United States Patent

Friend et al.

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[54] **MOBILE FRAME AND BODY STRAIGHTENER**

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[52] **U.S. Cl.** **72/705,** 72/453, 72/705

[51] **Int. Cl.**.....**B21d 1/14,** B21j 13/12

[58] **Field of Search**.....72/387, 705, 446, 447, 453

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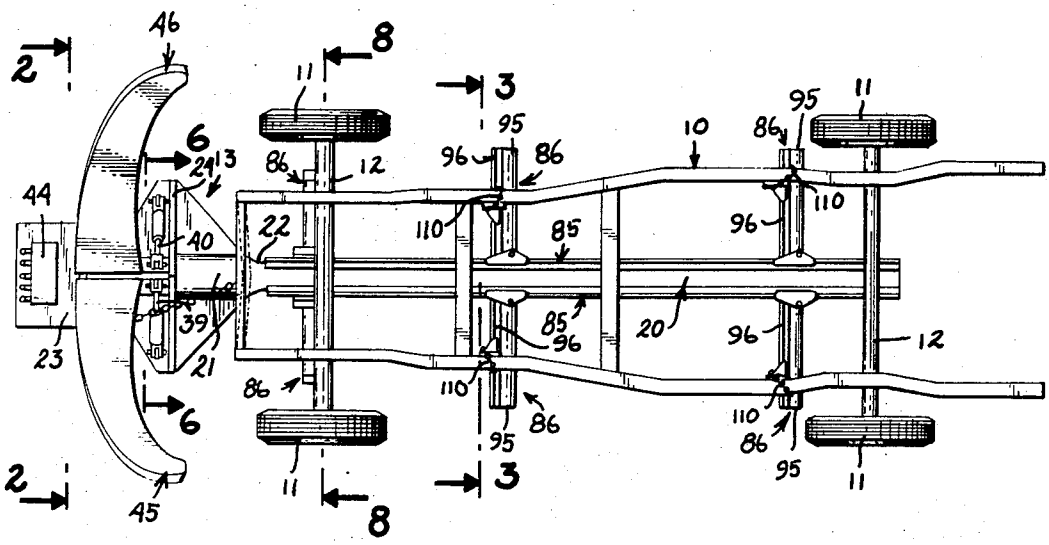
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[57] **ABSTRACT**

An elongated generally tubular body adapted for movement over a supporting surface and having a pair of generally arcuately shaped arms affixed thereto in outwardly extending relationship for pivotal movement about an axis parallel with the longitudinal axis of the body and for pivotal movement about an axis transverse to the longitudinal axis. A plurality of adjustable support members are affixed to the body for engaging the frame to be straightened and maintain the mobile straightener immovable relative thereto. Hydraulic cylinders and chains are mounted within the body and arms so as to be connectable to a frame and the like and apply a straightening force thereto in substantially any desired direction.

