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(54) Benævnelse: **Radiustransportør med magnetleje**

(56) Fremdragne publikationer:
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DESCRIPTION

BACKGROUND

[0001] The invention relates generally to power-driven conveyors and more particularly to radius belt conveyors.

[0002] When negotiating a turn, modular radius, or sideflexing, conveyor belts experience high radial forces at the inside radius of the turn. The resulting sliding friction between a rail at the inside of the turn and the side edge of the sideflexing belt increases belt tension and wear of the belt edge. Both increased belt tension and wear reduce belt life.

[0003] US 2013/264175 A1 describes a conveyor belt system that employs electromagnets and permanent magnets to provide a controllable interaction that applies forces to the conveyor belt to reduce friction and/or increase performance. US 2013/264175 A1 discloses a conveyor according to the preamble of claim 1.

[0004] WO 2010/005300 A1 describes a conveyor belt system that employs magnets to exert a driving force on a belt

SUMMARY

[0005] A conveyor embodying features of the invention comprises a sideflexing conveyor belt supported in a conveyor frame that includes a carryway with a turn section. The sideflexing conveyor belt is driven along the carryway and through the turn section. A side edge of the belt with first field-producing elements advances along the inside radius of the turn section. Second field-producing elements are disposed along the inside radius of the turn section. The first-field-producing elements form an array of permanent magnets, and the second field-producing elements are electrically conductive elements, or vice versa. The array of permanent magnets produces a magnetic field that induces currents in electrically conductive elements in the side edge of the conveyor belt. The induced currents produce an induced magnetic field that is opposed by the array's magnetic field. The result is a radially outward force directed against the sideflexing conveyor belt advancing through the turn section.

[0006] Optionally, one version of a conveyor belt comprises a series of rows of belt modules hingedly linked together. The series of rows extend in width from a first side edge to a second side edge. Electrically conductive plates are disposed along the first side edge of the rows of belt modules.

[0007] Another version of such a modular conveyor belt comprises a series of rows of belt modules hingedly linked together. The series of rows extend in width across an intermediate

portion from a first side edge to a second side edge. Electrically conductive elements are disposed along the first side edge. The intermediate portion is devoid of electrically conductive elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is an isometric view of a portion of a radius conveyor embodying features of the invention;

FIG. 2 is an enlarged view of a portion of the conveyor frame of the conveyor of FIG. 1 showing a magnetic bearing;

FIG. 3 is an isometric view of a belt module usable in the conveyor of FIG. 1; and

FIG. 4 is an enlarged view of the radially inner portion of the turn section of the conveyor of FIG. 1.

DETAILED DESCRIPTION

[0009] A portion of the carryway of a radius conveyor embodying features of the invention is shown in FIG. 1. The conveyor 10 includes a radius, or sideflexing, conveyor belt 12 supported in a conveyor frame 14. The top run of the conveyor belt 12 is supported on a carryway consisting of wearstrips or a carryway pan. The carryway is shown with a turn section 16 between two straight segments 18, 19. The conveyor belt 12 extends in width from a first side edge 20 to a second side edge 21 across an intermediate portion 22 constituting the majority of the width of the belt. The conveyor belt 12 is shown as a modular plastic conveyor belt constructed of a series of rows 24 of one or more belt modules 26 hingedly linked together by hinge rods (25, FIG. 3) at hinge joints 27 between consecutive rows. The sideflexing belt 12 has at least one set of elongated hinge-rod holes (23, FIG. 3) along each belt row 24 to allow the inside edge of the belt to collapse at the inside radius 28 of the turn section 16 while the outside edge 21 is fanned out at the outside radius 29 of the turn.

[0010] As shown in FIG. 2, the conveyor frame 14 has an inner side rail 30. In the straight segment 18, the side rail 30 has a wearstrip 32 made of a durable, low-friction material for low-friction sliding contact with the side edge of the conveyor belt. In the turn section 16 the wearstrip is replaced with an array of permanent magnets 34 along the inside radius 28.

