United States Patent

[11] **3,577,881**

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[54] **PORTABLE HIGHWAY CRASH RESCUE UNIT**
13 Claims, 13 Drawing Figs.

[52] **U.S. Cl.** **72/302,** 72/392, 72/705
[51] **Int. Cl.** **B21d 1/12**
[50] **Field of Search** ..... 72/302, 392, 705; 29/252; 254/93 (R)

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Primary Examiner—William S. Lawson
Attorney—Dennison and Dennison

ABSTRACT: A portable rescue unit to aid in the extraction of accident victims from wrecked vehicles including a base leg, a vertical actuating arm pivotally mounted to the base and an elongated power unit extending from the base to the side of the actuating arm and including a support abutment adapted to engage the vehicle frame. Extension of the power unit pivots the actuating arm which is connected to the vehicle door or other damaged part by a cable or chain having either a hook or a door piercing spike on the end thereof.

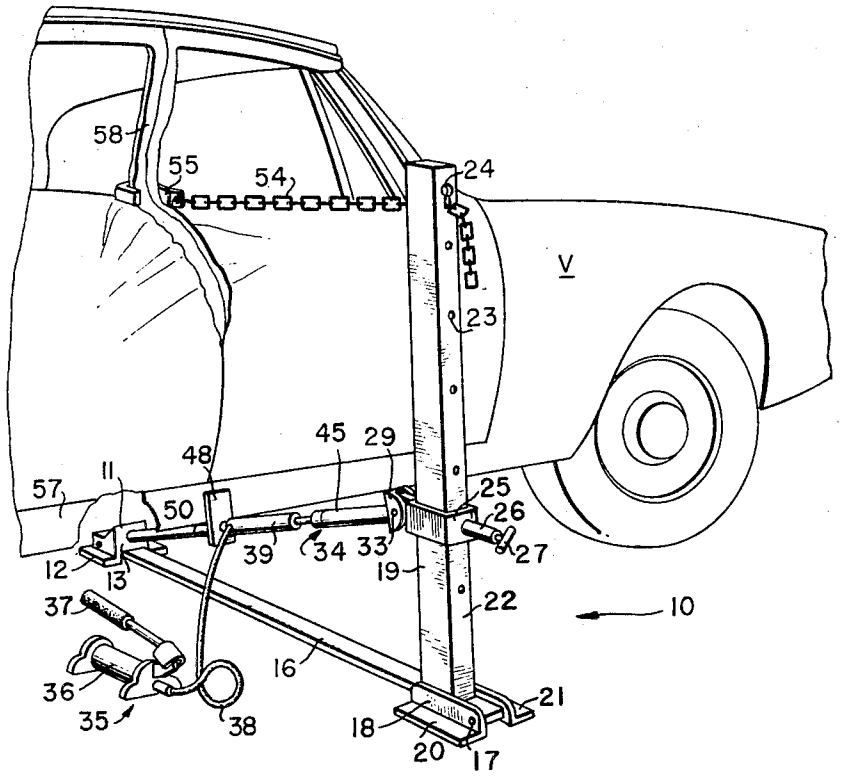

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FIG. 1

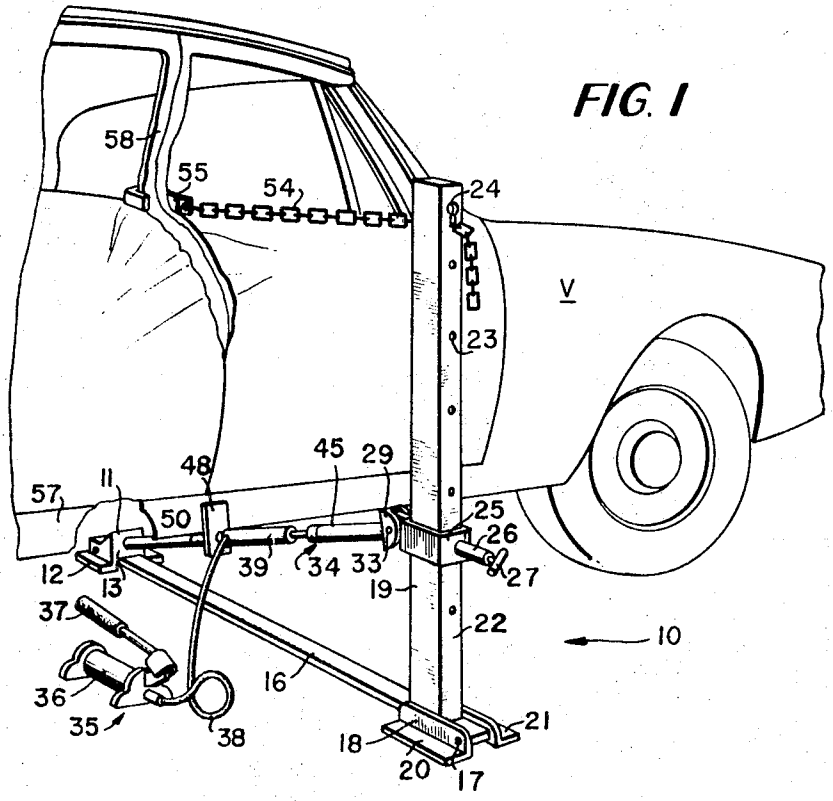