1 Claim, 10 Drawing Figures



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SHEET 1 OF 3

FIG_1

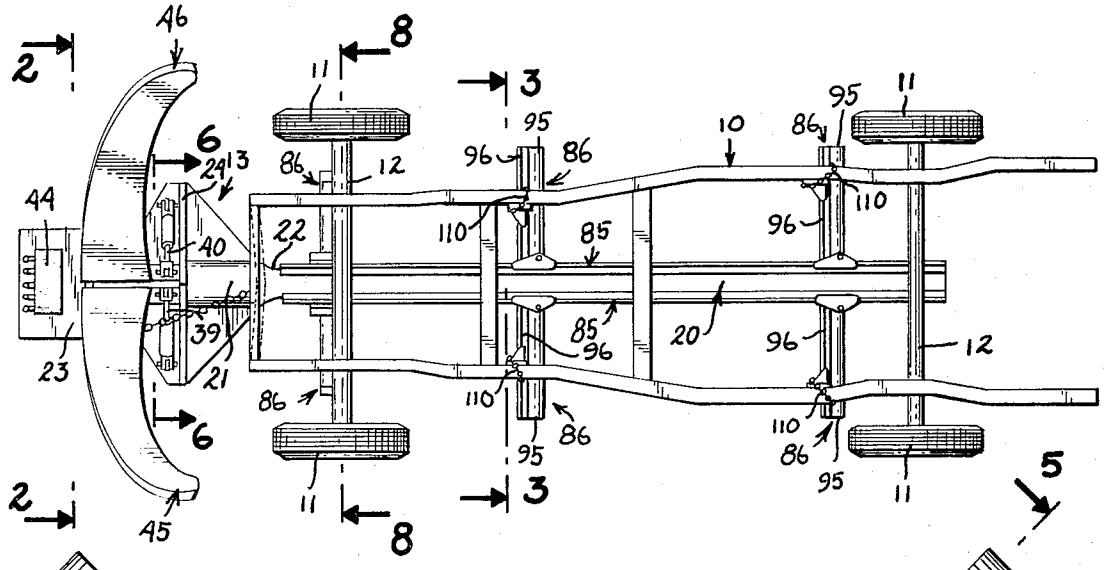
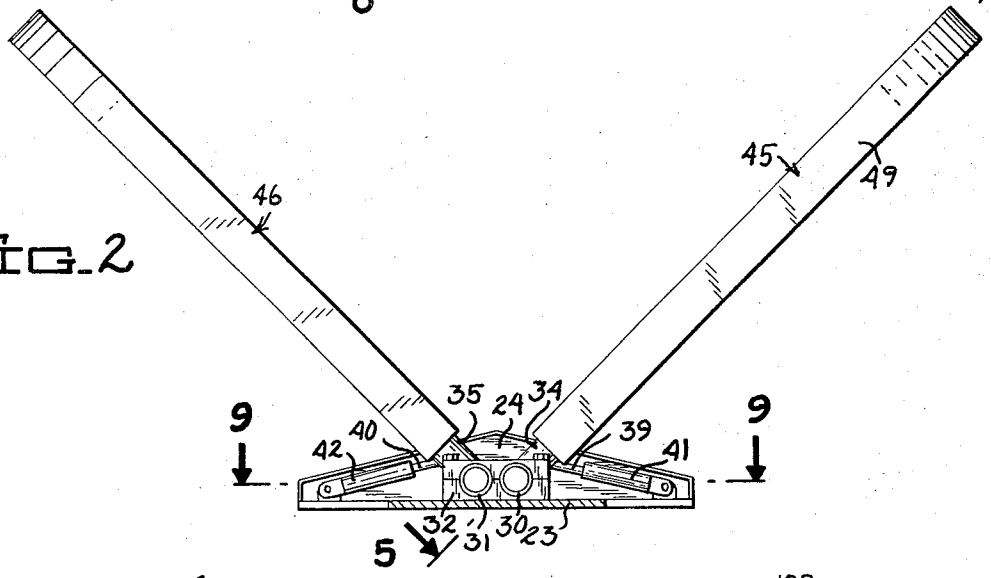


