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(54) Titre : SYSTEME DE MISE EN CONTACT ELECTRIQUE DE TIRANTS DANS DES MOYENS DE SUPPORT
(54) Title: SYSTEM FOR ELECTRICAL CONTACTING OF TENSILE CARRIERS IN SUPPORT MEANS

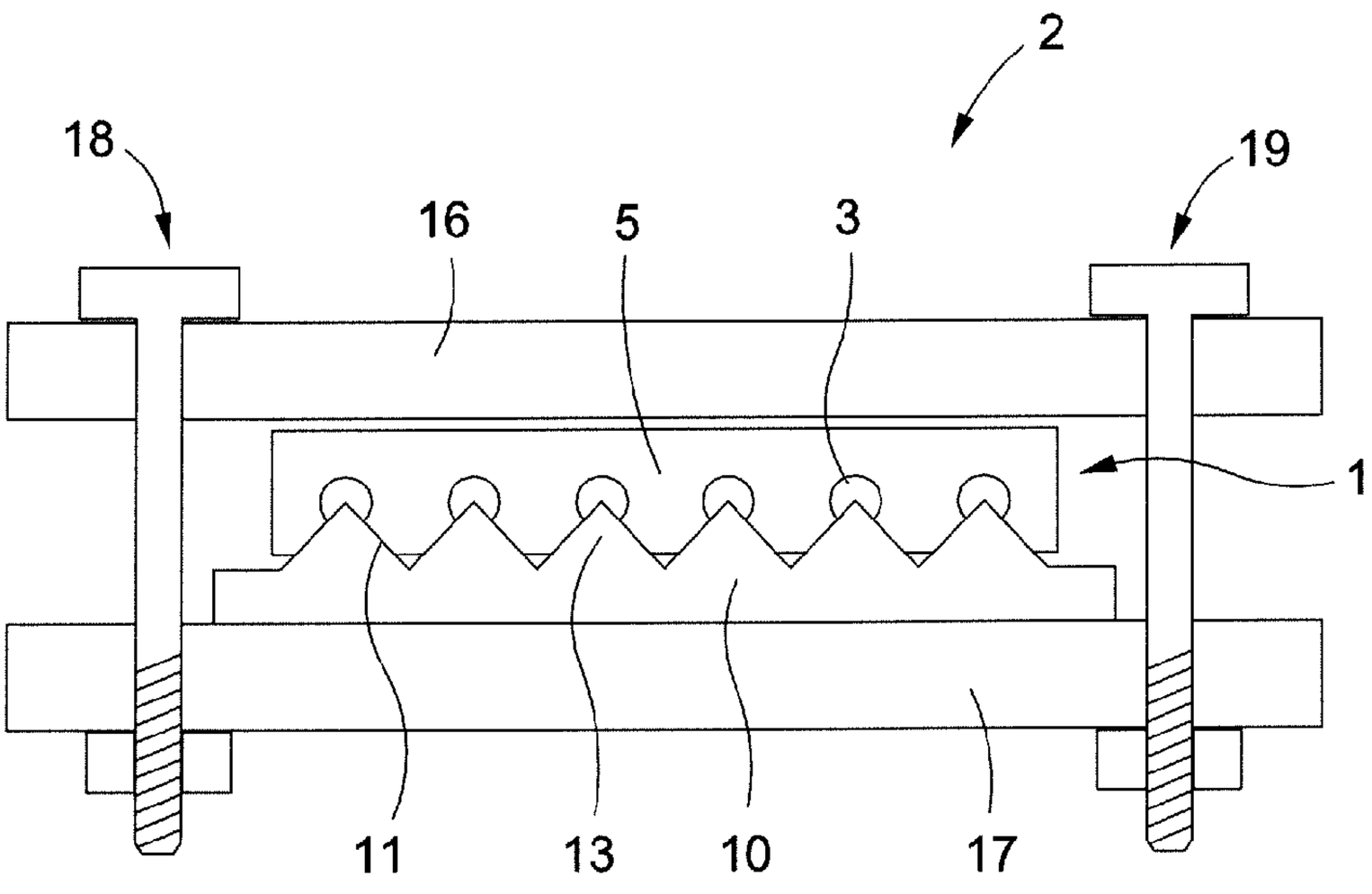


FIG. 4a

(57) Abrégé/Abstract:
A system for making electrical contact with tension members in load-bearing means comprises a load-bearing means (1) and a contacting arrangement (2). The load-bearing means has a casing (5) and at least four tension members (3). The tension members are arranged parallel to one another in the casing and are located substantially in one plane. The contacting arrangement has a contact element (10). The contact element has a cutting side (11) for piercing the casing, wherein the cutting side of the contact element is guided through the casing such that the contact element makes contact with the at least four tension members at least by way of the cutting side.

Abstract

A system for electrical contacting of tensile carriers in support means comprises a support means and a contacting device. The support means has a casing and at least four tensile carriers. The tensile carriers are arranged parallel to one another in the casing and lie substantially in one plane. The contacting device has a contact element. The contact element has a cutting side for penetration of the casing, wherein the cutting side of the contact element is so guided through the casing that the contact element contacts the at least four tensile carriers at least by the cutting side.

(Figure 4a)

System for electrical contacting of tensile carriers in support means

The subject of the invention is a system for electrical contacting of tensile carriers in support means in order to monitor support means in lift installations.

In many conveying devices such as, for example, lift installations, cranes or hoist use is made of belt-shaped support means. These support means in general comprise several tensile carriers which consist of steel wires and which absorb the tensile forces to be accepted by the support means. The tensile carriers are usually surrounded by a casing of synthetic material. The casing protects the tensile carriers from, for example, mechanical wear, because the support means are frequently guided over deflecting points. In addition, the casing improves the traction of the support means on deflecting or drive rollers and fixes the arrangement of the tensile carriers with respect to one another.

Such support means within a conveying device are a safety-critical component. Failure or breakage thereof can lead to dropping down of the object to be conveyed. This can lead to significant damage to articles or harm to persons. For this reason, check units are used in conveying devices which check, in particular, the mechanical state of the tensile carriers. Damage to the tensile carriers accepting the forces shall thereby be able to be recognised in good time so that the support means in the case of damage can be exchanged in order to prevent failure of the conveying device.

The tensile carriers are surrounded by the electrically insulating casing of synthetic material. For performance of a test of the state of the tensile carriers in some methods a contacting of a contact element with the tensile carrier is required. In this known method with the help of the contact element an electric current is conducted through the tensile carriers and serves as a test current establishing the state of the tensile carriers. Apart from that, other test methods which do not operate with electrical current, for example ultrasound, also come into consideration.

