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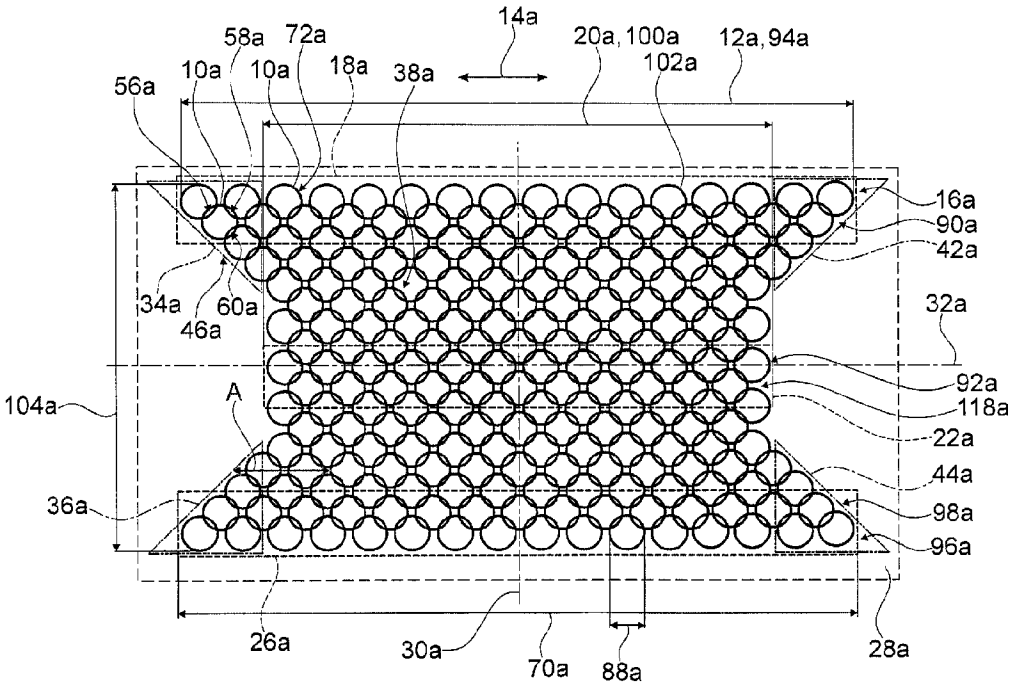

(57) Abrégé/Abstract:
The invention relates to a safety net, in particular for trapping heavy loads, preferably dynamic impact bodies, in particular rocks, the safety net being formed, at least to a large extent, from intermeshing net elements (10a-f). According to the invention, a maximum total extension (12a-f) of the safety net parallel to a main extension direction (14a-f) of the safety net, in an outer region (18a-f) of the safety net which comprises at least one outermost row (16a-f) of net elements (10a-f), is significantly greater than a minimum total extension (20a-f) of the safety net parallel to the main extension direction (14a-f) in an inner region (22a-f) which is different from the outer region (18a-f) of the safety net.

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(54) **Title:** SAFETY NET

(54) **Bezeichnung:** SICHERHEITSNETZ

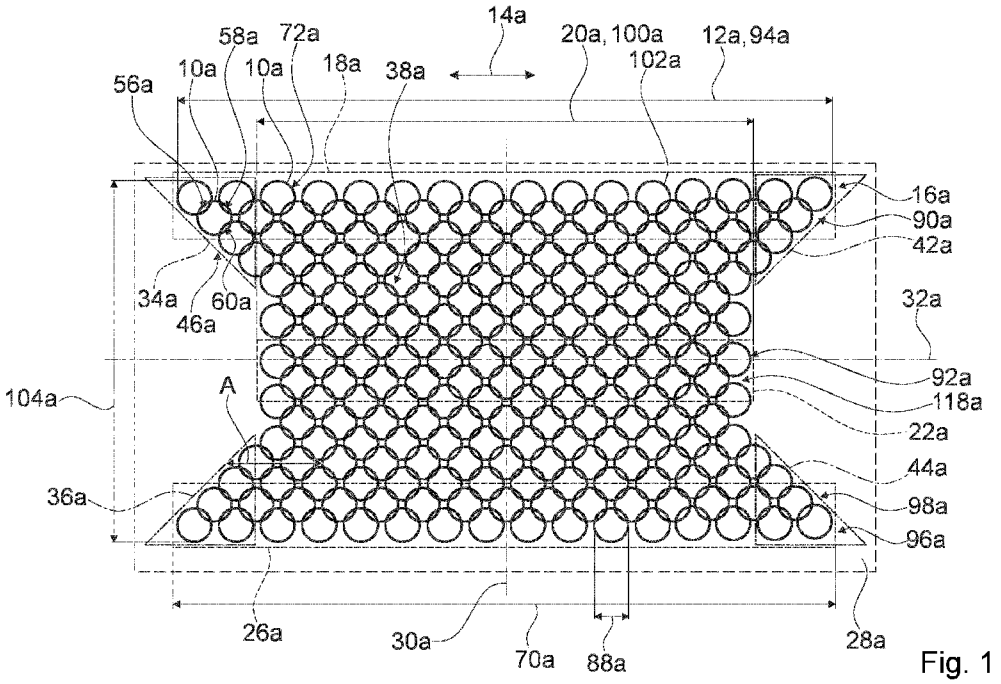

Fig. 1

(57) **Abstract:** The invention relates to a safety net, in particular for trapping heavy loads, preferably dynamic impact bodies, in particular rocks, the safety net being formed, at least to a large extent, from intermeshing net elements (10a-f). According to the invention, a maximum total extension (12a-f) of the safety net parallel to a main extension direction (14a-f) of the safety net, in an outer region (18a-f) of the safety net which comprises at least one outermost row (16a-f) of net elements (10a-f), is significantly greater than a minimum total extension (20a-f) of the safety net parallel to the main extension direction (14a-f) in an inner region (22a-f) which is different from the outer region (18a-f) of the safety net.

