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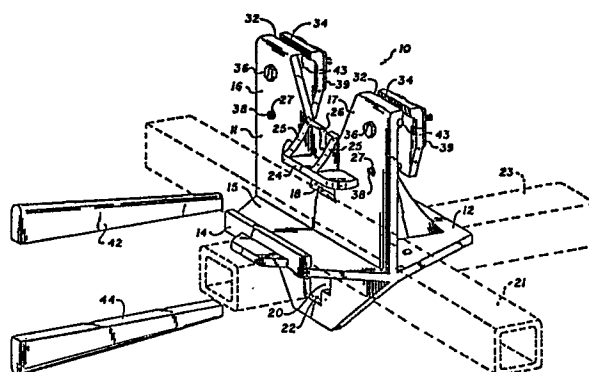
54 **Vehicle clamping and support apparatus.**

57 A clamping device (10), comprises a clamping means (16, 17) disposed towards an upper end of the device for clamping to a vehicle body and a securing means (11, 14, 15, 20, 42, 44) disposed towards a lower end of the device for releasably securing first and second transverse support members (21, 23). The device is clamped to a vehicle body and supports the vehicle body in a fixed position above the transverse support members (21, 23).

Vehicle clamping and support apparatus includes four such clamping devices (10). One pair of clamping devices is clamped to opposite rear undersides of the vehicle body. The other pair of clamping devices is clamped to opposite, front undersides of the vehicle body. First and second support members (21) are then slideably positioned along the lateral undersides of the vehicle by slideably engaging the support members with the clamping devices clamped along each side of the vehicle.

Third and fourth (23) support members slideably engage the front and rear clamping device pairs respectively, transversely to the first and second support members (21).

The support members (21, 23) are secured to the clamping devices (10), to provide a rigid framework for supporting the vehicle which facilitates collision repair work on the vehicle.



VEHICLE CLAMPING AND SUPPORT APPARATUS

Field of the Invention

This application pertains to apparatus for
5 clamping a vehicle and supporting the clamped vehicle in
a fixed position. The apparatus is particularly intend-
ed for use in vehicle collision repair shops where it is
often necessary to clamp and support a damaged vehicle
in a fixed position to facilitate repair work on the
10 vehicle.

Background of the Invention

Vehicle collision repair shops typically uti-
lize some form of apparatus for clamping and supporting
damaged vehicles in a fixed position to facilitate col-
15 lision repair work. Such known apparatus is clamped to
the damaged vehicle body at a number of pre-selected
locations to support the vehicle body while known pul-
ling equipment is used to force the damaged vehicle body
back into its original shape.

20 Many of the known types of vehicle clamping
and support apparatus are large and cumbersome -- typi-
cally occupying a complete bay in the collision repair
shop. Although some "portable" vehicle clamping and
support devices exist, they are relatively inconvenient
25 to use because they permit only limited flexibility in
selection of the points at which the vehicle body is
clamped. This often makes it awkward to use such de-
vices with many types of damaged vehicles. Further,
such known devices frequently provide only very limited
30 clearance with respect to the vehicle exhaust system and
other obstructions, which complicates affixation of such
devices to many types of damaged vehicles.

The present invention provides a simplified
vehicle clamping and support apparatus which includes a
35 number of separate clamping devices which may be inde-

pendently clamped to the vehicle body at pre-selected points. Support members which slideably engage the clamping devices are then slid into position and secured to the clamping devices, thereby providing a rigid
5 framework for supporting the vehicle body in the clamped position. Accordingly, the invention facilitates rapid clamping and support of a damaged vehicle.

Summary of the Invention

In accordance with the invention, there is
10 provided a clamping device, comprising clamping means disposed towards an upper end of the device for clamping to a vehicle body and for supporting the clamped position of the vehicle body in a fixed position; and, securing means disposed towards a lower end of the device
15 for releasably securing first and second transverse support members. The securing means releasably secures the first and second transverse support members at an adjustable point of cross-over of those members. Advantageously, the securing means slideably engages the
20 first and second transverse support members.

The clamping device securing means preferably includes a first wedge for wedging the first support member against the device, and a second wedge for wedging the second support member against the device. Advantageously, the first wedge may include a rounded edge
25 for permitting limited rotation of the first wedge while it is wedging the first support member against the device, thereby further wedging the first support member against the device.

30 The clamping device clamping means may comprise first and second spaced clamps for clamping to the vehicle body. A connecting means for connecting the device to a fixed support is included in the clamping means. Preferably, the connecting means comprises a
35 notch for releasably slideably securing a chain. The

notch is located on a vertical axis of the device, midway between the first and second clamps.

