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(54) Title: DETACHABLE TRACTION SYSTEM FOR ENDLESS TRACK VEHICLES

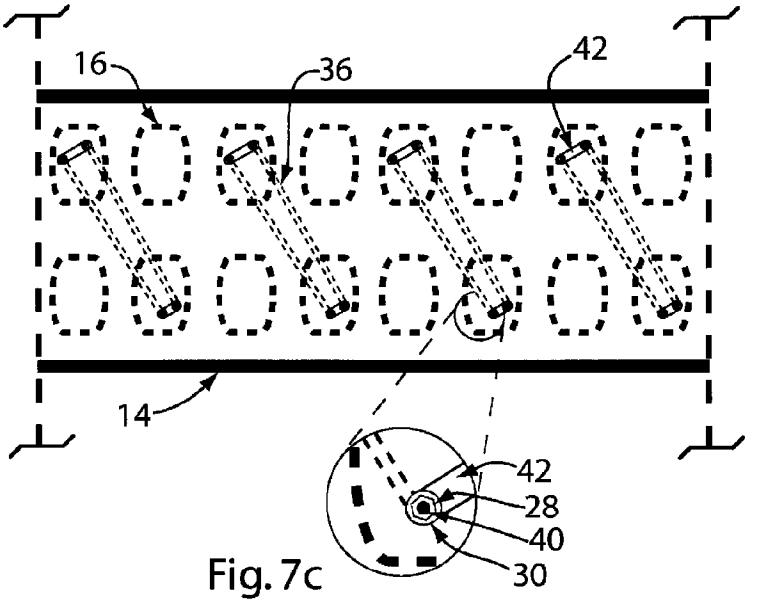

Fig. 7c

(57) Abrégé/Abstract:
The invention provides a detachable traction system for track vehicles comprising a multiplicity of gripping bars each of which is bolted through a tread of a corresponding multiplicity of treads on each track of an endless track vehicle. The ice traction components include gripping bars each having a gripping surface comprising a patch of durable rough protrusive material. The mud or snow traction components include gripping bars each having a compression trough. In combination with the gripping bars being angled across their respective treads toward ensuring stability of steering and direction of travel of the vehicle, the tapering of the compression troughs reduces or eliminates clogging of the compression bars with mud or snow during travel thereby increasing performance through snowy, slushy, or semi-liquid terrain.

DETACHABLE TRACTION SYSTEM FOR ENDLESS TRACK VEHICLES

ABSTRACT

The invention provides a detachable traction system for track vehicles comprising a multiplicity of gripping bars each of which is bolted through a tread of a corresponding multiplicity of treads on each track of an endless track vehicle. The ice traction components include gripping bars each having a gripping surface comprising a patch of durable rough protrusive material. The mud or snow traction components include gripping bars each having a compression trough. In combination with the gripping bars being angled across their respective treads toward ensuring stability of steering and direction of travel of the vehicle, the tapering of the compression troughs reduces or eliminates clogging of the compression bars with mud or snow during travel thereby increasing performance through snowy, slushy, or semi-liquid terrain.

DETACHABLE TRACTION SYSTEM FOR ENDLESS TRACK VEHICLES

SPECIFICATION

FIELD OF INVENTION

This invention relates to a novel device in the general field of traction improvements for flexible or endless tracked vehicles, and more specifically to a detachable traction system that ensures stable and efficient travel over slippery ice/snow and deep rut-forming slush/mud surfaces.

BACKGROUND OF THE INVENTION

The known prior art will now be discussed and critiqued. Three general categories of traction devices are known to be used with tracked vehicles; namely studs or detachable chains for ice/snow, and detachable bars for mud/slush.

Studs, as demonstrated in US7845741, are often embedded into the rubber material of a track, protruding into the slippery surface. Unfortunately, studs are often not removable, and if they are torn free from the track, the damage created can entail replacing the entire track. Also, studs flex

with the track because they are embedded into its resilient material, but they do not attach to the track as securely as they could be if they were affixed completely through the entire track.

Detachable chains, as demonstrated in US8016369, are used with specialized track designs, which enable them to be secured as shown and removed when not needed. However, chains tend to get clogged with ice/snow, tend to fall off when needed most, and often do not prevent sideways motion when traversing inclines.

Detachable bars, as demonstrated in US2967737 and US8424981, have been used to improve traction in deep slushy & muddy terrains, but they do not prevent sideways motion when traversing inclines, they can get clogged like chains, and they act more like paddles, which don't work unless you are going in a perfectly straight line.

BRIEF SUMMARY OF THE INVENTION

The Detachable Traction System for Endless Track Vehicles is designed to provide improved stability in all directions, and increased traction on both ice/snow as well as deep mud/slush, and comprises gripping bars that are bolted completely through selected treads of each track, angled to prevent sideways slippage, and with a gripping surface comprising a patch of durable rough protrusive material designed to claw into ice or hard-packed snow and ensure traction. Each component of the Detachable Traction System is detachable for each replacement of parts that

become damaged, or to switch from an ice system to a snow/mud system, or from either of those to both ice and mud/snow traction.

The invention provides a detachable traction system for track vehicles comprising a multiplicity of gripping bars each of which is bolted through a tread of a corresponding multiplicity of treads on each track of an endless track vehicle. The ice traction components include gripping bars each having a gripping surface comprising a patch of durable rough protrusive material. The mud or snow traction components include gripping bars each having a compression trough. Importantly, the gripping bars having compression troughs are tapered from a narrow end mounted adjacent to an inner area of a track on the vehicle to a wider end mounted adjacent to an outer area of the track, such that mud or snow is thrown down the trough and clear of the vehicle as it moves, rather than clogging the trough and reducing the traction effect of the compression trough of the respective gripping bar. In combination with the gripping bars being angled across their respective treads toward ensuring stability of steering and direction of travel of the vehicle, the tapering of the compression troughs reduces or eliminates clogging of the compression bars with mud or snow during travel thereby increasing performance through snowy, slushy, or semi-liquid terrain.

The gripping bars are bolted completely through and across selected treads of each track. Strength and durability of the position of each gripping bar is obtained by having gripping bars that extends perpendicularly at each end thereof into bolts mounted through holes in the treads, secured therein with nuts screwed onto the bolts.

In a preferred embodiment capable of providing enhanced traction in icy, snowy and muddy terrain, the system comprises a first plurality of gripping bars each have a gripping surface comprising a patch of durable rough protrusive material, and a second plurality of gripping bars each having a compression trough formed by flanges perpendicular to a bar base. Each compression trough of the second plurality of gripping bars is tapered from a narrow-trough end of a bar base of a gripping bar to a wider-trough end of the bar base of the gripping bar. The gripping bars on a first track of the vehicle are mounted at an angle to an edge of each tread of the first track, and the gripping bars on a second track of the vehicle are mounted at a mirror-image angle to an edge of each tread on the second track. The gripping bars each having a gripping surface comprising a patch of durable rough protrusive material alternate with gripping bars each having a compression trough, forming a pattern of gripping bars mounted to each track of the vehicle. The gripping bars having compression troughs each extend perpendicularly into a pair of bolts at each end of a bar base of the respective gripping bar, each such bolt being mounted through holes in the treads and secured therein with nuts screwed onto the bolts. The system provides an effective and durable traction system as each gripping bar is clamped across and through its respective tread, distributing forces exerted on each gripping bar across the tread as the vehicle travels in rough and slippery terrain.