(57) **Zusammenfassung:** Die Erfindung geht aus von einem Sicherheitsnetz, insbesondere zu einem Auffangen schwerer Lasten, vor-

[Fortsetzung auf der nächsten Seite]

WO 2019/072586 A1

WO 2019/072586 A1

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zugsweise dynamischer Einschlagskörper, insbesondere Gestein, wobei das Sicherheitsnetz zumindest zu einem Großteil aus ineinandergreifenden Netzelementen (10a-f) gebildet ist. Es wird vorgeschlagen, dass eine maximale Gesamterstreckung (12a-f) des Sicherheitsnetzes parallel zu einer Haupterstreckungsrichtung (14a-f) des Sicherheitsnetzes in einem, insbesondere zumindest eine äußerste Reihe (16a-f) von Netzelementen (10a-f) umfassenden, Außenbereich (18a-f) des Sicherheitsnetzes wesentlich größer ist als eine minimale Gesamterstreckung (20a-f) des Sicherheitsnetzes parallel zu der Haupterstreckungsrichtung (14a-f) in einem von dem Außenbereich (18a-f) verschiedenen Innenbereich (22a-f) des Sicherheitsnetzes.

Safety net

Field of the Invention

The invention relates to a safety net, in particular for catching heavy loads, preferably dynamic impact bodies, in particular rocks, wherein the safety net is formed at least to a large extent by mutually engaging net elements.

Object of the Invention

The object of the invention consists, in particular, in providing a generic safety net which has increased safety. The object is achieved according to the invention by means of the features described herein, which also show the advantageous configurations and developments of the invention.

Advantages of the invention

The invention proceeds from a safety net, in particular for catching heavy loads, preferably dynamic impact bodies, in particular rocks, wherein the safety net is formed at least to a large extent by mutually engaging net elements.

It is proposed that a maximum overall extension of the safety net parallel to the main extension direction of the safety net, is greater, in particular substantially, in an exterior region of the safety net, which includes, in particular, at least one outermost row of net elements, than a minimum overall extension of the safety net parallel to the main extension direction in an interior region of the safety net which differs from the exterior region. As a result, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic impact bodies. In an advantageous manner, it is possible to avoid a forming of open positions and/or holes on account of an impact of a dynamic impact body, in particular in a region

which has been covered by the catch area prior to the impact, as a result of which it is advantageously possible to prevent a further dynamic impact body falling through the safety net in the case of a further impact which follows the impact. It is advantageously possible to create an additional buffer path by means of additional net elements, which give way in particular when loaded, on at least one outer edge at which the safety net is suspended, as a result of which it is advantageously possible to cushion an impact in a better manner. In addition, it is advantageously possible to absorb an impact of a dynamic impact body in the vicinity of an edge of the safety net, in particular by an additional buffer path, in particular thereby reducing possible damage to a suspension of the safety net. Furthermore, simple guiding of the net elements about a support element which bears the safety net can be made possible by means of the safety net according to the invention in the mounted state. In addition, stability is also able to be advantageously improved, in particular by a force which cooperates with the safety net being able to be distributed advantageously to a large number of net elements, in addition, in particular an advantageous, in particular uniform, force distribution being able to be achieved, as a result of which it is possible to optimize, in particular, at least one trapping characteristic, such as, for example, deformability, extensibility, a spring-back characteristic, breakthrough strength, etc., of the safety net for catching at least one dynamic impact body. In addition, the safety net according to the invention enables, in particular, a simplified assembly, as a result of which it is advantageously possible to reduce costs and expenditure on material and/or assembly.

A “dynamic impact body” is to be understood, in particular, as a mass moved under the influence of a gravitational potential. In particular, the dynamic impact body includes at least one rock, preferably rubble and/or frozen water. As an alternative to this or in addition to it, the dynamic impact body can also include machines or machine parts, for example of means of transportation and/or construction machinery, and/or living organisms or parts of living organisms, for example tree trunks and/or branches. In particular, a “heavy load” is heavier than 1 kg, preferably

heavier than 10 kg, in a preferred manner heavier than 100 kg and in a particularly preferred manner heavier than 1000 kg. A "net element" is to be understood, in particular, as an, in particular separable, base element of the safety net which realizes the safety net by means of a mutual engaging with neighboring base elements. The net element is preferably realized as a filament-like structure, in particular wire structure, which is closed per se. As an alternative to this, the net element can be realized as at least one helix of a mesh network. The structure, in particular wire structure, is preferably substantially in one plane in a non-loaded state. The filament-like structure, in particular the wire structure, preferably the wire of the wire structure, is preferably a high-strength steel wire. For example, the high-strength steel can be spring steel and/or wire steel and/or a steel suitable for wire ropes. In particular, the wire comprises a tensile strength of at least 800 N mm^{-2}, advantageously of at least 1000 N mm^{-2}, particularly advantageously of at least 1200 N mm^{-2}, preferably of at least 1400 N mm^{-2} and in a particularly preferred manner of at least 1600 N mm^{-2}, in particular a tensile strength of approximately 1770 N mm^{-2} or a tensile strength of approximately 1960 N mm^{-2}. It is also conceivable for the wire to comprise an even higher tensile strength, for example a tensile strength of at least 2000 N mm^{-2} or of at least 2200 N mm^{-2} or even of at least 2400 N mm^{-2}. As a result, it is possible to achieve a high load capacity, in particular a high tensile strength and/or a high level of rigidity transversely to the mesh. In addition, advantageous bending characteristics can also be achieved. The net element can comprise, in particular, an irregular form or preferably a regular form which provides at least in part a form of a circle, a diamond and/or a regular and/or irregular polygon. In particular, various net elements of the safety net can comprise various forms, in a preferred manner, however, the net elements comprise a substantially identical form. In a preferred manner, the net element is realized as a ring, in particular a wire ring. In particular, the net element forms a net member of a ring network at least in part. A net member includes, in particular, at least one bundle of net elements or preferably precisely one individual net element. A bundle of net elements is to be understood, in particular, as a plurality of net elements which are