The invention also provides vehicle clamping and support apparatus comprising first and second
5 support members for positioning, respectively, along first and second lateral undersides of the vehicle; third and fourth support members for positioning, respectively, along the front and rear undersides of the vehicle, transverse to the first and second support
10 members; and first, second, third and fourth clamping devices for, respectively, releasably transversely securing the first and third, second and third, second and fourth, and first and fourth support members and for clamping to the vehicle body to support the clamped
15 position of the vehicle body in a fixed position above the support members.

Brief Description of the Drawings

Figure 1 is a pictorial illustration of a clamping device according to the preferred embodiment.

20 Figure 2 is a side elevation view of the clamping device of Figure 1.

Figure 3 is a rear elevation view of a portion of the clamping device of Figures 1 and 2.

Figure 4 is a rear elevation view of one of
25 the clamp jaws of the clamping device of Figures 1 and 2.

Figure 5 is a top view of the clamping device portion of Figure 3.

Figure 6 is a pictorial illustration of a
30 vehicle clamping and support apparatus which includes four clamping devices of the type shown in Figure 1 and four support members.

Figure 7 is a pictorial illustration of a clamping device like that of Figure 1 which has been

modified for use with support members of circular cross section.

Detailed Description of a Preferred Embodiment
of the Invention

5 Figure 1 illustrates a clamping device 10 of heavy steel plate or other high strength material construction which includes a "clamping means" disposed towards the upper end of device 10 for clamping to a vehicle body. Clamping device 10 also includes a "securing
10 means" disposed toward the lower end of device 10 for releasably securing first and second transverse support members 21, 23 (phantom lines are used in Figure 1 to illustrate support members 21, 23 to avoid obscuring details of the clamping device 10).

15 In the preferred embodiment, the "clamping means" of clamping device 10 comprises first and second clamps 16, 17 which are spaced apart from one another. Each of clamps 16, 17 includes a pair of jaws 32, 34 having serrated teeth. Compression springs 43 urge jaw
20 pairs 32, 34 apart. Bolts 36 pass through jaws 32, springs 43 and jaws 34 and threadably engage nuts 37 (held between flanges 39 as shown in Figure 4) thereby limiting the opening of jaw pairs 32, 34. Threaded studs 38 are affixed, respectively, at one end, to the
25 lower ends of jaws 34. The opposite ends of studs 38 protrude through apertures 27 in body plate 11. Studs 38 are not threaded into apertures 27 but simply slide with respect thereto. Nuts 29 are threaded onto studs 38 and positioned between jaws 32, 34. Rotation of nuts
30 29 on studs 38 to advance nuts 29 toward body plate 11 causes jaws 34 to pivot about nuts 37 and toward jaws 32.

 Clamping device 10 is easily clamped to a vehicle body by positioning clamps 16, 17 over the vehicle
35 underbody pinch welds, with jaws 32 toward the outside

of the vehicle and jaws 34 toward the inside of the vehicle. A wrench is then used to tighten nuts 29 against body plate 11, thereby securely clamping the vehicle underbody pinch welds in clamps 16, 17.

5 The "securing means" of clamping device 10 preferably comprises body plate 11, support plate 15 which is rigidly affixed to body plate 11 at right angles thereto, and flange 14 which is rigidly affixed to support plate 15 at right angles thereto. Body plate
10 11, flange 14 and support plate 15 define a generally "U" shaped trough for slideably engaging and supporting first support member 21 as shown in Figure 1. The "securing means" also comprises an aperture 20 formed in body plate 11 beneath support plate 15. The cross sec-
15 tional area of aperture 20 is made slightly larger than the cross sectional area of second support member 23 so that support member 23 will easily slide through aperture 20.

 The "securing means" of clamping device 10
20 also preferably includes first and second wedges 42, 44. Once first support member 21 has been slideably positioned on clamping device 10, first wedge 42 is driven into first wedge aperture 18, thereby firmly wedging support member 21 against support plate 15. Plate 24,
25 which is reinforced by flanges 25, provides a bracing surface against which wedge 42 acts to wedge first support member 21 against support plate 15. As shown in Figure 1, the upper surface of first wedge 42 is rounded. This is because support member 21 may tend to slip
30 along its longitudinal axis when forces typically encountered in collision repair work are applied to the clamped vehicle. When such slippage occurs, the rounded edge of first wedge 42 permits limited rotation of wedge 42, such that the squared corners of the lower, non-
35 rounded surface of wedge 42 tend to "bite" into the top

surface of support member 21, thereby further wedging support member 21 against support plate 15 and resisting slippage of support member 21.