FIG. 2

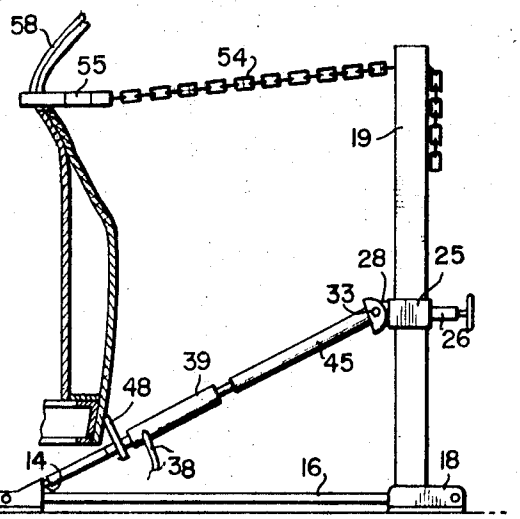

FIG. 3

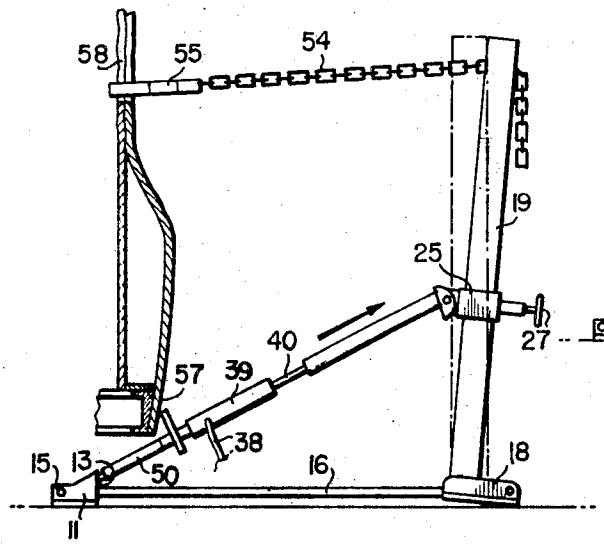

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FIG. 4

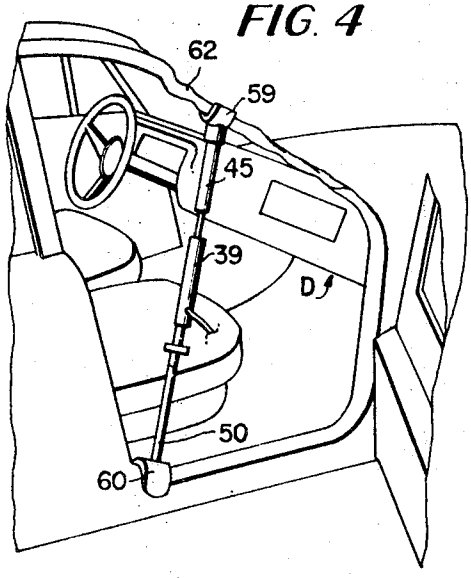

FIG. 5

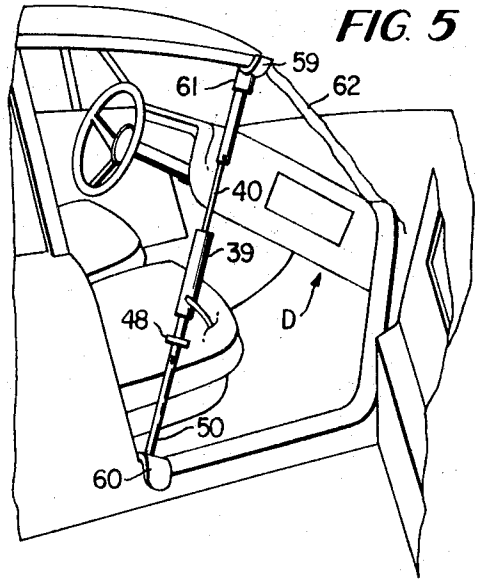

FIG. 6

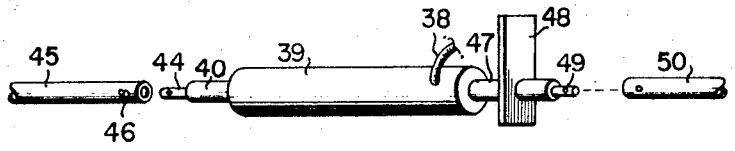

FIG. 7

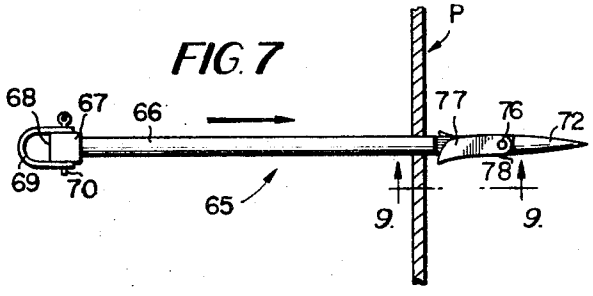

FIG. 8

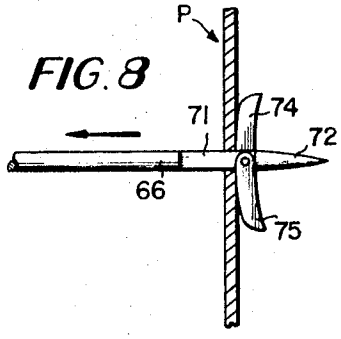

FIG. 9

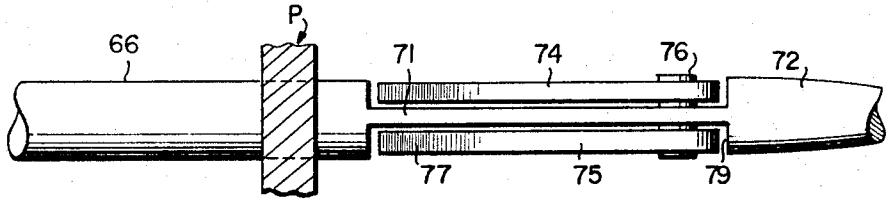

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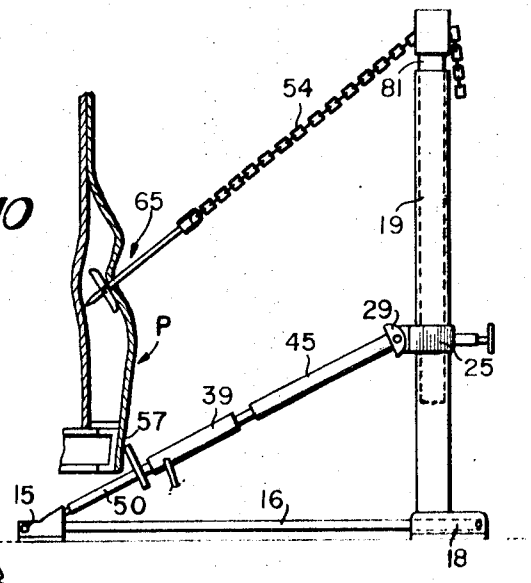
FIG. 10