DE 3 934 654 A1 shows a support means according to category. The ends of the tensile carriers are in that case conductively connected in pairs with a bridge part so that the tensile carriers of the support means are electrically connected in series. The tensile carriers of the support means are connected by way of an ammeter with a voltage source so that by means of the test current which is conducted through all tensile carriers by virtue of the electrical series circuit the state of the tensile carriers can be assessed.

WO 2005/094249 A2 shows a system for contacting a support means in which the contact elements puncture the casing of the support means perpendicularly to a longitudinal axis of the tensile carriers and then penetrate into the tensile carriers. It is disadvantageous in that case that the contact elements due to the required puncturing process through the casing can miss the tensile carriers.

An object of the present invention consists in providing a system for electrical contacting of tensile carriers in support means, in which the tensile carriers can be contacted reliably and in a precise manner by a contact element so as to be able to detect a state of the tensile carriers. The system shall be simple to manage and reliable as well as have low production costs.

For fulfilment of this object a system for electrical contacting of tensile carriers in support means is proposed which comprises a support means and a contacting device. The support means has a casing and at least four tensile carriers, which are arranged parallel to one another in the casing and which lie substantially in one plane. The contacting device has a contact element. The contact element has a cutting side for penetration of the casing, wherein the cutting side of the contact element is guided through the casing in such a manner that the contact element contacts the at least four tensile carriers at least by the cutting side.

This solution has the advantage that all tensile carriers of a support means can be contacted by only one contact element. Thus, only one contact element has to be led through the casing of the support means. This substantially simplifies the use of this system for electrical contacting of tensile carriers in support means. In addition, through such a system all tensile carriers in the support means can be connected in parallel in simple mode and manner.

The contact element with the cutting side additionally has the advantage that the contact element can be driven in knife-like manner through the casing in order to contact the tensile carriers.

Such a cutting side can, for example, be constructed as a rectilinear edge or, however, as a serrated edge with contact points or as an edge with contact depressions or contact elevations. Such contact points or contact depressions or contact elevations have the advantage that the tensile carriers can be respectively reliably contacted by contact point or contact depression or contact elevation. Advantageously, a respective contact point or contact depression or contact elevation is provided per tensile carrier. As a result, all tensile carriers of a support means can be reliably contacted by a single contact element.

In a further advantageous form of embodiment the contacting device comprises a first holding element and a second holding element. The support means is in that case substantially arranged between the first and second holding elements. The contact element is supported by one of the two holding elements so that the cutting side of the contact element is directed towards the support means. Such holding elements facilitate guidance of the contact element in desired manner through the casing of the support means.

In a further advantageous form of embodiment the first and second holding elements are connected together by a first fastening element and a second fastening element. Advantageously, the first and second holding elements are displaceable relative to one another through actuation of the first and second fastening elements. The holding elements can thus be guided towards one another in order to thereby drive the contact element into the casing of the support means.

In a further advantageous form of embodiment a hinge and a fastening element are provided in order to connect the first and second holding elements with one another. This has the advantage that only one fastening means has to be actuated in order to displace the first and second holding elements relative to one another and thereby drive the contact element into the casing of the support means.

In an exemplifying form of embodiment the first and second fastening elements or the single fastening element is or are constructed as a respective screw with nut. However, other forms of embodiment are also possible.

In an advantageous form of embodiment an electrical voltage is applied to a first contact element, which is arranged at a first support means end, in a use state, in which case an electrical current is measured which flows from the first contact element to a second contact element arranged at a second support means end. Any damage in the tensile carriers can thereby be ascertained.

In a further advantageous form of embodiment the support means comprises at least five tensile carriers, wherein the contact element contacts the at least five tensile carriers.

In a further advantageous embodiment a lift installation with such a system for electrical contacting of tensile carriers in support means is provided. In that case, the contacting devices are preferably arranged at regions of the support means which are not rolled over.

Details and advantages of the invention are described in the following by way of embodiments and with reference to the schematic drawings, in which:

Fig. 1 shows an exemplifying form of embodiment of a lift installation with a system for electrical contacting of tensile carriers in support means;

Figs. 2a to 2d show exemplifying forms of embodiment of support means for use in a system for electrical contacting of tensile carriers in support means;

Figs. 3a to 3d show exemplifying forms of embodiment of a contact element for use in a system for electrical contacting of tensile carriers in support means; and

Figs. 4a and 4b show exemplifying forms of embodiment of a system for electrical contacting of tensile carriers in support means, with a support means and a contacting device.

In Figure 1 two contacting devices 2 for contacting a support means 1 are installed in a lift installation 40. The schematic and exemplifying lift installation 40 includes at least one lift cage 41, counterweight 42 and support means 1 as well as a drive pulley 43 with associated drive motor 44. The drive pulley 43 drives the support means 1 and thus moves the lift cage 41 and the counterweight 42 diametrically oppositely. The drive motor 44 is controlled by a lift control 45. The cage 41 is designed to receive persons and/or goods and to transport them between storeys of a building. The cage 41 and counterweight 42 are guided along guides (not illustrated). In the example, the cage 41 and the counterweight 42 are respectively suspended at support rollers 46. The support means 1 is in that case fixed to a first support means fastening device 47 and then initially guided around the support roller 46 of the counterweight 42. The support means 1 is then laid over the drive pulley 43, guided around the support roller 46 of the cage 41 and finally connected with a fixing point by a second support means fastening device 47. This means that the support means 1 runs over the drive 43, 44 at a speed which is higher in correspondence with a suspension factor. In the example, the suspension factor is 2:1.

A free end 1.1 of the support means 1 is provided with the contacting device 2 for temporary or permanent contacting of the support means 1. In the illustrated example a contacting device 2 of that kind is arranged at both ends of the support means 1. In an alternative form of embodiment

(not illustrated) only one contacting device 2 is arranged at one of the support means ends 1.1. The support means ends 1.1 are no longer loaded by the tension force in the support means 1, since this tension force is already conducted beforehand into the building by way of the support means fastenings 47.

The contacting devices 2 are thus arranged in a region of the support means which is not rolled over.

The illustrated lift installation 40 in Figure 1 is by way of example. Other suspension factors and arrangements are possible. The contacting device 2 for contacting the support means 1 is then arranged in correspondence with the placing of the support means fastenings 47.

Different exemplifying embodiments of support means 1, which can be used in a system for electrical contacting of tensile carriers in support means, are illustrated in Figures 2a to 2d. The support means 1 respectively comprise a casing 5 and at least four tensile carriers 3. The tensile carriers 3 are in that case arranged parallel to one another in the casing 5 and lie substantially in one plane. The number of tensile carriers 3 and the form of the casing 5 can in that case be of different designs.

