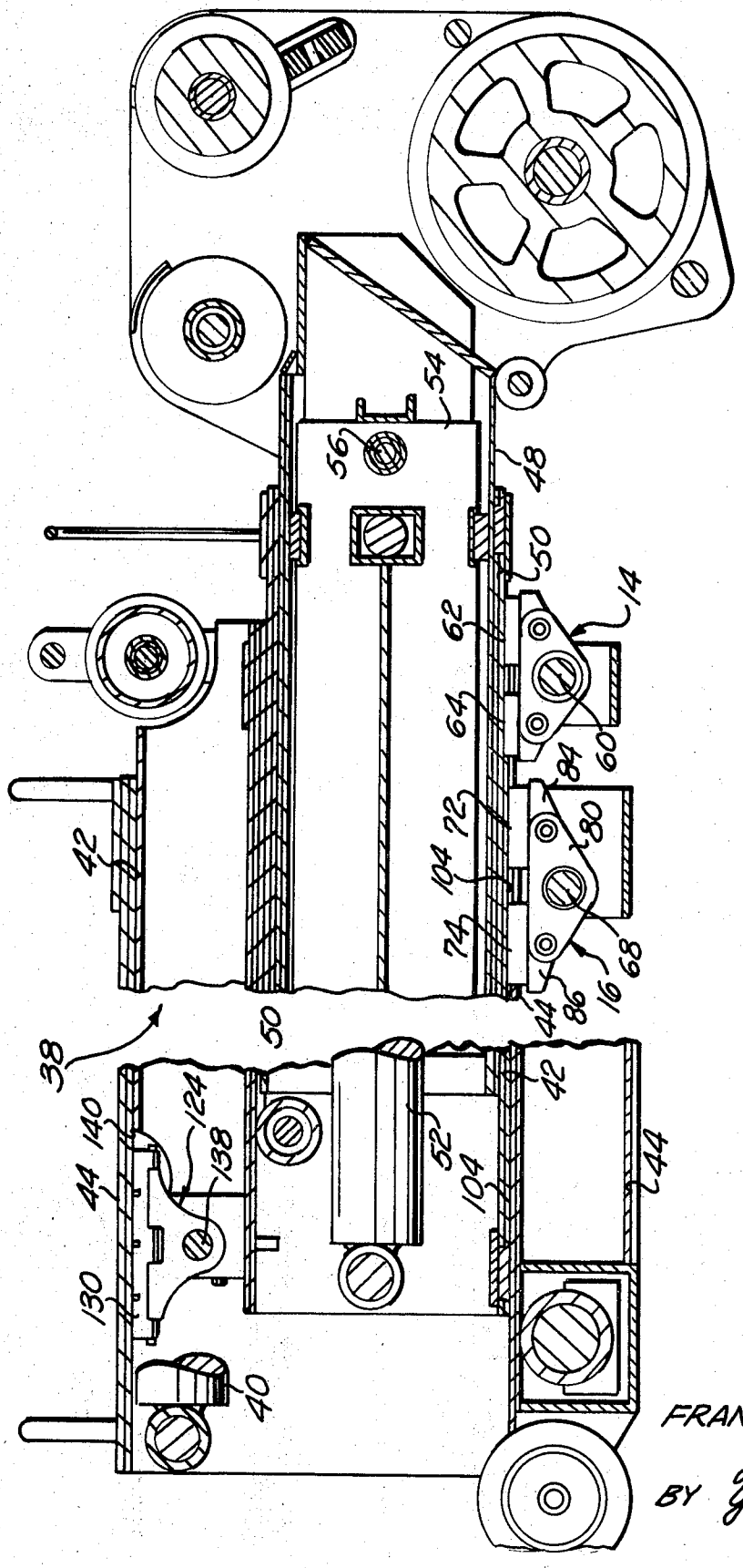


FIG. 2

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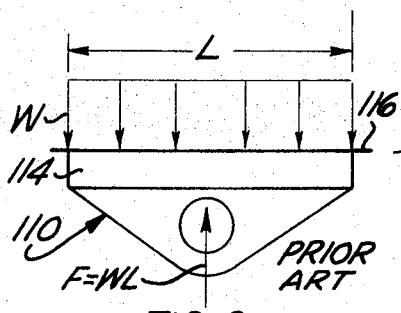