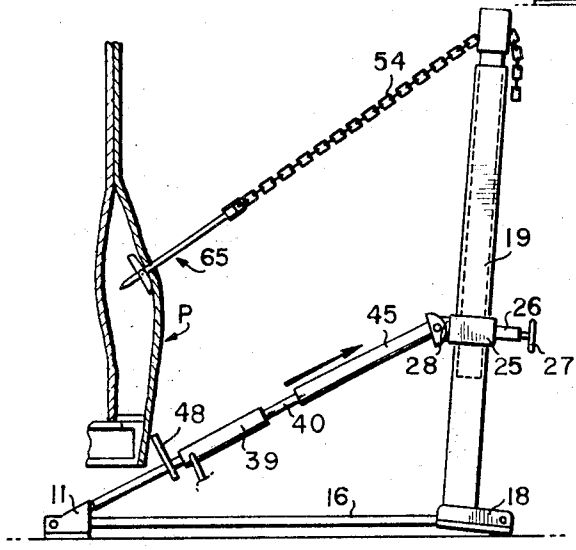


FIG. 11

FIG. 12

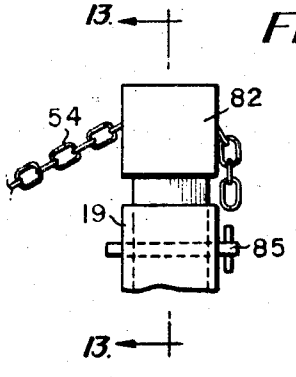
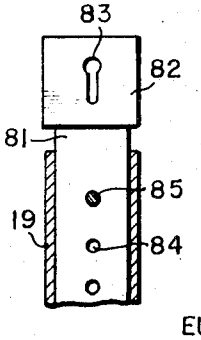


FIG. 13



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PORTABLE HIGHWAY CRASH RESCUE UNIT

This invention relates generally to the field of power-operated automobile body frame and panel forcing tools, and more specifically to a portable unit adapted to remove vehicle body doors, panels, and other structural members and to spread apart or bend access openings in a wrecked vehicle in order to rescue the driver and occupants.

With the advent of high-speed roads and turnpikes and automotive vehicles capable of sustained high speeds, the incidence of serious accidents on the highway and the resulting death toll has been increasing rapidly within the past few years. One of the primary reasons for the heavy death toll and incidence of serious injury has been the difficulty in extracting the victims from such high-speed automobile crashes. At the present time, there are two primary methods of removing victims from such accidents. The principal method requires the use of a heavy duty rescue truck, wrecking or tow truck which must be specially dispatched to the scene of the accident and which attempts to either pull the door open with either a powered boom or a winch. This equipment is of course mounted in a stationary manner on the vehicle and frequently it is impossible to get the truck close enough to the accident either due to the backup of traffic on the road near the accident scene or the difficulty in getting to the actual scene if the vehicle is off the road, as for example down in a gulley or ditch. Even after the truck has attached its necessary hooks and booms to the door of the wrecked vehicle, there is always the possibility of dragging the wreck along the highway because the door is jammed and will not open by pulling upon the same with no firm anchorage.

An alternate method of removing the vehicle door is by use of acetylene torches, wrecking bars, or portable hydraulic power equipment. These methods each have proven inadequate for several reasons. Frequently, wrecking bars cannot be wedged into place due to lack of an area upon which sufficient purchase can be made. In such cases, the bar cannot be used until a hole is made in the body of the wreck, either with a large maul and pin or with a saw. The use of flame torches of course has apparent disadvantages. The same cannot be used when there is a ruptured gas tank or when the wreck involves a vehicle loaded with combustible material. Further, use of a torch in the vicinity of upholstering can easily cause the same to ignite, presenting danger of serious injury to the victim.

The use of portable power equipment of the hydraulic jack type always requires that there be an opening into which the end tabs of the tool can be placed. Such power tools can only push and attempt to stretch the sheet metal of the vehicle since the tool itself does not have any definite anchor and must rely on the vehicle itself for an anchor point.

Portable hand and power saws are also used occasionally but also present danger due to emission of sparks which can cause fire in the same manner as the acetylene torch noted above. It is also possible that the accident victim may be in the path of the saw and in danger of being injured by the saw itself.

The present invention overcomes the many problems noted in the prior art and provides for the first time a small portable rescue pack which may be carried in the trunk of any automotive vehicle, and which is especially useful for employment as on board equipment in police cruisers, fire trucks, highway maintenance trucks, and the like. Since such a portable unit would be relatively low in cost, there is a good possibility that at least one vehicle equipped with the tool will be available in the immediate vicinity of any accident and the same can be brought to the scene almost immediately.