Figure 2a shows an exemplifying support means 1 with a rectangular cross-section and six tensile carriers 3 arranged parallel to one another. The support means 1 has a rear side 6 and a traction side 4. In this embodiment the support means 1 is of symmetrical form, i.e. the rear side 6 can be used as traction side or the traction side 4 can be used as rear side.

A further exemplifying support means 1 is illustrated in Figure 2b. In this embodiment the traction side 4 has longitudinal ribs 7. Such longitudinal ribs 7 improve the traction behaviour of the support means 1 and allow precise lateral guidance of the support means 1 on drive or deflecting rollers. The rear side 6 is constructed as in Figure 2a without additional structures. In this embodiment the support means 1 has six longitudinal ribs 7, wherein two tensile carriers 3 are associated with each longitudinal rib 7. Thus, in total twelve tensile carriers 3 are arranged in the casing 5 of the support means 1.

A further exemplifying form of embodiment of a support means 1 is illustrated in Figure 2c. In this embodiment the support means 1 has four tensile carriers 3 in the casing 5. In that case, the casing 5 is contoured around the tensile carries 3 so that the traction side 4 and also the rear side 6 have a

wavy form.

A further exemplifying form of embodiment of a support means 1 is illustrated in Figure 2d. This exemplifying support means 1 comprises eight tensile carriers 3 which are arranged parallel to one another and surrounded by the casing 5. The rear side 6 has a guide rib 8. It is thereby achieved that the support means 1 even when it is guided on its rear side 6 over deflecting rollers, can be guided laterally. In addition, the support means 1 has two guide grooves 9 on its traction side 4. The support means 1 can thus be laterally guided by corresponding guide channels on a drive or deflecting roller.

The support means 1 illustrated in Figures 2a to 2d are exemplifying forms of embodiment of a support means 1 which can be used in a system for electrical contacting of tensile carriers in support means. It will be obvious that any other forms of embodiment of support means can be used in such a system.

Different embodiments of a contact element 10 for use in a system for electrical contacting of tensile carriers in support means are illustrated in Figures 3a to 3d. These contact elements 10 each comprise a contact element body 12 and a cutting side 11. The cutting side 11 is suitable for the purpose of puncturing the casing of a support means and thereby leading the contacting element 10 up to the tensile carriers in the interior of the support means. The contact element body 12 is preferably made of an electrically conductive material such as, for example, a metal. The contact element body 12 is in additionally preferably of sufficiently robust construction so that the contact element 10 when guided into the support means casing is not damaged. The cutting side 11 is preferably constructed similar to a crest of a knife blade so as to enable a corresponding cutting action.

The cutting side 11 of the contact element 10 in Figure 3b is of substantially rectilinear construction. Such a contact element 10 can be used for many different support means, since the cutting side 11 is not matched to a specific number and arrangement of the tensile carriers in the support means. By contrast, the cutting sides 11 in Figures 3a, 3c and 3d have an irregular shape. Such irregular shapes are matched to the support means to be used with the contact element 10. Thus, for example, the contact element 10 of Figure 3a is provided for a support means with six tensile carriers. The contact points 13 in that case enable reliable contacting of the individual tensile carriers. In addition, the contact points 13 facilitate guidance of the contact element 10 through the casing of the support means. The contact depressions 14 or contact elevations 15 in

Figures 3c and 3d serve a purpose similar to the contact points 13 in Figure 3a. The contact depressions 14 are, in a use state, respectively arranged around a tensile carrier. The tensile carriers are thereby not contacted punctiformly, as is the case with contact points, but the tensile carriers are contacted on a greater part of the circumferential surface thereof by the contact depressions 14 of the contact element 10. The contact elevations 15 have an effect similar to the contact points 13, with the difference that the contact elevations 15 are rounded.

The contact elements 10 in Figures 3a to 3d are again exemplifying forms of embodiment for use in a system for electrical contacting of tensile carriers in support means. It will be obvious that such a contact element 10 can be constructed in various other ways (not illustrated).

A system for electrical contacting of tensile carriers in support means is illustrated in each of Figures 4a and 4b. In that case, a support means 1 with a rectangular cross-section and six tensile carriers 3 arranged parallel to one another is illustrated in Figure 4a. A support means 1 with a wavy traction side or rear side and four tensile carriers 3 arranged parallel to one another is illustrated in Figure 4b. The contact elements 10 used in the respective system are matched to the respective support means 1. Thus, in Figure 4a a contact element 10 with contact points 13 is arranged, wherein the number of contact points 13 corresponds with the number of tensile carriers 3. Correspondingly, in Figure 4 a contact element 10 with contact depressions 14 is illustrated. The number of contact depressions 14 again corresponds with the number of tensile carriers 3.

The support means 1 is respectively surrounded by a first holding element 16 and a second holding element 17. In that case, the contact element 10 is respectively supported by the second holding element 17 so that the cutting side 11 of the contact element 10 is oriented towards the support means 1. The first and second holding elements 16 and 17 are connected together by a first fastening element and a second fastening element 19. Through actuation of the fastening elements 18 and 19 the first and second holding elements 16 and 17 are displaceable relative to one another. The contact element 10 is thus guided in the casing 5 of the support means 1 by such an actuation of the fastening elements 18 and 19. The fastening elements 18 and 19 are now actuated until the contact element 10 contacts all tensile carriers 3 of the support means 1. In this embodiment the fastening elements 18 and 19 are respectively constructed as a screw with nut. After contacting of the tensile carriers 3 has taken place by the contact element 10 a voltage is applied so that a test current flows through the tensile carriers 3 in order to ascertain the state of the tensile carriers 3.

In an alternative embodiment (not illustrated) only one fastening element 18, 19 is provided and the

second fastening element is replaced by a hinge. The two elements 16 and 17 are thereby already connected together, which simplifies mounting, and only one fastening element 18, 19 has to be actuated in order to arrange the contacting device 2 at the support means 1.

Patent claims

1. System for electrical contacting of tensile carriers (3) in support means (1), the system comprising:
a support means (1) with a casing (5) and at least four tensile carriers (3), which are arranged parallel to one another in the casing (5) and which lie substantially in one plane, and
a contacting device (2) with a contact element (10),
characterised in that the contact element (10) has a cutting side (11) for penetrating the casing (5), wherein the cutting side (11) of the contact element (10) is so guided through the casing (5) that the contact element (10) contacts the at least four tensile carriers (3) at least by the cutting side (11).