Second wedge 44 is driven into second wedge aperture 22 after second support member 23 has been slideably positioned in aperture 20. Second wedge 44 wedges second support member 23 against the bottom of support plates 12 and 15. Although the drawings show second wedge 44 as having a rounded surface similar to that of first wedge 42, it has been found that second support member 23 is not as likely to slip during collision repair work as is first support member 21, and so inclusion of the rounded surface on second wedge 44 is optional.

As Figure 1 shows, clamping device 10 releasably secures first and second support members 21, 23 in transverse relationship. Clamping device 10 defines the point of cross over of members 21, 23 and readily facilitates adjustment of that point of cross over by sliding either of members 21 or 23 with respect to clamping device 10. Preferably, clamping device 10 is constructed such that the point of cross-over of members 21, 23 is maintained at least six inches below the point at which jaw pairs 32, 34 clampingly engage the vehicle body. This is to ensure adequate clearance between support members 21, 23 and obstructions such as the vehicle underbody, exhaust system etc. and also to provide clearance for measuring apparatus which, in some cases, may be inserted between support members 21, 23 and the vehicle underbody to obtain measurements for guiding collision repair work on the vehicle.

Clamping device 10 also preferably includes a "connecting means" such as notch 26 which is sized to releasably, slideably secure one link of a chain, thus facilitating attachment of an end of the chain to clamp-

ing device 10. The opposite end of the chain may be affixed, in known fashion, to a pulling device or to a fixed support. As may be seen in Figure 3, notch 26 is located on a central vertical axis of clamping device 10, midway between clamps 16 and 17.

In operation, a collision repairman selects four separate clamping devices like that shown at 10 in Figure 1, and roughly adjusts the spacing between jaw pairs 32, 34 of each clamping device with the aid of nuts 29, bolts 36 and nuts 37. The four clamping devices are then securely clamped over the vehicle underbody pinch welds as described above. One pair of clamping devices is clamped on opposite sides of the vehicle underbody, towards the rear of the vehicle. The second pair of clamping devices is clamped on opposite sides of the vehicle underbody, towards the front of the vehicle. The rear pair of clamping devices must be positioned at equal distances from the front of the vehicle to align apertures 20 of the rear pair of clamping devices so that a support member like that shown at 23 in Figure 1 may easily slide through apertures 20 of the rear pair of clamping devices. Similarly, the front, or second pair of clamping devices must be positioned at equal distances from the front of the vehicle to align apertures 20 of the front pair of clamping devices so that another support member, also like that shown at 23 in Figure 1, may easily slide through apertures 20 of the front pair of clamping devices.

Since four separate clamping devices are used, their positioning on the vehicle underbody is largely arbitrary (although the front and rear clamping devices must be aligned as just described). Thus, maximum flexibility is provided in the selection of points at which the clamping devices are clamped to the vehicle underbody.

Figure 6 is a pictorial illustration of a vehicle clamping and support apparatus which includes four clamping devices of the type shown in Figure 1 and four support members. The vehicle has been omitted from Figure 6 to avoid obscuring details of the vehicle clamping and support apparatus. In Figure 6 the reference numerals 10a, 10b, 10c and 10d designate, respectively, first, second, third and fourth clamping devices of the type shown and described above with reference to Figure 1. First and second clamping devices 10a, 10b are clamped on opposite sides of the vehicle underbody, towards the rear of the vehicle as described above. Third and fourth clamping devices 10c, 10d are clamped on opposite sides of the vehicle underbody, towards the front of the vehicle, as described above. First support member 21a is then positioned along one lateral underside of the vehicle by sliding first support member 21a along the "U" shaped troughs formed by body plate 11, flange 14 and support plate 15 in each of first and fourth clamping devices 10a, 10d. Second support member 21b is positioned, in similar fashion, along the other lateral underside of the vehicle by slideably supporting second support member 21b on second and third clamping devices 10b, 10c. Four separate wedges 42 are then driven into wedging apertures 18 of each of clamping devices 10a, 10b, 10c and 10d to secure first and second support members 21a, 21b. Third support member 23a is then positioned along the rear underside of the vehicle, transversely to support members 21a, 21b, by sliding third support member 23a through apertures 20 in each of clamping devices 10a, 10b. Fourth support member 23b is positioned in similar fashion, along the front underside of the vehicle, by sliding fourth support member 23b through apertures 20 in clamping devices 10c, 10d. Four separate wedges 44 are then driven into wedging aper-

tures 22 in each of clamping devices 10a, 10b, 10c and 10d to secure third and fourth support members 23a, 23b. The vehicle is thus clamped and secured to a rigid support framework comprising first and second support members 21a, 21b and third and fourth support members 23a, 23b.