FIG_2



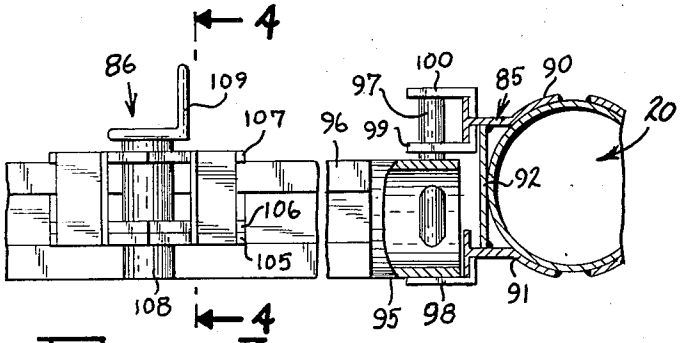


FIG_3

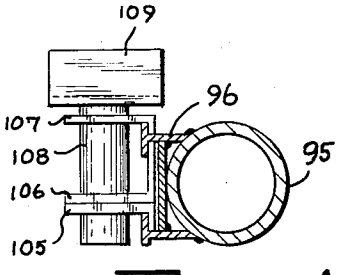


FIG_4

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FIG. 5

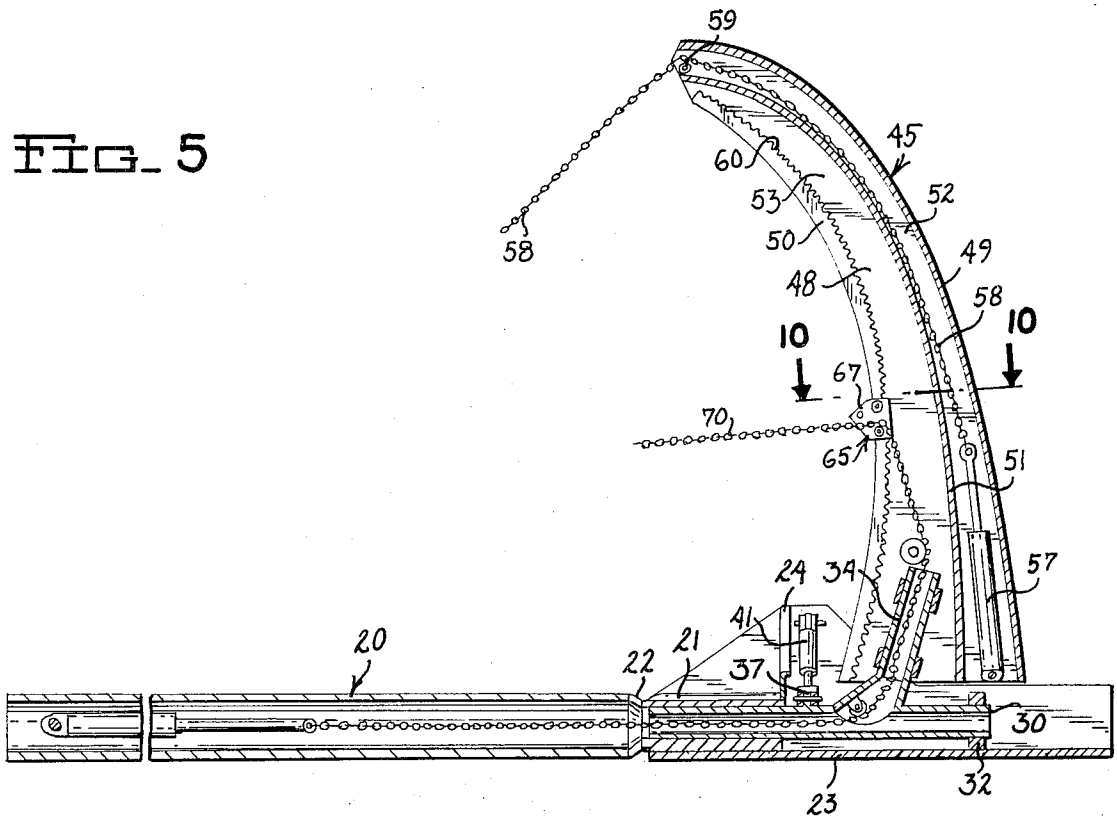


FIG. 6

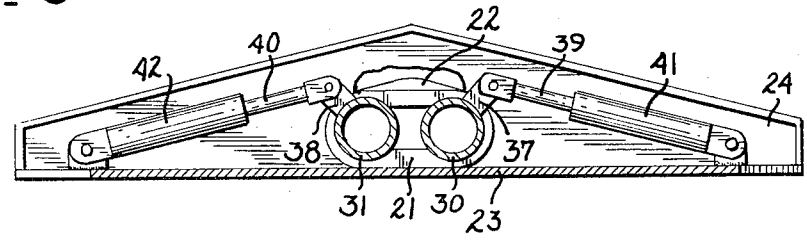
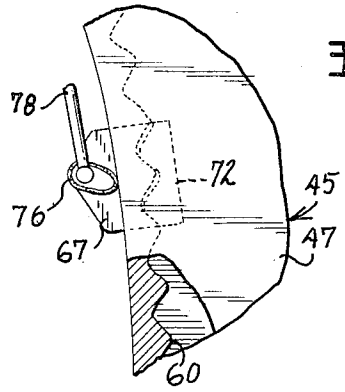