[0011] As shown in FIG. 3, the side edge 20 of a belt module 26 that rides along the inside radius of the turn section includes an electrically conductive element. The electrically

conductive element can be a side plate 36 made of an electrically conductive material such as copper or aluminum and attached to or embedded in the side edge 20, or it can be electrically conductive fibers or particles 38 mixed with plastic resin and molded together to form the module's edge 20. For belts that have to negotiate turns in only one direction, the electrically conductive material need reside at only one side edge. If the radius belt negotiates both left and right turn sections, both side edges have electrically conductive material. In FIG. 3, the belt module 26 forms a belt row 24 with an adjacent module 26'. The two modules are separated from each other at a seam 40. The adjacent edge module 26' has a side edge 21 without electrically conductive elements. The intermediate portion 22 of the belt row 24 is shown devoid of electrically conductive elements.

[0012] The sideflexing conveyor belt 12 is shown in FIG. 4 entering the turn section 16 of the carryway. The belt is motor-driven by drive sprockets or drums in a direction of belt travel 42. In the straight segment 18 the side edge 20 of the belt with the electrically conductive plates 36 on each belt row 24 can slide along the side-rail wearstrip 32. As the belt enters the turn section 16, the inside edge 20 of the belt collapses. The permanent magnets 34 forming the array produce a permanent magnetic field that induces electric currents in the electrically conductive material, such as the plates 36, at the belt edge 20 as the belt advances through the turn. The induced currents produce reaction magnetic fields that oppose, by Lenz's Law, the array's permanent magnetic field. The opposing fields produce a radially outward force F that repels the belt 12 away from the inside rail and the array of magnets 34. The radially outward force F prevents the inside edge 20 of the belt 12 from sliding on the turn section 16. Thus, the magnets and the electrically conductive elements form a touchless magnetic bearing. Frictional contact is avoided, which reduces belt tension and belt wear. And the faster the belt 12 is driven, the greater the repelling force F. Arranging the permanent magnets in a Halbach array increases the strength of the magnetic field coupled to the electrically conductive elements. The two field-producing elements-the permanent-magnet array and the electrically conductive elements-could alternatively be swapped in position such that the permanent magnets are in the edge of the conveyor belt and the electrically conductive elements are in the conveyor frame at the inside radius of a turn section. Such an arrangement would likewise produce a magnetic bearing with a radially outward force pushing the belt away from the inside radius of a turn.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- WO2010005300A1 [0004]

PATENTKRAV

1. Transportør (10), omfattende:

en transportørramme (14), omfattende en transportvej (16);

et sideværts bøjeligt transportbånd (12), understøttet i transportørrammen (14) og med en sidekant (20) med første felt-frembringende elementer;

hvorved det sideværts bøjelige transportbånd (12) drives langs transportvejen og gennem drejeafsnittet (2) med første felt-frembringende elementer (36, 38) rykkende frem langs en indersideradius for drejeafsnittet;

anden felt-frembringende elementer anbragt langs transportørvejen langs indersideradius (28) for drejesektionen (16),

hvorved første felt-frembringende elementer er elektrisk ledende elementer, og anden felt-frembringende elementer danner et array af permanentmagneter (34), eller vice versa, og

kendetegnet ved, at array'et af permanentmagneter (34) frembringer et magnetfelt, der inducerer strømme i de elektrisk ledende elementer, som frembringer et induceret magnetfelt modsat arrayet's magnetfelt, så der skabes en radialt udad rettet kraft (F) mod det sideværts bøjelige transportbånd (12), som rykker frem gennem drejesektionen (16).

2. Transportør ifølge krav 1, hvorved de elektrisk ledende elementer omfatter plader (36) af et elektrisk ledende materiale, der er fastgjort til transportbåndets (12) sidekant (20).

3. Transportør ifølge krav 2, hvorved det elektrisk ledende materiale er kobber eller aluminium.

4. Transportør ifølge krav 1, hvorved første felt-frembringende elementer er indlejret i det sideværts bøjelige transportbånd (12).

5. Transportør ifølge krav 1, hvorved det sideværts bøjelige transportbånd (12) er støbt af et plastmateriale blandet med de elektrisk ledende elementer.

