

1 STAB-IN REMOVABLE END CLIP

2 BACKGROUND OF THE INVENTION

3 The invention pertains to grid for
4 suspended ceiling construction and, in particular,
5 to an improved end connection for such grid.

6 Suspended ceilings are typically provided
7 with a supporting grid work of main runners and
8 cross runners. Ordinarily, the runners have the
9 form of an inverted "T" and are thus called main
10 tees and cross tees. Conventionally, a cross runner
11 end connects at a hole or slot in the main runner
12 with the main runner and, in tandem, with another
13 cross runner end. The holes are located with a
14 regular spacing along the length of the main runner
15 establishing the pattern of the grid, i.e. the
16 center-to-center spacing of the cross runners. The
17 great majority of connections in the construction of
18 a ceiling grid are of the cross runner end type.

19 Primary factors in the commercial
20 acceptance of a cross runner connector are the ease
21 with which it can be reliably interconnected and, to
22 a lesser but important extent, the ease by which it
23 can be disconnected. A variety of end connector
24 designs have been proposed to the industry to
25 facilitate the original erection of a grid and its
26 potential removal for various purposes such as the
27 correction of errors, last minute architectural
28 changes, and access for later installed equipment
29 including plumbing, heating, air conditioning,
30 wiring and the like. Examples of prior art
31 connectors are shown in U.S. Patents 4,108,563,
32 4,611,453 and 4,779,394.

SUMMARY OF THE INVENTION

The invention provides a connector for ceiling grid cross runners that is easy to install and that can be removed without tools even after full assembly into a trapped module condition. The disclosed connector establishes a first end lock with the slot of the main runner and then a runner-to-runner lock when an identical connector of an opposed cross runner is assembled in the slot from the opposite side. The connector for both the first end lock and the lock with the opposed cross runner is installed with a simple stab-in motion. This effort requires no extraneous motion such as a hook-in manipulation of the connector and the runner carrying it. The disclosed connector cooperates with a simple slot or hole configuration that has a single cell or pod so that the connector cannot be inadvertently caught in the wrong side of the slot. The first end lock is sufficient in strength to support its cross runner in a cantilever mode until the free end of this runner can be set in place thereby affording greater productivity and reduced risk of product damage or loss from accidental fall out. The runner-to-runner lock, sometimes called the connector-to-connector lock, of the disclosed connector produces precise grid dimensions and high connection strength.

In accordance with the invention, both the elements that provide the first end lock and the elements that provide the connector-to-connector lock are releasable without tools by simple hand manipulation of the main runner relative to the cross runner.

Besides the foregoing attributes, it is an object of the invention to provide the following

1 features: low requisite skill level on the part of
2 the installer, reusability, assured quality, and
3 assured building code compliance for seismic and
4 fire rated applications. The requisite skill for
5 installation is of a low level because, in addition
6 to the features mentioned above, an audible click is
7 produced when a connector is fully inserted and, at
8 the same time, full assembly can be visually
9 assured.

10 BRIEF DESCRIPTION OF THE DRAWINGS

11 FIG. 1 is a fragmentary perspective view
12 of the ends of an opposed pair of cross runners with
13 end connectors and aligned with a receiving slot in
14 a main or through runner;

15 FIG. 2 is a side elevational view of a
16 typical connector, shown in FIG. 1, and an
17 associated portion of its runner;

18 FIG. 2A is a fragmentary sectional view of
19 the connector taken in the plane at the lines 2a-2a
20 indicated in FIG. 2;

21 FIG. 2B is a fragmentary sectional view of
22 the connector taken in the plane at the lines 2b-2b
23 indicated in FIG. 2;

24 FIG. 2C is a fragmentary sectional view of
25 the connector taken in the plane at the lines 2c-2c
26 indicated in FIG. 2;

27 FIG. 2D is a fragmentary sectional view of
28 the connector taken in the plane at the lines 2d-2d
29 indicated in FIG. 2;

30 FIG. 3 is a front end elevational view of
31 the connector;

32 FIG. 4 is a fragmentary bottom view of the
33 connector;

34 FIG. 5 is a rear elevational view of the
35 connector;

1 FIG. 6 is a side elevational view of a
2 first cross runner connector inserted into the slot
3 of a main runner;

4 FIG. 7 is a fragmentary elevational view
5 taken in the plane indicated by the lines 7-7 in
6 FIG. 6 of the connector assembled in the respective
7 slot, of the main runner as well as an adjacent slot
8 without a connector;

9 FIG. 8 is a view similar to FIG. 6 showing
10 a pair of opposed connectors assembled and locked
11 together in a main runner slot; and

12 FIG. 9 is a view similar to FIG. 8 but
13 with the runners being forcibly displaced for the
14 disassembly of one of the connectors and its cross
15 runner.

16 DESCRIPTION OF THE PREFERRED EMBODIMENT

17 FIG. 1 illustrates a portion of a main or
18 through runner 10 and cross runners 11 forming
19 intersections in a suspension ceiling grid system in
20 accordance with the present invention. In the
21 illustrated embodiment, all of the runners 10 and 11
22 are tees formed with a central web 13, a stiffening
23 bulb 14 along one edge of the web 13, and oppositely
24 extending panel supporting flanges 16 along the
25 lower or opposite edge of the web. Ordinarily, the
26 runners 10, 11 are assembled with their longitudinal
27 axii lying in a horizontal plane and their webs 13
28 lying in vertical planes. It should be understood,
29 however, that in accordance with the broader aspects
30 of the invention, the disclosed connecting structure
31 can be applied to other forms of grid tees or
32 runners and that the particular tee structure is
33 illustrative of one preferred embodiment of this
34 invention. It should be further understood that the

1 grid tees are typically formed of thin sheet metal
2 which is bent to the cross section illustrated.
3 However, in accordance with the invention, the grid
4 tees can be formed in other ways, e.g. by extrusion
5 or the like.

6 In many grid systems for suspension
7 ceilings, a horizontal array of parallel, laterally
8 spaced main tees or runners are supported from the
9 building structure above the grid by wires or the
10 like, and cross tees or runners interconnect with
11 the main runners, with two opposed cross runner ends
12 positioned on opposite sides of the main runner at
13 each intersection. However, this invention is also
14 applicable to basket weave type grid systems in
15 which main runs and cross runs are not provided,
16 strictly speaking. Both types of grid systems,
17 however, provide intersections in which a through
18 runner extends past opposed runner ends which
19 interconnect with the through runner at
20 intersections. Therefore, as used herein, the term
21 "through runner" is used instead of "main runner" so
22 as to encompass basket weave grid systems, main run
23 and cross run grid systems, and other types of grid
24 systems which may incorporate the present invention.

25 Typically, the runners of a suspension
26 ceiling grid system are interconnected to form
27 rectangular or square openings bounded by flanges
28 16. Ceiling panels or fixtures such as lights and
29 air vents are then positioned in such openings and
30 are supported around their periphery by the
31 associated flanges 16.

32 Referring particularly to FIGS. 1 and 7,
33 the web 13 of the through runner 10 is formed with a
34 connector opening 18, and the ends of the two cross
35 runners 11 are provided with identical connectors

1 19. In the illustrated embodiment, the connectors
2 19 are formed of separate elements and are connected
3 to the webs 13 of the runner ends by a clinch-like
4 connection 21 known in the art.

5 FIG. 1 illustrates the runners before
6 either connector is installed in the opening 18.
7 FIGS. 6 and 7 illustrate the condition after the
8 connector 19 of the first runner end is installed in
9 the opening 18 and is held therein by the first end
10 lock discussed below. FIG. 8 illustrates a
11 completely assembled intersection of two runners 11
12 and the through runner 10.

13 A connector 19 is preferably stamped from
14 high strength steel. Major surface areas of the
15 connector 19 retain their original planar
16 configuration and represent the plane of the
17 connector body while other areas described below are
18 stamped out of the original plane. The connector 19
19 which in use normally lies in the vertical plane of
20 its runner web 13, has a lead end 26 with an
21 irregular, somewhat angular profile. The lead end
22 26 includes a generally vertical lead edge or nose
23 27, a lower minor bevel 28 and a major upper bevel
24 29; the bevels 28, 29 facilitate insertion of the
25 connector 19 into the slot 18 of the through runner
26 10. A lower edge 31, lying in a vertical plane
27 transverse to the plane of the connector, is adapted
28 to abut the web 13 of the through runner 10. Along
29 its upper edge, the connector 19 includes a pair of
30 projections 32, 33 providing opposed abutment or
31 stop edges 34, 35 facing rearwardly and forwardly,
32 respectively. The rear edge 34 of the forward
33 projection 32 is spaced horizontally from the lower
34 vertical edge 31 a distance at least as great as the
35 thickness of the web 13 of the through runner 10.