2. System according to claim 1, wherein the cutting side (11) is constructed as a substantially rectilinear edge.

3. System according to claim 1, wherein the cutting side (11) is constructed as a serrated edge with at least two contact points (13) and wherein each tensile carrier (3) of the at least two tensile carriers (3) is contacted by a respective contact point (13).

4. System according to claim 1, wherein the cutting side (11) has at least two contact depressions (14) and wherein each tensile carrier (3) of the at least two tensile carriers (3) is contacted by a respective contact depression (14).

5. System according to claim 1, wherein the cutting side (11) has at least two contact elevations (15) and wherein each tensile carrier (3) of the at least two tensile carriers (3) is contacted by a respective contact elevation (15).

6. System according to any one of the preceding claims, wherein the contacting device (2) further comprises a first holding element (16) and a second holding element (17) and wherein the support means (3) is arranged substantially between the first and second holding elements (16, 17).

7. System according to claim 6, wherein the contact element (10) is supported at the second holding element (17) so that the cutting side (11) is directed towards the support means (1).

8. System according to one of claims 6 and 7, wherein the first and second holding elements (16, 17) are connected together by at least one fastening element (18, 19).

9. System according to claim 8, wherein the first and second holding elements (16, 17) are displaceable relative to one another by actuation of the at least one fastening element (18, 19).

10. System according to claim 9, wherein the at least one fastening element (18, 19) is constructed as a screw with a nut.

11. System according to any one of the preceding claims, wherein in a use state an electrical voltage is applied to the contact element (10) in order to detect damage of the tensile carriers (3).

12. System according to any one of the preceding claims, wherein the support means (1) comprises at least five tensile carriers (3) and wherein the contact element (10) contacts the at least five tensile carriers (3).