Jacks 58 or other convenient means may be used to raise or lower the vehicle on the support framework. Ends of chains 54 may be releasably secured to notches 26 in each of clamping devices 10a, 10b, 10c and 10d. The opposite ends of chains 54 may be secured to convenient supports such as shop floor pots or a frame rack. Turnbuckles 56 may be provided to adjust the tension in each of chains 54.

Once the vehicle is clamped and supported as described above, collision damage to the vehicle may be repaired in conventional fashion to force the damaged vehicle body back into its original shape. When the collision repair work has been completed, the apparatus is easily disassembled by releasing chains 54 from notches 26, knocking out wedges 42, 44 at each clamping device, slideably removing support members 21a, 21b, 23a and 23b and releasing clamps 16, 17 at each clamping device.

Clamping device 10 need only be modified in minor respects to facilitate its use with support members of any desired cross section. Figure 7 shows, for example, how clamping device 10 may be modified for use with support members 21x, 23x of circular cross section. To facilitate such use, flange 14x should protrude upward from support plate 15 a distance equal to at least the radius of support member 21x. Also, the cross sectional shape and size of aperture 20x should be varied to accommodate the cross sectional shape and size of support member 23x.

Some vehicles have special adaptors for engaging jacks or support apparatus used in collision repair work. For example, Mercedes Benz automobiles have four reinforced sockets along the front and rear lateral undersides of the vehicle, one pair of such sockets on each side of the vehicle. These sockets are sized to slideably receive a pin. The jack provided with Mercedes Benz automobiles has a pin which must be slid into one of the four sockets to provide a point of leverage against which the vehicle may be raised with the aid of the jack. Clamping device 10 can be used with specialized supports of this type. For example, a pin sized for slideable insertion within the sockets of the particular vehicle under repair can be welded to a short piece of angle iron. The angle iron is then clamped securely to clamps 16, 17 and the pin inserted into the socket on the vehicle. Repair work then proceeds as previously described in respect of vehicles to which clamping device 10 is directly clamped.

As will be apparent to those skilled in the art, in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

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I CLAIM:

1. A clamping device, comprising:
 - (a) clamping means disposed towards an upper end
5 of the device for clamping to a vehicle body
and for supporting the clamped position of the
vehicle body in a fixed position; and,
 - (b) securing means disposed towards a lower end of
10 the device for releasably securing first and
second transverse support members.
2. A clamping device as defined in claim 1,
wherein said securing means releasably secures said
first and second transverse support members at an
15 adjustable point of cross-over of said members.
3. A clamping device as defined in claim 2,
wherein said securing means slideably engages said first
and second transverse support members.
20
4. A clamping device as defined in claim 3,
wherein said securing means includes a first wedge for
wedging said first support member against the device,
and a second wedge for wedging said second support
25 member against the device.
5. A clamping device as defined in claim 4,
wherein said first wedge includes a rounded edge for
permitting limited rotation of said first wedge while
30 said first wedge is wedging said first support member
against the device, thereby further wedging said first
support member against the device.

6. A clamping device as defined in claim 1,
wherein said clamping means comprises first and second
spaced clamps for clamping to the vehicle body.

5 7. A clamping device as defined in claim 6,
further comprising connecting means for connecting the
device to a fixed support.

8. A clamping device as defined in claim 7,
10 wherein said connecting means comprises a notch for
releasably slideably securing a chain.

9. A clamping device as defined in claim 8,
wherein said notch is located on a vertical axis of the
15 device, midway between said first and second clamps.

10. Vehicle clamping and support apparatus,
comprising:

- 20 (a) first and second support members for position-
ing, respectively, along first and second lat-
eral undersides of the vehicle;
- (b) third and fourth support members for position-
ing, respectively, along front and rear under-
sides of the vehicle, transverse to said first
25 and second support members;
- (c) a first clamping device, comprising:
 - (i) securing means disposed towards a lower
end of the device for releasably trans-
versely securing said first and third
30 support members;
 - (ii) clamping means disposed towards an upper
end of the device for clamping to the
vehicle body and for supporting the
clamped position of the vehicle body in
35

a fixed position above said first and third support members;

(d) a second clamping device, comprising:

5

(i) securing means disposed towards a lower end of the device for releasably transversely securing said second and third support members;

10

(ii) clamping means disposed towards an upper end of the device for clamping to the vehicle body and for supporting the clamped position of the vehicle body in a fixed position above said second and third support members;

(e) a third clamping device, comprising:

15

(i) securing means disposed towards a lower end of the device for releasably transversely securing said second and fourth support members;

20

(ii) clamping means disposed towards an upper end of the device for clamping to the vehicle body and for supporting the clamped position of the vehicle body in a fixed position above said second and fourth support members; and,

25

(f) a fourth clamping device, comprising:

(i) securing means disposed towards a lower end of the device for releasably transversely securing said first and fourth support members;

30

(ii) clamping means disposed towards an upper end of the device for clamping to the vehicle body and for supporting the clamped position of the vehicle body in a fixed position above said first and fourth support members.