FIG. 7



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FIG. 8

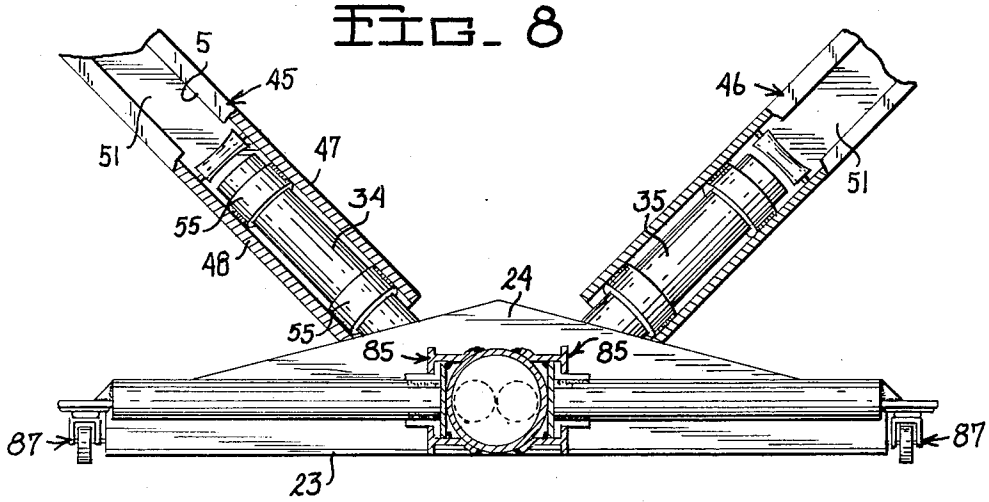


FIG. 9

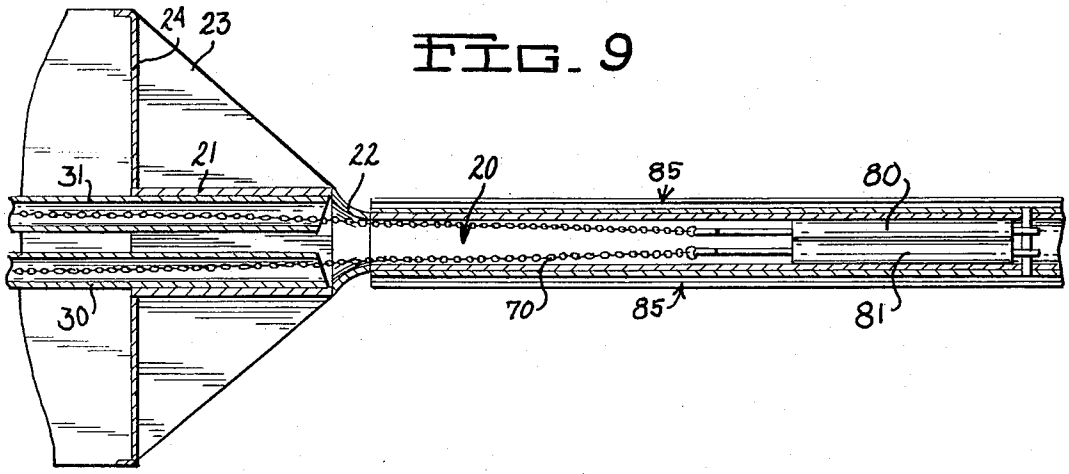
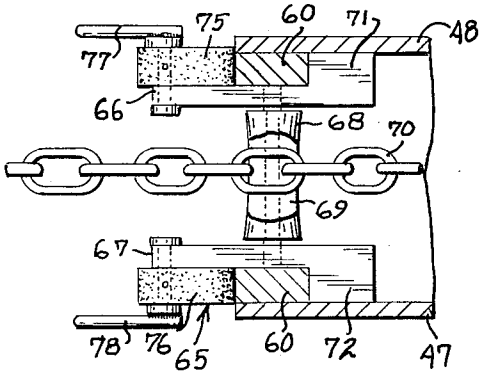


FIG. 10



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MOBILE FRAME AND BODY STRAIGHTENER

BACKGROUND OF THE INVENTION

1. Field of the Invention

In the automotive field and all similar fields wherein vehicles and portions thereof, such as the frame, body, etc., become bent, misaligned, etc., it is often desirable to straighten the bent or misaligned portion, rather than discard the entire vehicle or apparatus. It is well known that accidents producing bends and misalignments in vehicles and the like can occur in substantially any portion of the vehicle and the bends and misalignments can be made in substantially any direction. Further, accidents often produce more than one bend or misalignment in a body or frame and, in many instances, these bends could or should be straightened simultaneously.