The Detachable Traction System allows the operator of a tracked vehicle to select the appropriate traction element to match the terrain conditions, gripping bars for ice/hard snow, and compression troughs for slush/mud, or both for mixed conditions. The angled traction elements ensure sideways stability when navigating uneven or inclined terrain. The securement means

ensures that the traction systems will not damage the track by ripping free, which ensures consistent traction when needed.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 shows a Side view of an Endless Tracked Vehicle with Gripping bar and Compression Trough aspects of the Detachable Traction System.

Fig. 2a shows a Side closeup view of a right side track portion with an angled gripping bar being installed. Fig. 2b shows a Facing view of an Gripping Bar, where Fig. 2c shows a Top view of same with its protrusive surfacing.

Fig. 3a shows a Top view of a Compression Trough; Fig. 3b a Side view; Fig. 3c an End view with attachment hardware; and Fig. 3d a Facing view of a Trough Plate.

Fig. 4 shows a Side view of a right side track section with Gripping bars installed.

Fig. 5a shows a Top view of a Track section with Gripping bars installed, Fig. 5b shows a Bottom view of a Track section with cleat attachment hardware, and Fig. 5c shows a Closeup view of said hardware.

Fig. 6 shows a Side view of a Track section with Compression Troughs installed.

Fig. 7a shows a Top view of a right side Track section with angled Compression Troughs, Fig. 7b shows a Bottom view of a Track section with trough attachment hardware, and Fig. 7c shows a Closeup view of said hardware.

DETAILED DESCRIPTION

Drawing elements will now be introduced by reference to figures, then how each element functions and interacts with each other element will be described where necessary.

Fig.1 shows a side view of an endless tracked vehicle 12 with gripping bar 22 and compression trough 36 aspects of the detachable traction system 10, which are attached to treads 16 of the track 14 which is rotated by the drive assembly 20, enabling stable traction through low-friction 46 and semi-liquid 48 terrains.

Fig. 2a shows a side closeup view of a right side track 14 portion with an angled gripping bar 22 installed through mounting holes 44 in a tread 16, and secured by nut 28 and washer 30 to its threading 26. Fig. 2b shows a facing view of an gripping bar 22 with its protrusive surfacing 24, and Fig. 2c shows a top view of same.

Fig. 3a shows a top view of a compression trough 36 with its non-parallel flanges 38. Fig. 3b shows a side view of a compression trough 36 with its trough bolts 40 and threading 26. Fig. 3c

shows an end view of a compression trough 36 with its tapering flanges 38, trough bolts 40, threading 26, trough plate 42, washers 30 and nuts 28. Fig. 3d shows a facing view of a trough plate 42.

Fig. 4 shows a side view of a right side track 14 section with angled gripping bars 22 installed through selected treads 16 and secured to the threaded ends 26 by nuts 28 and washers 30. Optionally, one may use a cleat plate 34, which uses the same outline as a trough plate 42, in place of washers 30.

Fig. 5a shows a top view of a track 14 section with gripping bars 22 installed on an angle through selected treads 16 separated by tread gaps 18, and on both sides of the track gap as shown. Fig. 5b shows a bottom view of the same track 14 section with corresponding cleat attachment hardware, with Fig. 5c showing a closeup view of said hardware, namely nuts 28, and washer 30 or optional cleat plate 34 secured to each cleat bolt 32. Hatched lines represent treads 16 from topside of track 14.

Fig. 6 shows a side view of a right side track 14 section with angled compression troughs 36 installed through selected treads 16 and secured to threading 26 of trough bolts 40 (see Fig. 3c) by nuts 28 and trough plate 42.

Fig. 7a shows a top view of a right side track 14 section with angled compression troughs 36 with tapering flanges 38 spanning across the track gap 19 and secured by trough bolts 40 through

selected treads 16 as shown. Fig. 7b shows a bottom view of a track 14 section with corresponding trough attachment hardware, with Fig. 7c showing a closeup view of said hardware, namely nuts 28, optional washers 30, and trough plate 42 secured to each trough bolt 40. Hatched lines represent treads 16 and compression troughs 36 from topside of track 14.

The preferred embodiment of the Detachable Traction System for Endless Track Vehicles will now be described in detail. Each complementary aspect of the traction system will be discussed separately as follows:

Gripping bars:

The functionality of a traction system necessarily requires aspects that improve gripping that match the terrain it is employed upon. In this aspect, an gripping bar 22 is used to increase traction on low friction terrain 46 such as ice & hardened snow. A key aspect of the gripping bar 22 is the creation of a roughened, claw-like protrusive surfacing 24 on the low friction terrain 46 (ice/hard snow) engaging section of the cleat 22. (Fig. 2b) The protrusive surfacing 24 is created by running an irregularly welded carbon steel bead along the top surface of the metal cleat 22, which creates a strong ice crushing and snow gripping protrusion area that bites into ice or compacted snow, thereby improving traction.

An additional aspect of gripping bars 22 is their length and orientation. Studs are singular points of contact with low friction terrain 46, whereas gripping bars 22 are elongated areas of contact

with multiple points of gripping contact. Another aspect of gripping bars 22 is their angled orientation (see Fig. 5a) which prevents the tracked vehicle 12 from slipping sideways on low friction terrain 46, or while ascending inclines or uneven terrain. The orientation angle and elongated area of the gripping bars 22 allow the track 14 to grip low friction terrain 46 more reliably than uncleated vehicles 12, and can even marginally improve grip on mixed terrains that include mud/slush.

The gripping bar 22 as shown in Figs. 2a-c bolts entirely through the track 14 and its tread 16, thereby increasing its securement over prior art studs or removable chains. The gripping bar 22 is secured with two bolts 32 running completely through the track 14, and this provides a strength against being torn out much greater than if a stud was merely mounted part way into the track 14 belt. In addition, a cleat plate 34 can be used in place of washers 30 to secure each gripping bar 22 even more robustly to the track, spreading the torquing forces across a greater area, and thereby ensuring the longevity and utility of this aspect of the traction system.