provided for the purpose of lying one above another in a substantially concentric manner in a safety net. The net elements preferably comprise at least one diameter of 3 cm, in a preferred manner at least of 5 cm and in a particularly preferred manner of less than 40 cm. The term "to a large extent" is to be understood, in particular in this connection, as in particular up to at least 80%, preferably up to at least 90%, in a preferred manner up to at least 95% and in a particularly preferred manner completely. The term "overall extension" is to be understood, in particular, as an extension between two oppositely situated outermost edges of the safety net. A "main extension direction" of an object is to be understood, in this case, in particular, as a direction which runs parallel to a longest edge of a smallest geometrical cuboid which barely surrounds the object completely. In particular, any type of extension is to be understood such that it is measured with a safety net spread-out in a completely flat manner, in particular devoid of inner stresses. An "outermost row of net elements" is to be understood, in particular, as a row, which extends along a straight line, of net elements which are devoid of neighboring net elements on at least one common side. The exterior region extends, in particular, in a main extension direction of the safety net at least over an entire extent, in particular over an in particular maximum overall extension, of the safety net. The exterior region preferably includes at least a plurality, of in particular complete rows of net elements, which extend along a straight line which is preferably parallel to the main extension direction, in a preferred manner at least two, in particular complete, rows of net elements which extend along a straight line which is preferably parallel to the main extension direction and in a particularly preferred manner at least one, in particular complete, row of net elements which extends along a straight line which is preferably parallel to the main extension direction. The exterior region preferably includes at least one outermost row of net elements. The interior region extends in particular in a main extension direction of the safety net at least over an entire extent, in particular over a, in particular minimum overall extension, of the safety net. The interior region preferably includes at least a plurality, of in particular complete rows of net elements, which extend along a straight line which is preferably parallel to the main extension

direction, in a preferred manner at least two, in particular complete, rows of net elements which extend along a straight line which is preferably parallel to the main extension direction and in a particularly preferred manner at least one, in particular complete, row of net elements which extends along a straight line which is preferably parallel to the main extension direction. In particular, the exterior region and the interior region are without overlap with respect to one another.

It is additionally proposed that the maximum overall extension of the safety net parallel to a main extension direction of the safety net is greater in the exterior region at least by one, preferably by at least two, in a preferred manner by at least three mean diameter(s) of the net elements and/or is greater by at least 5%, preferably by at least 10%, in a preferred manner by at least 15% and in a particular preferred manner by at least 20%, than the minimum overall extension of the safety net parallel to the main extension direction in the interior region which differs from the exterior region. In particular, increased safety can be made possible in an advantageous manner as a result of such a design of the safety net in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area in which dynamic impact bodies can be reliably trapped can be increased in size, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic body. It is advantageously possible to create an additional buffer path by means of additional net elements, which give way in particular when loaded, on at least one outer edge at which net elements are suspended, as a result of which it is advantageously possible to cushion an impact in a better manner. A “mean diameter” is to be understood, in particular, as an average diameter of net elements when seen in a substantially planar spreading direction of the safety net. In particular, a plurality of randomly determined, in a preferred manner all, net elements of the safety net is/are used to calculate the mean diameter. A diameter of an individual net element is calculated preferably from an average of a diameter parallel to the main extension direction of the safety net and/or of a diameter perpendicular to the main extension direction of the safety net. A “diameter”

of a net element is to be understood preferably as a diameter of a smallest circle which includes the net element completely, in particular in a main extension direction of the safety net. In particular, a form of a spread-out safety net deviates from a rectangular form by at least one corner.

It is additionally proposed that a maximum overall extension of the safety net parallel to a main extension direction of the safety net is greater in a further exterior region of the safety net, which differs from the exterior region and includes, in particular, at least one further outermost row of net elements which differs, in particular, from the outermost row of net elements, than a minimum overall extension of the safety net parallel to the main extension direction in an interior region of the safety net which differs from the exterior region and from the further exterior region. In particular, as a result of such a design of the safety net, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged. It is advantageously possible to create an additional buffer path by means of additional net elements, which give way in particular when loaded, on at least one outer edge at which net elements are suspended, as a result of which it is advantageously possible to cushion an impact in a better manner, in particular by being able to keep the catch area advantageously large after an impact of the dynamic impact body. The further exterior region extends, in particular, in a main extension direction of the safety net at least over an entire extent, in particular over an, in particular, maximum overall extension of the safety net. The further exterior region preferably includes at least a plurality, in particular of complete rows of net elements which extend along a straight line which is preferably parallel to the main extension direction, in a preferred manner at least two, in particular complete rows of net elements which extend along a straight line which is preferably parallel to the main extension direction and in a particularly preferred manner at least one, in particular complete row of net elements which extends along a straight line which is preferably parallel to the main extension

direction. The further exterior region preferably includes at least one outermost row of net elements. The exterior region the further exterior region and/or the interior region are preferably without overlap with respect to one another. The further exterior region preferably includes a further outer edge of the safety net which is located opposite an outer edge included in the exterior region in a direction perpendicular to the main extension direction of the safety net. In particular, the form of the spread-out safety net deviates from a rectangular form in particular at least at two corners. The main extension direction of the exterior region, of the further exterior region and/or of the interior region preferably extend/s in a plane parallel to the safety net perpendicularly and/or in a preferred manner parallel to the main extension direction of the safety net. The exterior region, the further exterior region and/or the inner region preferably includes/include at least one, in a preferred manner at least two, side edge /side edges of the safety net which extend, in particular, at least partially angled and/or at least partially perpendicular to the main extension direction.

