March 27, 1962 A. H LUEDICKE, JR., ET AL 3,026,925

STRAIGHTENING VEHICLE FRAMES OR BODIES

Original Filed May 20, 1959

2 Sheets-Sheet 1

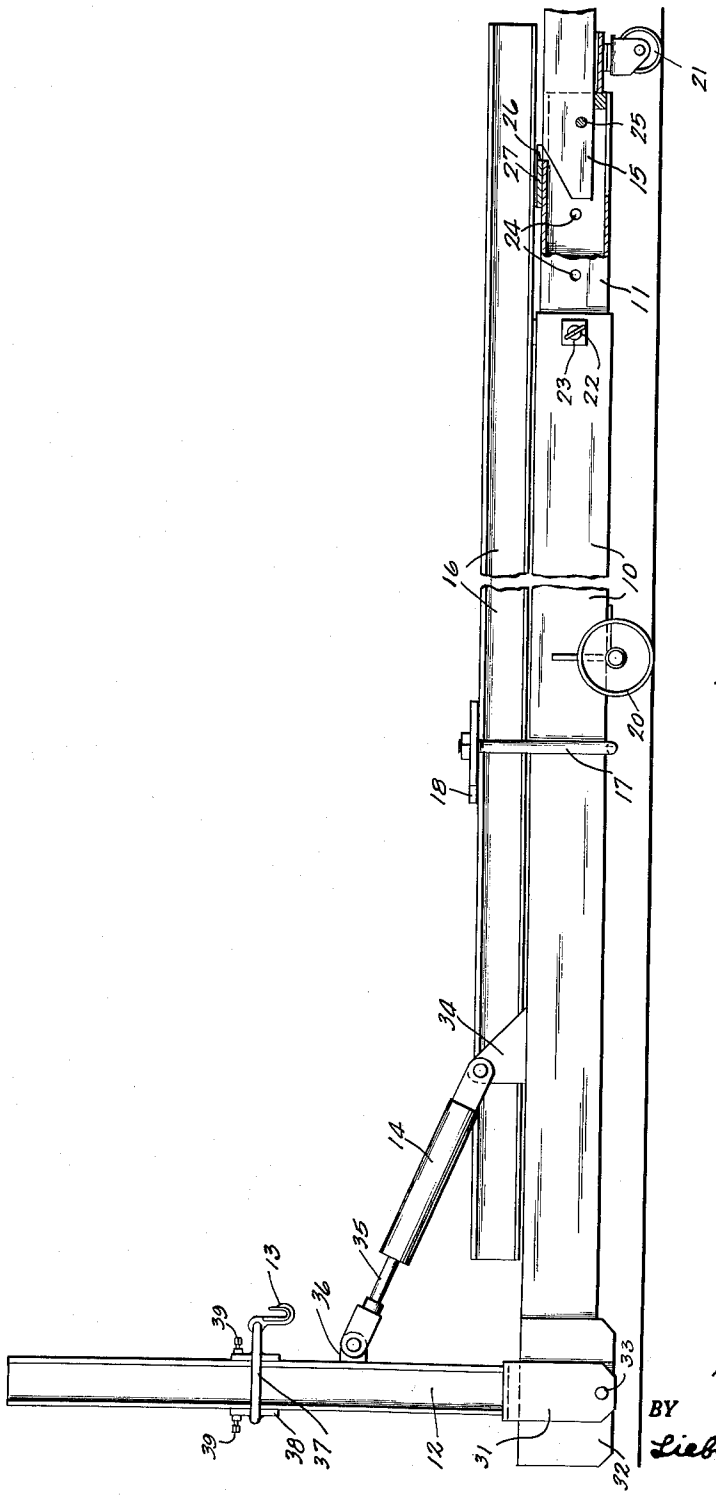

Fig. 1

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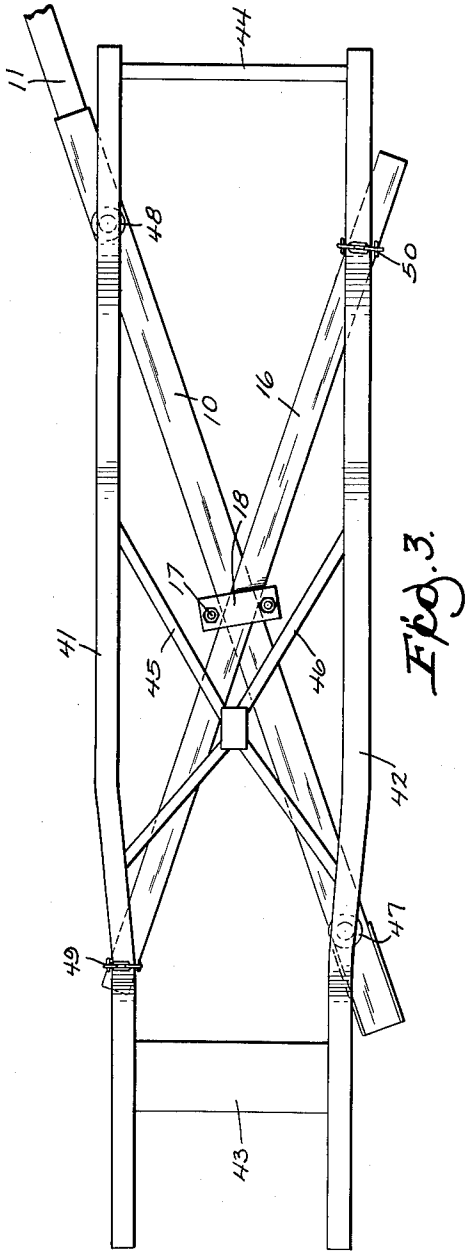

Fig. 3.

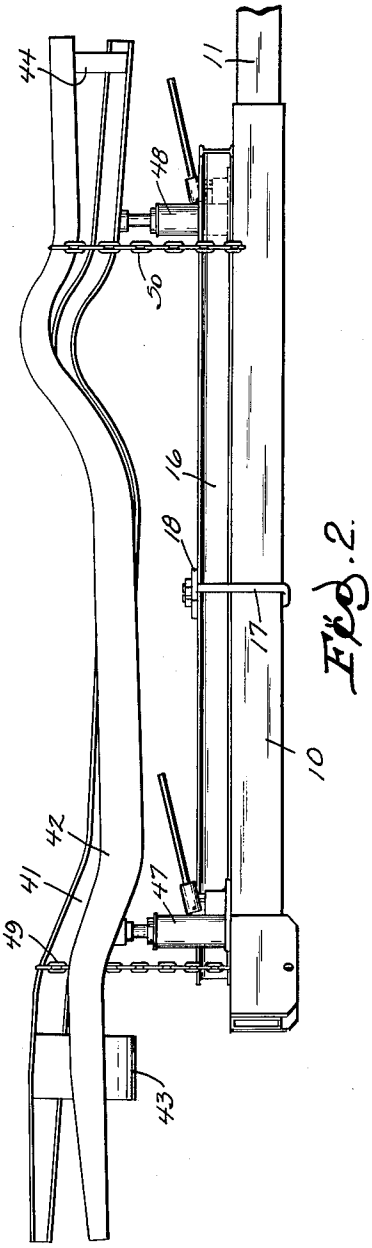

Fig. 2.

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STRAIGHTENING VEHICLE FRAMES OR BODIES

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Original application May 20, 1959, Ser. No. 814,428, now Patent No. 2,998,837, dated Sept. 5, 1961. Divided and this application Mar. 8, 1961, Ser. No. 94,397
5 Claims. (Cl. 153—32)

The present invention relates generally to improvements in the art of straightening structural elements, and relates more particularly to improvements in the construction and operation of vehicle frame and/or body straighteners and a method of straightening frames.

This application is a divisional application of our copending United States application Serial No. 814,428, filed May 20, 1959.