An object of this invention is to provide a compact light weight power rescue unit useful for prying apart structural members of a vehicle and especially for removing doors of wrecked vehicles.

A further object of the present invention is to provide a portable highway crash rescue unit which is capable of easy disassembly and the component parts of which can be stored in a relatively small place, such as a vehicle trunk.

A still further object of the instant invention is to provide a portable highway crash rescue unit, the power section of which can be detached and used separately to expand an access opening in a vehicle or to push a dashboard away from a seat.

Another object of the instant invention is to provide a portable highway rescue unit which is of small dimension and is light in weight and which can exert great force on the vehicle frame member sufficient to distort the same.

Another object of the instant invention is to provide a portable power unit for rescue purposes including means to readily penetrate a vehicle door and then lock against the same to pull the door outwardly.

Another object of this invention is to provide a portable rescue unit which can be readily moved to the scene of an accident and which does not require any external support for application of pressure to the vehicle.

A yet further object of this invention is to provide a power unit for application to wrecked automotive vehicles which is adjustable in all dimensions in order to accommodate various sized vehicles.

Another object of this invention is to provide a portable highway crash rescue unit which is relatively simple in construction, inexpensive to manufacture, durable in use, and at all times safe and efficient.

For yet a better understanding of the invention, reference may be had to the following detailed description and drawings wherein like reference characters represent the same elements and wherein:

FIG. **1** is a perspective view of the portable highway crash rescue unit including a hook attachment in use in pulling on a vertical door post;

FIG. **2** is a side elevation of the rescue unit of FIG. **1** before application of pressure to the power unit;

FIG. **3** is a side elevation similar to FIG. **2** but showing partial extension of the power unit in application of force to the pulling hook;

FIG. **4** is a perspective view showing the power unit being separately used for the purpose of pushing up a vehicle front corner post;

FIG. **5** is a perspective view similar to FIG. **4** showing the power unit in extended position;

FIG. **6** is a partial perspective view of the power unit and its telescopic connection to the extension arms;

FIG. **7** is a side elevation of the door piercing spike attachment during insertion thereof through a vehicle door;

FIG. **8** is a partial side elevation of the door piercing attachment of FIG. **7**, but showing the tool moved rearwardly to engage against the inside surface of the door;

FIG. **9** is an enlarged plan view on the head of the door piercing attachment with parts being shown in section;

FIG. **10** is a side elevation of the portable highway crash rescue unit with the door piercing spike attached secured through a vehicle door;

FIG. **11** is an elevation similar to FIG. **10** but showing the tool after power has been applied;

FIG. **12** is an elevation of a modified head for the lever arm incorporating an extension attachment; and

FIG. **13** is a sectional view taken along lines **13–13** of FIG. **12**.

The portable highway crash rescue unit of the invention is shown generally at **10** and includes a foot support plate **11** at the forward end thereof having opposed side flanges **12** and a central housing portion **13**. A stub shaft **14** of round bar stock is pivotally mounted to the forward portion of the central housing portion as by a pivot pin **15** (FIG. **3**).

A rearwardly extending horizontal base leg **16** is rigidly secured within the central housing portion **13** of the support plate. This base leg forms one of the legs of the triangular force triangle as later described and terminates in a pivotal connection **17** with base member **18** of the actuating lever arm **19**. As can be seen best in FIG. **2**, the base leg **16** passes nearly completely through the length of the base member **18** which is

formed with an open bottom construction defined by outwardly extending ground engaging flanges 20 and 21. In this manner, the base member can pivot in a clockwise direction as seen in FIGS. 1 through 3, and the base leg will remain stationary. The actuating lever arm member 19 is welded or otherwise securely attached to the top surface of the base member 18. The lever arm 19, which forms the second leg of the force applying triangle, is preferably formed of rectangular cross section structural tubing which is light in weight and very strong. It will of course be understood that the member 19 could well be formed of circular cross section material if desired. The rear face 22 of the actuating lever arm is provided with a plurality of spaced pin receiving holes 23 and adjacent its top is further provided with a chain fitting keyhole opening through both the front and rear faces for adjustable mounting of the pull chain.