It is also proposed that the net elements are arranged in a mirror symmetrical manner with reference to a mirror plane which is at least substantially perpendicular to a main extension plane of the safety net and/or with reference to a mirror plane which is at least substantially parallel to a main extension direction of the safety net. In particular, as a result of such a design of the safety net, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic body. It is advantageously possible to create an additional buffer path by means of additional net elements, which give way in particular when loaded, on at least one outer edge at which net elements are suspended, as a result of which it is advantageously possible to cushion an impact in a better manner. In particular, the form of the spread-out safety net deviates from a rectangular form by at least four corners. A “main extension direction” of a structural unit is to be understood, in

particular, as a plane which is parallel to a largest side surface of a smallest imaginary cuboid which barely surrounds the structural unit completely and which runs, in particular, through the center point of the cuboid.

It is additionally proposed that at least one partial region of the safety net, in particular an exterior region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net comprises at least four, preferably at least six, in a preferred manner at least nine and in a particularly preferred manner at least twelve net elements. In particular, as a result of such a design of the safety net, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic body. The term "at least one partial region of the safety net which protrudes over the interior region in a direction parallel to a main extension direction of the safety net" is to be understood, in particular, as an exterior region. An "exterior region" of the safety net is to be understood, in particular, as at least one partial region of the safety net which forms an overlap over a rectangular region, of a maximum size, of the safety net which is completely covered by the safety net. The exterior region preferably includes at least one net element, in a preferred manner a plurality of net elements, which protrude beyond the minimum extension of the safety net in a main extension direction.

It is additionally proposed that at least one partial region of the safety net, in particular an exterior region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, comprises a number of net elements, which are arranged side by side in a row in the main extension direction of the safety net, which corresponds to at least a twentieth, preferably at least a fifteenth, in a preferred manner at least a tenth and in a particularly preferred manner at least a fifth

of a maximum number of all rows of net elements arranged side by side perpendicularly to the main extension direction of the safety net. In particular, as a result of such a design of the safety net, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic impact body.

It is additionally proposed that at least one partial region of the safety net, in particular an exterior region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, comprises a number of net elements, which are arranged side by side in a row perpendicularly to the main extension direction of the safety net, which corresponds to at least a tenth, preferably at least an eighth, advantageously at least a sixth, in a preferred manner at least a quarter and in a particularly preferred manner at least half of a maximum number of all rows of net elements arranged side by side perpendicularly to the main extension direction of the safety net. In particular, as a result of such a design of the safety net, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic impact body. The number of net elements arranged side by side in a row perpendicularly to the main extension direction of the safety net in the partial region of the safety net protruding over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, preferably corresponds to at least half the number, preferably to at least the precise number and in a preferred manner to at

least twice the number of net elements arranged side by side in a row parallel to the main extension direction of the safety net in the partial region.

It is also proposed that at least one partial region of the safety net, in particular an exterior region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, comprises an at least substantially triangle-shaped arrangement of net elements. In particular, as a result of such a design of the safety net, increased safety can advantageously be made possible, in particular with regard to catching dynamic impact bodies in the safety net. In an advantageous manner, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic impact body. The triangle-shaped arrangement preferably comprises substantially a form of a triangle which tapers at an angle of less than 45° in the main extension direction of the safety net. As an alternative to this, the triangular form can also be in the form of a substantial isosceles triangle and/or in the form of a triangle which converges at an angle greater than 45° in the main extension direction of the safety net.

It is further proposed that at least one net element of at least one partial region of the safety net, in particular of an exterior region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net comprises a periphery which deviates substantially from a mean periphery of net elements outside the partial region. In particular, as a result, a distribution of force in the safety net which is advantageous when under load, can be made possible, as a result of which, in particular, at least one trapping characteristic of the safety net for catching at least one dynamic impact body can be optimized. In addition, stability can also be advantageously increased. A “periphery” of a net element is to be understood, in particular, as an overall length, in particular of at least one winding, of the filament, closed per se, of which the net element consists. In the case of a ring, the periphery

corresponds to a circle circumference. A "mean periphery" is to be understood, in particular, in this context, as a mean value of the peripheries, in particular of the overall lengths, in particular of the windings, of the filaments closed per se of which the net elements consist, of a random selection of a plurality of, preferably of all, net element/s of the safety net. A "substantial deviation" is to be understood, in particular, in this context, as a periphery of at least one net element deviating in the partial region by at least 50%, preferably by at least 30%, in a preferred manner by at least 20% and in a particularly preferred manner by at least 10% from the mean periphery of the net elements outside the partial region. In particular, all net elements of the partial region can comprise a substantially identical deviation. As an alternative to this, the net elements of the partial region comprise a different deviation at least in part. The net elements in the partial region are preferably at least in part greater by at least 10%, preferably greater by at least 20%, in a preferred manner greater by at least 30% or in a particularly preferred manner greater by at least 50% than the net elements outside the partial region. As an alternative to this or in addition to it, the net elements in the partial region can be at least in part smaller by at least 50%, preferably smaller by at least 30%, in a preferred manner smaller by at least 20% or in a particularly preferred manner smaller by at least 10% than the net elements outside the partial region.