Compression Troughs:

In this aspect of the detachable traction system, a compression trough 36 is used to increase traction on semi-liquid terrain 48 such as mud & slush. As can be seen in Figs. 3a & 3c, the bar-like compression trough 36 is unlike the prior art described above, and these aspects are critical to its utility. The compression trough 36 does not have parallel flanges 38 (i.e. sidewalls), and when employed as shown in Fig. 7a with a mirror image orientation for the left track, the unique

utility of this aspect of the traction system becomes apparent. Angular orientation of the compression troughs 36 function in a similar way to the angled cleats 22 above, preventing sideways slippage as the vehicle operates on semi-liquid terrain 48. A key aspect of the compression troughs 36 are its tapering flanges 38 as shown in the figures. Unlike ice, where all one needs to do it break into and grip the rigid surface of a low friction terrain 46 to achieve traction, the semi-liquid nature of mud/slush creates a frictionless barrier that prevents traction. Prior art has attempted to solve this problem by using paddle-like bars that may work in one direction, after a fashion, but not reliably when turning or taking inclines.

The compression trough 36 overcomes this issue by temporarily trapping a section of mud/slush between the flanges 38 of the trough 36, which creates the equivalent of an extended track length tread that grips the underlying mud/slush. Instead of mud/slush smearing out as it slides over itself when pushed by a normal track, the compressed mud in compression troughs 36 stick to the mud/slush in the immediate area around each trough 36 and thereby create a temporary adhesion zone as long as the mud/slush is held between the flanges 38 of the trough 36. This solution is unlike the prior art, and enables the operator to navigate semi-liquid terrain safely and reliably without becoming bogged down.

An additional aspect of the compression trough 36 is its tapered flanges 38 as shown in Fig. 7a, with the narrow end towards the inside of the track 14, nearest the vehicle, and the wider end towards the edge of the track 14. Fig. 7a shows a right side track 14, and a mirrored orientation is used for the left side track. By this means mud/slush is temporarily compressed into the

compression troughs 36, but as the vehicle 12 moves the mud/slush should be removed from the troughs 36 or it will build up and the vehicle 12 will bog down. The widening of the troughs 36 towards the outside edges of the tracks allows the mud/slush to flow away from the vehicle 12 instead of becoming trapped between the flanges 38 of each trough 36. By this means the troughs 36 allow the vehicle 12 to compress and grip the mud/slush momentarily for traction, and then shed the mud/slush away from its sides to prevent clogging the troughs 36 as it moves. Other embodiments are not ruled out or similar methods leading to the same result.

The preferred materials for constructing said novel traction elements include, but may not be limited to, any metal strong enough to withstand the forces of the terrain, including carbon steel, stainless steel, composites, or any other material that leads to the same performance objectives outlined above.

The foregoing description of the preferred apparatus and method of installation should be considered as illustrative only, and not limiting. Other forming techniques and other materials may be employed towards similar ends. Various changes and modifications will occur to those skilled in the art, without departing from the true scope of the invention as defined in the above disclosure, and the following general claims.

The embodiments of the invention in which an exclusive property or privilege is claimed and defined as follows:

1. A detachable traction system for track vehicles comprising a multiplicity of rigid gripping bars each of which includes a pair of bolts integrally formed with and extending therefrom adapted to be passed through a tread of a corresponding multiplicity of treads on each track of an endless track vehicle wherein each bolt of said pair of bolts includes a nut for securing each of said pair of bolts to the track wherein said rigid gripping bars are located to an exterior of said track and said nuts are located to an interior of said track.

2. The detachable traction system of Claim 1, in which each of the gripping bars extends perpendicularly at each end thereof into bolts mounted through holes in the treads, secured therein with nuts screwed onto the bolts.

3. The detachable traction system of Claim 2, comprising a first plurality of the gripping bars each have a gripping surface comprising a patch of durable rough protrusive material, and a second plurality of gripping bars each having compression troughs formed by flanges perpendicular to a bar base.

4. The detachable traction system of Claim 3, in which each compression trough of the second plurality of gripping bars is tapered from a narrow-trough end of a gripping bar base to a wider trough end of the gripping bar base.

5. The detachable traction system of Claim 4, in which the gripping bars on a first track of the vehicle are mounted at an angle to an edge of each tread of the first track, and the gripping bars on a second track of the vehicle are mounted at a mirror-image angle to an edge of each tread on the second track.

6. The detachable traction system of Claim 5, in which gripping bars each having a gripping surface comprising a patch of durable rough protrusive material alternate with

gripping bars each having a compression trough, forming a pattern of gripping bars mounted to each track of the vehicle.

7. The detachable traction system of Claim 6, in which the gripping bars having compression troughs comprising each extend perpendicularly into the pair of bolts at each end of a bar base of the respective gripping bar, each such bolt being mounted through the holes in the treads and secured therein with the nuts screwed onto the bolts.

8. The detachable traction system of Claim 2, in which the nuts are flanged nuts.

9. The detachable traction system of Claim 8, in which the flanged nuts each have pin holes to fit a flange nut driver tool having flange pins and a bolt tube to receive a protruding end of a bolt.

10. The detachable traction system of Claim 8, in which exposed ends of the bolts in the flange nuts are trimmed such that the flanged nuts are flush with an inside surface of each track, in order to allow rollers or tires within the track to run over the flange nut without damaging the rollers or tires.

11. The detachable traction system of Claim 10, in which a cleat secures a compression trough to the tread.

12. The detachable traction system of Claim 10, in which the compression trough and securing cleats are of substantially like height in order to allow adhesion surfacing on the compression trough to just clear the top of flanges on the compression trough.

13. The detachable traction system of Claim 1, in which a plurality of the gripping bars each have a gripping surface comprising a patch of durable rough protrusive material.

14. The detachable traction system of Claim 1, in which a plurality of the gripping bars each have compression troughs formed by flanges perpendicular to a bar base of each such gripping bar.

15. The detachable traction system of Claim 14, in which the compression troughs are tapered from a narrow-trough end of a bar base of each compression trough to a wider-trough end of a bar base of each compression trough to a wider-trough end of the bar base of the compression trough.

16. The detachable traction system of Claim 14, in which the gripping bars each extend perpendicularly into the pair of bolts at each end of the bar base of the respective gripping bar, each such bolt being mounted through holes in the treads and secured therein with the nuts screwed onto the bolts.

17. The detachable traction system of Claim 1, in which the gripping bars on a first track of the vehicle are mounted at an angle to an edge of each tread of the first track, and the gripping bars on a second track of the vehicle are mounted at a mirror-image angle to an edge of each tread on the second track.

18. The detachable traction system of Claim 1, in which a combination of gripping bars having a gripping surface comprising patches of durable rough protrusive material, and of gripping bars having compression troughs, are mounted to the tracks of the vehicle.

19. The detachable traction system of Claim 18, in which gripping bars having gripping surfaces comprising patches of durable rough protrusive material alternate with gripping bars having compression troughs to form a pattern of gripping bars mounted on the reads of each track of the vehicle.