13. Lift installation (40) with a system according to any one of the preceding claims.

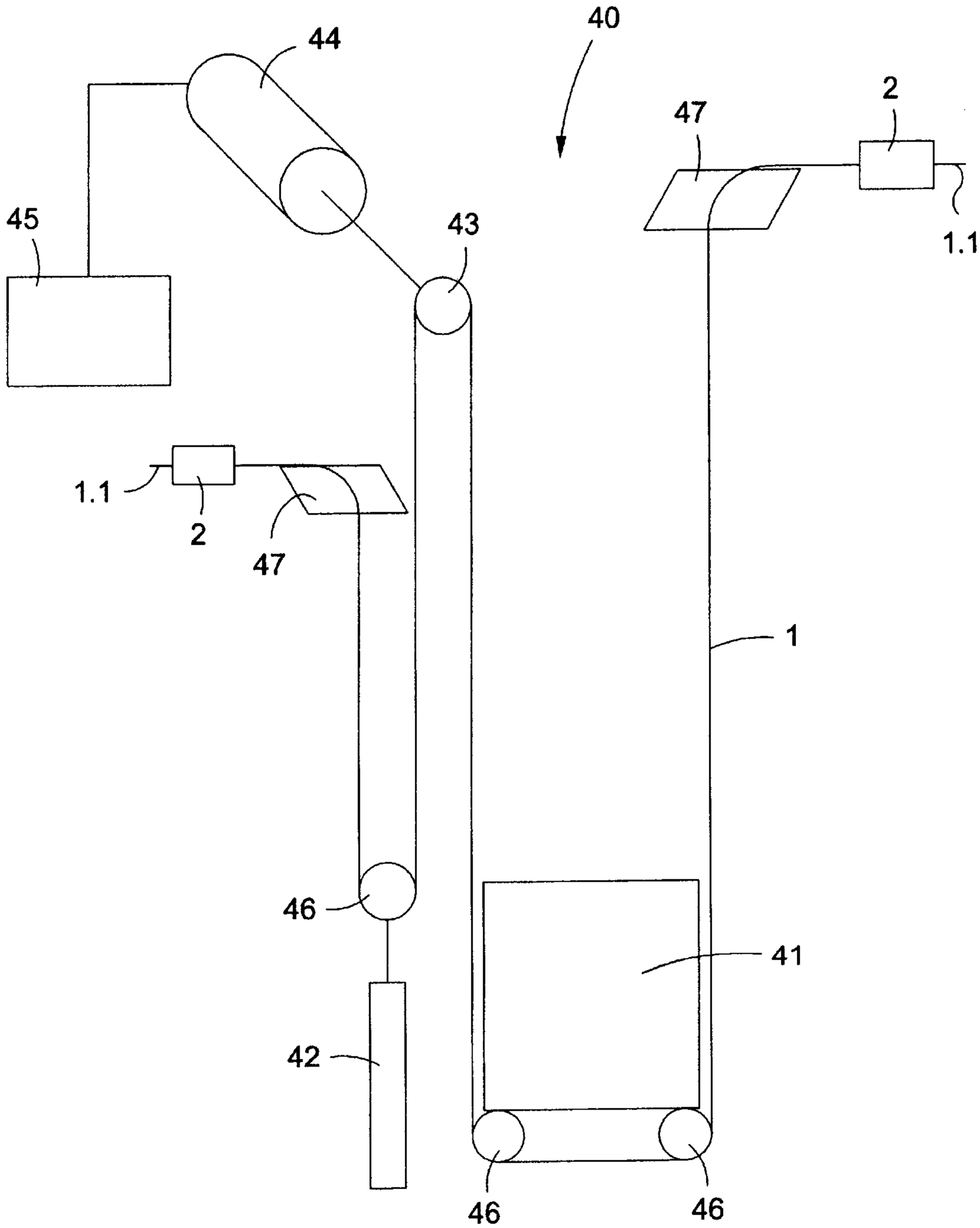


FIG. 1

FIG. 2a

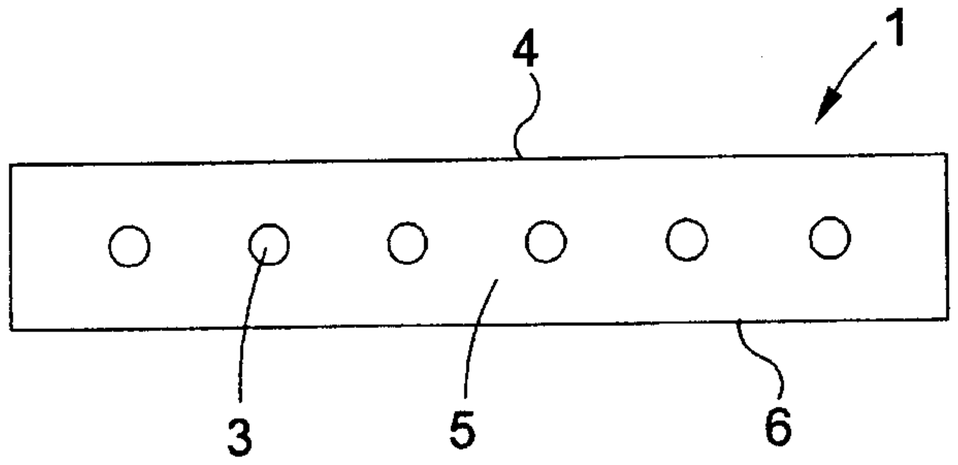


FIG. 2b

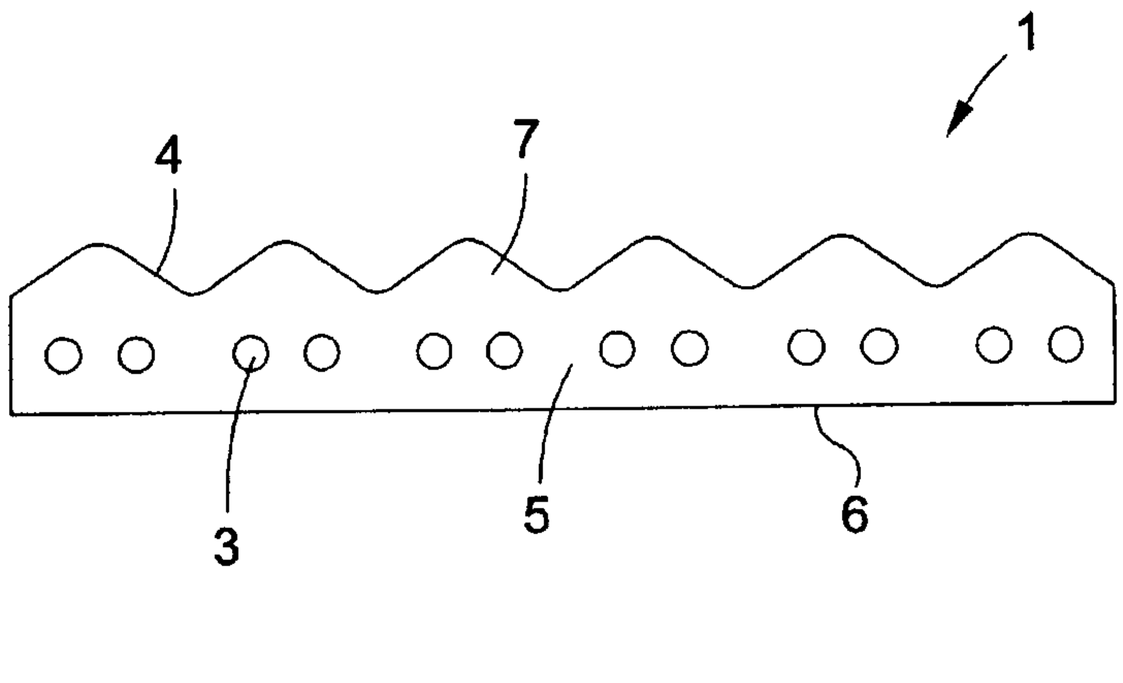


FIG. 2c

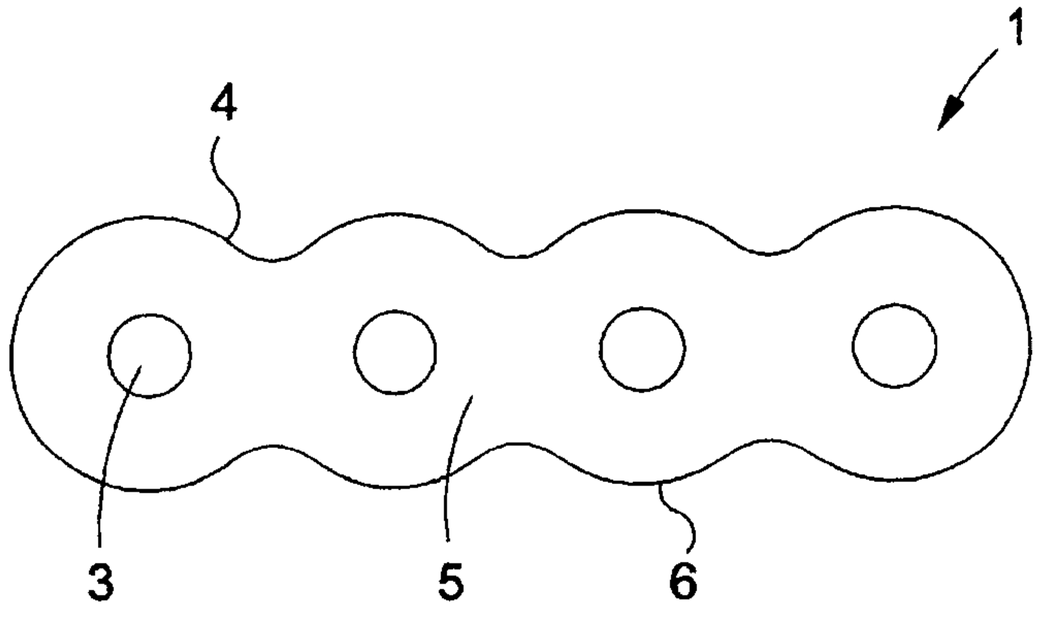
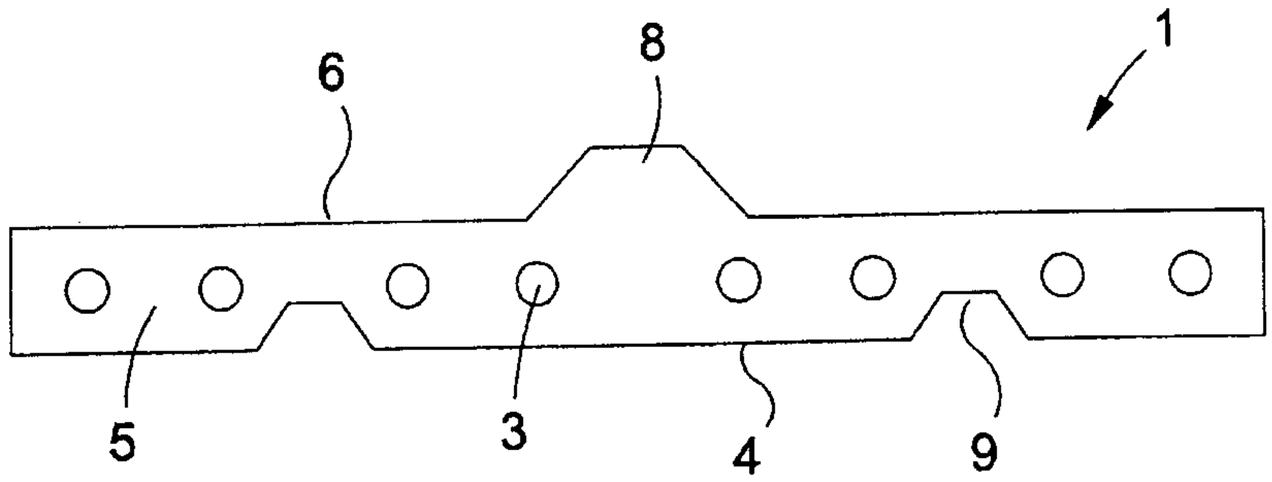