1 The forward edge 35 of the rear projection is spaced
2 slightly rearwardly of the lower edge 31 so that
3 with respect to the forward projection 32, it also
4 provides for the thickness of the through runner web
5 13. The height of the forward projection 32 above a
6 lower edge 37 of the lead end 26 is less than the
7 height of the slot 18 so that the projection 32 does
8 not hinder insertion of the lead end into the slot.
9 As will become apparent, when the connector 19 is
10 installed, the web 13 of a through runner is
11 positioned between the front projection 32, at one
12 side, and the lower edge 31 and rear projection 33
13 to the other side.

14 A generally U-shaped flag or lock tab 41
15 is lanced from the plane of the connector 19. The
16 interior profile of the tab 41 is formed by a D-
17 shaped hole that has a straight vertical edge 42 at
18 a predetermined spacing from the lead edge 27 so as
19 to leave a strap 45 therebetween of fixed horizontal
20 width. The tab 41 extends rearwardly and laterally
21 outwardly (above the plane of the drawing of FIG. 2)
22 from a base or bend line that is generally
23 coincident with the hole edge 42. The free end of
24 the tab 41, remote from its base adjacent the edge
25 42, has an upwardly angled lower edge 43 and a
26 downwardly angled bend line 44 mutually converging
27 toward a rearward vertical edge 46. A flap section
28 47 of the tab 41 generally rearward of and above the
29 bend line 44 is bent inwardly to return towards the
30 plane of the connector 19. The free edge 46 of the
31 tab 41 is generally in the same imaginary vertical
32 plane, transverse to the plane of the connector 19,
33 as is the rear edge 34 of the forward projection 32.

34 Spaced rearwardly of the lock tab 41 is a
35 pair of oppositely facing locking projections 51, 52

1 formed from the plane of the connector 19 to a side
2 opposite that from which the tab projects. The
3 projections 51, 52 are spaced from one another by an
4 hour glass shaped hole 53. The projections 51, 52
5 are essentially mirror images of one another with
6 each having a configuration loosely resembling three
7 sides of a pyramid. The rearward projection 52 can
8 be slightly larger in its extension from the plane
9 of the connector 19. Edges 56, 57 of the
10 projections 51, 52 formed by the hole 53 are out of
11 plumb with respect to a vertical line so that they
12 form a point or apex 58, 59 as viewed, for example,
13 in FIG. 2 and FIG. 4 and so that they present a
14 slight undercut with reference to the rearward and
15 forward directions from their respective points 58,
16 59. The horizontal spacing between the projection
17 points 58, 59 is desirably just slightly larger than
18 the horizontal width of the strap 45. As shown, the
19 hole 53 has the same elevation as the strap 45.

20 Along its bottom, the connector 19 is
21 formed with a longitudinal stiffening flange 61
22 created by stamping the relevant area out of the
23 plane of the connector to the side where the tab 41
24 is located. The flange 61 lies in a vertical plane
25 and is connected to the main portion of the body of
26 the connector 19 by a laterally downwardly slanted
27 web area 62 (FIG. 3). The forward extent of the
28 flange 61 and web 62 form the edge 31. A stiffening
29 rib 63 is embossed in the body of the connector 19
30 above the locking projections 51, 52 to the side
31 carrying the tab 41. The rib 63 extends
32 longitudinally, i.e. horizontally, from the zone
33 between the projections or stops 32, 33 to a zone
34 between the projections 51, 52 where it merges with
35 a stiffening flange 64. The flange 64 has a side

1 profile that slants upwardly from the rib 63 and
2 then longitudinally like the lower flange 61. The
3 rib 63, which in assembly with the through runner 10
4 extends through the plane of the through runner web
5 13, works with the flanges 61, 64 to increase the
6 compressive and bending strength of the connector to
7 reduce damage from rough handling or seismic shock.

8 Two vertically aligned holes 66 are
9 punched in the rear portion of the connector 19 to
10 enable it to be joined to a runner end 11 at the
11 clinch-like connections 21. Preferably, the end of
12 each runner 11 is embossed with a shallow pocket 67
13 having dimensions large enough to receive the rear
14 portion of the connector 19. The lateral depth of
15 the pocket is sufficient to generally make the
16 associated runner 11 laterally centered with the
17 slot 18.

18 The slot 18 which is elongated in the
19 vertical direction has a polygonal profile with a
20 central plane of symmetry. At its upper and lower
21 ends, the slot 18 has short sides or ends 71, 72
22 respectively. At the upper end or short side 71,
23 the slot 18 has opposed vertical sides 70 from which
24 it diverges outwardly to an intermediate width
25 formed by two opposed vertical sides or edges 73. A
26 mid-section 74 of the slot is formed, with reference
27 to a downward vertical direction, by diverging edges
28 78, parallel vertical edges 77 and converging edges
29 80. The lower section of the slot 18 includes
30 vertical edges 79, converging edges 81 and vertical
31 edges 82. The spacing of the edges 70 and 82
32 respectively at each end of the slot 18 is
33 proportioned to closely confine the thickness of the
34 sheet stock of two connectors 19. The mid-section
35 74 represents the major width area of the slot 18.

1 While the illustrated slot 18 has its profile formed
2 as a polygon, equivalent arcuate segments can be
3 used to achieve desired results.

4 A first runner 11 is connected to a
5 through runner 10 by inserting the lead end 26 of
6 its connector 19 into a selected slot 18. More
7 specifically, this insertion technique involves a
8 stab-in motion essentially limited to translation
9 along the longitudinal or horizontal axis of the
10 runner 11. Hook-like motion, rocking motion or
11 other extraneous non-translation motion is
12 unnecessary. The connector 19 is thrust into the
13 slot 18 until the lead edge 35 of the trailing
14 projection 33 abuts the web 13 immediately above the
15 slot end 71. During this motion, the tab or flag 41
16 bears against the side of the slot 18 in the mid-
17 section 74 and by camming action therewith is
18 squeezed toward the plane of the main body of the
19 connector 19 until it passes fully through the slot
20 18. At this point, the tab 41 snaps back into its
21 free configuration emitting an audible click
22 essentially simultaneously with the seating of the
23 projection edge 35 against the through runner web
24 13. The audible click assists the installer in
25 ascertaining that the connector 19 has been fully
26 installed. This condition is illustrated in FIGS. 6
27 and 7. As shown in FIG. 7, the slot 18 and tab 41
28 are configured so that regardless of the lateral
29 position of the connector 19 in the slot, the free
30 vertical edge 46 of the tab is laterally outside of
31 at least portions of the slot so that the connector
32 19 is locked or caught on the web 13 of the through
33 runner 10 because the tab 41 under ordinary axial
34 forces cannot simply move axially back out of the
35 slot.

1 Still with reference to FIG. 6, a single
2 connector 19 in the slot 18 provides a so-called
3 first end lock capable of supporting the associated
4 runner 11 as a cantilever from the through runner
5 10. The tab 41 locked on the far side of the
6 through runner web 13 is capable of supporting the
7 runner 11 against axial pull-out forces occasioned
8 by an ordinary cantilever condition. Pivoting
9 motion about a contact area, indicated at 76 in FIG.
10 6 between an offset 75 of the cross runner flange 16
11 and the through runner flange 16, in a cantilever
12 condition, causes the connector 19 to rise slightly
13 in the slot 18 and, consequently, the projection
14 edge 34 to contact the adjacent face of the web 13
15 immediately above the slot. This contact prevents
16 further pivotal movement contributing to the first
17 end lock and the connector's assured resistance to
18 ordinary cantilever forces. The described ability
19 of the connector 19 to provide cantilever support of
20 the associated runner 11 is very helpful in the
21 installation of a ceiling grid since it allows the
22 runner to be temporarily supported at one end until
23 the installer has an opportunity to connect the
24 opposite end (not shown) of the relevant runner,
25 typically, to another through runner. It will be
26 understood from the foregoing disclosure with
27 reference particularly to FIG. 7, that the connector
28 19 cannot be improperly assembled in the simple slot
29 18 as may be the case where a receiving slot is H-
30 shaped or otherwise re-entrantly configured with
31 pods or pockets that can trap a connector on the
32 wrong side of such slot.

33 A second runner 11 is connected to the
34 through runner 10 by inserting its connector 19 into
35 the slot 18 occupied by the first connector 19. In

1 the illustrated design, the second connector 19 is
2 inserted in the slot 18 to the left of the first
3 connector 19 (when viewed from a reference point
4 associated with the main part of this second runner
5 being installed). Again, this installation is
6 accomplished by a stab-in motion parallel to the
7 longitudinal or horizontal axis of the runner being
8 installed. Besides effecting a lock of the
9 associated tab 41 through the slot 18 (with an
10 audible click), the assembly motion of the second
11 connector 19 produces a connector-to-connector lock
12 sometimes referred to as "hand shaking". This
13 condition is depicted in FIG. 8 where it can be seen
14 that upon full assembly of both connectors 19 in a
15 slot 18 (with their stop edges 35 abutting or close
16 to the faces of the web 13), the strap 45 of one
17 connector 19 is received and locked between the
18 projections 51, 52 of the other connector and vice
19 versa. This result is achieved by the pyramid
20 configuration of the lead or front projection 51; a
21 face 83 (FIG. 1) of each projection 51 works as a
22 cam to deflect the advancing strap 45 of the
23 opposite connector laterally outwardly and past this
24 first or lead projection 51 until the strap is able
25 to snap back into its plane and between the opposed
26 projections 51, 52 of the receiving or opposite
27 connector.