A rectangular sliding support sleeve 25 of a size slightly larger than the cross-sectional dimensions of the actuating lever arm 19 is slidably engaged thereon and is provided on its rear face with a cylindrical pin guide 26. A T-handled spring biased lock pin 27 is freely slidable within the pin guide and is adapted to engage within a selected one of the pin receiving holes 23 on the rear face 22 of the actuating lever arm. It is to be understood that the T-handled lock pin 27 is normally biased inwardly so as to always engage within one of the pin receiving holes if the same is in alignment with said pin. It will therefore be understood that the support sleeve 25 may be placed in selected vertical position of adjustment on the actuating lever arm 19 and secured in such position by means of the lock pin 27.

The forward face of sleeve 25 is provided with an outwardly extending flat flange 28 provided with a pivot pin receiving hole in the central portion thereof. A clevis bracket 29 is pivotally mounted to the flange 28 by means of a clevis pin 33. Extending from the front face of clevis bracket 29 is a hollow tubular stub shaft having a transverse hole therethrough, not shown, but identical to the hollow shaft portion 45 shown at the left side of FIG. 6.

Power is applied to the rescue unit in order to swing the actuating lever arm, in a manner described in detail later herein, by means of a hydraulic power unit 34. The unit 34 includes a hydraulic actuator 35 incorporating a piston-cylinder unit 36 operated in a conventional manner by a hand pump lever 37. This power unit is remote from the rescue unit proper and is connected thereto by means of a reinforced hose 38. The hydraulic unit on the unit includes a cylinder 39. Extending from the rearward end of the cylinder is a piston shaft 40 connected directly to the piston within the cylinder, not shown. The rearward end of the piston shaft terminates in a reduced diameter pin post 44 adapted to be removably and telescopically received within an extension tube 45. Lock hole 46 is provided in the extension tube and is adapted to align with a similar hole in the pin post 44. A removable pin may be applied through the holes in order to lock the two elements in position. In normal use, however, such pin lock is not required since the parts 40 and 45 are in compression and hence the problem of pulling loose is not encountered.

The forward end of the cylinder is secured to a reduced cross section tubular member 47 which also terminates in a yet further reduced cross-sectional pin post 49. A car engaging abutment plate 48 is welded or otherwise secured on the section 47 and is preferably rectangular in shape and mounted somewhat off center so as to provide an upwardly extending portion adapted to engage the rocker panel 57 of an automobile vehicle V as shown best in FIGS. 1 and 2. The pin post 49 is adapted to be received in a forward extension tube 50. This tube receives at its forward end the pin post 14 of the foot support plate 11. The extension tube 45 receives the extending pin on the clevis bracket 29 as previously described.

It will therefore be understood that a triangular unit has been provided for application of force to a vehicle body. Two of the legs of the triangle, namely, the base leg 16 and the leg between the base member 18 and the support sleeve 25, are fixed in length. The third leg defined by the hydraulic cylinder and its extension tubes can be extended or retracted by means of the actuator unit 35. Due to the pivotal connection of the actuating lever arm 19 to the base member 18, any extension of the hydraulic cylinder will cause pivotal movement of the lever arm 19 about its pivot point 17.

In use, a conventional metal link chain 54, provided at one end with a hook 55, may be placed about a post or other portion of a vehicle V which is to be displaced. The other end of the chain is passed through the chain keyhole 24 and locked into selected position to remove most of the slack therein as shown in FIGS. 1 and 2. The base member 16 is placed generally perpendicular to the longitudinal axis of the vehicle with the foot support plate 11 located beneath the vehicle so that the car engaging abutment plate 48 rests directly against the sill or rocker panel 57 of the vehicle frame. With the unit in this position, the hand pump lever 37 may be operated to extend the hydraulic unit thereby moving the piston shaft 40 in the direction shown by the arrow in FIG. 3. Extension of the unit causes the actuating lever arm 19 to pivot from the dotted line position in FIG. 3 to that shown in solid lines. This movement of course causes tension in the chain 54 and the unit acting against the sill 57 will cause deformation of the vehicle part against which pressure is being applied such as the door post 58. No external abutment is required as the sill 57 of the vehicle itself provides the necessary stable support and base.

In order to provide adjustment for various sizes of vehicles and for different portions of the vehicle, a selection of different length extension tubes 50 are provided with the tool so that the distance from the car engaging abutment plate 48 to the foot support plate 11 may be varied. In a similar manner, the extension tube 45 can be replaced with similar tubes of different length.