FIG. 2d



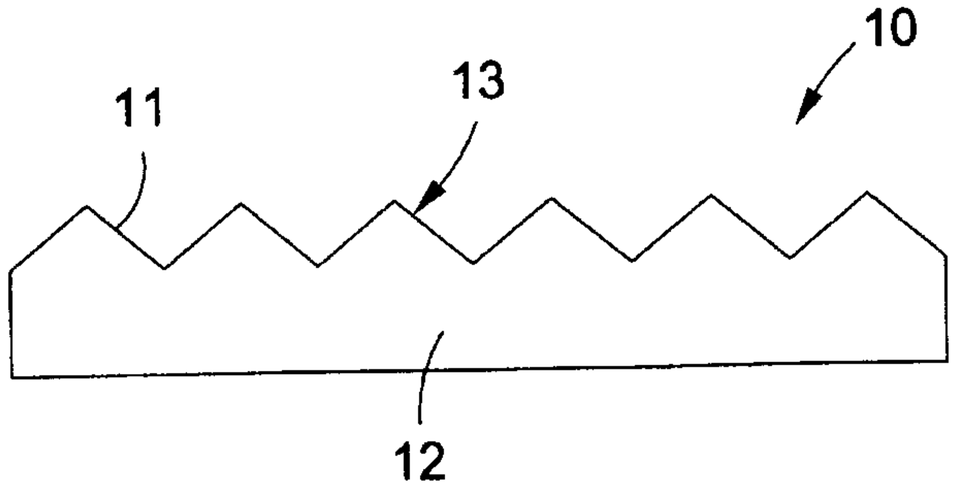


FIG. 3a

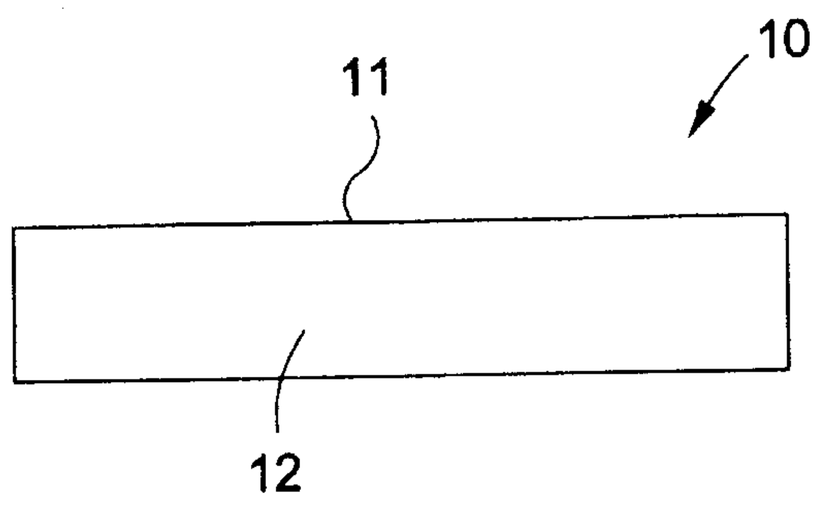


FIG. 3b