2. Description of the Prior Art

In the prior art some relatively large permanent frame straightening devices have been devised wherein complex and multiple bends can be removed from frames and the like with little difficulty. Examples of such devices are described in two Latuff et al. U.S. Pats. Nos. 3,269,169 and 3,377,834. However, it should be noted that these devices are relatively large and permanently installed. Further, they require substantial room which cannot be utilized for any other purposes because of the permanence of the devices.

Some mobile frame straighteners have been devised but, all of these devices, are restricted to a simple bend and cannot be utilized to remove a complex bend. In general, a complex bend is a bend which was produced by a force angularly disposed relative to a straight portion of a frame or the like. An example of a prior art mobile frame straightener is disclosed in Bronson et al. U.S. Pat. No. 3,122,194. Bronson discloses a device which can produce a single force in a variety of directions but the single force must always lie in the plane of the body and upstanding post. Complex bends and the like cannot be removed with the device of Bronson et al. unless more than one such device is utilized simultaneously.

SUMMARY OF THE INVENTION

The present invention pertains to a mobile frame and body straightener including an elongated body having a longitudinal axis and at least one transversely extending arm affixed thereto for pivotal movements about a first axis parallel with said longitudinal axis and a second axis transverse to the first axis with means for maintaining said body and frame relatively immovable and means associated with said arm for producing a straightening force between said arm and the frame to be straightened.

It is an object of the present invention to provide a new and improved mobile frame and body straightener.

It is a further object of the present invention to provide a mobile frame and body straightener which can produce one or a plurality of forces in a variety of directions, simultaneously, for straightening complex and plural bends in frames and the like.

These and other objects of this invention will become apparent to those skilled in the art upon consideration of the accompanying specification, claims and drawings.

DESCRIPTION OF THE DRAWINGS

Referring to the drawings, wherein like characters indicate like parts throughout the figures:

FIG. 1 is a view in top plan of the present invention engaged with an automotive frame;

FIG. 2 is an enlarged sectional view as seen from the line 2—2 in FIG. 1;

FIG. 3 is an enlarged sectional view as seen from the line 3—3 in FIG. 1, portions thereof broken away;

FIG. 4 is a sectional view as seen from the line 4—4 in FIG. 3;

FIG. 5 is an enlarged sectional view as seen from the line 5—5 in FIG. 2, portions thereof broken away;

FIG. 6 is an enlarged sectional view as seen from the line 6—6 in FIG. 1;

FIG. 7 is an enlarged fragmentary view of a portion of the apparatus illustrated in FIG. 5;

FIG. 8 is an enlarged sectional view as seen from the line 8—8 in FIG. 1, portions thereof broken away;

FIG. 9 is an enlarged sectional view as seen from the line 9—9 in FIG. 2, portions thereof broken away; and

FIG. 10 is an enlarged fragmentary sectional view as seen from the line 10—10 in FIG. 5 portions thereof being broken away and background portions not being shown.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the numeral 10 generally designates an automotive frame having wheels 11 attached thereto by axles 12. A mobile straightener, generally designated 13 is illustrated in engagement with the frame 10. The frame 10 is illustrated in simplified form to illustrate one possible orientation of an automotive frame and the present straightener 13 and to aid in describing the operation of the straightener 13. It should be understood, however, that the straightener 13 can be utilized in a great variety of orientations relative to the frame 10 which is being straightened.

Referring to the FIGS. 2–9, it will be seen that the straightener 13 is illustrated in greater detail. The straightener 13 includes an elongated generally tubular body 20, of substantially uniform cross-section, and an extension 21 communicating with the body 20 through a connecting fairing 22, all of which are fixedly attached in generally coaxial relationship by some convenient means such as welding or the like. The fairing 22 between the body 20 and extension 21 provides a smooth inner surface for reasons which will become apparent presently. An irregular-shaped plate or platform 23 is fixedly attached to the underside of the extension 21, by welding or the like, and extends transversely outwardly on either side thereof and somewhat beyond the end. The plate 23 is mounted so that it will be approximately horizontally oriented with the straightener 13 in an operative position. An upstanding bracket 24 is fixedly attached to the upper surface of the plate 23 and extends from one edge thereof transversely of the extension 21 to the other edge thereof at approximately the end of the extension 21. The bracket 24 is utilized to strengthen the plate 23 and the edges of the bracket 24 are rolled or flanged to add additional strength.