28 A study of FIG. 7 reveals that when
29 contact between the rib 63 and the adjacent vertical
30 slot edge 73 is established, the connector 19 is
31 confined laterally. Thus, when two connectors 19
32 are assembled in the same slot 18, significant
33 lateral movement is prevented and the connectors are
34 snugly held laterally against one another and a
35 precisely controlled module length is achieved

1 throughout a ceiling grid. This confinement assures
2 that the straps 45 are held in the space between
3 pairs of projections 51 and 52 for a reliable
4 connection.

5 As discussed earlier, the width of the
6 strap 45 in the longitudinal direction of the runner
7 11 is just slightly less than the gap between the
8 points or apexes 58, 59 of the projections so that
9 the connectors 19 and their associated runners 11
10 are precisely positioned relative to one another.
11 On each side of the through runner web 13, a strap
12 45 is restrained in tension and compression by the
13 adjacent projections 51, 52. An exceptionally high
14 restraining force level is achieved by the undercut
15 provided by the receding or non-plumb edges 56, 57.
16 This high restraining force results from the tongue
17 and groove configuration provided by the strap 45
18 and projections 51, 52, respectively. In
19 particular, the strap 45 acting as a tongue under a
20 generally axial force between joined connectors
21 extends into a generally vertical groove or undercut
22 laterally underlying each of the projection points
23 58 or 59 resulting from the angularity or out of
24 plumb orientation of the edges 56, 57. By extending
25 into such a groove or recess the strap and adjacent
26 portions of the connector are positively gripped and
27 prevented from bending laterally out of abutting
28 contact with the opposed connector.

29 It will be understood that each of the
30 runners 11 ordinarily has a connector 19 identical
31 to that disclosed herein on the end opposite that
32 shown in the figures.

33 Occasionally, it becomes necessary to
34 remove a connector 19 of a cross runner 11 from the
35 slot 18 of a through runner 10 as in the case where

1 an error has been made in the original assembly or
2 where remodeling and reconstruction is performed.

3 With reference to FIG. 9, there is shown a
4 manner by which a connector 19 and its associated
5 runner 11 may be disassembled from a fully installed
6 condition with a through runner and a connector 19
7 of an opposed runner 11. It will be understood that
8 the depiction in FIG. 9 is that of the situation
9 where the runner 11 to be removed is in a so-called
10 trapped module condition where its ends, at the
11 beginning of the removal process, are each fully
12 assembled with an opposed connector and a through
13 runner. Initially, for disassembly, the associated
14 through runner 10 is twisted on its longitudinal
15 axis towards the inclined temporary position
16 illustrated in FIG. 9. In order for the through
17 runner 10 to reach this position, it is necessary
18 for the projection or stop 33 of the connector 19 on
19 the left in FIG. 9 to cut through the material of
20 the web 13 of the through runner in the local area
21 of the slot end 71. This is readily accomplished
22 manually without tools particularly where, as
23 disclosed, the connector 19 is of a high strength
24 material and is harder than the metal material
25 comprising the through runner web 13. As shown, the
26 height of the connector to the rear of the
27 projection 33 is reduced to receive the temporarily
28 twisted through runner web 13.

29 As the through runner 10 is being twisted and
30 cut by the projection 33, the inwardly bent flap section
31 47 of the tab 41 enters the relatively wide mid-section
32 74 of the slot 18. The configuration of the slot
33 profile formed by the edges 78, 77 and 80 and the re-
34 entrant or bent-in orientation of the flap section 47
35 permits the flap section following the twisting of

1 the through runner to resiliently cam the tab 41
2 laterally inwardly towards the center of the slot
3 thereby permitting the tab to pass back out through
4 the slot.

5 With the through runner 10 twisted or
6 cocked to the position indicated in FIG. 9 it will
7 be understood that the connector 19 of the runner 11
8 on the right is enabled to move upwardly with
9 respect to the connector 19 of the opposed runner 11
10 since the former connector, by virtue of the
11 clearance provided by its bevel 29, is not confined
12 by the top edge 71 of the slot 18. Vertical
13 relative movement of the connectors 19 allows the
14 straps 45 of each of the connectors to move out of
15 the pockets formed by the projections 51, 52 of the
16 other connector as the result of a camming action
17 where the face of one connector slides across the
18 faces of the projections 51, 52 of the other
19 connector. At this point the projections 51, 52
20 release their connection of the other connector and,
21 as a result, the rightward runner 11 is released
22 from both the opposed runner 11 and the through
23 runner 10. The runner 11 can be completely released
24 by performing a similar operation at its opposite
25 end (not shown).

26 It will be understood that the release or
27 removal of a connector 19 from the opposite
28 connector 19 to which it is coupled and the slot 18
29 of the through runner 10 is accomplished without
30 tools. It can also be understood that, likewise
31 without tools, a first end connection or lock, i.e.
32 where only one connector 19 exists in a slot 18, can
33 be released from the slot 18 by manually
34 manipulating the cross runner relative to the
35 through runner so that a condition similar to that

1 of FIG. 9 is approached and the flap section 47 is
2 enabled to cam the tab 41 laterally inwardly and
3 allow it to escape from the slot. It will be
4 understood that when the through runner 10 is tilted
5 or twisted about its longitudinal axis, the flap
6 section 47 of the tab 41 is disposed at a point
7 where it will readily enter the major opening area
8 74 of the slot and as the twisting motion continues,
9 the tab 41 is cammed inwardly until, ultimately, the
10 edge 46 can pass completely out of the slot and the
11 connector 19 is released. In the case where only a
12 single connector 19 exists in a slot 18 and the
13 associated cross runner is cantilevered, it may be
14 removed by its own manipulation without significant
15 twisting of the through runner so long as the
16 relative angular positions of the through runner web
17 and the cross runner are caused to approach their
18 relative oblique condition illustrated in FIG. 9.
19 In twisting the through runner 10, and/or downwardly
20 rotating the cross runner 11 to be removed in the
21 case of a first end lock, it may be necessary to
22 resiliently deflect the flange 16 under the
23 connector 19 downwardly and may be necessary for the
24 projection 32 to slightly cut through the through
25 runner web above the slot 18 for proper release. In
26 all cases of cross runner removal, the through
27 runner 10 and connector 19 are left in a state where
28 they can be re-used with essentially full
29 functionality except for the possible loss in a cut
30 slot of cantilever support of a cross runner.

31 The capability of the disclosed connector
32 to effect a connection by a simple stab-in motion
33 allows the installer to work from either below or
34 above the plane of the ceiling. This capability
35 thus offers greater flexibility to the installer.

1 The ability to remove the connector without tools is
2 an advantage to the installer because it can be
3 accomplished in less time and with less effort than
4 ordinarily expended with prior connector designs.

5 It should be evident that this disclosure
6 is by way of example and that various changes may be
7 made by adding, modifying or eliminating details
8 without departing from the fair scope of the
9 teaching contained in this disclosure. For example,
10 with a runner made of appropriate material the
11 connector can be integrally formed with the runner
12 web. The projection 33 can be arranged to break or
13 bend out of the way of the through runner web 13
14 when the latter is forcibly twisted to release a
15 cross runner. The invention is therefore not
16 limited to particular details of this disclosure
17 except to the extent that the following claims are
18 necessarily so limited.

CLAIMS:

1 1. A connector for a ceiling grid cross
2 runner formed from a body of planar sheet metal
3 stock, the connector being adapted to be assembled
4 with horizontal movement into a vertically oriented
5 slot formed in a vertical web of a through runner,
6 the connector having a tab lanced from and extending
7 laterally of the plane of the body in a free
8 condition, the tab being resiliently deflectable
9 laterally inwardly by engagement with the side of
10 the slot to enable a portion of the connector
11 including the tab to pass through the slot in the
12 through runner when the connector is forced into the
13 slot and being capable of springing back towards its
14 free condition, the tab, in its free condition,
15 after passing into the slot, being arranged to
16 normally prevent the connector from being moved
17 rearwardly out of the slot when the web of the
18 through runner is in the normal vertical orientation
19 and a runner to which the connector is fixed extends
20 in a horizontal direction in transverse relation to
21 the through runner web, and a cam element operable
22 when the plane of the through runner web and the
23 runner to which the connector is fixed are displaced
24 from a transverse relation to compress the tab
25 laterally inwardly and enable it to be pulled
26 rearwardly back through the runner opening.

1 2. A connector set forth in claim 1,
2 wherein the cam element is integral with the tab.

1 3. A connector as set forth in claim 2,
2 wherein the cam element is formed by an inwardly
3 bent portion of the tab.



1 4. A connector as set forth in claim 1,
2 wherein the connector includes elements for
3 interengaging and releasably locking with an
4 identical connector assembled through the same slot
5 from an opposite side of the through runner web.