It is additionally proposed that at least one net element of at least one partial region of the safety net, in particular of an exterior region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net has in a test trial a tear resistance which deviates substantially from a mean tear resistance of net elements outside the partial region. As a result, in particular when under load, an advantageous distribution of force in the safety net can be made possible. Advantageously, a reaction of the net to an impact, in particular to an impact which is to be expected, can be optimized, as a result of which safety can be improved. A "tear resistance" is to be understood, in particular, as a maximum possible load of a

net element prior to breaking the net element. The maximum load prior to breaking can preferably be measured in a test trial by means of a suitable test arrangement. In the test trial, an artificial load is exerted onto a test net element by means of the test arrangement. The test net element provides a net element which is identical to the net element arranged in the partial region. In particular, the test net element originates from a same production batch as the net element, in particular to take account of fluctuations in the quality of the material. An incremental increase in a load acting on the test net element brings about a deformation and/or breakage of the test net element at a certain force. The value of the minimum force necessary for breaking determines the tear resistance. A "mean tear resistance" is in particular to mean an average tear resistance of a plurality of test net elements of identical design and/or of an identical production batch. A "substantial deviation" is in particular to mean, in this context, a tear resistance of at least one net element in the partial region deviating by at least 500%, preferably by at least 300%, advantageously by at least 150%, in a preferred manner by at least 50% and in a particularly preferred manner by at least 10% from the mean tear resistance of net elements outside the partial region. In particular, all net elements of the partial region can comprise a substantially identical deviation. As an alternative to this, the tear resistances of the net elements of the partial region comprise different deviations at least in part. The net elements in the partial region preferably have at least in part a tear resistance which is greater by at least 10%, preferably greater by at least 50%, advantageously greater by at least 150%, in a preferred manner greater by at least 300% or in a particularly preferred manner greater by at least 500% than a mean tear resistance of the net elements outside the partial region. As an alternative to this or in addition to it, the tear resistance of the net elements in the partial region can be at least in part smaller by at least 500%, preferably smaller by at least 300%, advantageously smaller by at least 150%, in a preferred manner smaller by at least 50% or in a particularly preferred manner smaller by at least 10% than a mean tear resistance of the net elements outside the partial region.

It is additionally proposed that at least one net element, in particular of at least one partial region of the safety net, which protrudes over the interior region in a direction parallel to a main extension direction of the safety net comprises a predetermined breaking point, as a result it is advantageously possible to guide a force in a targeted manner in the case of an impact. In addition, uncontrolled tearing of the safety net can be avoided in an advantageous manner. A predetermined breaking point can be realized, in particular, as a point with a thinner material thickness compared to the rest of the net element, as a preloaded point, for example as a result of manual bending back and forth and/or as a point with a material composition which deviates from the rest of the net element.

It is also proposed that at least one net element of at least one partial region of the safety net, in particular an outer region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, at least has a material composition which differs substantially from an, in particular mean, material composition of the net elements outside the partial region. In particular, as a result, a distribution of force in the safety net which is advantageous when under load, can be made possible, as a result of which, in particular, at least one trapping characteristic of the safety net for catching at least one dynamic impact body can be optimized. In addition, stability can also be advantageously increased. A material composition "differing substantially" from another material composition, is in particular to mean that the net elements in the partial region at least have a material composition in which a mass fraction of an atomic and/or molecular main component deviates by at least 0.1% by weight, preferably by at least 0.5% by weight, advantageously by at least 1% by weight, in a preferred manner by at least 10% by weight or in a particularly preferred manner by at least 99% by weight from a mass fraction of the same molecule and/or atom in the, in particular mean, material composition of the net elements outside the partial region. An "atomic and/or molecular main component" is to be understood, in particular, as an element and/or molecule which, in the case of a

production, is added in a targeted manner to a material, in particular with the aim of influencing at least one material characteristic. It is conceivable, in particular, for a net element to consist of different components with various materials. Advantageously, a net element, in particular in the partial region, could comprise a coating, for example of plastics material. It is additionally conceivable for at least one net element to include a plurality of wire strands. The wire strands can be realized from identical wires of the same material. As an alternative to this, the wire strands can be realized, at least in part from different wires, in particular with various material compositions.

It is additionally proposed that at least one net element of at least one partial region of the safety net, in particular an outer region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, comprises at least one wire winding, in particular a wire strand winding, the wire diameter of which is substantially greater than a mean wire diameter of wire windings, in particular wire strand windings, of net elements outside the partial region. In particular, as a result, a distribution of force in the safety net which is advantageous when under load, can be made possible, as a result of which, in particular, at least one trapping characteristic of the safety net for catching at least one dynamic impact body can be optimized. In addition, stability can also be advantageously increased. A “wire winding” is to be understood, in particular, as at least part of a filament, in particular of a wire, which describes a periphery of a net element precisely once. A “wire strand winding” is to be understood, in particular, as at least part of a wire strand which describes a periphery of a net element precisely once. A “mean wire diameter” is to be understood, in particular, as a mean value of the wire diameter, in particular in a perpendicular cross section through the wire, of a random selection of a plurality of, of preferably all, net elements of the safety net, in particular outside the partial region. The wire diameter is preferably a diameter of a smallest circle which can be placed around a cross section of a filament, in particular of a wire, and in this case,

surrounds the filament, in particular the wire, completely. A "mean wire strand diameter" is to be understood, in particular, as a mean value of the wire strand diameter, in particular in a perpendicular cross section through the wire strand, of a random selection of a plurality of, of preferably all, net elements of the safety net, in particular outside the partial region. The wire strand diameter is preferably a diameter of a smallest circle which can be placed around a cross section of a wire strand and in this case, surrounds all the wire windings completely. The term "substantially greater" is to be understood in this context, in particular, as a diameter being greater by at least 10%, preferably by at least 20%, advantageously by at least 30%, in a preferred manner by at least 50% and in a particularly preferred manner by at least 100%.