FIG. 6

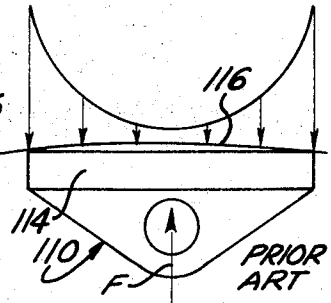


FIG. 7

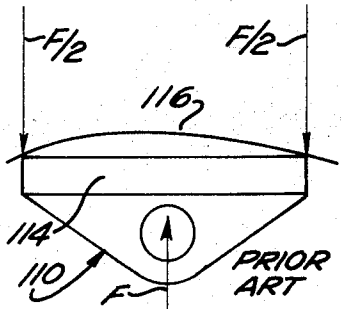


FIG. 8

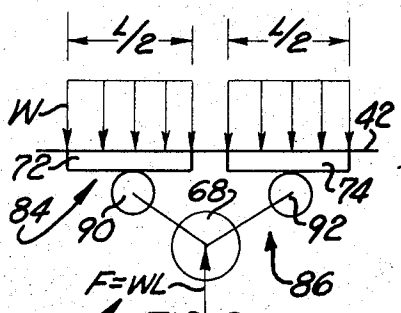


FIG. 9

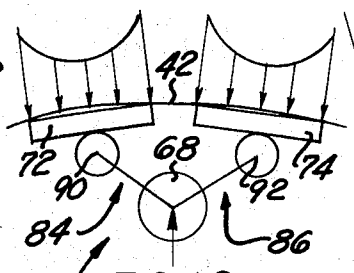


FIG. 10

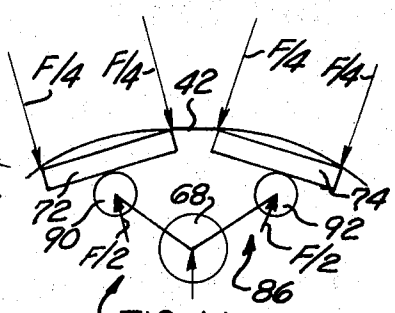


FIG. 11

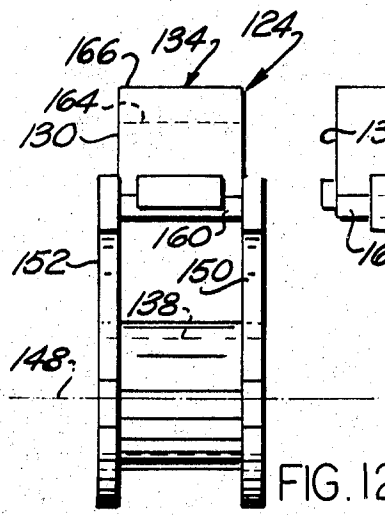


FIG. 12

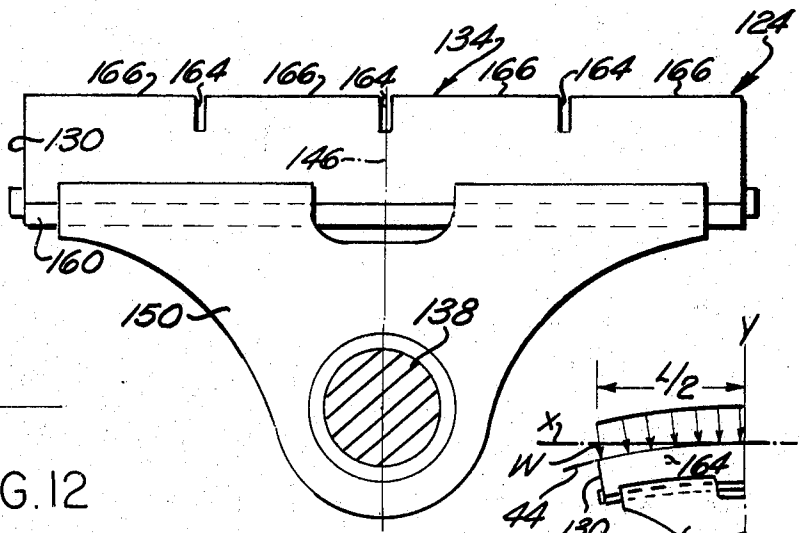


FIG. 13

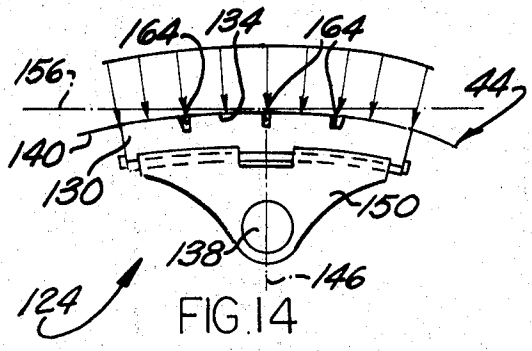


FIG. 14

FIG 15

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BOOM SLIDER ASSEMBLY

This is a continuation of application Ser. No. 29,408, filed Apr. 17, 1970 now abandoned.

This invention relates to an improved slider assembly which tends to promote the uniform distribution of bearing loads between the slider assembly and a supported boom section.

Telescopic booms commonly include slider assemblies which support sections of the boom for movement relative to each other. A known slider assembly includes a single slider pad which, upon deflection of the boom, is subjected to relatively large loads at its leading and trailing end portions. The relatively large load at one end portion of the slider assembly can, under extreme conditions, approach as much as 50 percent of the load carried by the slider assembly. This concentration of the load at the ends of the slider assembly tends to reduce the load carrying capacity of the boom by forming undesirable stress concentrations in the boom. In addition, the concentration of the load at the ends of the slider assembly promotes wearing of the slider assembly.

Accordingly, it is an object of this invention to provide a new and improved slider assembly for use in supporting sections of a boom and which tends to promote the uniform distribution of bearing loads between the slider assembly and an associated boom section upon application of an operating load to the boom.

Another object of this invention to provide an articulated slider assembly for use in supporting relatively movable sections of a boom and which compensates for deflection of the boom under the influence of an operating load to thereby reduce stress concentrations in the boom and enable the boom to carry a greater load.