1 5. A suspension ceiling grid system
2 comprising elongated grid runners interconnected at
3 intersections including a through runner and two
4 opposed runners, said runners each including a
5 vertical web, an elongated vertically extending slot
6 in the web of the through runner, and an identical
7 generally planar end connector on an end of each of
8 said opposed runners projecting into said slot from
9 opposite sides thereof, the slot having opposed
10 sides that provide a width sufficient to receive
11 both of said connectors in laterally abutting
12 relation, the connectors each being arranged with
13 respect to the slot to provide a first end lock with
14 said slot, the slot having a configuration that
15 avoids the risk of receiving and laterally
16 restricting a connector to an incorrect one of its
17 sides, said slot and connectors having respective
18 configurations that allow the connectors to each be
19 installed in said slot with a stab-in motion and to
20 each be removed from said slot by relative
21 manipulation of said through runner and its
22 associated runner to release said first end lock
23 without tools.



1 6. A suspension ceiling grid system as
2 set forth in claim 5, wherein each connector and the
3 slot are arranged to release said first end lock by
4 manually manipulating the through runner relative to
5 the associated runner to dispose the web of the
6 through runner in a plane oblique to the
7 longitudinal direction of the associated runner.

1 7. A suspension ceiling grid system as
2 set forth in claim 5, wherein the first end lock
3 includes a tab projecting in a free condition
4 laterally outwardly from the plane of the connector
5 and adapted to be resiliently compressed towards the
6 plane of the connector to pass through the slot when
7 the connector is inserted in the slot, said tab
8 being arranged to snap back into its free condition
9 after passing through said slot to normally prevent
10 said connector from being pulled out of said slot.

1 8. A suspension ceiling grid system as
2 set forth in claim 7, wherein said tab includes a
3 flap bent inwardly towards the plane of the
4 connector, said flap providing a camming action to
5 compress said tab towards the plane of the connector
6 when the plane of the through runner web is
7 displaced into an oblique relation to the associated
8 runner.

1 9. A suspension ceiling grid system as
2 set forth in claim 8, wherein said connector
3 includes mutually engaging elements that produce a
4 connector-to-connector lock.



1 10. A suspension ceiling grid system as
2 set forth in claim 9, wherein said mutually engaging
3 elements are arranged to provide both tensile and
4 compressive interlocking.

1 11. A suspension ceiling grid system as
2 set forth in claim 5, wherein the slot is narrow at
3 opposite vertical ends and is widened at a mid-
4 section between said ends.

1 12. A suspension ceiling grid system
2 comprising elongated grid members interconnected at
3 intersections including a through runner and two
4 opposed runners, said runners each including a
5 vertical web, an elongated vertically extending slot
6 in the web of the through runner, and an identical
7 generally planar end connector on an end of each of
8 said opposed runners projecting into said slot from
9 opposite sides thereof, the slot having opposed
10 sides that provide a width sufficient to receive
11 both of said connectors in laterally abutting
12 relation, each connector being arranged to interlock
13 with the other connector when both are received in
14 said slot, the slot having a configuration that
15 avoids the risk of receiving and laterally
16 restricting a connector at a wrong one of its sides,
17 said slot and each connector having respective
18 configurations that allow the connector with its
19 associated runner to be installed in said slot with
20 a stab-in motion and be removed from said slot by
21 relative manipulation of said through runner and the
22 associated runner to release the interconnection of
23 said connectors without tools.



1 13. A suspension ceiling grid system as
2 set forth in claim 12, wherein the connector and
3 slot are arranged to release the connector-to-
4 connector lock by manually manipulating the through
5 runner relative to the associated runner to dispose
6 the web of the through runner in a plane oblique to
7 the longitudinal direction of the associated runner.

1 14. A suspension ceiling grid system as
2 set forth in claim 13, wherein said connector is
3 arranged to provide a first end lock with said
4 through runner web.

1 15. A suspension ceiling grid system as
2 set forth in claim 14, wherein said first end lock
3 provided by said connector is releasable without
4 tools by the manipulation of said through runner and
5 associated runner performed to release the
6 connector-to-connector lock.

1 16. A suspension ceiling grid system as
2 set forth in claim 12, wherein the slot is narrow at
3 opposite vertical ends and is widened at a mid-
4 section between said ends.

1 17. A connector on an elongated suspended
2 ceiling grid runner having a longitudinal axis, the
3 connector being adapted to mate with an identical
4 opposed connector through a hole in a through runner
5 web and comprising a generally planar metal body,
6 the body having a forward portion and an
7 intermediate portion, the forward portion being
8 arranged to laterally abut the intermediate portion
9 of an opposed connector, the forward portion and
10 intermediate portion of opposed identical units of



11 said connector having interlocking elements
12 including laterally extending edges that produce a
13 connector-to-connector lock, the interlocking
14 elements having a configuration when either a
15 tensile force or a compressive force is applied to
16 the connection of identical units of said connectors
17 to positively resist lateral separation between
18 abutting sets of said forward and intermediate
19 portions.

1 18. A connector as set forth in claim 17,
2 wherein the body has an embossed reinforcing rib
3 extending in a longitudinal direction along said
4 intermediate portion and adapted to extend through
5 the slot of the through runner.

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* C L N S *

1 STAB-IN REMOVABLE END CLIP

2 ABSTRACT OF THE DISCLOSURE

3 A connector for suspended ceiling grid
4 that provides a first end lock in a main tee slot
5 and a lock with an identical opposed connector. The
6 connector in the first end lock and in the
7 connector-to-connector lock is installed with a
8 simple stab-in motion. The connector works with a
9 non-re-entrant slot profile that avoids the risk of
10 improper assembly. The connector is releasable
11 without tools and is reusable. The connector emits
12 an audible click when fully installed, is resistant
13 to damage from rough handling, and affords high
14 tensile and compressive strength in its connections.