6. Transportør ifølge krav 1, hvorved array'et af permanentmagneter (34) er arrangeret i et Halbach-array.

7. Transportør ifølge krav 1, hvorved det sideværts bøjelige transportbånd (12) omfatter:

en serie af rækker (24) af båndmoduler (26), som er hængslet sammen og strækker sig i bredden hen over et mellemliggende afsnit (22) fra en første sidekant (20) til en anden sidekant (21), hvorved de elektrisk ledende elementer (36, 38) er anbragt langs den første sidekant (20) af rækkerne (24) af båndmoduler (26), hvorved det mellemliggende afsnit (22) er fri for elektrisk ledende elementer.

8. Transportør ifølge krav 7, hvorved de elektrisk ledende elementer er indlejret i første sidekant (20).

9. Transportør ifølge krav 7, hvorved båndmodulerne (26) er støbt af et plastmateriale, der er blandet med de elektrisk ledende elementer (38).

10. Transportør ifølge krav 7, ydermere omfattende elektrisk ledende elementer, der er anbragt langs anden sidekant (21) af rækkerne (24) af båndmoduler (26).

11. Transportør ifølge krav 7, hvorved de elektrisk ledende elementer er af kobber eller aluminium.

12. Transportør ifølge krav 7, hvorved de elektrisk ledende elementer (36) er elektrisk ledende plader.

13. Transportør ifølge krav 12, hvorved hver af rækkerne (24) af båndmoduler (26) omfatter en plade (36), der er monteret til den første sidekant (20).