Another object of this invention is to provide a new and improved slider assembly for use in supporting sections of a boom for relative movement wherein the slider assembly includes a rocker member which is adapted to be pivotally connected with one section of the boom for pivotal movement relative thereto, first and second slider members which are pivotally connected to the rocker member at spaced apart locations for pivotal movement relative thereto, and first and second pad means mounted on the slider members for engaging a supported section of the boom at spaced apart locations and wherein the rocker member and the first and second slider members are pivotal relative to the supported section of the boom to at least partially compensate for deflection of the boom upon application of a load thereto.

Another object of this invention is to provide a new and improved slider assembly for use in supporting relatively movable sections of a boom and which has a structural deflection curve which matches the deflection curve of a slidably engaged section of the boom to thereby provide for the transmission of a uniform bearing load between the slider assembly and the engaged boom section.

Another object of this invention is to provide new and improved boom assembly and includes a slider means for facilitating relative movement between sections of the boom assembly and wherein the slider means has a flexural rigidity such that upon application of a predetermined operating load to the boom assembly a deflection curve for a section of the boom assembly which is slidably engaged by the slider means is the same as a deflection curve for the slider means to thereby provide for the transmittal of a uniform bearing load between the slider means and the section of the boom assembly.

Another object of this invention is to provide a new and improved boom assembly in accordance with the next preceding object and wherein the slider means includes a pad which slidably engages the section of the boom, the pad being divided into a plurality of sections which are movable relative to each other upon deflection of the section of the boom assembly under the influence of an operating load to thereby facilitate maintenance of the surface of the slider pad sections in abutting engagement with the section of the boom assembly upon deflection of the boom assembly.

Another object of this invention is to provide a new and improved slider assembly for supporting sections of a boom for relative movement wherein the slider assembly includes a pad which is mounted on a support assembly and is adapted to be disposed in abutting engagement with a section of the boom and wherein the slider pad includes means for dividing the pad into a plurality of sections to enable relative movement to occur between the sections of the slider pad upon deflection of the boom to thereby facilitate maintenance of the surfaces of the slider pad sections in abutting engagement with the section of the boom upon deflection of the boom.

These and other objects and features of the invention will become more apparent upon a consideration of the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is an illustration of a known crane vehicle having a boom assembly;

FIG. 2 is an enlarged fragmentary sectional view of the boom assembly of the crane vehicle of FIG. 1;

FIG. 3 is an enlarged illustration of an articulated slider assembly constructed in accordance with the present invention and utilized in the boom assembly of FIG. 2 to support one section of the boom assembly for movement relative to another section of the boom assembly;

FIG. 4 is an elevational view taken generally along the line 4—4 of FIG. 3, illustrating the relationship between a rocker arm and a pair of slider block assemblies which are pivotally mounted on the rocker arm;

FIG. 5 is a plan view, taken generally along the line 5—5 of FIG. 4, further illustrating the relationship between the slider block assemblies and the rocker arm;

FIG. 6 is a schematic illustration of a known slider assembly in a lightly loaded condition in which a uniform bearing load is carried by the slider assembly and there is substantially no deflection of a boom with which the slider assembly is associated;

FIG. 7 is a schematic illustration depicting a tendency for the bearing load to concentrate at end portions of the known slider assembly of FIG. 6 upon deflection of the boom under the influence of an operating load;

FIG. 8 is a schematic illustration depicting an extreme loading condition in which the boom has been deflected to such an extent that the entire bearing load is concentrated at opposite end portions of the known slider assembly;

FIG. 9 is a schematic illustration of the articulated slider assembly of FIG. 3 in a lightly loaded condition with substantially no deflection of an associated boom

section and corresponds to the operating condition shown in FIG. 6 for the known slider assembly;

FIG. 10 is a schematic illustration of the articulated slider assembly in a loaded condition in which there is some deflection of the boom and corresponds to the operating condition shown in FIG. 7 for the known slider assembly;

FIG. 11 is a schematic illustration of the articulated slider assembly an extreme loading condition in which there is substantial deflection of the boom and corresponds to the operating condition shown in FIG. 8 for the known slider assembly;

FIG. 12 is an end view of a spring type slider assembly forming another embodiment of the present invention;

FIG. 13 is an elevational view of the spring type slider assembly of FIG. 12;

FIG. 14 is a schematic illustration depicting the matching deflection curves for the spring type slider assembly of FIGS. 12 and 13 and an associated boom section; and

FIG. 15 is a schematic illustration depicting the manner of considering half of the spring type slider assembly as a cantilevered beam for purposes of calculating deflection of the spring type slider assembly.