It is additionally proposed that at least one net element of at least one partial region of the safety net, in particular an outer region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, comprises at least a number of wire windings, in particular wire strand windings, which deviates substantially from a mean number of wire windings, in particular wire strand windings, of net elements outside the partial region. In particular, as a result, a distribution of force in the safety net which is advantageous when under load, can be made possible, as a result of which, in particular, at least one trapping characteristic of the safety net for catching at least one dynamic impact body can be optimized. In addition, stability can also be advantageously increased. A "mean number of wire windings" is to be understood, in particular, as a mean value of the number of wire windings of a random selection of a plurality of, preferably of all, net elements of the safety net, in particular outside the partial region. A "mean number of wire strand windings" is to be understood, in particular, as a mean value of the number of wire strand windings of a random selection of a plurality of, preferably of all, net elements of the safety net, in particular outside the partial region. A "substantial deviation" is to be understood in this context, in particular, as a number of wire windings, in particular

wire strand windings, of at least one net element in the partial region deviating at least 200%, preferably at least 100%, in a preferred manner at least 50% and in a particularly preferred manner at least 10% from the mean number of wire windings, in particular wire strand windings, outside the partial region. In particular, all net elements of the partial region can comprise a substantially identical deviation. As an alternative to this, the net elements of the partial region comprise at least in part a different deviation. The number of wire windings, in particular wire strand windings, of the net elements in the partial region is preferably at least in part greater by at least 10%, preferably greater by at least 50%, in a preferred manner greater by at least 100% and in a particularly preferred manner greater by at least 200% than the number of wire windings, in particular wire strand windings, of the net elements outside the partial region. As an alternative to this or in addition to it, the number of wire windings, in particular of wire strand windings, in the partial region can be at least in part smaller by at least 200%, preferably smaller by at least 100%, in a preferred manner smaller by at least 50% or in a particularly preferred manner smaller by at least 10% than the number of wire windings, in particular of wire strand windings, of the net elements outside the partial region.

It is additionally proposed that at least one net element of at least one partial region of the safety net, in particular an outer region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, comprises at least one energy absorber. In particular, as a result, a distribution of force in the safety net which is advantageous when under load, can be made possible, as a result of which, in particular, at least one trapping characteristic of the safety net for catching at least one dynamic impact body can be optimized. In addition, stability can also be advantageously increased. An “energy absorber” is to be understood, in particular as an element which is provided for the purpose of converting at least part of a kinetic energy of a dynamic impact body, in particular when the dynamic impact body impacts into the safety net, into at least one energy form which differs from the kinetic

energy, for example a potential energy and/or thermal energy, in particular deformation energy and/or inner friction. An energy absorber which can include, in particular, at least one torsion spring, can be arranged, in particular, between at least two net elements and or between at least one net element and at least one suspension, for example a cable.

It is additionally proposed that the energy absorber is realized integrally with the at least one net element. As a result, a simple design, in particular of the energy absorber, can advantageously be made possible. In addition, simple assembly and/or integration of the energy absorber into the safety net can advantageously be made possible. In particular, the energy absorber can be realized as a net element which, at least in part, is wavy and/or wrinkled and in particular is provided for the purpose of stretching under load. As an alternative to this, it is conceivable for at least part of a net element to be bent in the form of a torsion spring and/or to be replaced by a torsion spring.

It is also proposed that at least one net element, in particular a net element in at least one partial region of the safety net, preferably an outer region of the safety net, which protrudes over the interior region, in particular over an overall extension of the interior region, in a direction parallel to a main extension direction of the safety net, realizes precisely three connection regions to neighboring net elements. As a result, an advantageous design of the safety net, in particular, can be made possible, as a result of which safety can be advantageously increased, in particular with regard to catching dynamic impact bodies in the safety net. By means of the advantageous design, a catch area, in which dynamic impact bodies are able to be reliably trapped, can be advantageously enlarged, in particular by the catch area being able to be kept advantageously large after an impact of the dynamic impact body. A “connection region” is to be understood, in particular, as a region of a net element and/or of a net member, in particular of a bundle of net elements which are located one above another in a concentric manner in a safety net, in which the net element and/or the net member, in particular the bundle of net elements, in particular in a ready-

assembled safety net, overlaps with at least one neighboring net element and/or at least one neighboring net member and/or at least one bundle of net elements. The net element and/or the neighboring net element can be realized, in particular, as a single net element and/or as a net member, in particular as a bundle of net elements. The net element and/or the net member, in particular the bundle of net elements, preferably overlaps in the connection region with precisely one net element and/or with precisely one net member, in particular precisely with one bundle of net elements. At least two of the connection regions, in particular with the safety net in a spread-out state, are preferably arranged located diametrically opposite one another relative to the net element. In particular, the connection regions each comprise a center of gravity. The centers of gravity of the connection regions, when seen from a center point of the net element comprising the precisely three connection regions, in particular with the safety net in a spread-out state, are arranged with respect to one another at an angle greater than 30°, preferably greater than 45°, advantageously greater than 60°, in a preferred manner greater than 75° and in a particularly preferred manner greater than 85°. In particular, each connection region of a net element is realized without overlap to each further connection region of the net element. At least one further net element of the safety net which is neighboring the net element with the precisely three connection regions, preferably comprises, in particular with the safety net in a totally spread-out state, precisely three connection regions. At least two additional further net elements of the safety net neighboring the net element with the precisely three connection regions, comprise, in a preferred manner, in particular with the safety net in a totally spread-out state, precisely three connection regions.