Fig. 1

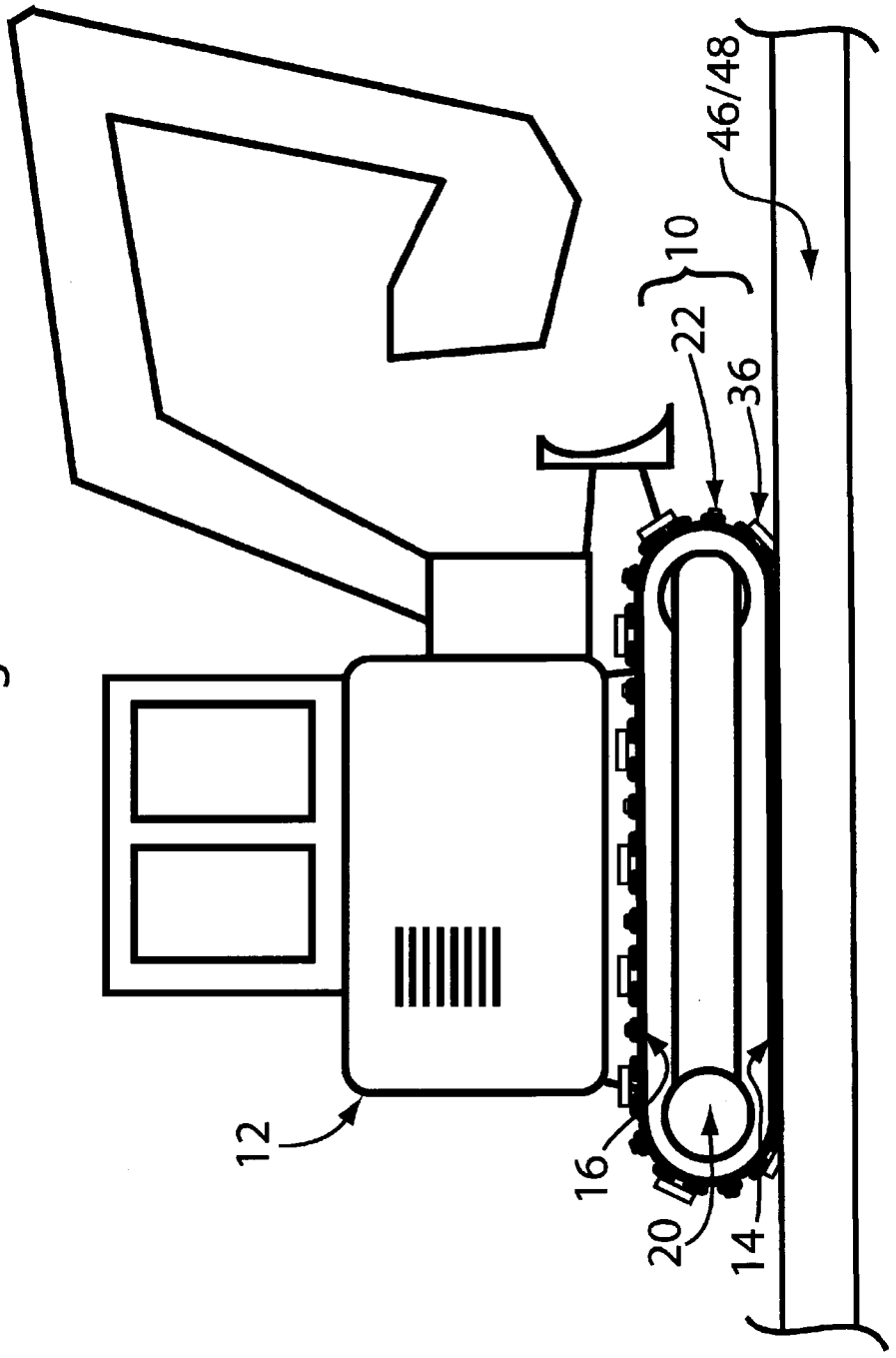

Fig. 2a

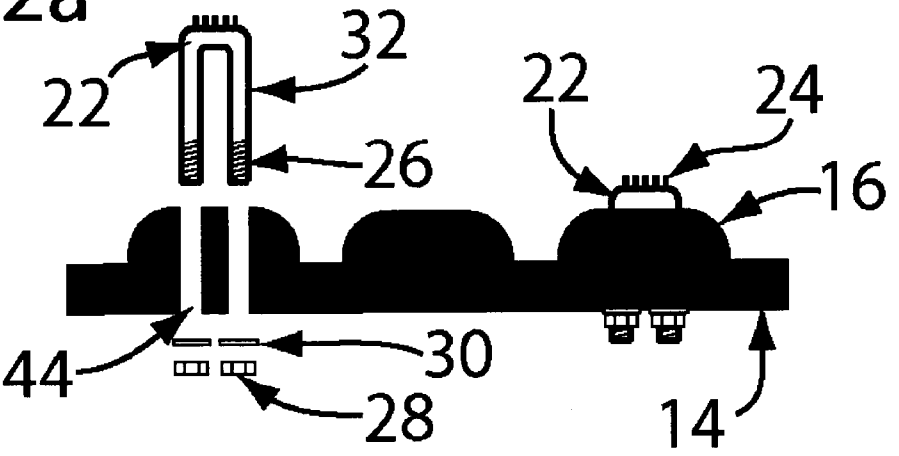

Fig. 2b

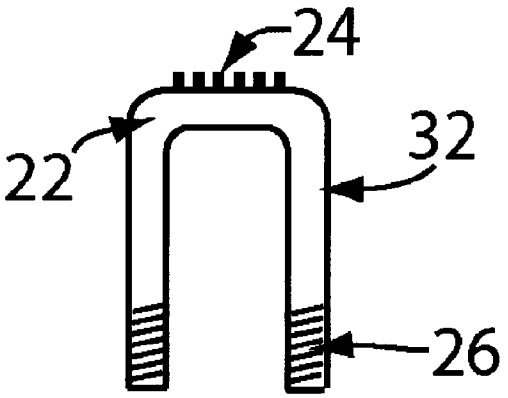

Fig. 2c

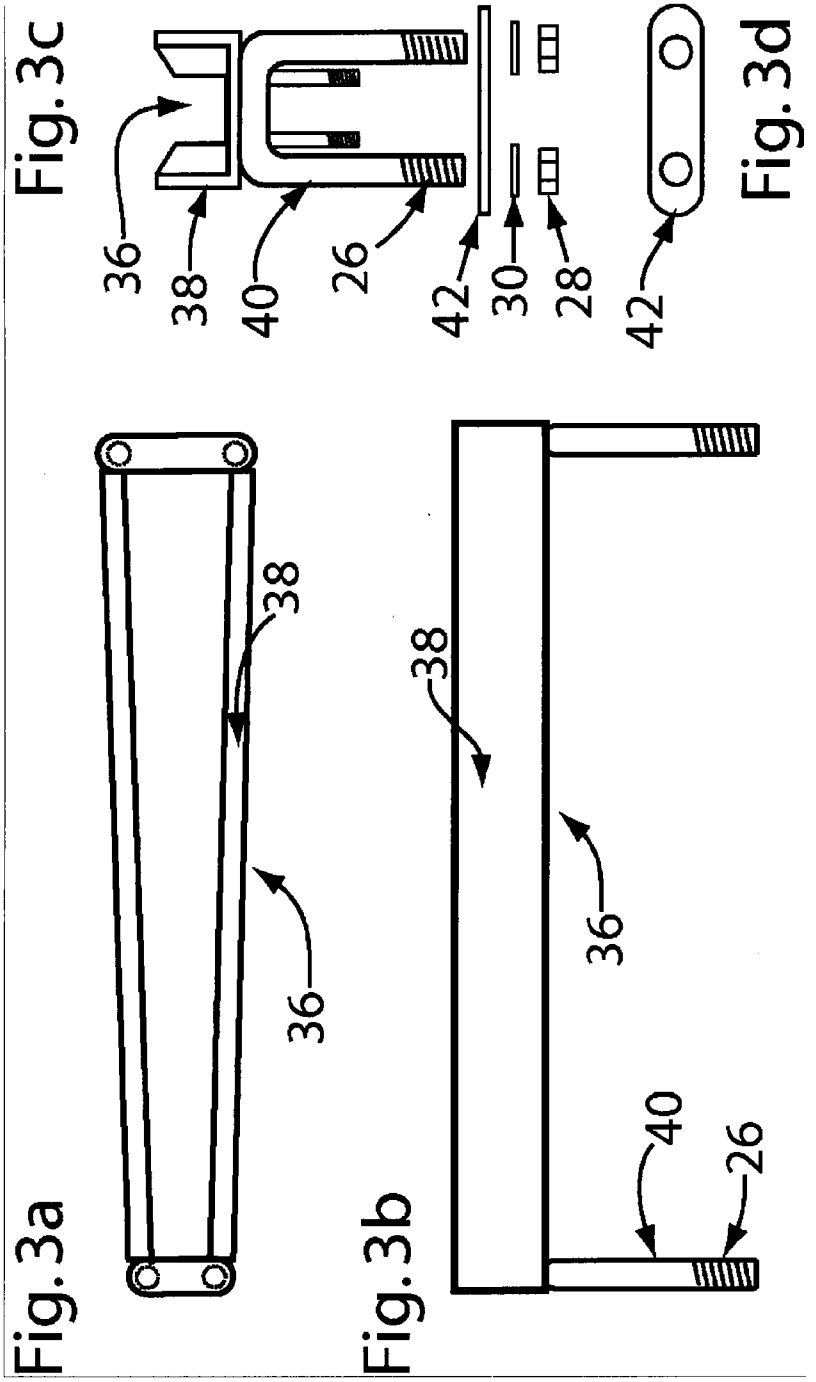
Fig.3c
36
38
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28