A slider assembly constructed in accordance with the present invention increases the load carrying capacity of a boom assembly by compensating for deflection of a supported boom section in a manner which tends to reduce stress concentrations in the boom section. An articulated slider assembly accomplishes this by providing for independent pivotal movement or rotation of slider block assemblies upon deflection of the supported boom section. In another embodiment of the invention, a spring type slider assembly has a flexural rigidity such that the curve of deflection of the spring type slider assembly matches the curve of deflection of the surface of a slidably engaged boom section. Therefore the configuration of a support surface for the slider assembly changes with deflection of the associated boom section in such a manner that a uniform bearing load is transmitted between the slider assembly and the boom section. To further promote the transmittal of a uniform bearing load between the spring type slider assembly and the boom section, the slider assembly includes a slider pad which is divided into a plurality of sections which are movable relative to each other upon the occurrence of deflection in the boom section to thereby facilitate maintenance of the support surface of the slider pad in abutting engagement with the boom section as the boom section deflects. It is contemplated that the separate embodiments of the slider assemblies could be combined into a single slider assembly having features of each of the separate embodiments.

Although a slider assembly constructed in accordance with the present invention can be utilized in other boom assemblies in many different types of environments, a boom assembly **10** having articulated slider assemblies **14** and **16** (FIG. 2) constructed in accordance with the present invention, is shown in association with a crane vehicle **18** (FIG. 1). The boom assembly **10** is supported on a base frame **22** for rotation relative to a vehicle frame **24** by a turntable **26.** An operator in a cab **28** controls the operation of a power plant **30** to effect rotational movement of the boom assembly **10** relative to the frame **24** of the vehicle. Suitable controls are provided in the operator's cab **28** for effecting upward pivoting movement of the boom **10** from the illustrated over-the-road or transport position of FIG. **1.** In addition, controls are provided in the cab **28** to operate a winch assembly **32** to lift a load with a hook **33.** The crane type vehicle **18** is driven over-the-road by a driver in a cab **34** which is mounted on a forward portion of the frame **24.**

The boom assembly **10** is operated in a known manner from the retracted position of FIG. **2** to an extended position (not shown) by increasing the telescopic relationship between a plurality of relatively movable sections **38** of the boom assembly. Thus, a first piston and cylinder assembly **40** is extendable to move a first intermediate section **42** of the boom assembly **10** outwardly relatively to a base section **44** of the boom assembly. A fly or outermost section **48** of the boom assembly **10** is moved outwardly relative to the first intermediate section **42** and a second intermediate section **50** by extending a second piston and cylinder assembly **52** with a coupling member **54** connected to the fly section **48.** The second intermediate section **50** and fly section **48** are then extended relative to the first intermediate section **42** and base section **44** of the boom assembly **10** by disconnecting a pin **56,** retracting the piston cylinder assembly **52** to withdraw the coupling member **54** and then connecting the coupling member to the intermediate section **50** with the pin **56.** The manner of extending the boom assembly **10** is more fully explained in U.S. Pat. No. 3,368,696 to Johnston et al. and, for purposes of avoiding prolixity of description, will not be further described herein.

The articulated slider assemblies **14** and **16** at least partially support the intermediate boom sections **42** and **50** in a load carrying position and enable the sections to be moved axially relative to each other. Thus the articulated slider assembly **14** is pivotally mounted on a support shaft **60** connected to the first intermediate section **42** and has slider pads **62** and **64** disposed in sliding engagement with an outer surface of the second intermediate section **50** to support the boom section **50** for sliding movement relative to the boom section **42.** Similarly, the articulated slider assembly **16** is pivotally mounted on a support shaft **68** connected with the base section **44** and includes slider pads **72** and **74** disposed in sliding engagement with an outer surface of the first intermediate boom section **42** to support the first intermediate boom section for sliding movement relative to the base section **44.**

The articulated slider assembly **16** includes a pair of rocker or base members **78** and **80** (see FIGS. **3** through **5**) which are fixedly interconnected and pivotally mounted on the support shaft **68.** A pair of spaced apart slider block assemblies **84** and **86** are mounted between the rocker members **78** and **80** and are independently pivotal about parallel support pins **90** and **92** which extend between the rocker members **78** and **80.** The support pins **90** and **92** are spaced equal horizontal and vertical distances from the support shaft **68.** The two slider block assemblies **84** and **86** are substantially identical in construction and each includes a pair of slider arms **94** and **96** which extend parallel to each other and to the rocker members **78** and **80.** The slider pads **72** and **74** are mounted on support plates **100,** one of which extends between and fixedly interconnects each of the pairs of slider arms **94** and **96.**

The articulated slider assembly **16** is rotatably mounted on the support shaft **68** which is in turn

fixedly connected to the boom section **44**. The slider pads **72** and **74** extend into abutting engagement with an outer surface **104** (see FIG. **2**) of the first intermediate section **42**. The articulated slider assembly **14** is constructed in the same manner as previously explained for the articulated slider assembly **16** and therefore will not be described in detail. However, it should be noted that the articulated slider assembly **14** is pivotally mounted on the first intermediate boom section **42** by the support shaft **60** with the slider pads **62** and **64** in engagement with the second intermediate boom section **50**. Of course other slider assemblies, which may or may not be articulated, are provided to assist in supporting the boom sections **42, 44, 48** and **50** for movement relative to each other.

A known type of slider assembly **110** is shown in FIG. **6**. The slider assembly **110** includes a slider pad **114** having a surface area which is equal to the combined surface areas of the two slider pads **72** and **74** of the articulated slider assembly **16**. The slider pad **114** is disposed in abutting engagement with an outer surface of a lightly loaded boom section indicated schematically at **116**. There is little or no deflection of the boom section **116** when it is lightly loaded as shown in FIG. **6**. Therefore a relatively small and uniform bearing load, designated W in FIG. **6**, is applied to each unit of length of the slider pad **114**. The total downward load on the slider pad **114** is equal to the product of the load *W* per unit of length multiplied by the length *L* of the slider pad. This downward load is balanced by an upward reaction force designated F in FIG. **6**.