A pair of tubular members 30 and 31 each have one end journalled in the extension 21 for rotation about an axis parallel with the longitudinal axis of the body 20. The opposite ends of the tubular members 30 and 31 are journaled in a bearing block 32. Each of the tubular members 30 and 31 has a tubular pintle 34 and 35, respectively, fixedly attached thereto so that the inner openings are in communication and form a passageway, which in turn communicates with the opening in the body 20. The pintles 34 and 35 are angularly disposed relative to the tubular members 30 and 31 and, in this embodiment, form an angle slightly less than 90° therewith.

Each of the tubular members 30 and 31 has an ear 37 and 38, respectively, fixedly attached thereto in transversely outwardly extending relationship (see FIG. 6). The ears 37 and 38 each has a connecting arm 39 and 40, respectively, of hydraulic cylinders 41 and 42 pivotally affixed thereto. The bodies of the hydraulic cylinders 41 and 42 are pivotally affixed to the upper surface of the plate 23 in outwardly extending relationship to the tubular members 30 and 31. The hydraulic cylinders 41 and 42 are double-acting cylinders which operate, independently, to rotate the tubular members 30 and 31 in clockwise or counterclockwise directions about their longitudinal axes and to maintain the tubular members 30 and 31 fixedly positioned in any desired orientation. A control panel 44 situated at the front of the plate 23 (see FIG. 1) has a plurality of controls thereon for controlling pressure applied to the hydraulic cylinders 41 and 42.

Elongated generally arcuate arms 45 and 46 are formed with a generally U-shaped cross-section. Each of the arms 45 and 46 are substantially similar and include two relatively flat, spaced apart side walls 47 and 48 and an outer arcuate wall 49. An inner arcuate side 50 is open, for reasons which will become apparent presently. The outer arcuate wall 49 and the inner arcuate side 50 diverge toward the base of each of the arms 45 and 46 and converge toward the outer most end thereof. A partition 51 is fixedly attached between the side walls 47 and 48 in generally parallel spaced apart relationship from the outer arcuate wall 49 so as to divide each of the arms 45 and 46 into a passageway 52 which extends the length thereof, and a channel 53, which also extends the length thereof. A pair of coaxially aligned spaced apart sockets 55 are fixedly attached between the side walls 47 and 48, within the channel 53, of each of the arms 45 and 46. The sockets 55 have the tubular pintles 34 and 35, which are affixed to the tubular members 30 and 31, pivotally engaged therein. Thus, the arms 45 and 46 are mounted for pivotal movement about an axis parallel with the longitudinal axis of the body 20 and for further pivotal movement about an axis transverse to the axis of the body 20.

A hydraulic cylinder 57 is mounted within the passageway 52 of each of the arms 45 and 46 so that the body portion is affixed to the arm 45 or 46 adjacent the base thereof and the connecting rod extends into the passageway 52. Flexible connecting means, such as a chain 58 is connected to the connecting rods of each of the hydraulic cylinders 57 and extends through the passageway 52 outwardly through the opening at the upper end of each of the arms 45 and 46. A pulley 59 is provided at the opening of each of the arms 45 and 46 to insure smooth travel of the chain 58 into and out of the passageway 52. A hook or the like is provided at the end of the chain 58 so that it can be readily attached to an automotive frame or the like.