DRAWINGS

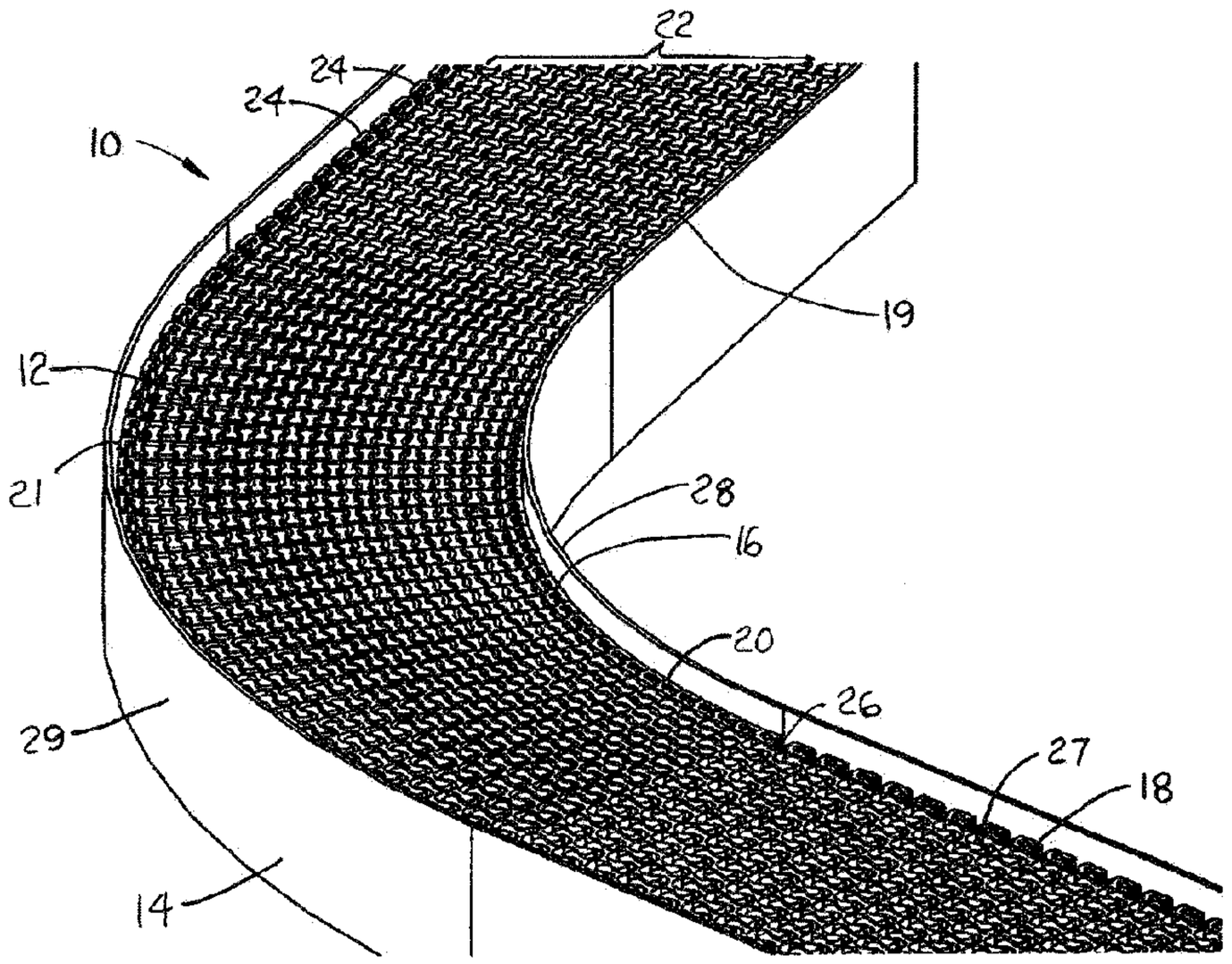

FIG. 1