As the load on the boom section **116** increases, the boom section tends to deflect in a manner shown schematically in FIG. **7**. As the boom section **116** deflects it curves or bows so that the bearing load tends to become concentrated toward the leading and trailing end portions of the known slider assembly **110** and is no longer applied uniformly throughout the length *L* of the slider assembly. As the operating load on the boom section **116** is further increased, the curve of deflection for the boom section increases and the loading approaches the extreme condition shown in FIG. **8** wherein half of the load is concentrated at one end portion of the slider assembly and the other half of the load is concentrated at the other end portion of the slider assembly. As the load on the slider assembly **110** approaches the condition shown in FIG. **8**, stress concentrations in the boom section **116** increase. Of course, the increasing stress concentrations in the boom section **116** reduce the load carrying capacity of the boom section. In addition, the concentrated forces on the leading and trailing end portions of the slider pad **114** tend to promote a rapid wearing of the slider pad.

The articulated slider assemblies **14** and **16** compensate for deflection of the associated boom sections to reduce stress concentrations in the boom sections and thereby increase the load carrying capacity of the boom sections. To accomplish this, the articulated slider assemblies **14** and **16** tend to promote a more uniform distribution of the bearing loads between the slider assemblies and the associated boom sections upon loading of the boom sections. This is illustrated schematically in FIGS. **9** through **11** for the slider assembly **16**. However, it should be understood that the slider assembly **14** operates in much the same manner to promote a more uniform load distribution upon deflection of the second intermediate boom section **50**.

When the first intermediate boom section **42** is in a normal or lightly loaded condition (FIG. **9**) there is little or no deflection of the boom section and a uniform load W per unit length is transmitted from the boom section **42** to the articulated slider assembly **16**. Since the slider pads **72** and **74** have the same combined length as the slider pad **114**, the total reaction force F is the same for the articulated slider assembly **16** as for the known slider assembly **110** if the uniform load W per unit length is the same. As the operating load on the boom section **42** is increased, the total bearing load and reaction force F will increase and the boom section will tend to deflect in the manner illustrated schematically in FIG. **10**. As the curve of deflection **40** by the boom section **42** increases with a corresponding increase in the operating load on the boom assembly **10**, the bearing load tends to become concentrated toward the opposite end portions of the slider pads **72** and **74** (FIG. **10**). The curve of deflection of the boom section **42** is increased with further increases in the operating load and the loading on the slider pads **72** and **74** approaches the extreme condition shown schematically in FIG. **11**.

The articulated slider assembly **16** compensates for the deflection of the boom section **42** to decrease stress concentrations in the boom section to a level which is lower than is obtainable with the known slider assembly **110** under the same operating conditions. Of course, decreasing the stress concentrations in the boom section **42** increases the load carrying capacity of the boom section. The articulated slider assembly **16** decreases the level of the stress concentrations in the boom section **42** by allowing independent pivoting movement of the slider block assemblies **84** and **86** to occur relative to the rocker arms **78** and **80** upon deflection of the boom section **42**. This pivoting movement enables the bearing load transmitted between the articulated slider assembly **16** and boom section **42** to tend to become concentrated in four areas at the end portions of the two slider pads **72** and **74** (FIG. **10**). As was previously explained, the bearing load transmitted between the known slider assembly **110** and boom section **116** tends to become concentrated in two areas at the end portions of the slider pad **114** (FIG. **7**). Therefore if equal total loads are applied to the two slider assemblies, the magnitude of the load concentrated at each of the two end portions of the known slider assembly **110** is greater than the magnitude of the load concentrated at each of the four end portions of the articulated slider assembly **16**.

The compensating action of the articulated slider assembly **16** is perhaps best seen by a comparison of an extreme loading condition for the known slider assembly **110** (see FIG. **8**) and the articulated slider assembly **16** (see FIG. **11**). If it is assumed that an equal total load F is applied to each of the slider assemblies, under conditions of extreme deflection one half of the total load (F/2) tends to be transmitted between the supported boom section and each of the opposite end portions of the known slider assembly **110**. However, under conditions of extreme deflection only one fourth of the total load (F/4) tends to be transmitted between the supported boom section and each of the opposite end portions of the slider pads **72** and **74** of the articulated slider assembly **16**. The two pivot axes **90** and **92** are equally spaced from the axis of the support shaft **68** so that counterbalancing torque forces applied to the

rocker arms **78** and **80** by equal loads on the slide block assemblies **84** and **86.**

From the foregoing it can be seen that the articulated slider assembly **14** generates a greater load bearing capacity in a supported boom section due to pivotal movement or rocking of the slider block assemblies **84** and **86** upon deflection of the supported boom section. This pivotal movement of the slider block assemblies **84** and **86** reduces the load which is concentrated at the leading and trailing end portions of the slider pads **72** and **74** to thereby decrease the stress concentrations in the supported boom section **42.** It should be understood that although the articulated slider assembly **14** has been shown in association with a specific boom assembly **10,** the articulated slider assembly could be utilized with other types of boom assemblies.