35

11. Vehicle clamping and support apparatus as defined in claim 10, wherein:

- 5 (a) said first clamping device releasably secures said first and third support members at an adjustable point of cross-over of said first and third members;
- 10 (b) said second clamping device releasably secures said second and third support members at an adjustable point of cross-over of said second and third members;
- (c) said third clamping device releasably secures said second and fourth support members at an adjustable point of cross-over of said second and fourth members; and,
- 15 (d) said fourth clamping device releasably secures said first and fourth support members at an adjustable point of cross-over of said first and fourth members.

20 12. Vehicle clamping and support apparatus as defined in claim 11, wherein:

- (a) said first clamping device slideably engages said first and third support members;
- 25 (b) said second clamping device slideably engages said second and third support members;
- (c) said third clamping device slideably engages said second and fourth support members; and,
- (d) said fourth clamping device slideably engages said first and fourth support members.

30

13. Vehicle clamping and support apparatus as defined in claim 10, wherein said first, second, third and fourth clamping device clamping means each comprise first and second spaced clamps for clamping to a flange
35 of the vehicle body.

14. Vehicle clamping and support apparatus as defined in claim 13, wherein said first, second, third and fourth clamping devices each further comprise a connecting means for connecting each of said clamping
5 devices to a fixed support.

15. Vehicle clamping and support apparatus as defined in claim 14, wherein each of said connecting means comprises a notch for releasably slideably
10 securing a chain.

16. Vehicle clamping and support apparatus as defined in claim 15, wherein each of said notches is located on a vertical axis of said respective clamping
15 devices, midway between said first and second clamps.

17. A clamping device as defined in claim 3, wherein said point of cross-over is maintained at least six inches below the point at which the device clamping-
20 ly engages the vehicle body.

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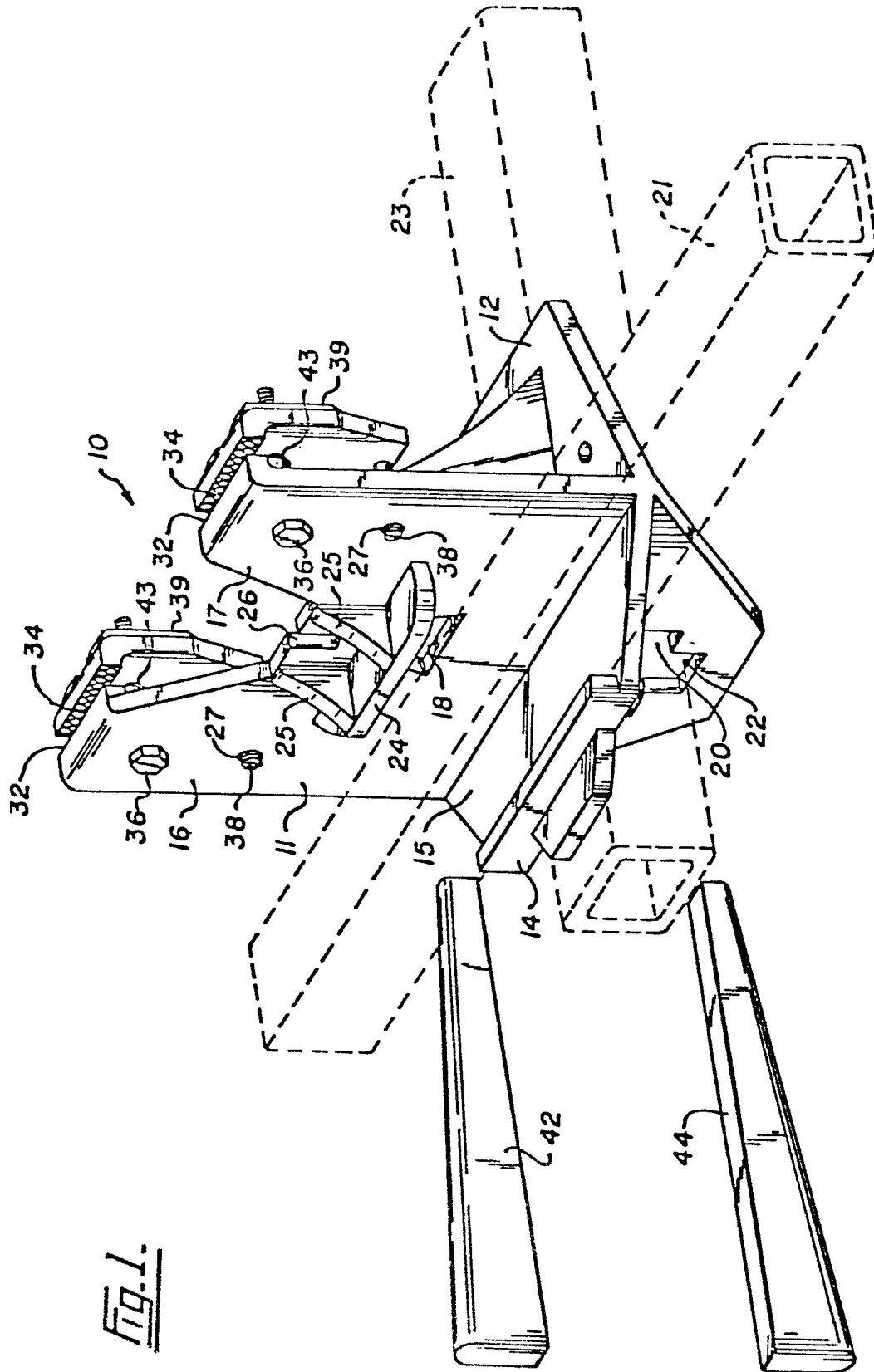