Fig.3d
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Fig.3a
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36
Fig.3b
38
36
40
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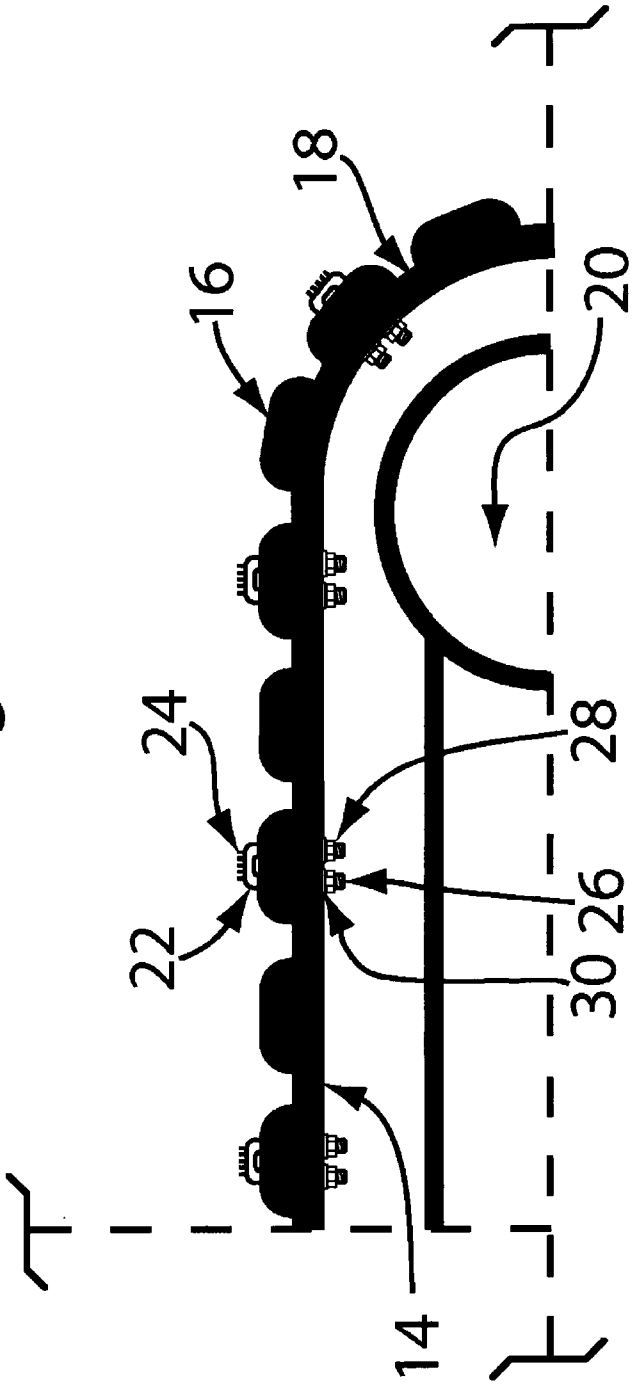
Fig. 4