A spring type slider assembly **124** (FIGS. **12** and **13**) forms another specific embodiment of the present invention. The spring type slider assembly **124** enables a uniform load per unit length of the slider assembly to be transmitted between the slider assembly and a supported boom section even though the boom section deflects under the influence of an operating load. To this end the spring type slider assembly **124** has a structural deflection curve which matches the deflection curve of the supported boom section in an area where the slider assembly engages the boom section. Since the slider assembly **124** and the supported boom section deflect to the same extent, a slider pad **130** deflects with the boom section to maintain a support surface **134** of the slider pad in uniform pressure engagement with the supported boom section.

The spring type slider assembly **124** is pivotally mounted on a support shaft **138** (FIG. **2**) on the first intermediate boom section **42.** The slider pad **130** is disposed in sliding engagement with an inner surface **140** of the base section **44** of the boom assembly **10.** Upon operation of the piston and cylinder assembly **40,** the first intermediate boom section **42** and spring type slider assembly **124** are moved longitudinally along the boom section **44.**

When an operating load is applied to the boom assembly **10,** the boom section **44** tends to deflect under the influence of the operating load. The curve of deflection of the spring type slider assembly **124** matches the deflection curve of the boom section **44.** Therefore under application of a laod to the boom section **44,** the spring type slider assembly **124** deflects to the same extent that the boom section **44** deflects. This results in a uniform bearing load being transmitted between the spring type slider assembly **124** and the boom section **44** in the manner illustrated schematically in FIG. **14.** It should be noted that the spring type slider assembly **124** substantially eliminates the concentration of the bearing loads at the leading and trailing end portions of the slider assembly, in the manner which occurs with the known slider assembly **110** (see FIGS. **7** and **8**).

The spring type slider assembly **124** is constructed so that when a predetermined operating load is applied to the boom assembly **10,** the curve of deflection of the spring type slider assembly **124** is the same as the curve of deflection of the portion of the boom section **44** which is engaged by the spring type slider assembly **124.** This construction of spring type slider assembly **124** is arrived at by first determining the curve of deflection of the boom section **44** and then designing the spring type slider assembly to have the same curve of deflection. The curve of deflection of the boom section **44** is determined by applying a series of predetermined loads to the boom assembly **10** and measuring the deflection of a plurality of points on the boom section **44.** Alternatively, the deflection of the boom section **44** can be calculated by use of the method of superposition, i.e., the well known method of obtaining the deflection at any point by summing the deflections produced at this point by separate loads applied to the boom assembly. Of course, the calculated configuration of the boom deflection curve can be readily checked experimentally by merely applying a predetermined load to the boom assembly **10** and measuring the actual deflection.

Once the deflection curve for the boom section **44** has been either calculated or measured, the spring type slider assembly **124** is designed by equating its deflection equation to the known curve of deflection for the boom section. The equation for the curve deflection of the spring type slider assembly **124** may be determined by considering the spring type slider assembly as having two halves forming cantilevered beams. This is illustrated schematically in FIG. **15** wherein a half of the slider assembly **124** extending to the left of a plane **146** through the center of slider assembly is shown deflected under a uniform load of W lbs. per unit length. The plane **146** extends perpendicular to the support surface **134** of the spring type slider assembly **124** when it is in the normal condition of FIG. **13** and through an axis **148** of rotation of a pair of fixedly interconnected rocker arms **150** and **152** of the spring type slider assembly **124** (see FIGS. **12** and **13**).

The curve of deflection for each half section of the slider assembly **124** (see FIG. **15**) is represented by the well known cantilevered beam equation:

$$Y = (WX^2/24EI)\,[X^2 + 6(L/2)^2 - 4(L/2)X\,].$$

In this equation the deflection Y at any section located a distance X from the plane **146** is defined as being positive in a downward direction as viewed in FIG. **14.** Since the deflection Y of the boom section **44** at any given section of the slider assembly **124** has been determined in the manner previously described, the matching deflection of the section of the spring type slider assembly **124** at this location is known. Of course, the uniformly distributed load of W lbs. per unit length over the total length L of the slider assembly **124** can also be determined for a given operating load. Therefore, the deflection equation can be solved for the flexural rigidity (EI) of any given section of the spring type slider assembly **124.** (E being Young's modulus of elasticity for the material of the slider assembly and I being equal to the moment of inertia of the cross sectional area of the slider assembly with respect to the neutral axis at a selected location X.)

In making the determination of the flexural rigidity (EI) of the spring type slider assembly **124** at any section along a plane extending parallel to the plane **146,** the flexural rigidity of the entire cross section of the spring type slider assembly **124** should be considered. Thus, the flexural rigidity of the slider arms **150** and **152,** slider pad support plate **160,** and the slider pad **138** should be considered. The geometry of the design for the spring type slider **124** and the material utilized in making up the various components of the spring type slider **124** is determined by manufacturing consider-

ations as long as each section of the spring type slider assembly **124** has the required structural rigidity.