Fig. 2.

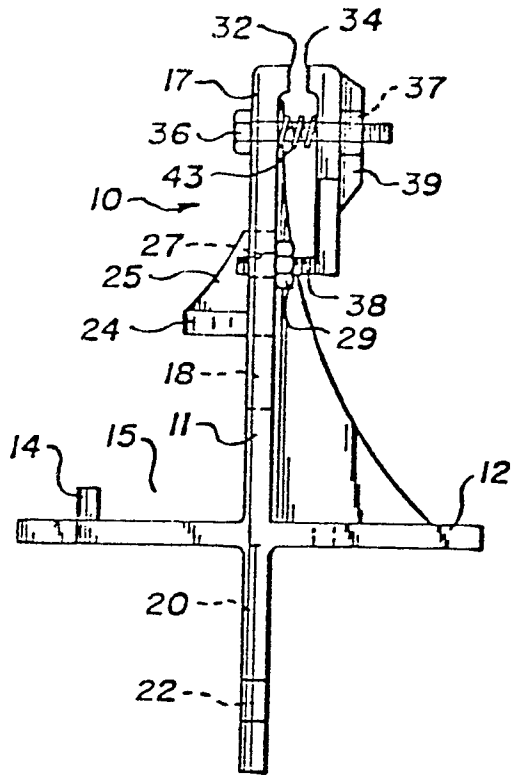


Fig. 3.

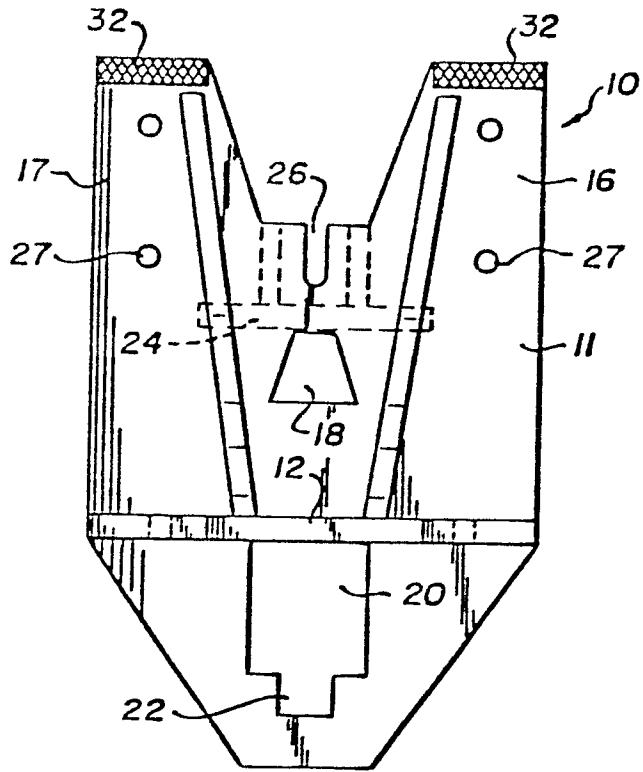


Fig. 4.