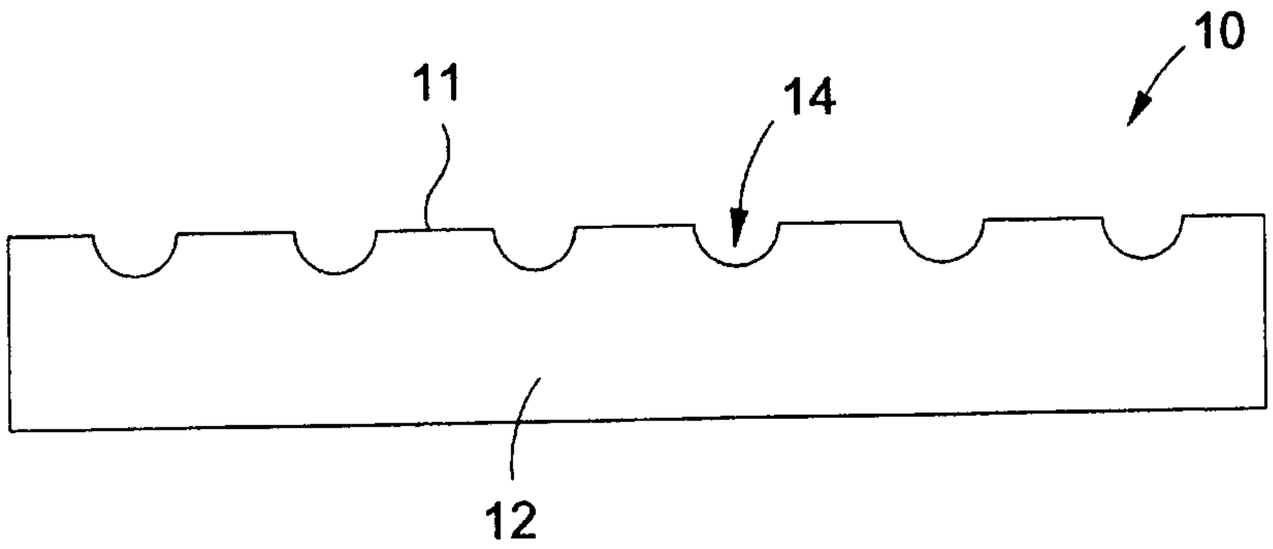


FIG. 3c

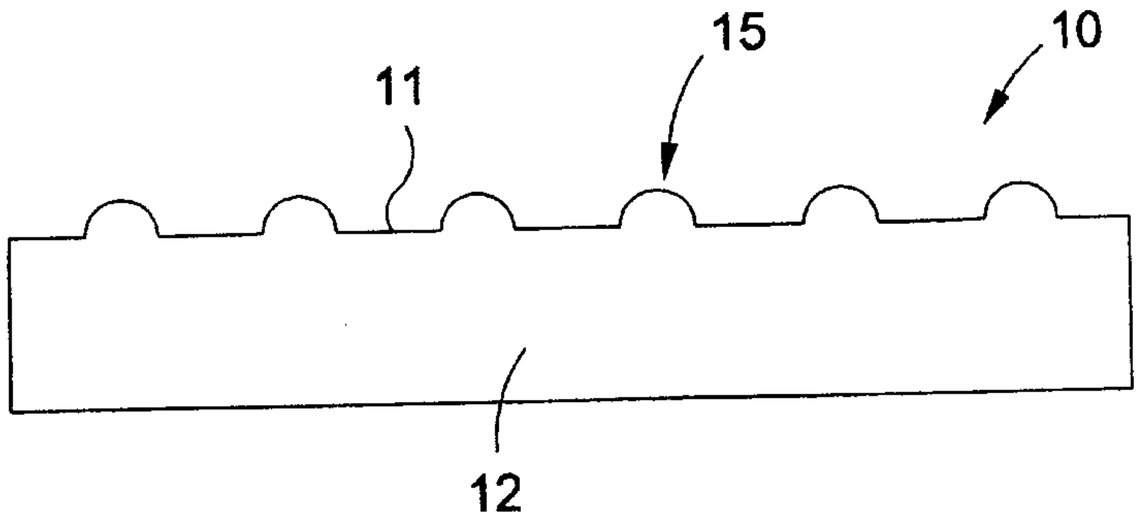


FIG. 3d

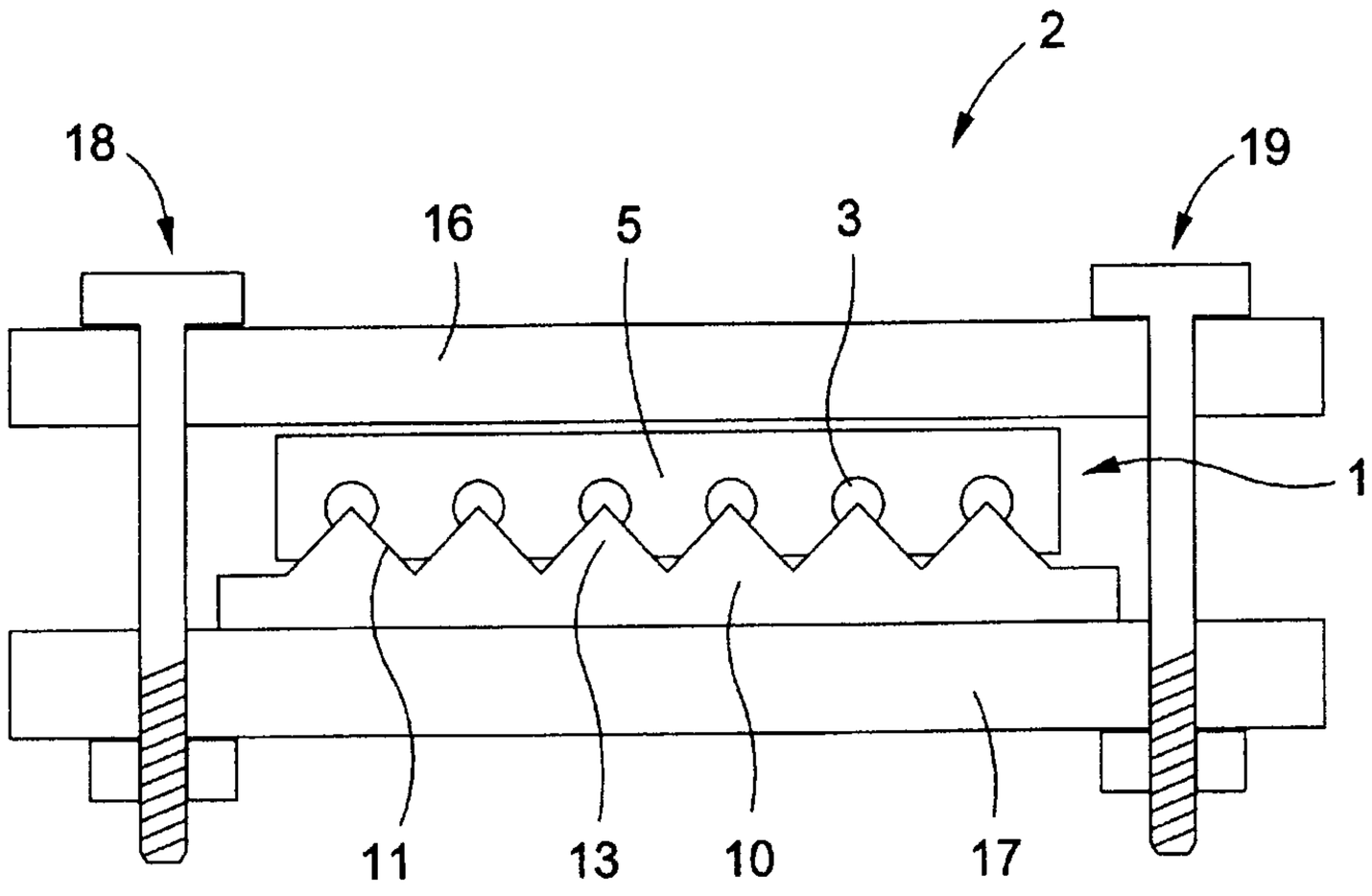