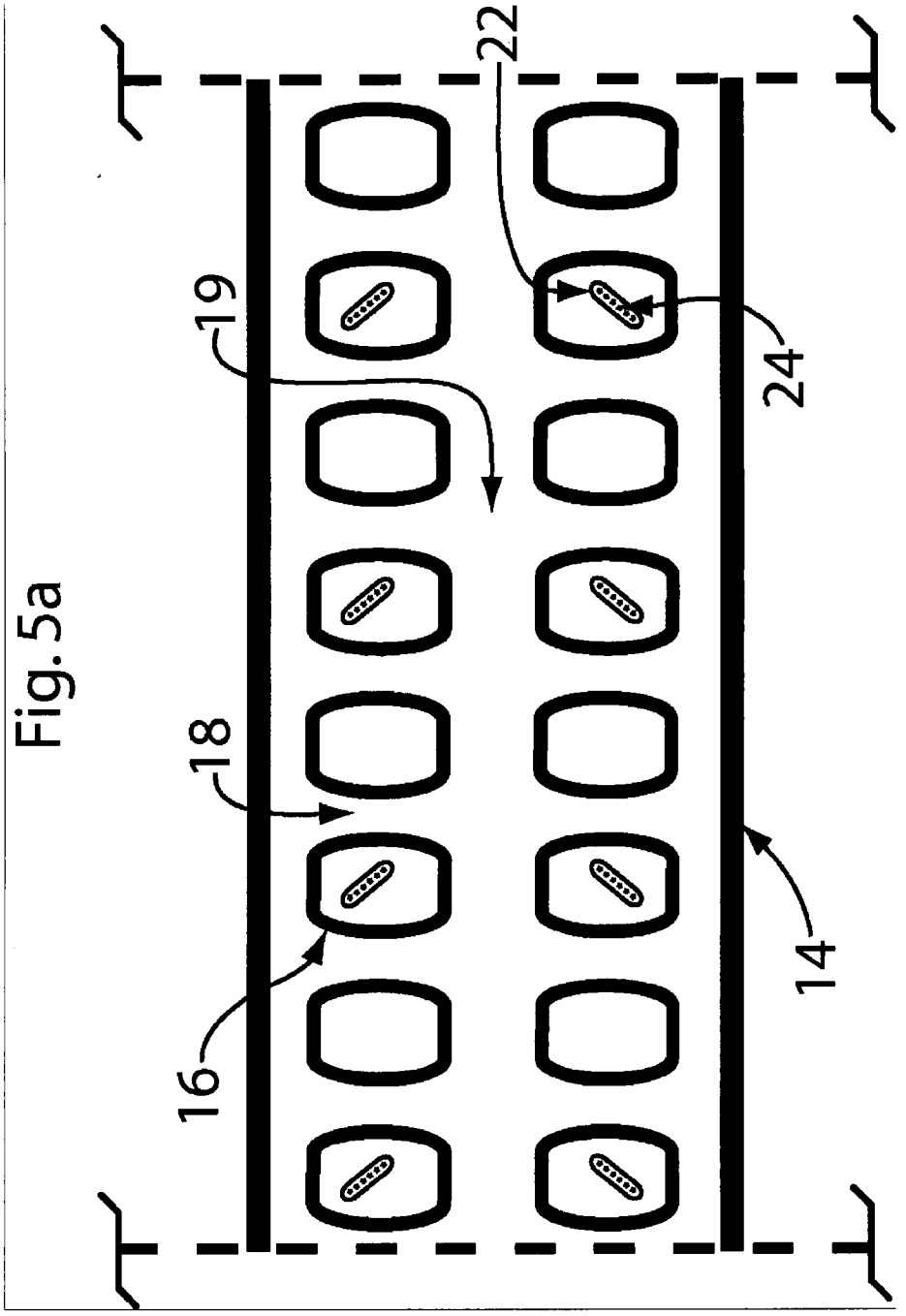


Fig.5a

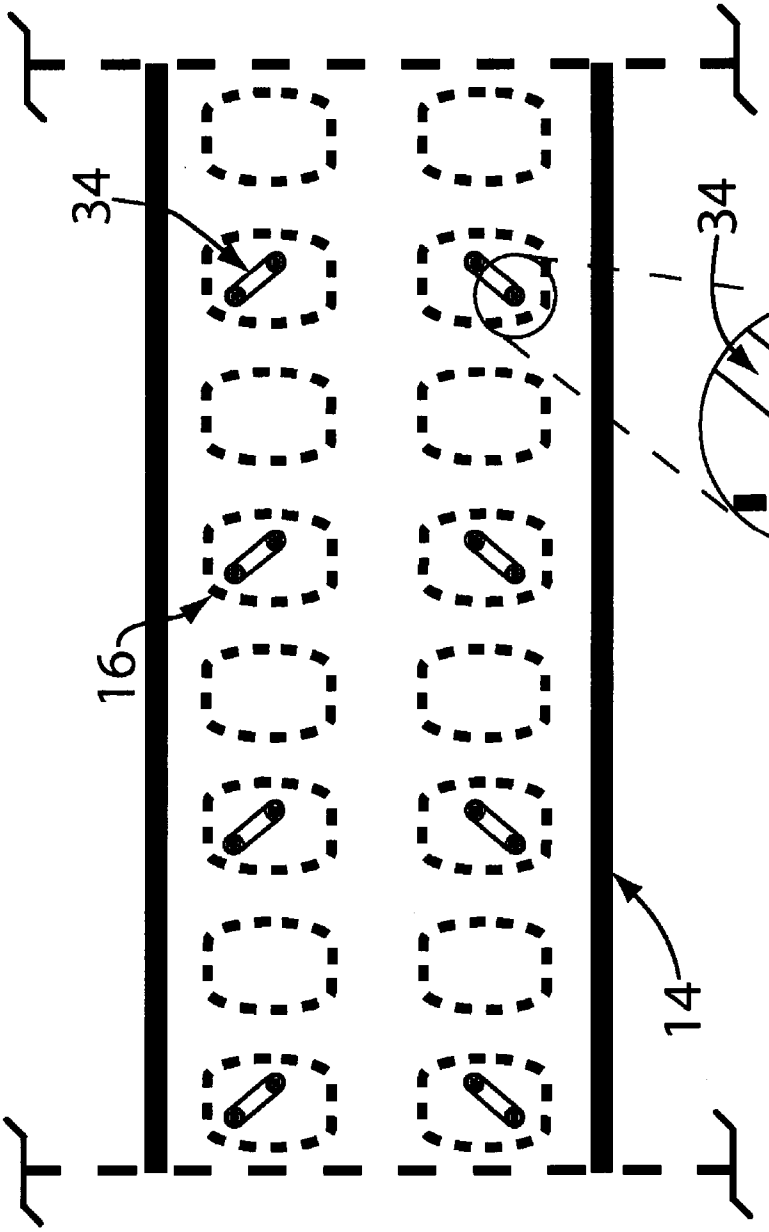


Fig. 5b

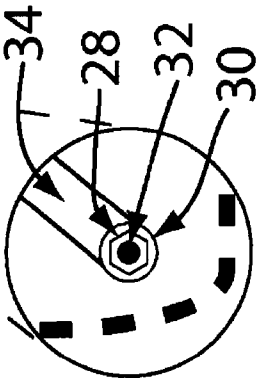
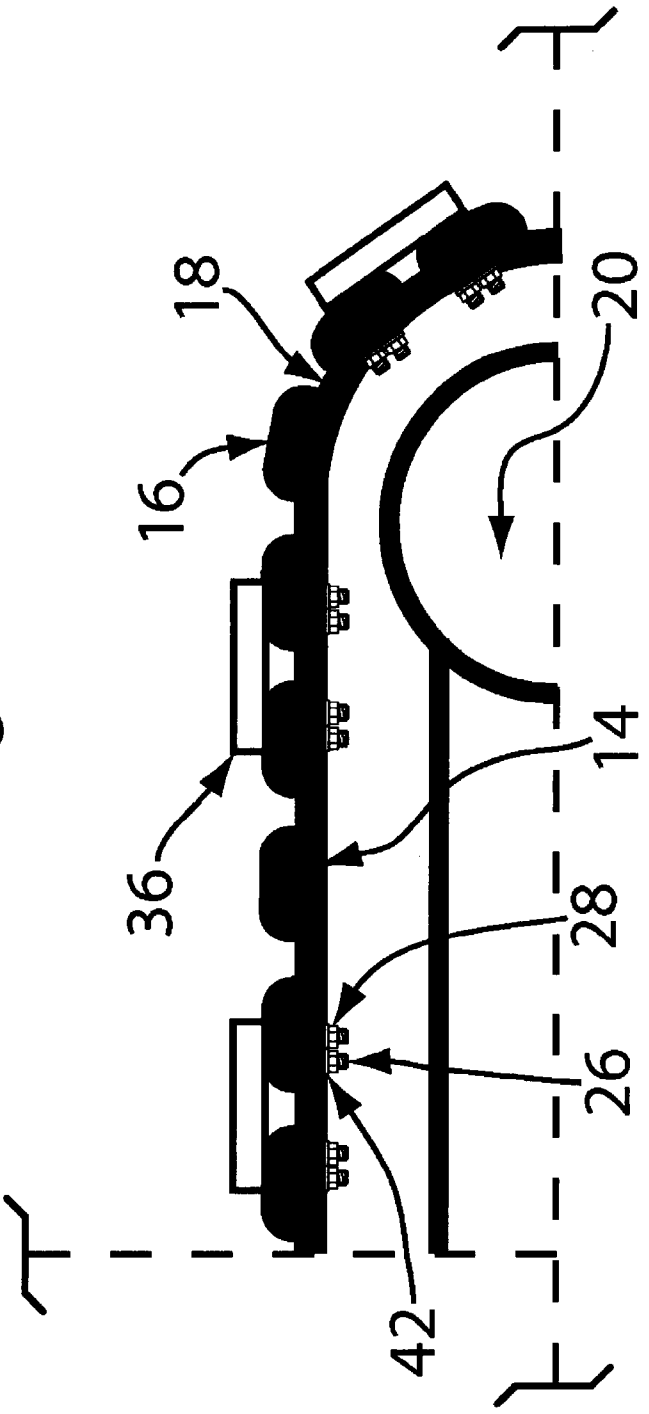