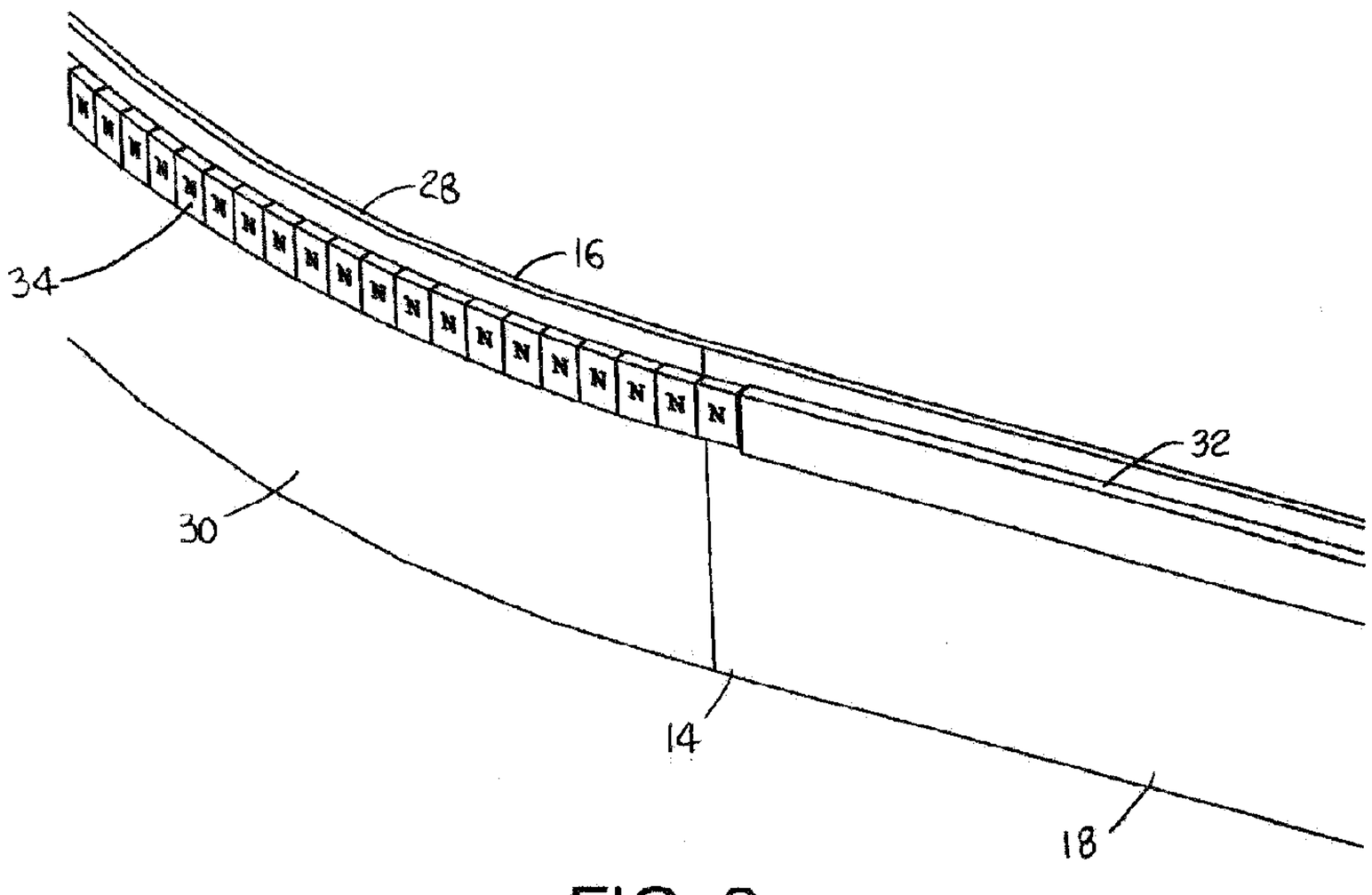

FIG. 2

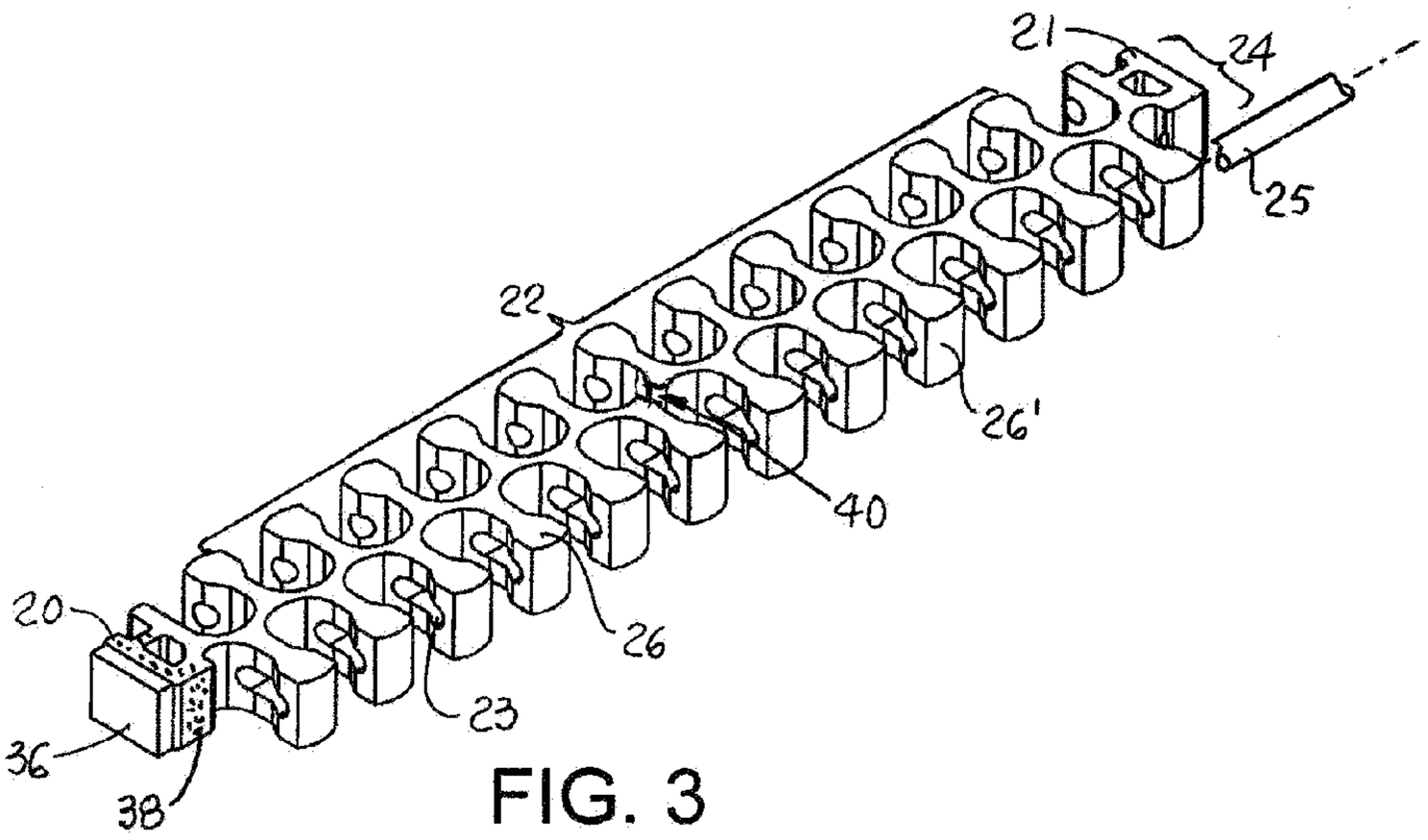