FIG. 4a

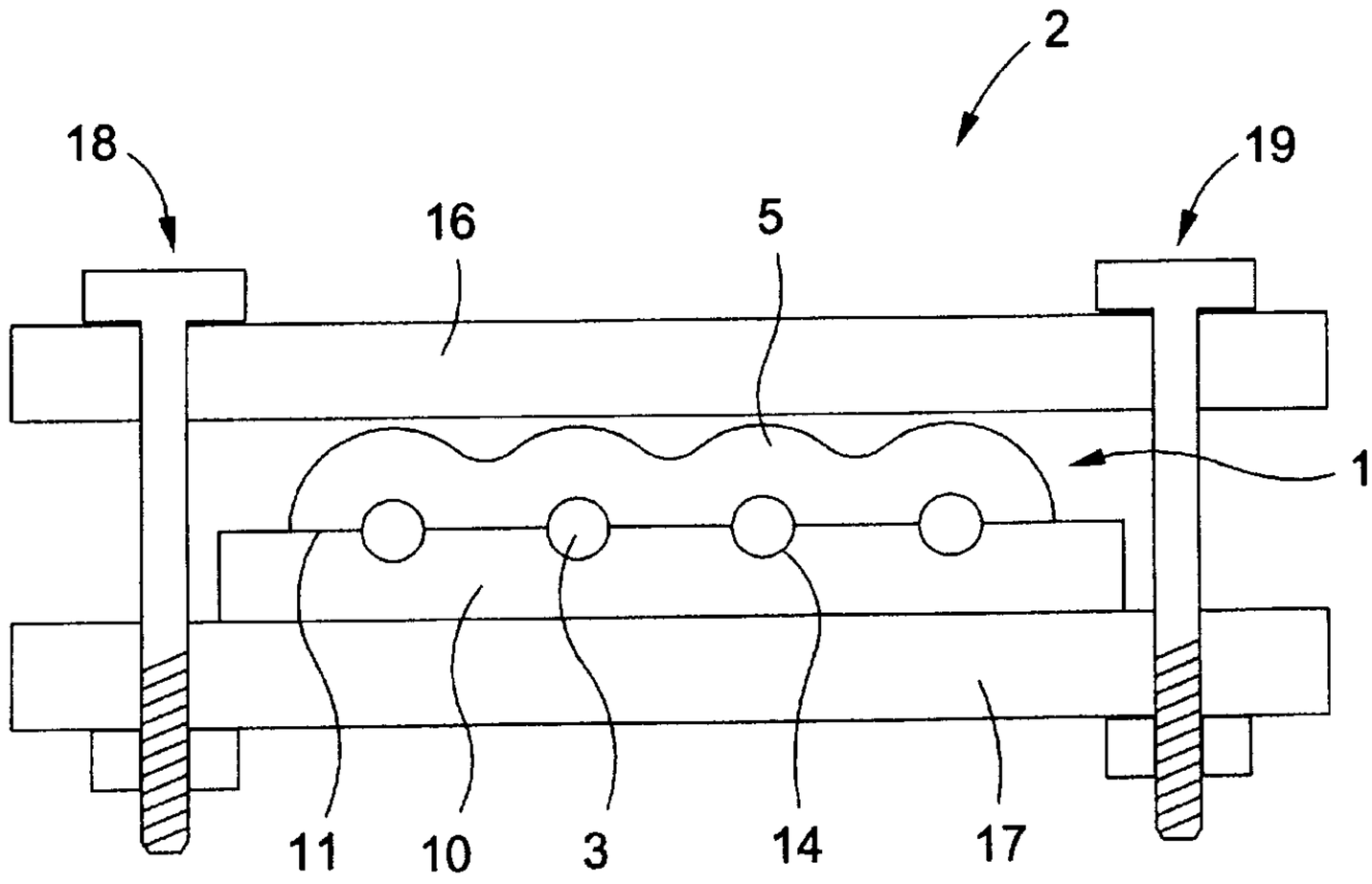


FIG. 4b

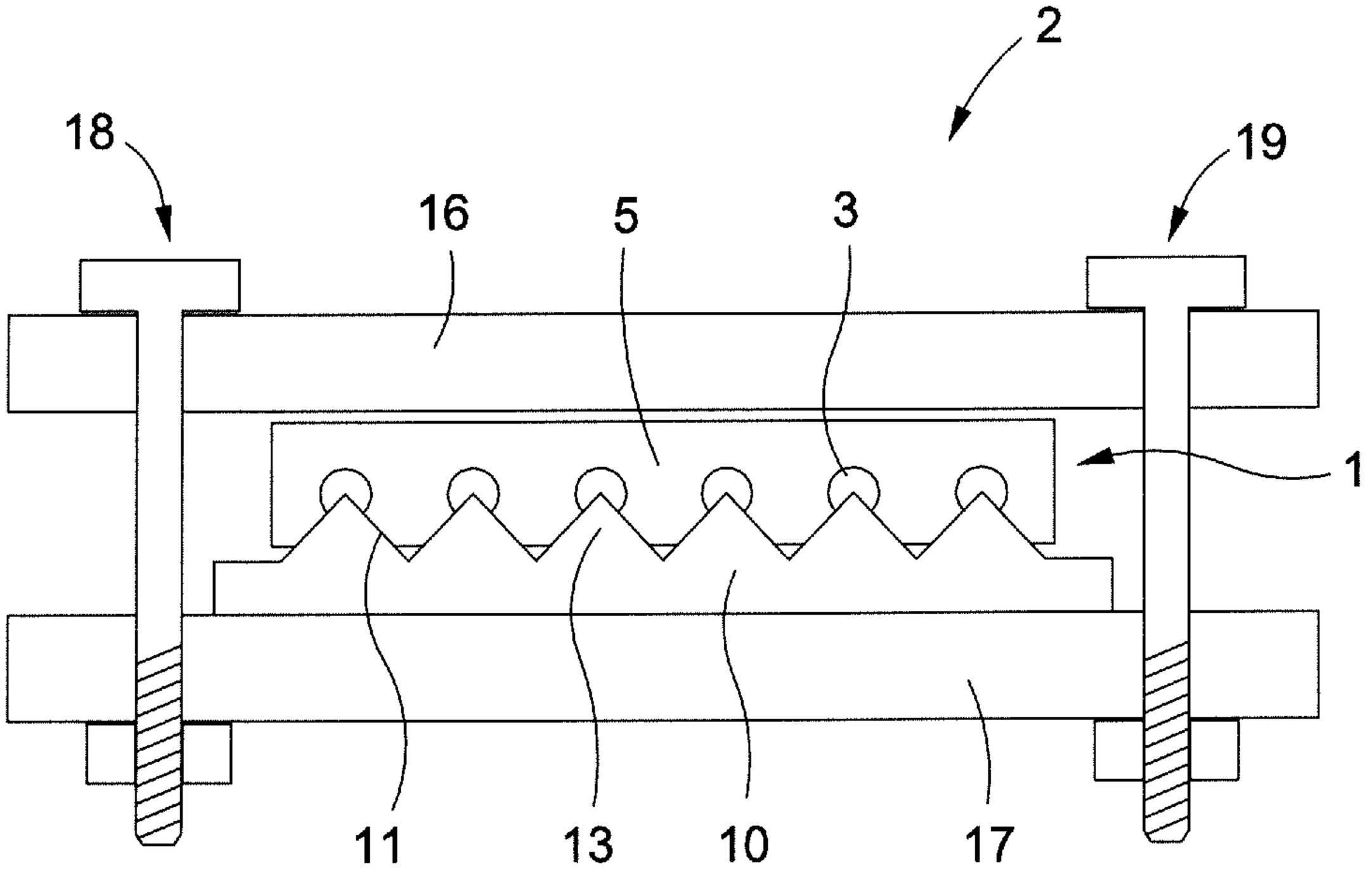


FIG. 4a