In vehicle frame straightening work, the repairmen are generally confronted with five basic types of frame damage, namely, vertical distortion or sag, side sway or lateral distortion, twist, siderails which are longitudinally displaced or out of square, and kick-up or sharp bends in the siderails. While several straightening tools have been heretofore proposed which are adapted to correct one or more of such types of damage, no single tool thus far commercially available is capable of effectively repairing all five of the basic types of damage.

Furthermore, it is also essential that frame straightening apparatus for work on damaged vehicles be of a portable nature and readily adjustable for convenience in properly manipulating the tool and applying the same to the damaged frame for most effectively performing the necessary restoring work. While some of the presently commercially available frame straighteners are portable or semi-portable, they do not possess the desired degree of adjustability and flexibility of application.

In addition, the frame straightening devices heretofore proposed have for the most part been unduly bulky and difficult to store and manipulate, and some of these devices require the use of expensive lifting equipment, special costly adapters, and considerable manpower in their application and use.

It is therefore an important object of the present invention to provide an improved vehicle frame and/or unitized body straightening device and method which obviates all of the above-mentioned disadvantages and objections to prior frame straightening devices especially in the correction of twist damage.

Still another object of our invention is to provide an improved vehicle frame straightening device which is extremely portable, relatively compact, readily adjustable, and highly flexible in its adaptations, and which is capable of manipulation and use by a single operator.

An additional important object of the present invention is to provide an improved method of and apparatus for removing or correcting twist damage to vehicle frames and unitized bodies.

These and other objects and advantages of the invention will become apparent from the following detailed description.

A clear conception of the several features constituting the present improvement and of the mode of applying and utilizing the apparatus, as well as the method, in the correction of twist damage, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

FIG.1 is a fragmentary side view of a typical straightening device embodying a twist correction beam and showing the same in assembled condition for storage;

FIG. 2 is a fragmentary side view showing the improved device in operative position and applied to a typical, twisted vehicle frame; and

FIG. 3 is a fragmentary top view of the device as applied to the twisted frame of FIG. 2.

While the present invention has been shown and described herein as being especially applicable in straightening vehicle frames of a particular type having one form of damage, it should be understood that the use of the improved device is not thereby unnecessarily restricted since it is equally adaptable to the correction of any known types of frames having one or more forms of damage, and the device is also well adapted to the repair of unit bodies which are difficult to manipulate with prior frame straighteners. It is also contemplated that the broadest possible interpretation shall be given to various descriptive terms used herein, and the use of the term "frame" throughout this specification and the appended claims is intended to apply either to a structural frame member as such or to that part of a unitized body corresponding to the frame.

Referring to the drawings and particularly FIG. 1, the typical improved frame straightening device shown therein as embodying a twist correction beam comprises, in general, a tubular main beam **10**, a beam extension **11** adapted to telescope within one end of the beam **10** and extensible to various positions of adjustment, a pivot arm **12** secured to the other end of the main beam **10**, a hook **13** slidable longitudinally to different positions of adjustment along the pivot arm **12**, a hydraulic power actuator **14** secured between the beam **10** and pivot arm **12**, a post **15** secured to the exposed end of the extensible beam **11** and adapted to be swung from an inactive horizontal position to vertical position, and a twist correcting beam **16** detachably secured to the main beam **10** as by means of a U-bolt **17** and clamp **18**.

The main beam **10** is shown as being supported by a pair of floor-engaging wheels **20** while the extensible member is provided with a floor-engaging caster **21** to thus render the device readily portable and capable of proper positioning by a single operator. To accommodate frames of different types and sizes and to permit adjustment for the performance of various types of work, the telescopic beam extension may be readily extended to desired positions, and upon adjustment, a lock pin **22** may be inserted through alined holes **23**, **24** in the beams **10**, **11** respectively to maintain the beams in extended condition.

The post **15** is secured within a cut-out portion of the extensible beam **11** by means of a pivot pin **25** to permit the same to be readily swung from horizontal inactive position as shown in FIG. 1 to a vertical position, and when in vertical position, the post **15** bears against a transverse edge **26** of the upper run of the beam **11** which is reinforced by a bearing plate **27** secured to the beam as by welding or the like.