The edges of the channels 53 adjacent the inner arcuate side 50 of the arms 45 and 46 have an inwardly directed row of teeth 60, similar to a rack extending the length thereof, affixed to the inner surface on each side of the opening forming the inner arcuate side 50. A pulley assembly, generally designated 65 and illustrated in detail in FIGS. 7 and 10, is mounted within the opening in the arcuate side 50 of each of the arms 45 and 46 for adjustable movements therealong. Each pulley assembly 65 includes a pair of parallel spaced apart plates 66 and 67 having upper and lower pulleys 68 and 69 rotatably mounted therebetween. The upper and lower pulleys 68 and 69 are spaced apart a sufficient distance to allow the free movement of a chain 70 therebetween. The plates 66 and 67 are sufficiently wide to extend into the channel 53 a short distance and to extend outwardly beyond the arcuate side 50 a short distance. Blocks 71 and 72 are fixedly attached to the outwardly directed surfaces of the plates 66 and 67, respectively, within the channel 53 so as to lie in the plane of the teeth 60 adjacent the plate 66 or 67. The surface of each of the blocks 71 and 72 adjacent the teeth 60 has outwardly projecting teeth thereon which mate or mesh with the teeth 60 (see FIG. 7) to prevent relative movement s therebetween. Cam elements 75 and 76 are pivotally attached to the plates 66 and 67, respectively, adjacent the outwardly directed surfaces thereof out of or beyond the channel 53. The cam elements 75 and 76 have handles 77 and 78 affixed thereto and, upon rotation, engage the rear surface of the teeth 60 to move the blocks 71 and 72 into tight engagement with the teeth 60 and maintain the pulley assembly 65 fixedly positioned on the arm 45 or 46. Upon loosening the cam elements 75 and 76 the blocks 71 and 72 can be disengaged from the teeth 60 and the pulley assembly 65 can be moved longitudinally within the channel 53 to any desired position on the arm 45 or 46, after which the cam elements 75 and 76 can again be tightened to maintain the pulley assembly 65 in the desired position.

A pair of hydraulic cylinders 80 and 81 are positioned within the tubular body 20 so that the bodies or housings thereof are fixedly attached relative to the body 20 and the connecting rods extend therefrom toward the fairing 22 and extension 21. The chains 70 extending through the pulley assemblies 65 are threaded through the tubular pintles 34 and 35, the tubular members 30 and 31, the fairing 22 and the body 20. One end of each of the chains 70 is connected to one of the connecting rods of the hydraulic cylinders 80 and 81, while the other end of each of the chains 70 extends outwardly through one of the pulley assemblies 65 and is adapted to be connected to an automotive frame or the like. The hydraulic cylinders 80 and 81 and the hydraulic cylinders 57 in each of the arms 45 and 46 are controlled by a plurality of controls on the panel 45. The hydraulic cylinders 57, 80 and 81 may be single acting hydraulic cylinders or they may be double acting hydraulic cylinders if speed and ease of handling is desired. Further, it should be understood that power

means other than the hydraulic cylinders **57**, **80** and **81** might be utilized and these hydraulic cylinders are illustrated for their simplicity, inexpensive operation, initial cost, etc.

The body **20** has an outwardly directed track generally designated **85**, on each side thereof and each track **85** has three support members, generally designated **86**, slidably engaged therein. The tracks **85** are substantially similar and all of the support members **86** are substantially similar, except the forward most two which have casters **87** affixed thereto (see FIG. **8**), and, accordingly, only one track **85** and support member **86** will be described in detail. Referring to FIG. **3**, the track **85** is formed by affixing the body portion of each of two rails **90** and **91**, having a generally T-shaped cross-section, to the outer surface of the body **20** in partially encircling relationship with the cross members of the rails **90** parallel and spaced apart. A plate **92** is affixed to the outer surface of the body **20** in generally tangential relationship and is further affixed between the rails **90** and **91** for support and to maintain the cross members parallel and spaced apart the correct distance. The tracks **85** extend the length of the body **20** so that the support members **86** can be moved to any desired position therealong.

Referring to FIGS. **3** and **4**, the support member **86** includes an elongated cylinder **95** having a track **96** extending along one side thereof and constructed similar to the track **85**. A pintle **97** is rotatably engaged in one end of the cylinder **95** and extends radially outwardly on each side thereof. A first plate **98** is fixedly attached to the lower end of the pintle **97** so as to extend slightly beyond the cross member of the rail **91** and includes an upwardly extending flange which engages a rearwardly directed surface of the cross member of rail **91**. Second and third plates **99** and **100** are fixedly attached to the pintle **97** on the opposite side of the cylinder **95** from the first plate **98** and are further spaced part a distance slightly greater than the width of the cross member of rail **90**. Each of the second and third plates **99** and **100** have flanges which are engaged behind the rear surfaces of the cross members of the rail **90** and are directed inwardly toward the body thereof. Thus, the flanges of the plates **98**,**99** and **100** are engaged with the rails **90** and **91** to allow longitudinal movement of the support member **86** along the body **20** but prevent transverse movement thereof. The pintle **97** is positioned in the support member **86** somewhat to the rear of the central axis so that a force tending to move the automotive frame **10** forward and the body **20** rearward, relative to each other, will pivot the support member **86** into a frictional nonsliding engagement with the track **85** to prevent movement of the support member **86** along the track **85** during operation of the straightener **13**.