To further promote the transmittal of a uniform bearing load between the spring type slider assembly **124** and the boom section **44**, the slider pad **130** is divided into a plurality of sections by slots **164** which extend transversely of the slider path in a direction parallel to the axis of rotation **148** of the slider assembly **124**. Thus, the bearing surface **134** of the slider pad **130** is divided into a plurality of rectangular sections **166** of equal area. Upon deflection of the spring type slider assembly **124**, each of the sections of the slider pad **130** tend to move somewhat relative to each other to maintain the surface areas **166** in uniform pressure engagement with the inner surface **140** of the boom section **44** (see FIG. **14**). Of course, this causes the slots **164** to be deformed by a widening of their outer end portions from the normal condition shown in FIG. **13** upon a bending of the boom section **44** and slider assembly **124** in a manner illustrated schematically in FIG. **14**. Of course if the slider assembly **124** was associated with a boom section which deflected upwardly rather than downwardly (as viewed in FIG. **14**), the sections **166** of the slider pad **130** would tend to move toward each other with a resulting decrease in the width of the outer end portions of the slots **164**.

In another specific embodiment of the invention, the slider block assemblies **84** and **86** of the articulated slider assembly **16** are designed so that their curve of deflection matches the curve of deflection of the supported boom section. Of course, the structural geometry and material composition of the slider block assemblies **84** and **86** are determined in the manner previously explained for the spring type slider assembly **124** so that the flexural rigidity of the slider block assemblies **84** and **86** is such as to result in the desired matching curves of deflection. Of course, the slider pads **72** and **74** could be divided into a plurality of sections by slots, similar to the slots **164**, to further promote the transmittal of a uniform bearing load between the slider block assemblies **72** and **74** and the supported beam section **42**.

In view of the foregoing description, it can be seen that the slider assemblies **16** and **124** reduce stress concentrations in a boom section by promoting the uniform distribution of bearing loads transmitted between the slider assemblies and the boom section. The articulated slider assembly **16** reduces stress concentrations in the boom by rotation of the slider block assemblies **84** and **86** relative to the rocker arms **78** and **80** upon deflection of the supported boom section to thereby compensate for this deflection. The spring type slider assembly **124** has a structural deflection curve which matches the deflection curve of the boom section **44** in the area where the slider assembly **124** engages the boom section. Since the structural deflection curve of the spring type slider assembly **124** matches the structural deflection curve of the boom section **44**, a uniform bearing load is transmitted between the slider pad **130** and the boom section **44** throughout the entire length of the spring type slider assembly **124**. When the slider block assemblies **84** and **86** are designed so that their structural deflection curves match the structural deflection curve of the supported boom section, a uniform load is transmitted between the slider pads **72** and **74** of the articulated slider assembly **16** and the supported boom section **42** upon deflection of the boom section.

Having described specific preferred embodiments of the invention, the following is claimed:

1. A slider assembly for use in supporting first and second sections of a boom for relative movement, said slider assembly comprising a rocker member adapted to be pivotally connected with a second section of a boom for pivotal movement relative thereto about a first axis, a first slider member pivotally connected to said rocker member for pivotal movement relative thereto about a second axis spaced from the first axis, a second slider member pivotally connected to said rocker member for pivotal movement relative thereto about a third axis spaced from said first and second axes, first pad means connected with said first slider member for slidably engaging a first section of the boom, and second pad means connected with said second slider member for slidably engaging the first section of the boom at a location spaced from said first pad means, said rocker member and said first and second slider members being pivotal relative to the second section of the boom to at least partially compensate for deflection of the first section of the boom upon application of a load thereto.

2. A slider assembly as set forth in claim **1** wherein said first and second slider members are independently pivotal relative to said rocker member to enable said slider members to assume different angular positions relative to said rocker member in accordance deflection of the first section of the boom.

3. A slider assembly as set forth in claim **1** wherein said first and second pad means each include surface areas of equal magnitude for engaging the first section of the boom so that substantially equal loads are applied to said first and second slider members by said first and second pad means upon loading of the boom, said second and third axes of rotation being located on opposite sides of and at substantially equal distances from said first axis whereby a torque load applied to said rocker member by said first slider member upon loading of the boom is substantially equal and opposite to a torque load applied to said rocker member by said second slider member upon loading of the boom.

4. A slider assembly as set forth in claim **1** wherein said first slider member and said first pad means have a flexural rigidity at any point along said slider member such that upon application of an operating load to the boom a deflection curve for the first section of the boom at a location where said first pad means engages the first section of the boom is the same as a deflection curve for said first slider member and said first pad means to thereby provide for the transmittal of a uniform bearing load between said first pad means and the first boom section throughout the length of said first pad means.

5. A slider assembly as set forth in claim **1** wherein said first pad means includes a slider pad and means for dividing said slider pad into a plurality of sections having outer surfaces adapted to be disposed in abutting engagement with the first section of the boom to enable relative movement to occur between said sections of said slider pad upon deflection of the boom to thereby facilitate maintenance of the surfaces of said slider pad sections in abutting engagement with the first section of the boom.