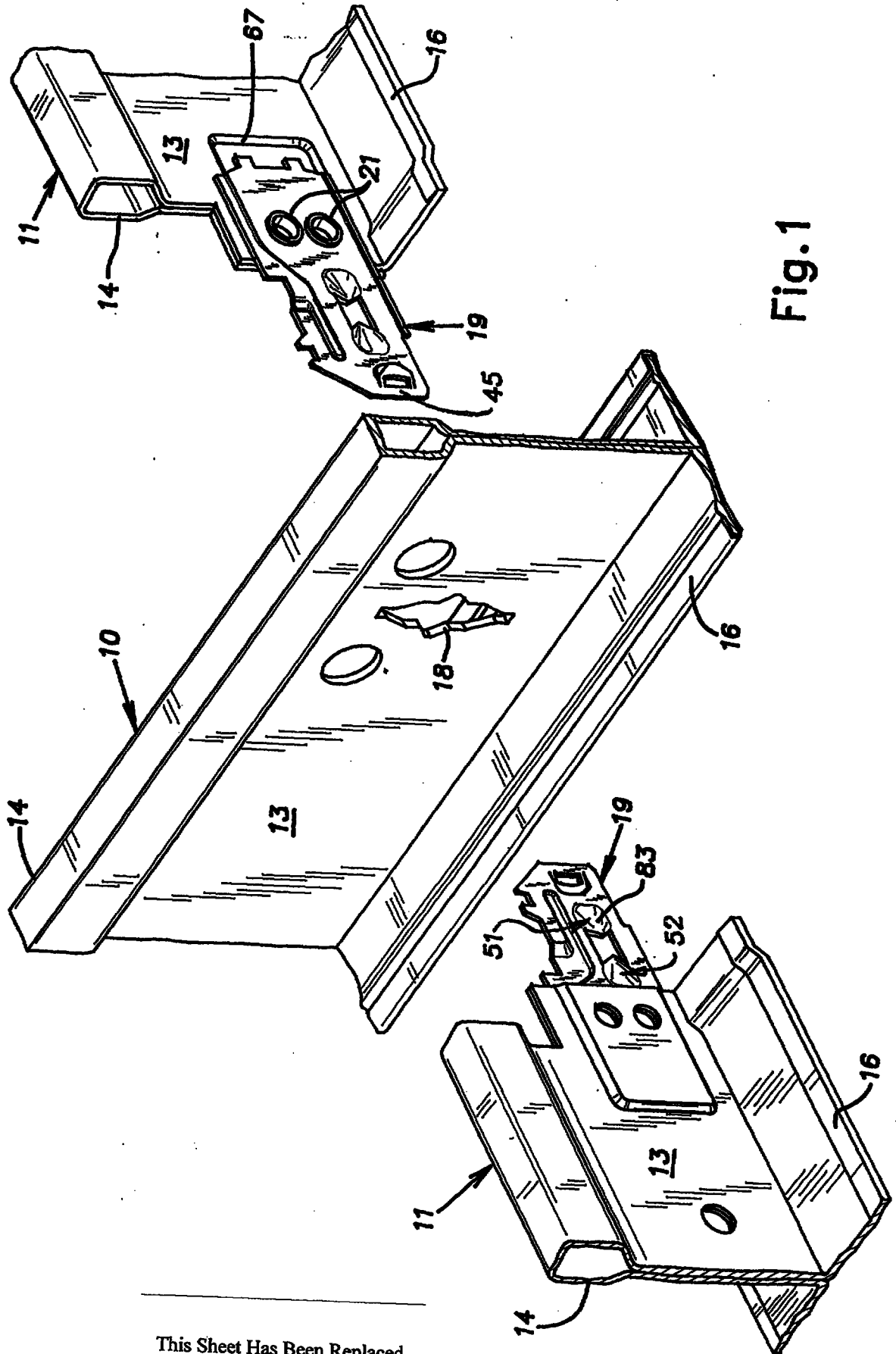


Fig. 1





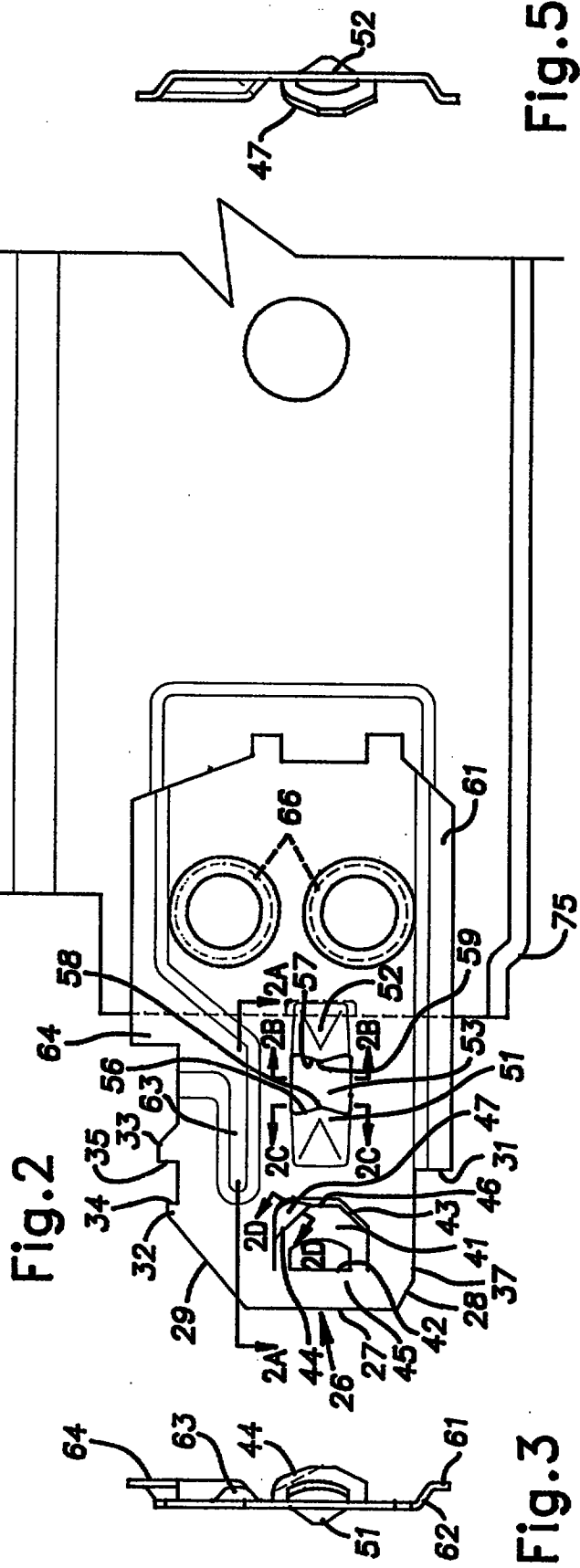


Fig. 5

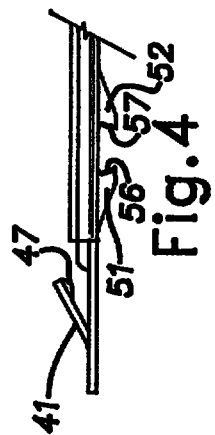


Fig. 4

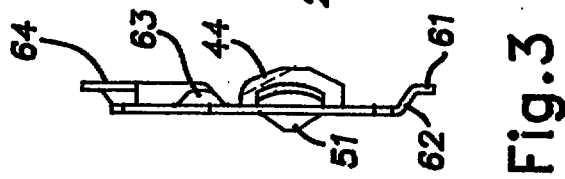


Fig. 3

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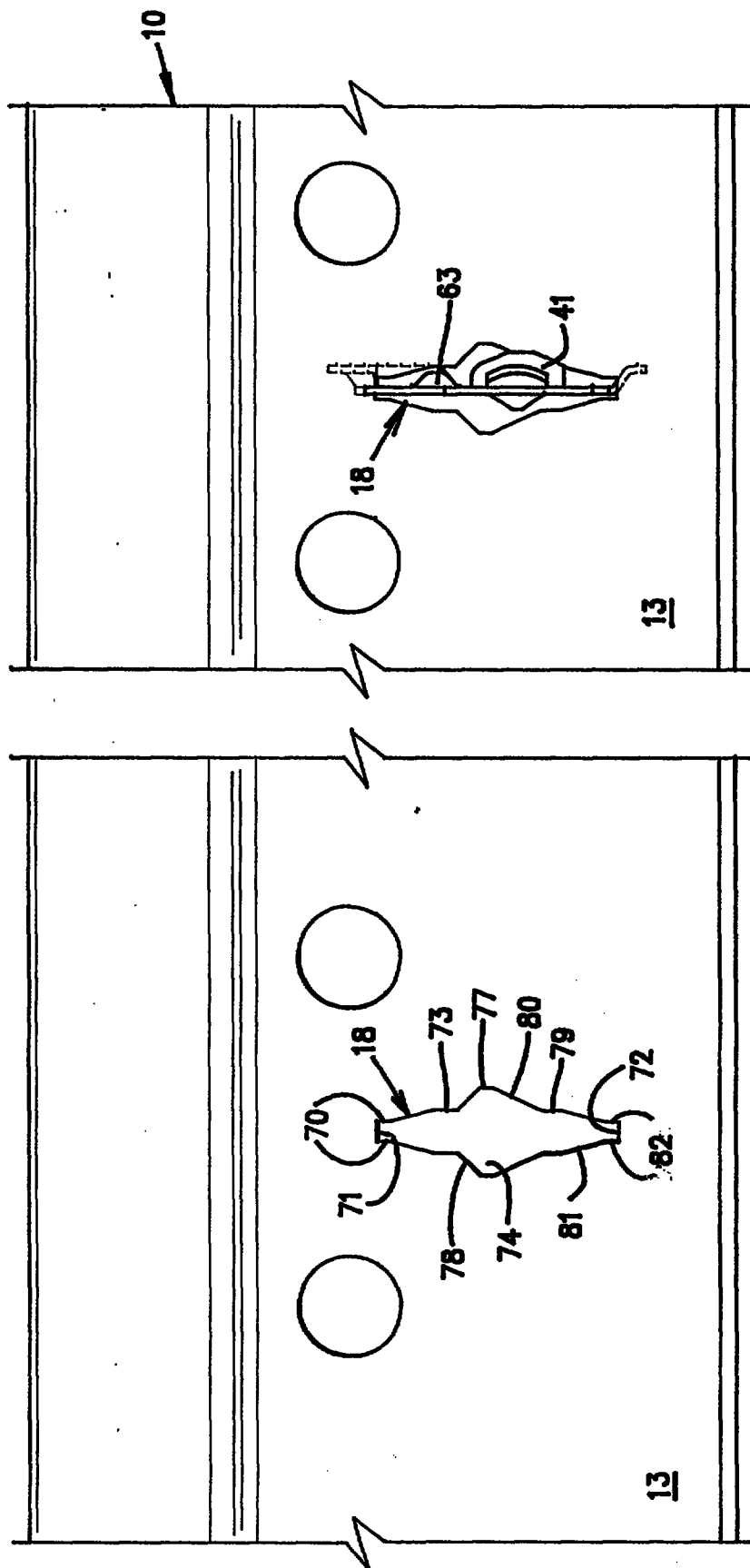