Further proposed is a net and rope construction with at least one safety net according to the invention. As a result, a high degree of safety and/or advantageous behavior in the event of an impact can advantageously be achieved. The net and rope construction is preferably a wire net and wire rope structure. The net and rope construction can be, for example, a rockfall protection installation, a motorsport

barrier, a catchment fence, a road safety net and/or rail safety net, an avalanche net, a bullet catch net, a vehicle safety fence, in particular an aircraft safety fence, a test track safety net or the like.

The net and rope construction advantageously comprises at least one guide rope which is guided through at least every third, preferably every other, in a preferred manner each net element of a row of net elements which extends parallel to a main extension direction of the safety net on at least one outer edge of the safety net. The guide rope advantageously determines a degree of freedom of movement of the net elements. As a result, in particular in the event of impact, advantageous cushioning of the impact can be made possible, in particular as a result of displacing at least part of the net elements of the safety net in a directed manner. The guide rope is realized in particular as a wire rope. The guide rope is connected, in particular, to at least one support, preferably to at least two supports, of the net and cable construction. In particular, the support is provided for holding and/or suspension of the safety net. The support can preferably be fastened on at least one side to a substrate and/or to a wall, preferably a rock wall. In a particularly preferred manner, a main extension of the support extends in a state fastened to the substrate and/or to the wall, preferably a rock wall, in particular from a fastening point, substantially perpendicularly to a direction of the force of gravity. The term “at least every third” is to be understood, in particular, as in the row of neighboring net elements, in particular on the outer edge of the safety net, each net element which is devoid of the guide rope being passed through it, comprises no more than one neighboring net element of the row which is also devoid of the guide rope being passed through it. In particular, the row of net elements is devoid of three consecutive neighboring net elements which are devoid of the guide rope being passed through them. The term “at least every other” is to be understood, in particular, as in the row of neighboring net elements, in particular on the outer edge of the safety net, each net element which is devoid of the guide rope being passed through it, comprises exclusively neighboring net elements of the row through which the guide rope is passed. In particular, the row of net elements is

devoid of two consecutive neighboring net elements which are devoid of the guide rope being passed through them. The outer edge of the safety net is realized, in particular, by a side of the outermost row of net elements which is devoid of neighboring net elements. The net and rope construction preferably comprises at least one guide rope on at least two outer edges which differ from one another.

It is additionally proposed that the guide rope is realized as at least one support rope which is provided, in particular, for the purpose of bearing the safety net and/or in the event of a load, in particular as a result of rubble and/or at least one further dynamic impact body, to absorb at least a substantial part of the load and/or to transmit it, preferably to at least one support. As a result, a simple design can advantageously be achieved, in particular by it being possible to dispense with additional guide rope, running cable and/or further additional suspensions. As a result, costs, in particular assembly costs and/or material costs, can be advantageously saved. The support rope is preferably realized as a wire rope. It is conceivable, in addition, for the support rope to be realized as a cable bundle which consists of at least two support ropes, as a result of which safety and/or stability can be further improved.

The safety net according to the invention can be advantageously used in the net and rope construction as a catch net. The net and rope construction preferably includes a plurality of safety nets which are connected together, in particular by means of cables, preferably support ropes, and/or by means of shackles.

The safety net according to the invention is not to be restricted, in this connection, to the above-described application and embodiment. In particular, the safety net according to the invention, for fulfilling an operating principle described herein, is able to comprise a number of individual elements, components and units which deviates from a number named herein.

Drawings

Further advantages are produced from the following description of the drawing. Six exemplary embodiments of the invention are shown in the drawings. The drawings, the description and the claims include numerous features in combination. The expert will also look at the features individually in an expedient manner and combine them to form sensible further combinations. In addition, in the case of the value ranges specified in said disclosure, values also lying within the named limits apply as disclosed and as arbitrarily applicable.

The drawings are as follows:

- Fig. 1 shows a schematic top view of a safety net,
- Fig. 2 shows a schematic top view of an alternative safety net,
- Fig. 3 shows a schematic top view of a further alternative safety net,
- Fig. 4 shows a schematic sectional view through net elements of part of the safety net,
- Fig. 5 shows a schematic top view of part of a net and rope construction with the safety net,
- Fig. 6 shows a schematic view of parts of net elements with a predetermined breaking point,
- Fig. 7 shows a schematic view of alternative net elements with energy absorbers,
- Fig. 8 shows a schematic sectional view through net elements of part of an alternative safety net,
- Fig. 9 shows a schematic sectional view through net elements of part of a further alternative safety net,
- Fig. 10 shows a schematic sectional view through net elements of part of an additional further alternative safety net and

Fig. 11 shows a schematic top view of a second additional further alternative safety net.

Description of the exemplary embodiments

Fig. 1 shows a safety net. The safety net is spread out along a main extension plane 28a. The safety net serves for catching heavy loads. The safety net is formed from net elements 10a. The net elements 10a are realized as rings 102a. The net elements 10a are realized substantially identically. The net elements 10a comprise a net element diameter 88a. The net elements 10a engage in neighboring net elements 10a. Two interconnecting net elements 10a realize a connection region 56a, 58a, 60a. At least one net element 10a of the safety net realizes precisely three connection regions 56a, 58a, 60a to neighboring net elements 10a. The net elements 10a realize adjoining rows of net elements 10a perpendicularly to a main extension direction 14a of the safety net. The net elements 10a of a row are without overlap with respect to one another. Net elements 10a of one row overlap with net elements 10a of neighboring rows. Net elements 10a of one row engage in net elements 10a of neighboring rows. It is conceivable for at least one net element 10a to comprise a predetermined breaking point 40a (cf. fig. 6).