FIG. 3

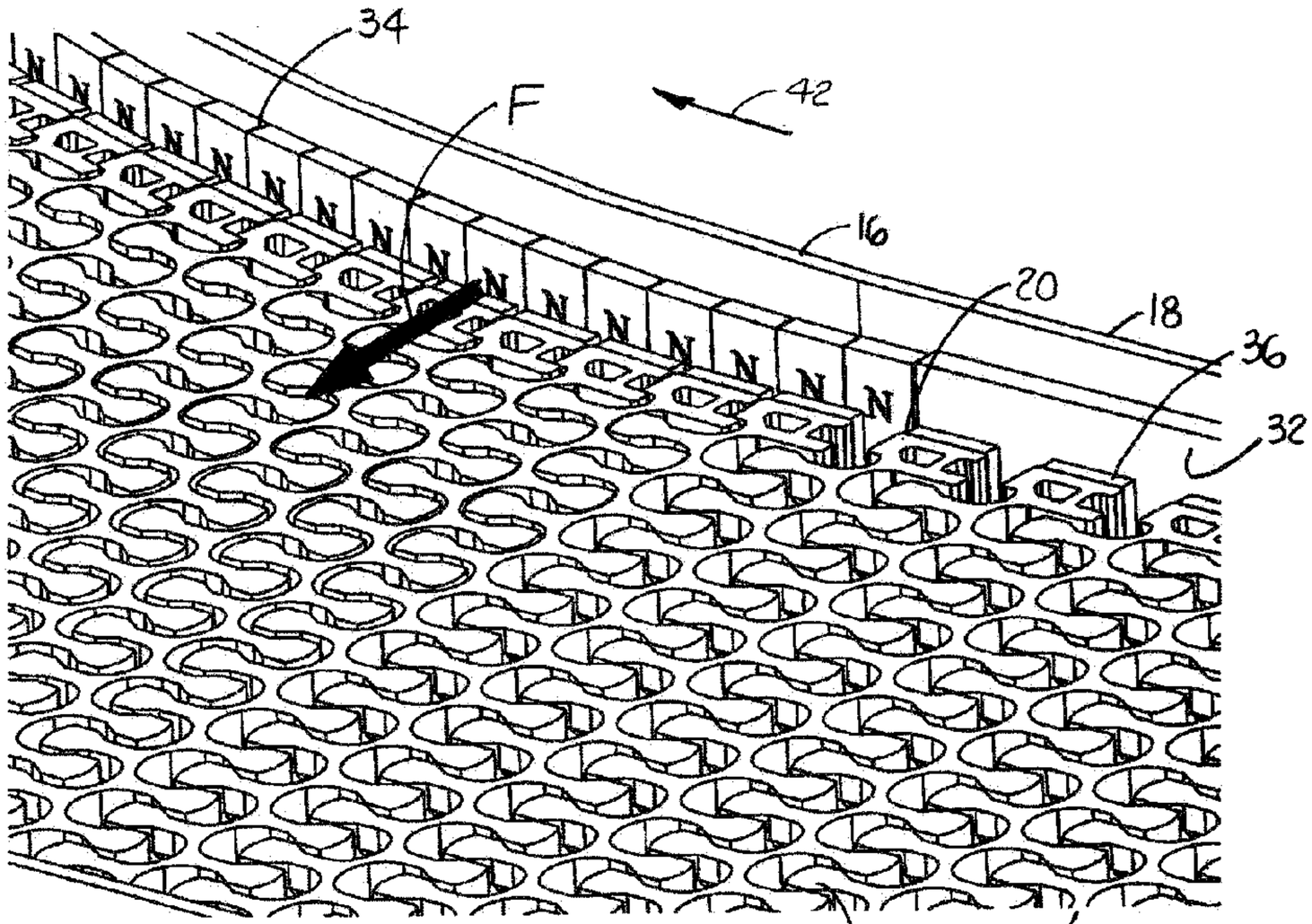

FIG. 4