Fig.7



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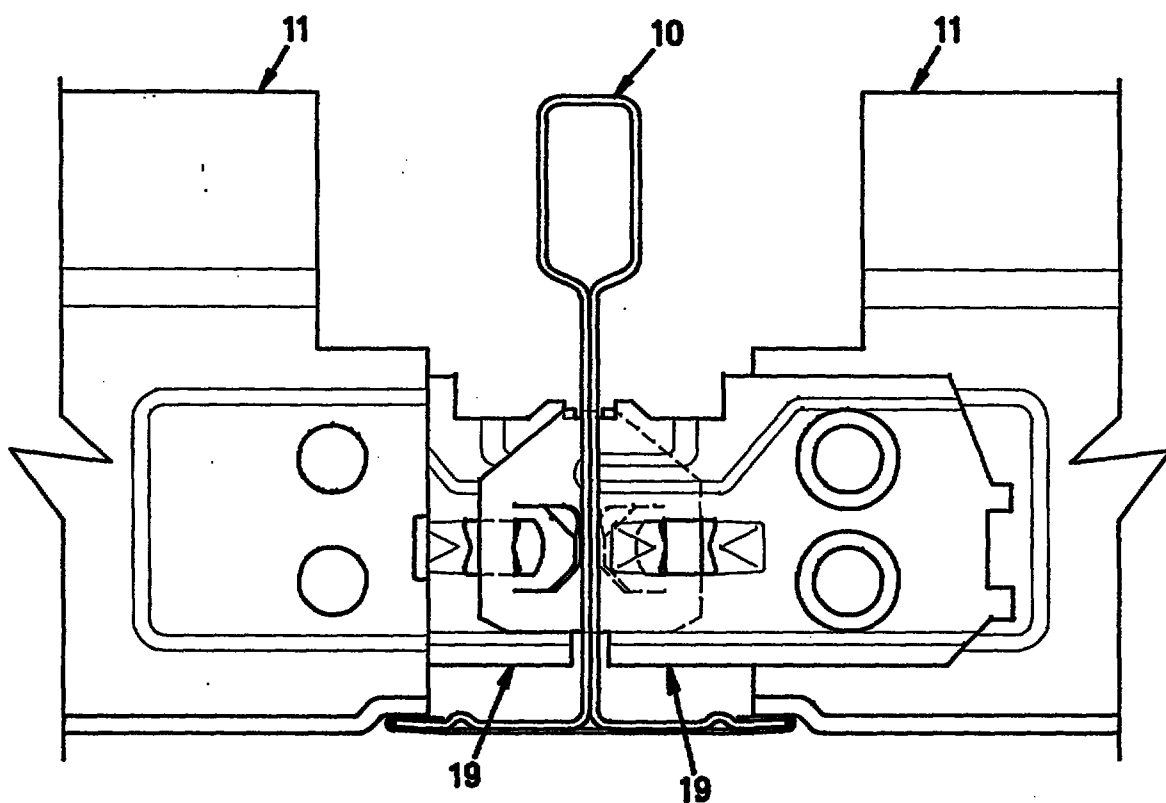
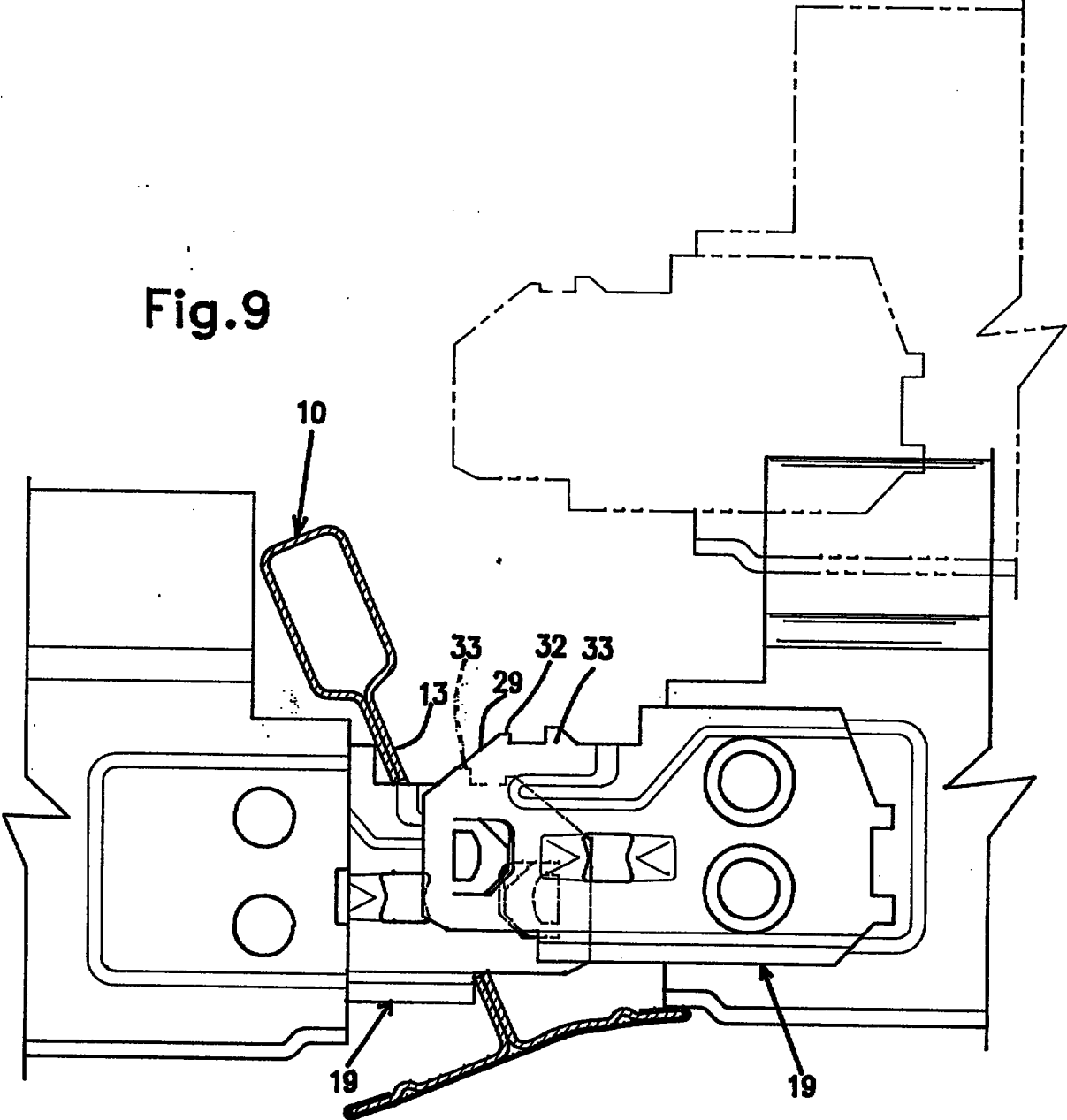