The pivot arm **12** is secured to the beam **10** by means of a pair of lower flange plates **31** forming a bifurcated member extending on opposite sides of the beam and secured to the beam or to suitable side plates **32** thereof by a pivot pin **33** to permit swinging movement of the arm **12**. The power actuator **14** may be in the nature of a fluid motor, the head or cylinder end of which is pivotally attached to a bracket or upstanding flange **34** on the beam **10** and the piston or plunger **35** of which is pivotally attached to a bracket or flange **36** on the arm **12**. The motor or power actuator **14** is of conventional type, either single or double acting, and the cylinder thereof is connected by a fluid conduit to a suitable pump for furnishing pressure fluid thereto to extend the piston **35** and thus swing the arm **12**. The hook **13** is swingably

carried by a strap 37 slidably embracing the arm 12, the strap 37 having suitable slide shoes 38 secured thereto and provided with set screws 39 for securing the hook assembly in any desired position of adjustment along the arm 12.

The twist correcting beam 16 may be conveniently secured to the main beam 10 in approximately longitudinal alignment therewith by means of the U-bolt 17 and clamping bracket 18 when the device is stored or inactive. When the device is used for correcting sag, side sway, longitudinal siderail displacement, or sharp siderail bends, as described in detail in our co-pending application, the beam 16 may be readily removed in an obvious manner by merely dismantling the bolt 17 and clamp 18. However, when it is desired to correct a frame which is twisted, the bolt 17 is loosened and the beam 16 is swung relative to the beam 10 to provide an X-shaped tool when viewed from above, as shown in FIGS. 6 and 7 and as hereinafter more fully described, the bolt 17 and clamp 18 then again being tightened.

In straightening damaged vehicle frames, the main idea is to reverse the blow that caused the damage in the first instance so that the metal returns to its normal shape. It is therefore necessary to first determine the type of damage requiring correction, and this is done with the aid of commercially available frame gages and dimension charts. After the type of damage has been determined, the improved frame straightener should be applied to the damaged frame so as to pull the bent parts under applied pressure along substantially the same line of impact or initial bending force until the frame is restored to its original position. If several types of damage have been caused and require correction, these should be repaired one at a time, and it is generally best to start with repairs that pull the damaged parts.

Referring now to FIGS. 2 and 3, the improved frame straightening device is shown as applied to a typical twisted frame generally of the box or ladder type which comprises a pair of siderails 41, 42 joined near their opposite ends by transverse rails 43, 44 and at their medial portions by cross-rails 45, 46. In this case wherein the frame has been twisted so that the front and rear ends of the siderails 41, 42 are out of horizontal alignment, the method employed for correcting the damage is as follows. The beam 10 is first positioned diagonally beneath the frame to extend under the low points of the siderails 41, 42, and the twist beam 16 is swung about the main beam 10 to form an X-shaped supporting structure with the beam 16 also extending diagonally of the frame and under the high points of the siderails 41, 42.

After clamping the beams 10, 16 firmly together as by means of the U-bolt 17 and clamp 18, a pair of force applying devices such as suitable hydraulic hand jacks 47, 48 are placed between the main beam 10 and the two low points of the frame siderails 41, 42, and the opposite ends of the twist beam 16 are chained to the high points of the frame siderails 41, 42 as at 49, 50. Then, upon application of pressure to the low points of the frame by means of the jacks 47, 48, the low points will be raised and the high points of the frame will be simultaneously pulled or held down by the chains 49, 50 until the frame is twisted back into proper alignment, the correction twisting operation being just the reverse of the force which caused the damage initially.

From the drawing and the foregoing description, it is apparent that the restorative operation is accomplished without the application of torque to the damaged members such as inherently occurs when the members are firmly clamped in a common plane in the straightening tool while restorative force is applied. In other words, the jacks 47, 48 and the chains 49, 50 permit lateral movement of the respective frame portions since these pressure applying elements are not rigidly clamped to the respective beams and frame members, and also by its very nature, the X-shaped work support permits relative movement of the beams during the restorative pressure application due to the fact that they are crossed with the upper beam having but a single bearing point at a medial portion thereof.