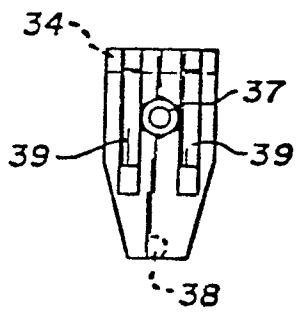
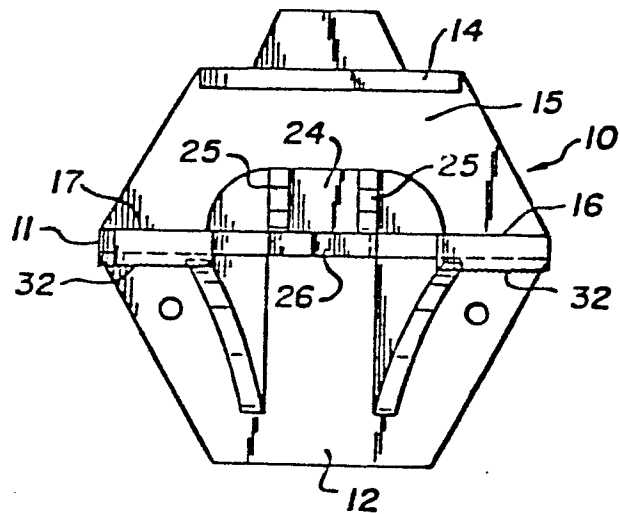
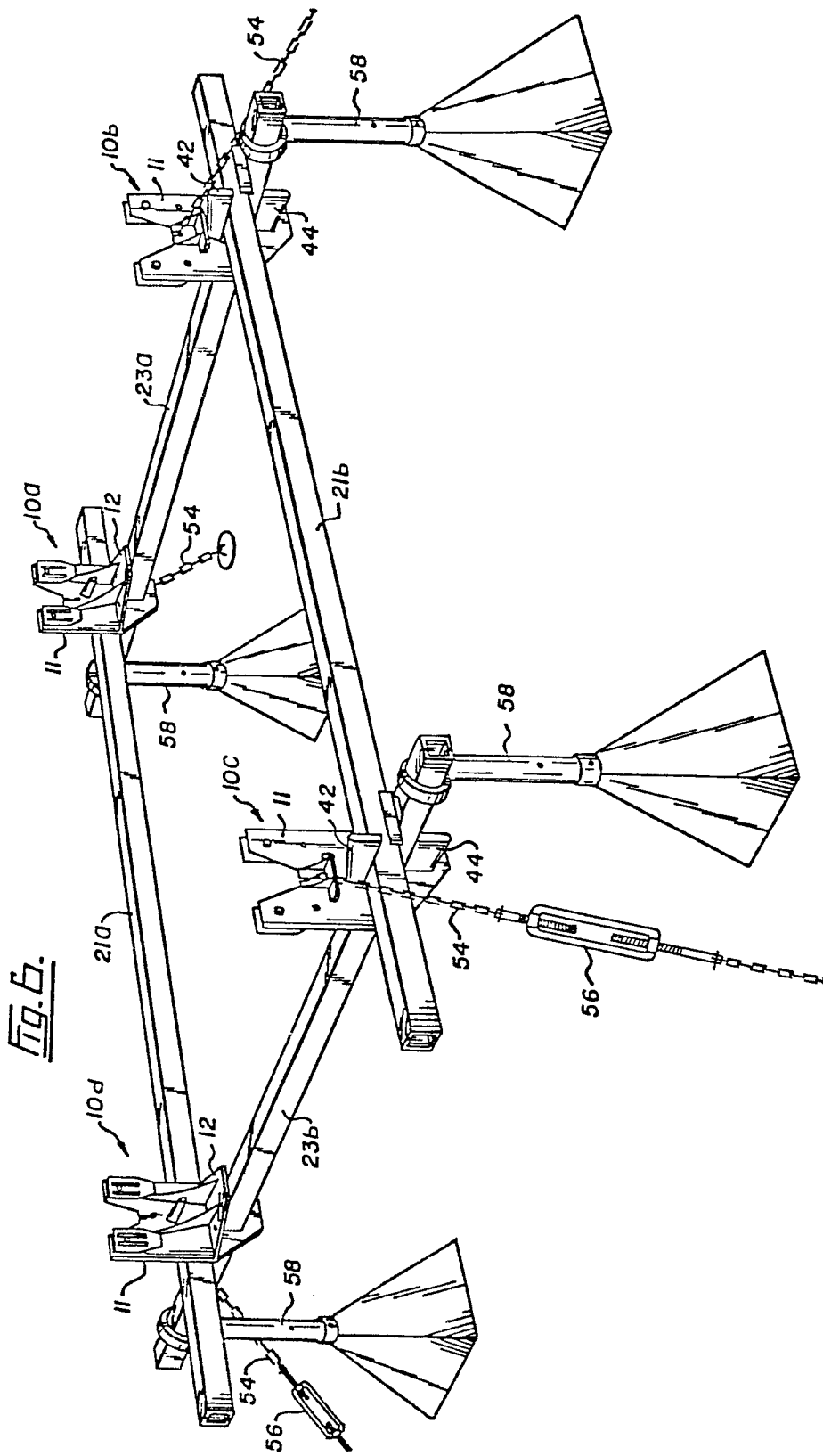
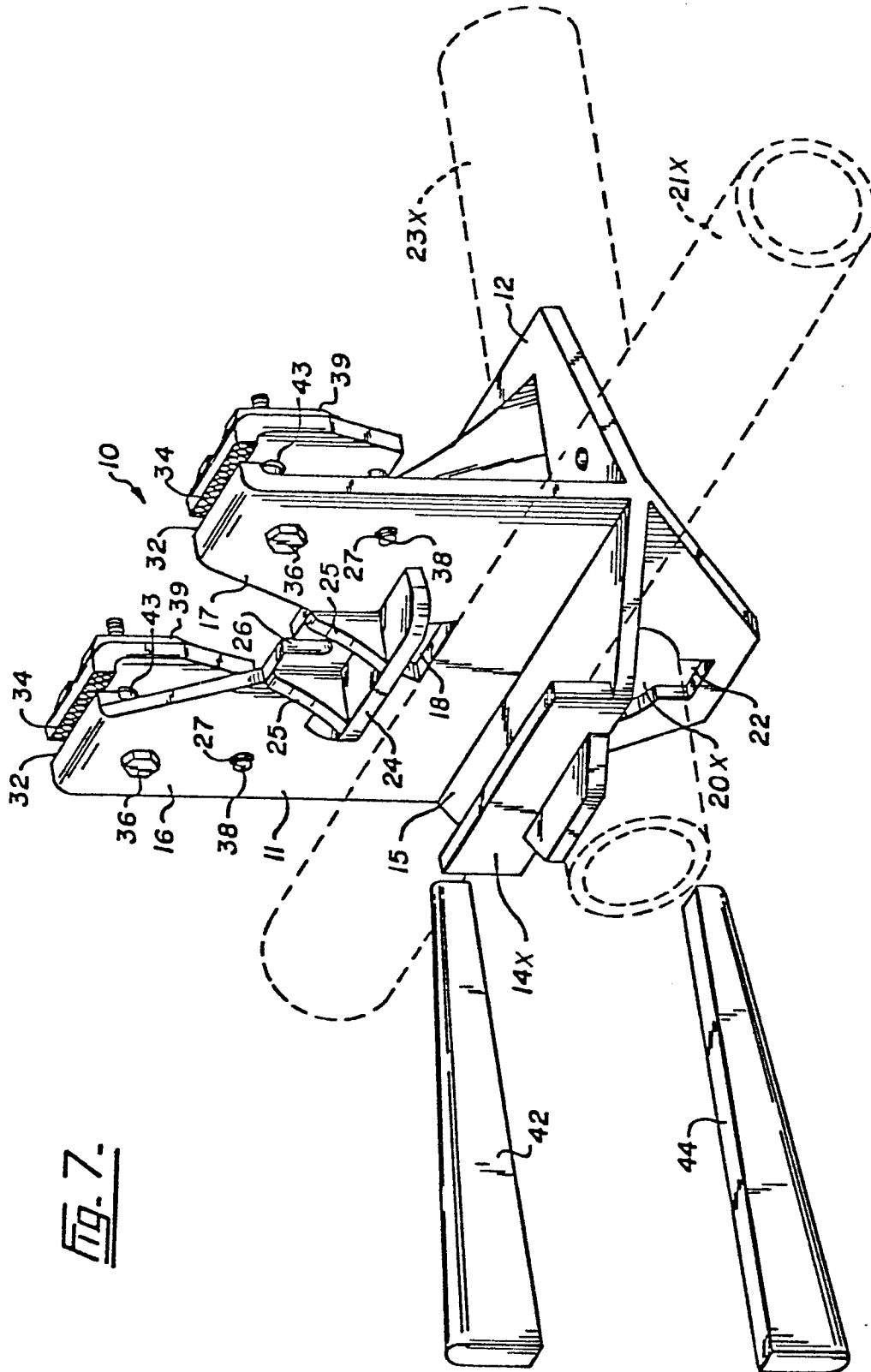


Fig. 5.









DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE-A-2 718 241 (VOLKSWAGENWERK) * Figure 1 *		B 60 S 5/00
A	DE-A-2 745 807 (CELETTE) * Figure 2 *		
A	DE-A-2 834 277 (APPLIED POWER)		
A	US-A-3 921 433 (W.D. WHITNEY) * Figures 7-9 *		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 21 D 1/00 B 60 S 5/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 12-12-1984	Examiner BECKER W D H
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	