Fig. 5c

Fig.6



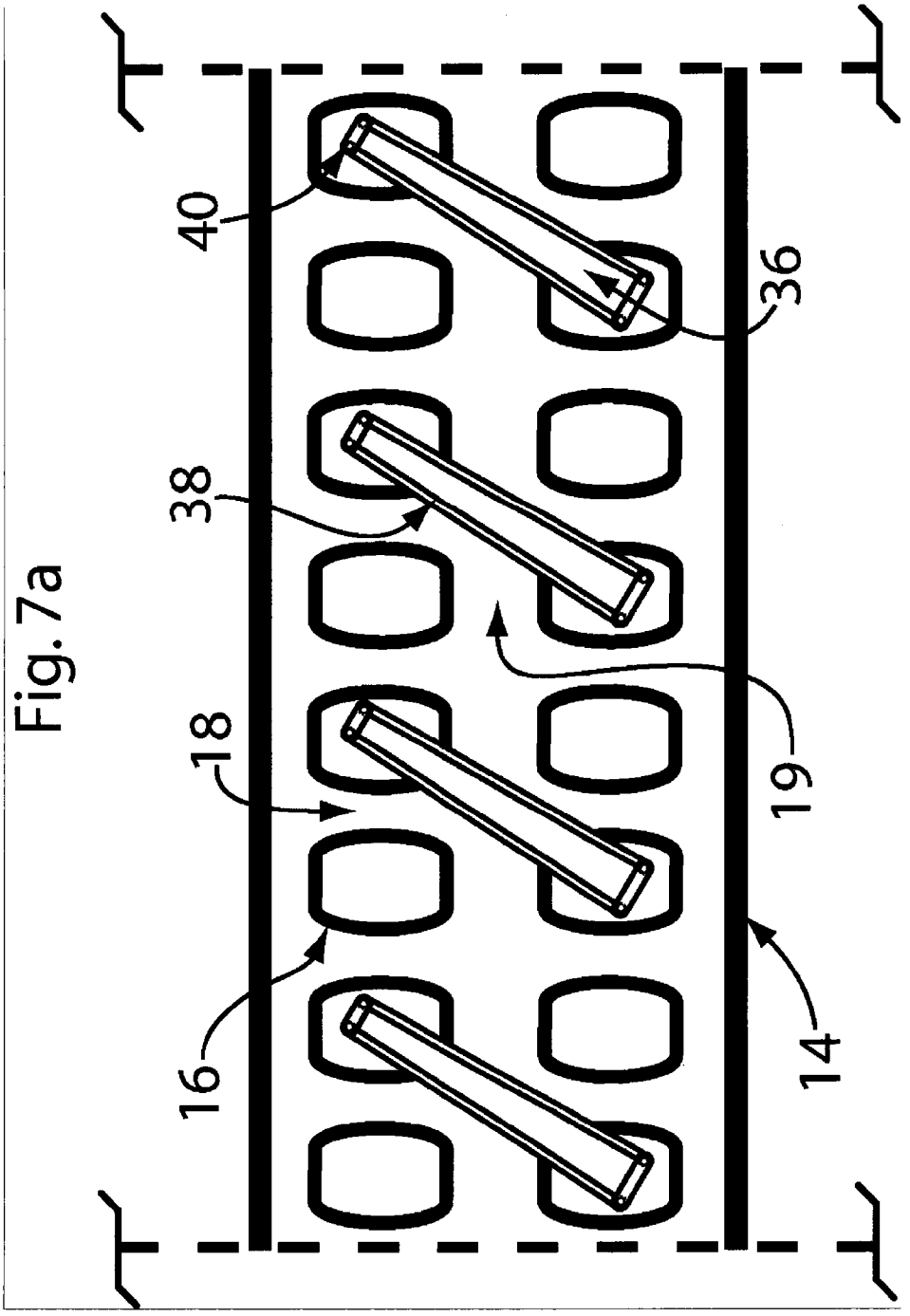


Fig. 7a

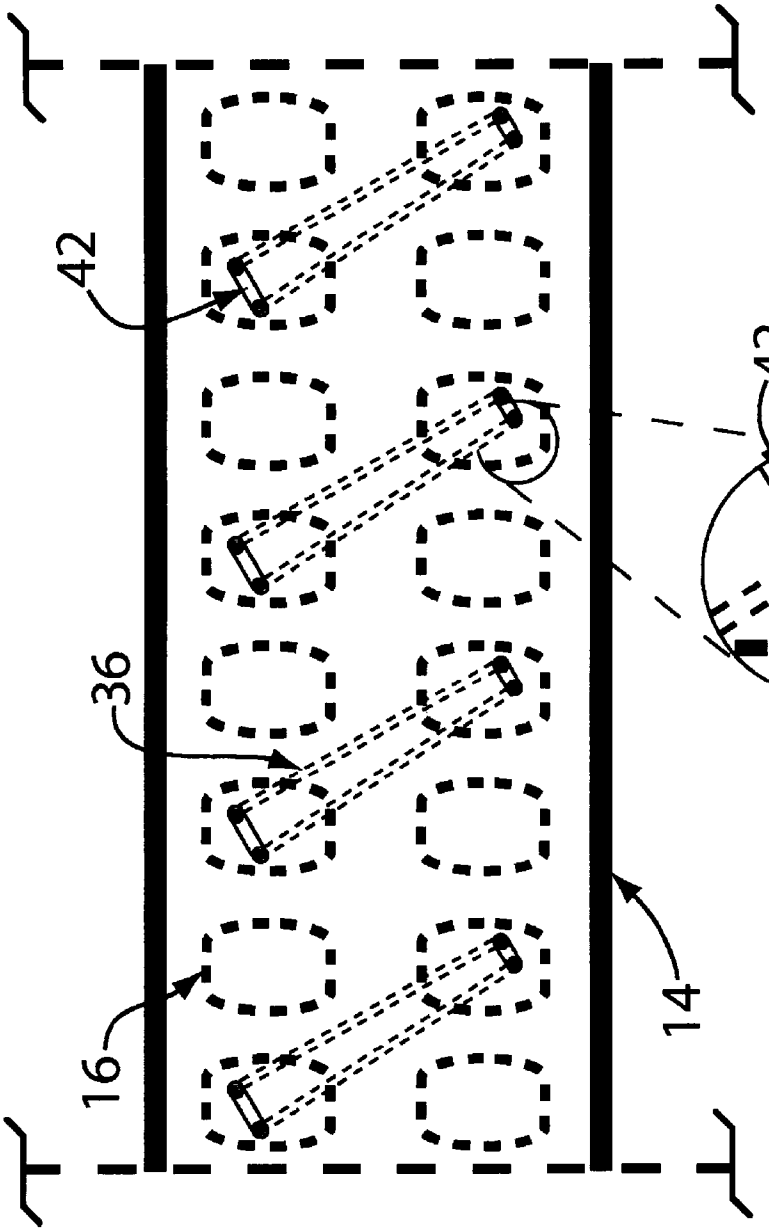