It should be understood that it is not desired to limit this invention to the exact details of construction of the improved device or to the precise steps of the frame correction method herein shown and described, since various modifications within the scope of the appended claims will occur to persons skilled in the art to which this invention pertains, and the same procedure herein described may be followed in the correction of twist damage to a unitized body.

We claim:

1. A vehicle frame straightening device comprising, a horizontal main beam, an auxiliary beam supported on and secured to a medial portion of said main beam for swinging movement relative thereto in a horizontal plane to provide an X-shaped work support for use in correcting twist damage to a generally rectangular vehicle frame having diametrically opposed high and low points to be restored, said X-shaped work support being positionable under said frame with the ends of said beams located under the high and low points thereof, means interposed between and coacting with the ends of one of said beams and the adjacent low portions of the damaged frame for applying upward pressure to said low frame portions, and means secured between the ends of the other of said beams and the adjacent high portions of the damaged frame for resisting upward movement of said high frame portions during said pressure application to said low frame portions whereby the low and high points of said frame are thus restored said beams being relatively movable during said pressure application.

2. A vehicle frame straightening device comprising, a horizontal main beam, an auxiliary beam supported on and secured to a medial portion of said main beam for swinging movement relative thereto in a horizontal plane to provide an X-shaped work support for use in correcting twist damage to a generally rectangular vehicle frame having diametrically opposed high and low points to be restored, said X-shaped work support being positionable under said frame with the ends of said beams located under the high and low points thereof, means interposed between and coacting with the ends of said main beam and the adjacent low portions of the damaged frame for applying upward pressure to said low frame portions while permitting lateral movement of said frame portions, and means secured between the ends of said auxiliary beam and the adjacent high portions of the damaged frame for resisting upward movement of said high frame portions during said pressure application to said low frame portions while permitting lateral movement of said frame portions whereby the low and high points of said frame are thus restored, said beams being relatively movable during said pressure application.

3. A vehicle frame straightening device comprising, a horizontal main beam, an auxiliary beam supported on and secured to a medial portion of said main beam for swinging movement relative thereto in a horizontal plane to provide an X-shaped work support for use in correcting twist damage to a generally rectangular vehicle frame having diametrically opposed high and low points to be restored, said X-shaped work support being positionable under said frame with the ends of said beams located under the high and low points thereof, a jack interposed between and coacting with each end of said main beam and the adjacent low portion of the damaged frame for applying upward pressure to said low frame portions, and a flexible connecting element of fixed length secured between each end of said auxiliary beam and the adjacent high portion of the damaged frame for resisting upward movement of said high frame portions during said pressure application to said low frame portions whereby the low and high points of said frame are thus

restored, said beams being relatively movable during said pressure application.

4. The method of correcting a twisted generally rectangular vehicle frame having diametrically opposed high points and diametrically opposed low points to be restored, which comprises, providing a pair of medially crossed horizontal beams below said frame with the ends of said beams located in proximity to the low and high points of said frame, and thereafter simultaneously applying pressure in vertical planes between the ends of said beams and the adjacent low and high points of said frame respectively in opposite directions while permitting relative movement of the beams with respect to each other until the twist has been removed from said frame and the low and high points restored.

5. The method of correcting a twisted generally rectangular vehicle frame having diametrically opposed high points and diametrically opposed low points to be restored, which comprises, providing a pair of medially crossed horizontal beams below said frame with the ends of the lowermost beam located in proximity to and beneath the low points of said frame and with the ends of the uppermost of said beams being located in proximity to and beneath the high points of said frame, and thereafter applying restoring pressure upwardly from the ends of the lowermost beam against the adjacent low points of said frame while simultaneously restraining movement between the ends of the uppermost beam and the adjacent high points of said frame to thereby restore the high and low points of said frame, said beams being relatively movable during said pressure application.

References Cited in the file of this patent

UNITED STATES PATENTS

2,646,101	Ferguson	July 21, 1953
2,718,913	Smith	Sept. 27, 1955