6. A slider assembly for use in supporting first and second sections of a boom for movement relative to each other, said slider assembly comprising a pair of spaced apart and substantially parallel rocker members adapted to be pivotally mounted on a second section of a boom for pivotal movement relative thereto about a first axis, a first slider assembly pivotally mounted intermediate said rocker members for pivotal movement relative thereto about a second axis spaced from and extending parallel to said first axis, said first slider assembly including a pair of spaced apart slider members extending substantially parallel to said rocker members and pivotally connected with said rocker members, a support member interconnecting said slider members, and first pad means mounted on said support member and having a bearing surface for slidably engaging a first section of the boom, and a second slider assembly pivotally mounted intermediate said rocker members for pivotal movement about a third axis extending parallel to said first axis and spaced from said first axis by a distance which is substantially equal to the distance between said first and second axes, said second slider assembly including a pair of spaced apart slider members extending substantially parallel to said rocker members and pivotally connected with said rocker members, a support member interconnecting said slider members of said second slider assembly, and second pad means mounted on said support member of said second slider assembly and having a bearing surface for slidably engaging the first section of the boom at a location spaced from said first slider assembly, said bearing surfaces of said first and second pad means having substantially equal areas so that substantially equal loads are applied to said first and second pad means by the first section of the boom upon the application of a load to the boom, said first and second slider assemblies being independently pivotal relative to said rocker members to enable said slider assemblies to assume different positions relative to the first section of the boom upon application of a load to the boom to thereby at least partially compensate for deflection of the first section of the boom upon application of a load thereto.

7. A boom assembly comprising a plurality of relatively movable sections, first and second slider means for supporting at least some of said sections of said boom assembly for relative movement, said first slider means including a rocker member pivotally connected with one of said sections of said boom assembly for pivotal movement relative thereto about a first axis, a first slider member pivotally connected to said rocker member for pivotal movement relative thereto about a second axis spaced from the first axis, a second slider member pivotally connected to said rocker member for pivotal movement relative thereto about a third axis spaced from said first and second axes, first pad means connected with said first slider member for slidably engaging another of said sections of said boom assembly, and second pad means connected with said second slider member for slidably engaging said other section of said boom assembly at a location spaced from said first pad means, said rocker member and said first and second slider members being pivotal relative to said one section of said boom assembly to at least partially compensate for deflection of said other section of said boom assembly upon application of a load thereto, said second slider means including a longitudinally extending support assembly pivotally connected with one of said sections of said boom assembly for pivotal movement relative thereto, and a slider pad mounted on said support assembly and disposed in abutting engagement with one of said sections of said boom assembly adjacent to said section of said boom assembly to which said support assembly is connected, said slider pad including means for dividing said slider pad into a plurality of sections having outer surfaces disposed in abutting engagement with one of said sections of said boom assembly to enable relative movement to occur between said sections of said slider pad upon deflection of said boom assembly to thereby facilitate maintenance of the surfaces of said slider pad sections in abutting engagement with the engaged one of said sections of said boom assembly upon deflection of said boom assembly.

8. A boom assembly as set forth in claim 7 wherein said first and second slider members are independantly pivotal relative to said rocker member to enable said slider members to assume different angular positions relative to said rocker member in accordance with deflection of the said boom assembly.

9. A boom assembly as set forth in claim 8 wherein said means for dividing said slider pad into a plurality of sections includes means for defining a plurality of slots which extend across said slider pad in a direction transverse to a longitudinal axis of said boom assembly.

10. A boom assembly comprising a plurality of boom sections including a first boom section having a predetermined longitudinal curve of deflection under load and a second boom section operatively connected with said first boom section, means for effecting relative movement between said boom sections to thereby extend and retract said boom assembly, means for applying an operating load to said boom assembly which tends to effect longitudinal deflection of said boom assembly, first slider means mounted on said second section of said boom assembly and disposed in engagement with said first section of said boom assembly for transmitting a uniform bearing load to an engaged surface area of said first boom section to facilitate relative movement between said sections of said boom assembly, said first slider means having a load deflection curve in a direction extending longitudinally of said first boom section which matches the predetermined longitudinal deflection curve of said first boom section, second slider means for use in supporting third and fourth sections of said boom assembly for relative movement, said second slider means comprising a rocker member adapted to be pivotally connected with the fourth section of said boom assembly for pivotal movement relative thereto about a first axis, a first slider member pivotally connected to said rocker member for pivotal movement relative thereto about a second axis spaced from the first axis, a second slider member pivotally connected to said rocker member for pivotal movement relative thereto about a third axis spaced from said first and second axes, first pad means connected with said first slider member for slidably engaging said third section of said boom assembly, and second pad means connected with said second slider member for slidably engaging said third section of said boom assembly at a location spaced from said first pad means, said rocker member and said first and second slider members being pivotal relative to the fourth section of said boom assembly to at least partially compen-

sate for deflection of third section of said boom assembly upon application of a load thereto.

11. A boom assembly as set forth in claim **10** wherein said first and second pad means each include surface areas of equal magnitude for engaging said third section of said boom assembly so that substantially equal loads are applied to said first and second slider members by said first and second pad means upon loading of said boom assembly, said second and third axes of rotation being located on opposite sides of and at substantially equal distances from said first axis whereby a torque load applied to said rocker member by said first slider member upon loading of said boom assembly is substantially equal and opposite to a torque load applied to said rocker member by said second slider member upon loading of said boom assembly.

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