Fig. 7b

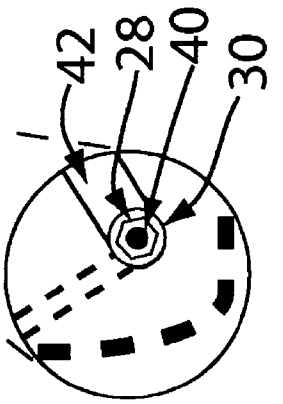


Fig. 7c

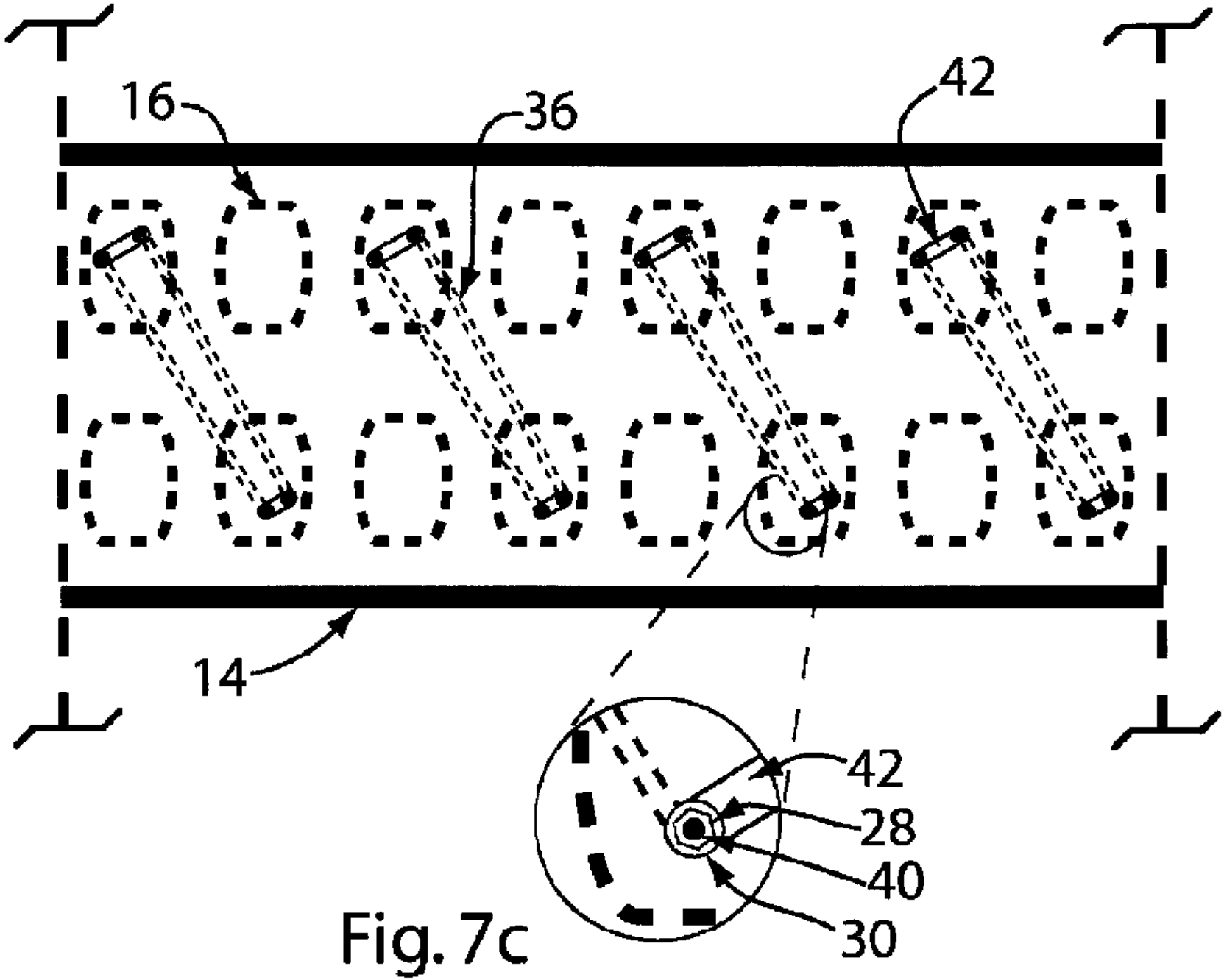


Fig. 7c