The power leg components may be used separately for application of force to perform various additional functions in passenger rescue operations. It has been found that frequently the entire dash unit of the vehicle and the front corner posts are displaced rearwardly so that the distance between the seat backs and the bottom portion of the dash is insufficient for proper removal of the victim. In such cases, portable power units must be brought into play to displace the dash unit forwardly. An application of the power leg components to such an operation is shown in FIGS. 4 and 5. Here the cylinder 39 and its extension tubes 45 and 50 have been removed from the remaining components of the portable rescue unit. Saddle members 59 and 60 are applied over the ends of the extension tubes. The saddles 59 and 60 may be provided in various shapes to accommodate the different contours of the vehicle corner posts and dash although for all practical purposes a generally U-shaped saddle will be sufficient. The saddle 59 is provided with a collar 61 which telescopically receives the extension tube 45. A similar collar member may be provided for the saddle 60. As shown in FIGS. 4 and 5, the saddle units are emplaced at the corner of the front door frame with the upper end engaging the corner of the vehicle corner post 62 and the lower saddle engaging the sill corner. The same unit could be applied between the bottom of the door and the dash D by mere removal of the extension tube 45 or 50 to shorten the effective length of the unit. It will of course be understood that the power leg components just described can be used for various functions for supplying force where necessary in crash rescue operations.

It has been found that in many serious vehicular accidents, the door becomes sprung and is impossible to open by nearly unlatching the conventional hand lock and pulling the door about its pivot points. In such cases, it is frequently necessary to drill a hole completely through the door panel in order to secure some form of pulling implement therein. To this end I have provided an attachment for the crash rescue unit which is depicted in FIGS. 7 through 11. A door spike 65 comprising an elongated shaft 66 is formed of bar or rod stock and is preferably fabricated from steel and includes a rectangular head construction 67 at one end thereof provided with a rear

flat striking face 68. A clevis 69 to receive the pull chain 54 is pivotally mounted on the rectangular head by means of a clevis pin 70. Adjacent the head of the spike, the body portion of the shaft 66 is cutaway on both sides to define a central web 71. The forward end of the spike is tapered to a sharp point as shown at 72. The door spike may be placed with the point 72 against the door panel of the vehicle P and the rear face 68 of the head 67 may be struck sharply with a maul or heavy hammer. The force will cause the pointed end 72 to penetrate the panel.

In order to secure the spike in the door panel for rearward application of force, a pair of pivoted wings 74 and 75 are mounted on the spike by means of a common pivot pin 76 passing therethrough and through the central web 71 adjacent its forward portion. Each wing is provided with a cam curve portion 77 adjacent its rearward end. It will be noted that each of the wings is a mirror image of the other so that they will act oppositely as shown in FIG. 8. A rearward pull on the spike in the direction of the arrow shown in FIG. 8 will cause the cam surface 77 to engage against the inside face of the panel P and continued application of pressure will cam the wings further outwardly to the position as shown in FIG. 8. A flat surface 78 formed on the side of the wing adjacent its forward end will then engage against a flat shoulder 79 on the elongated shaft (see FIG. 9) thereby acting as a limit stop to pivotal movement and the wings will be disposed as shown in FIG. 8. Application of force to the spike will then be transferred to the elongated portion of the wings resting against the inside face of the panel and the spike will remain in place and will not pull free. It will be apparent that the wings will be folded into nested position during their passage through panel P as shown in FIG. 7.

With the spike forced through the door panel and with the wings 74 and 75 extended, all as shown in FIG. 10, force may be applied to the actuating lever arm 19 in the manner shown in FIG. 11 to cause tension on the chain 54 and hence force will be applied to the door panel through the spike and the wings to open the door panel or pry the panel loose from the frame.

In FIGS. 10—13, I have shown a further modification of the invention to provide an additional degree of adjustment in regard to the point of force application on the chain 54. Here, an extension post 81 is shown which is adapted to be telescopically received in the top of actuating lever arm 19. The post includes a rectangular head 82 provided with a chain keyhole therethrough shown at 83. A plurality of lock pin adjustment holes 84 are provided along the longitudinal extent of the extension post and are adapted to be engaged by a pin 85 passing through both the extension post and the actuating lever arm 19. The adjustability provided by the extension post 81 is useful in applying the pulling force to remote and normally unaccessible areas such as escape hatches of buses or aircraft.