First and second plates **105** and **106** are affixed in parallel abutting relationship with flanges extending outwardly in opposite directions from each of the plates **105** and **106** to provide a member with a generally T-shaped cross-section. The flanges of the plates **105** and **106** are slidably engaged between the rails of he track **96** on the cylinder **95** for sliding movement therealong. A third plate **107** having a downwardly projecting flange engaged behind the cross member of the upper rail of track **96** is positioned in spaced relation from the first and second plates **105** and **106**. Axially aligned openings are provided through all of the plates **105**, **106** and **107** and a pintle **108** is engaged therein for rotary movement about the axis thereof. A piece of angle iron **109** or the like is fixedly attached to the upper end of the pintle **108** for rotary movement therewith and is adapted to be fixedly attached to the frame **10** by any convenient means such as chain **110**. The pintle **108**, angle iron **109** and chains **110** are illustrated for simplicity but it should be understood that a variety of means might be utilized to fixedly attach the cylinder **95** to the frame **10**. For example, the pintle **108** might be provided with limited vertical movement so that the angle iron **109** can be affixed at varying vertical heights. Further, a variety of clamping devices or the like might be utilized in place of the angle iron **109** and chains **110**. It should be understood that more than one of the assemblies including plates **105**, **106** and **107** and pintle **108** might be utilized on each of the support members **86** if desired and that more or less than the number of support members **86** illustrated might be utilized. In each instance, the number of support members **86** and assemblies thereon will depend upon the particular application and type of frame or the like being straightened.

Thus, a mobile straightener is disclosed which can be easily stored and readily moved into any desired position. Further, the mobile straightener is constructed to provide a single pull or a plurality of pulls simultaneously if desired. Further, while a relatively simple embodiment of the present mobile straightener is illustrated, it should be understood that additional flexible connecting means and power means might be installed to operate in cooperation with those included in the present disclosure. Because of the variety of pulls which can be performed simultaneously by the present straightener, complex bends and multiple bends can be quickly and easily straightened.

What is claimed is:

1. A mobile frame and body straightener comprising:
   a. a body adapted for movement over a supporting surface and having a longitudinal, generally horizontal axis;
   b. two transversely extending arms affixed to said body in juxtaposition for independent pivotal movements about first axes approximately parallel with the longitudinal axis of said body and for pivotal movements about second axes transverse to said first axes, respectively;
   c. means affixed to said arms and said body for positioning and maintaining said arms in a desired orientation about said first axes relative to each other and to said body, each of said arms being generally arcuately shaped with the arc extending toward a frame and the like to be straightened, said arms each being hollow and each having inner and outer arcuate walls connected by side walls, said inner arcuate walls each having a longitudinally extending opening therein with pulley means adjustably mounted in said opening;
   do means adjustably affixed to said body for engaging a frame and the like to be straightened and maintaining said body substantially fixedly positioned relative to said engaged frame and the like;

e. first and second flexible connecting means adapted to engage the frame and the like to be straightened and each being adjustably engaged with one of said arms;

f. first and second power means on said body attached to said first and second flexible means respectively for applying a force thereto tending to straighten a frame and the like to which the flexible means are engaged, each said flexible means extending from said associated power means on said body through said associated hollow arm over said pulley means; and

g. said arms each having a longitudinally extending partition mounted between the side walls thereof forming a first channel adjacent said inner arcuate wall and a second channel adjacent said outer arcuate wall, second pulley means mounted at an outer end of each arm in said second channel, further power means mounted in each of said second channels, and further flexible frame engagable connecting means in each said second channel engaging said further power means and second pulley means therein.

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