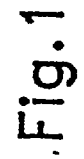
Fig.8



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Fig.9





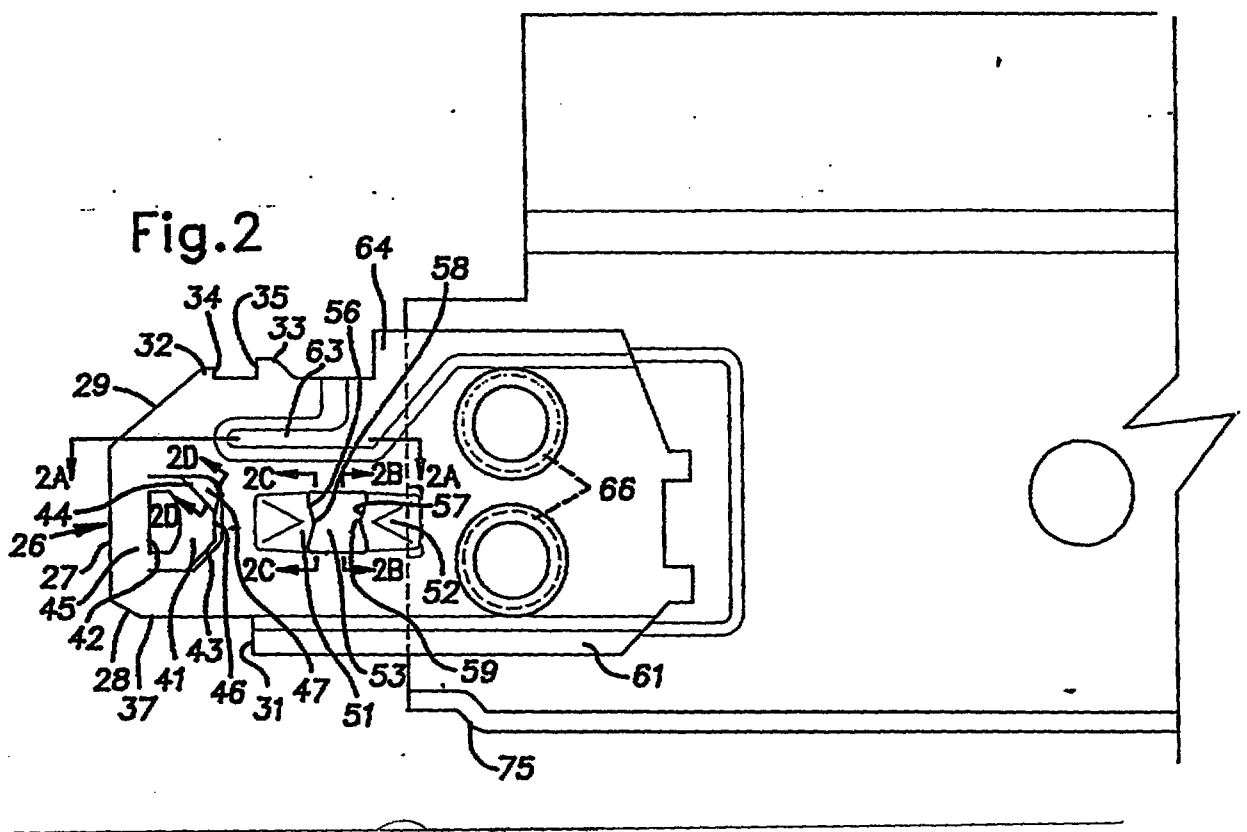


Fig. 2A



Fig. 2B



Fig. 2C



Fig. 2D

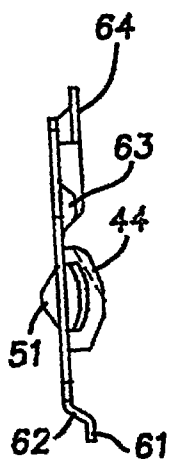


Fig.3

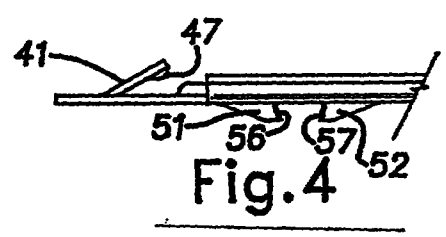


Fig.4

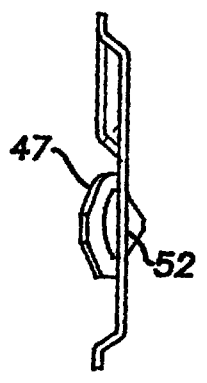


Fig.5

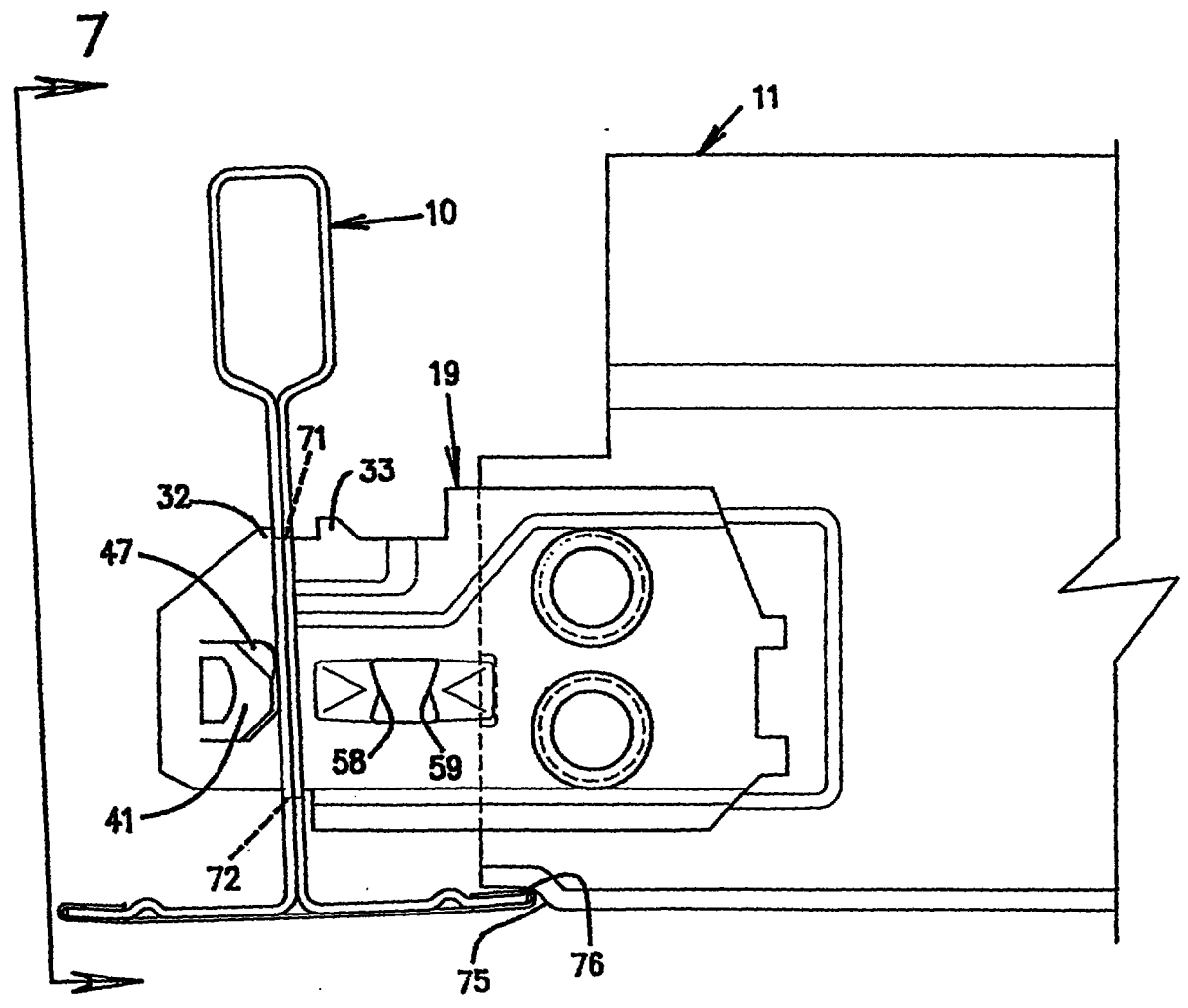


Fig.6

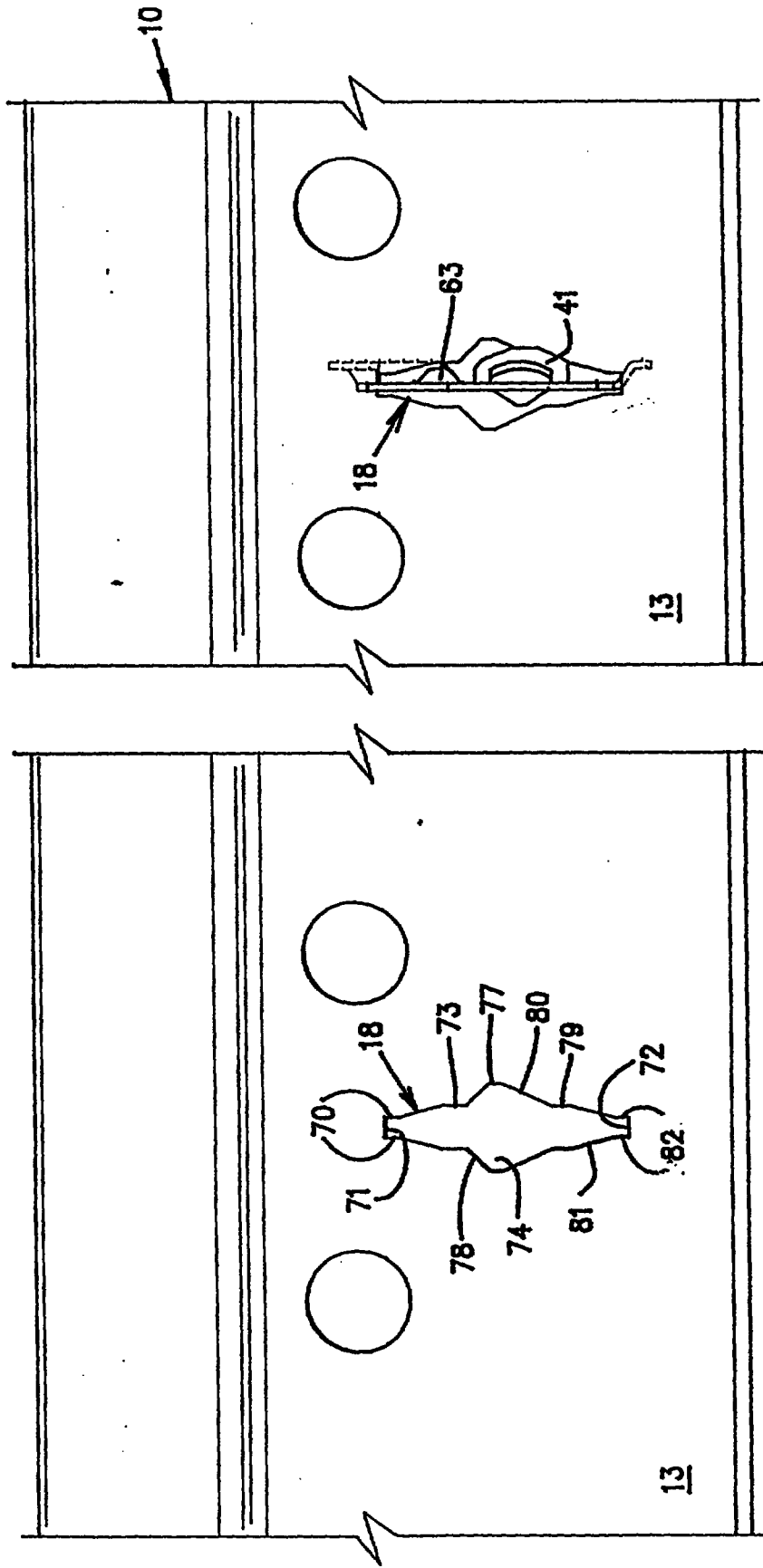


Fig.7

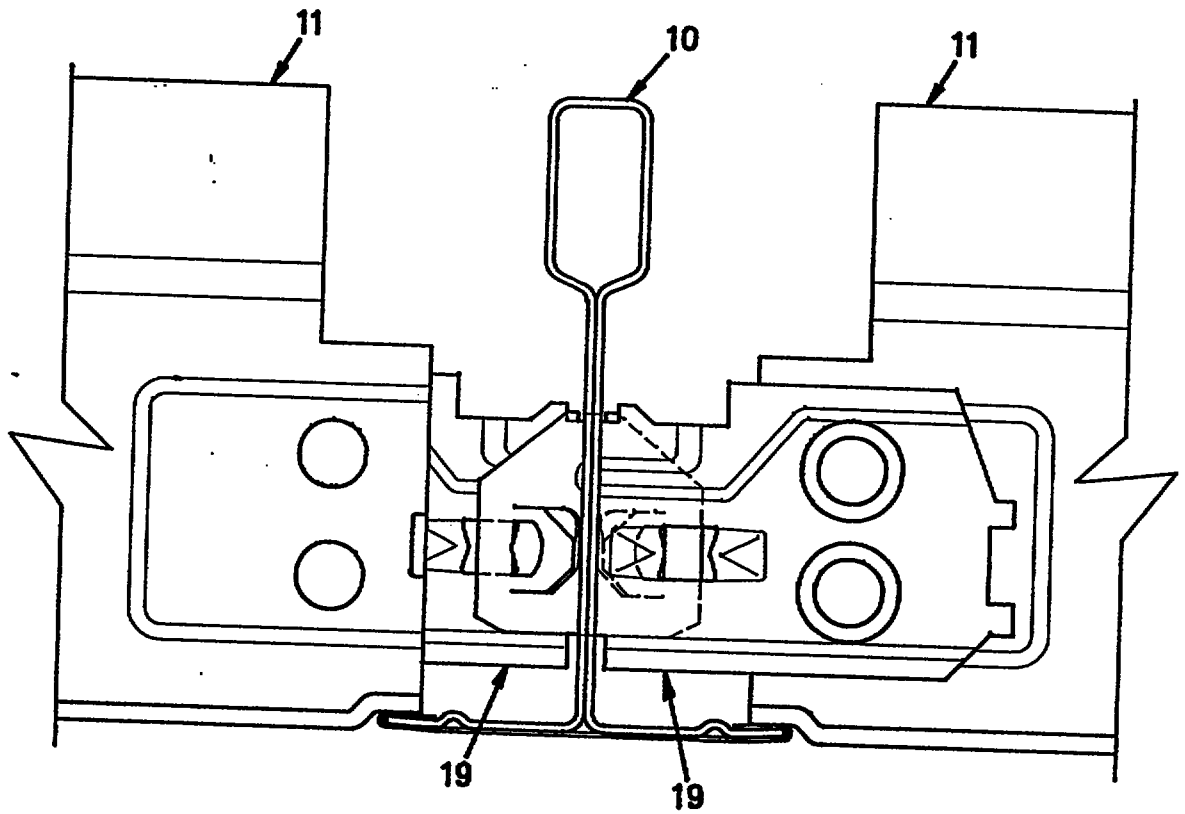
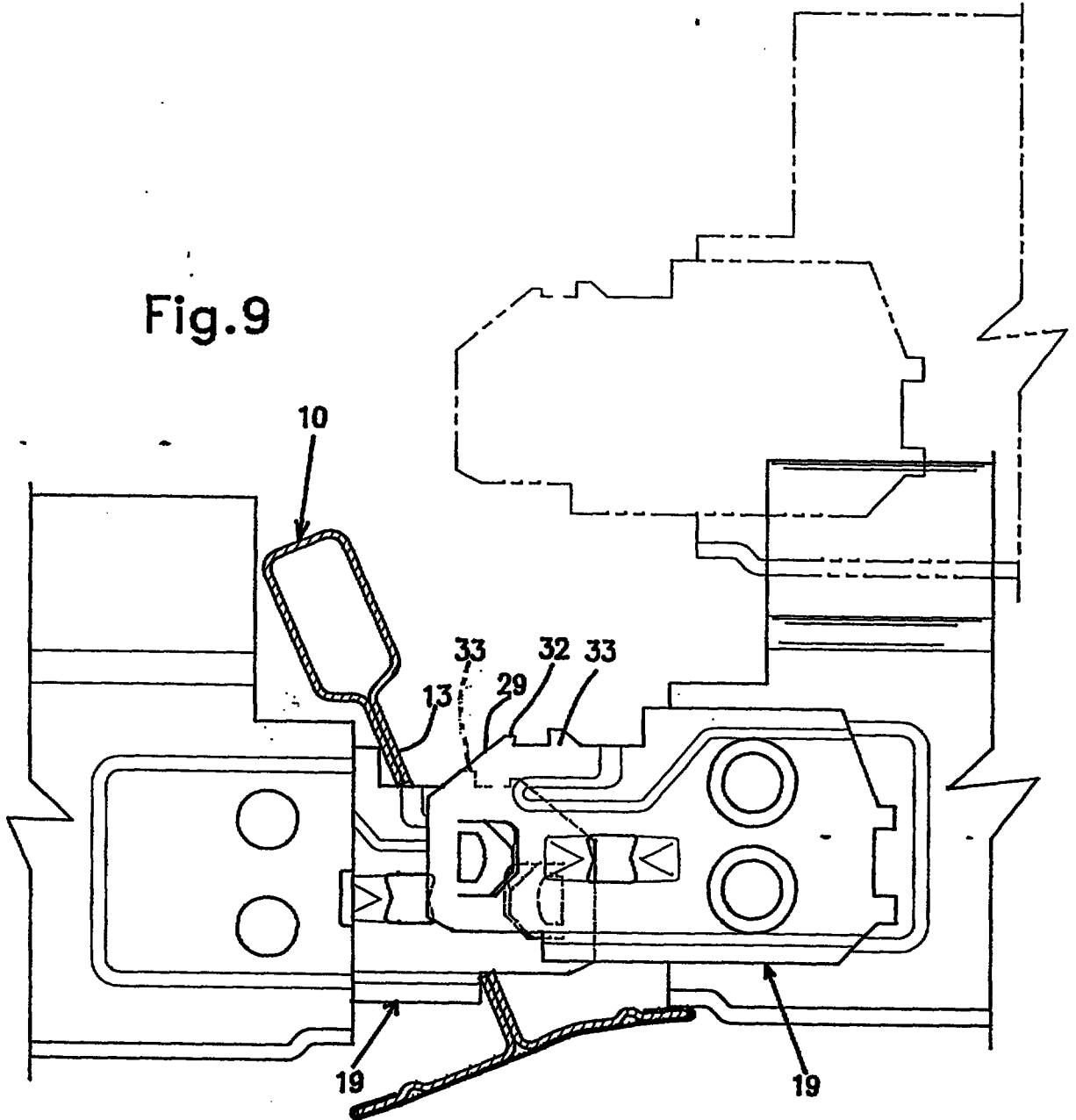


Fig.8

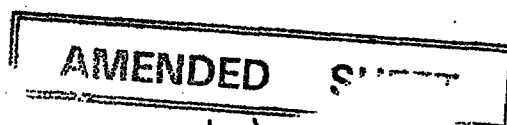
Fig.9



said connector having interlocking elements including laterally extending edges that produce a connector-to-connector lock, the interlocking elements having a configuration when either a tensile force or a compressive force is applied to the connection of identical units of said connectors to positively resist lateral separation between abutting sets of said forward and intermediate portions.

18. A connector as set forth in claim 17, wherein the body has an embossed reinforcing rib extending in a longitudinal direction along said intermediate portion and adapted to extend through the slot of the through runner.

19. An end connector for opposed runners for a suspension ceiling grid system having elongated grid runners including a through runner and two opposed runners interconnected at intersections, each of the runners including a vertical web with the web of the through runner having an elongated vertically extending slot for an end of each of said opposed runners, the end connector being generally planar and being adapted to project into said slot from opposite sides thereof, the slot having opposed sides that provide a width sufficient to receive both of said connectors in laterally abutting relation, the connectors each being arranged with respect to the slot to provide a first end lock with said slot, the slot having a configuration that avoids the risk of receiving and laterally restricting a connector to an incorrect one of its sides, said slot and connectors having respective configurations that allow the connectors to each be installed in said slot with a stab-in motion and to each be removed from said slot by relative manipulation of said through runner and its associated runner to release said first end lock without tools.



22/7/96