The portable highway rescue unit, described above, is designed to weigh somewhat less than 60 pounds and hence can be easily manipulated by one man. Due to its relatively small size and the use of pin connections, the entire unit can be collapsed and carried in the trunk of any vehicle or rescue unit. In order to fold the unit for storage, it is only necessary to disconnect the clevis 29 and the extension tube 50 from their respective adjacent members. In this manner, the actuating lever arm 19 may be folded about its pivot pin 17. Due to the small size and weight of the unit, experience has shown that the unit can be erected, secured to the vehicle, and a door pulling operation performed all in less than seven minutes. While the unit may be constructed utilizing existing hydraulic units of various parameters, the specific unit chosen for application in the preferred embodiment is capable of exerting over 20,000 pounds of hydraulic pressure which is more than sufficient to completely remove the door of most vehicles presently on the road.

While I have shown and described a preferred embodiment of the portable highway rescue unit, it is to be understood that various substitutions of equivalents may be made by those skilled in the art.

I claim:

1. A portable vehicle crash rescue unit comprising the elongated base leg, an upstanding actuating arm, pivot means connecting the lower end of said arm to said base leg, adjacent one end thereof extensible fluid powered motor means, one end of said motor being pivotally connected to said actuating arm at a point spaced from said lower end thereof, the other end of said motor means being pivotally connected adjacent to the other end of said base leg, tension means connecting said actuating arm to a portion of a vehicle to be pulled, abutment support means rigidly mounted on said motor means and engageable with the frame of said vehicle, and fluid pump means to extend said motor means thereby moving said actuating arm about said pivot means and applying a pulling force on said tension means.

2. A portable crash rescue unit as defined in claim 1 wherein said motor means comprises a piston-cylinder unit, and conduit means connecting said cylinder to said pump means.

3. A portable crash rescue unit as defined in claim 2 and further including, removable extension tubes interposed between said motor means and said actuating arm and base leg respectively, said motor means and actuating tubes being removable as a unit from the base leg and actuating arm for independent use as a force applying implement.

4. A portable vehicle crash rescue unit as defined in claim 1 wherein said pivot means comprises a base member having outwardly extending support flanges rigidly secured to the lower end of said actuating arm, and a pivot pin connecting said base member to said base leg.

5. A portable vehicle crash rescue unit as defined in claim 1 and including a slidable collar mounted on said actuating arm, lock means to secure said collar in selected position on said actuating arm, and pivot means on said collar for connection to said motor means.

6. A portable vehicle crash rescue unit as defined in claim 5 wherein said pivot means on said collar comprises a flange, a clevis, a pin pivotally connecting said clevis to said flange, and a connection post extending from said clevis.

7. A portable vehicle crash rescue unit as defined in claim 1 wherein said actuating arm is a hollow tube and further including extension post means received in the upper end of said tube, pin means to lock said extension post means in selected extended position in said tube, a head on the upper end of said extension post means, and means on said head for connection to said tension means.

8. A portable vehicle crash rescue unit as defined in claim 1 and further including a pull hole secured to said tension means for connection to the portion of the vehicle to which force is to be applied.

9. A portable crash rescue unit as defined in claim 1 and further including a panel piercing spike having a pointed end means to secure said spike to said tension means, wing means pivotally mounted on said spike adapted to pass through said panel with said spike and to open into extended position to prohibit withdrawal of said spike from said panel.

10. A portable crash rescue unit as defined in claim 9 and further including a flat striking face on the rear of said spike, and said means to secure said spike to said tension means comprising a clevis pivotally mounted on said spike about the striking face.

11. A portable crash rescue unit as defined in claim 9 wherein said spike is provided with opposed cut away wing receiving areas adjacent said pointed end thereof, said wing means including two elongated wing members, a pivot pin connecting the forward ends of said wing members to the spike at the forward position of said wing receiving areas.

12. A portable crash rescue unit as defined in claim 11 wherein a cam surface is formed on the rear of each of said wing members adapted to engage the inner wall of a vehicle panel and to cam said wing members into full extended position when rearward tension is imparted to said spike.

13. A portable crash rescue unit as defined in claim 12 and including a shoulder on said spike on the forward portion of said wing receiving areas engageable by said wing members and serving as a stop to limit extension thereof.