The safety net comprises an exterior region 18a. The exterior region 18a includes an outermost row 16a of net elements 10a. The exterior region 18a includes two rows of net elements 10a. The exterior region 18a extends over all net elements 10a of an outermost row 16a of net elements 10a. The exterior region 18a extends over all net elements 10a of a further row 90a of net elements 10a which differs from the outermost row 16a. The safety net comprises a maximum overall extension 94a. The maximum overall extension 94a runs parallel to the main extension direction 14a of the safety net. The safety net comprises a maximum overall extension 12a which lies inside the exterior region 18a. The maximum overall extension 12a which lies inside

the exterior region 18a and the maximum overall extension 94a of the safety net are identical to one another.

The safety net comprises a further exterior region 26a. The further exterior region 26a is realized differently from the exterior region 18a. The further exterior region 26a and the exterior region 18a are without overlap to one another. The further exterior region 26a extends over all net elements 10a of a further outermost row 96a of net elements 10a. The further exterior region 26a extends over all net elements 10a of an additional row 98a of net elements 10a which differs from the further outermost row 96a. The safety net comprises a maximum overall extension 70a lying inside the further exterior region 26a. The maximum overall extension 70a lying inside the further exterior region 26a and the maximum overall extension 94a of the safety net are identical to one another

The safety net comprises an interior region 22a. The interior region 22a is without overlap to the exterior region 18a and to the further exterior region 26a. The interior region 22a includes an inner row 92a of net elements 10a. The interior region 22a includes a further inner row 118a of net elements 10a neighboring the inner row 92a. The inner row 92a lies in the center of the safety net. The inner row 92a lies between the outermost row 16a and the further outermost row 96a. The safety net comprises a minimum overall extension 100a. The minimum overall extension 100a runs parallel to the main extension direction 14a of the safety net. The safety net comprises a minimum overall extension 20a lying inside the interior region 22a. The minimum overall extension 20a lying inside the interior region 22a and the minimum overall extension 100a of the safety net are identical to one another. The maximum overall extension 12a lying inside the exterior region 18a, 26a and/or the maximum overall extension 94a is greater than the minimum overall extension 20a lying inside the interior region 22a and/or the minimum overall extension 100a of the safety net. The maximum overall extension 12a lying inside the exterior region 18a, 26a and/or the maximum overall extension 94a of the safety net is greater by at least a mean diameter of the net elements 10a of the safety net than the minimum overall

extension 20a lying inside the interior region 22a and/or the minimum overall extension 100a of the safety net. In the exemplary embodiment shown in figure 1, the mean diameter of the net elements 10a corresponds to the net element diameter 88a. A difference in size between the maximum overall extension 12a, 94a and the minimum overall extension 20a, 100a is greater than four times the net element diameter 88a. It is conceivable for at least one net element 10a to comprise a predetermined breaking point 40a in the exterior region 18a, the further exterior region 26a and/or the interior region 22a.

The safety net comprises two mirror planes 30a, 32a. The mirror planes 30a, 32a are arranged perpendicularly to a main extension plane 28a of the safety net. One mirror plane 30a is perpendicular to the main extension direction 14a. One mirror plane 32a is parallel to the main extension direction 14a. The net elements 10a are arranged in a mirror-symmetrical manner with respect to the mirror planes 30a, 32a. The safety net comprises a constant overall extension 104a perpendicular to the main extension direction 14a in a direction lying in the main extension plane 28a.

The safety net comprises four partial regions 34a, 36a, 42a, 44a which protrude over the minimum overall extension 20a of the interior region 22a in a direction parallel to a main extension direction 14a of the safety net. The partial region 34a, 36a, 42a, 44a comprises six net elements 10a. The partial region 34a, 36a, 42a, 44a of the safety net comprises a number of net elements 10a, which are arranged side by side in a row in the main extension direction 14a of the safety net, which corresponds to two seventeenths of a maximum number of all rows of net elements 10a arranged side by side perpendicularly to the main extension direction 14a of the safety net. The partial region 34a, 36a, 42a, 44a of the safety net comprises a number of net elements 10a, which are arranged side by side in a row perpendicularly to the main extension direction 14a of the safety net, which corresponds to two seventeenths of the maximum number of all rows of net elements 10a arranged side by side perpendicularly to the main extension direction 14a of the safety net. The partial region 34a, 36a, 42a, 44a of the safety net comprise a triangle-shaped arrangement

46a of net elements 10a. As an alternative to this, at least one of the partial regions 34a, 36a, 42a, 44a can comprise an arrangement which deviates from the triangle-shaped arrangement 46a, for example an at least rectangular arrangement 120a (cf. fig. 2) and/or an at least partially polygonal arrangement. In a test trial, a net element 10a in the partial region 34a, 36a, 42a, 44a of the safety net has a tear resistance which deviates from a mean tear resistance of net elements 10a outside the partial region 34a, 36a, 42a, 44a. As an alternative to this, all net elements 10a can have a substantially identical tear resistance in the test trial. It is conceivable for at least one net element 10a to comprise a predetermined breaking point 40a in at least one of the partial regions 34a, 36a, 42a, 44a. As an alternative to this, the safety net can be realized as a mesh network 122a (cf. fig. 3). The mesh network 122a is realized from mutually engaging helices 124a. At the ends, the helices 124a comprise at least one knot 128a which forms a loop 126a. Loops 126a of neighboring helices 124a mesh together. The safety net realized from helices 124a comprises four partial regions 34'a, 36'a, 42'a, 44'a which protrude over the minimum overall extension 20a of the interior region 22a in a direction parallel to a main extension direction 14a of the safety net. The partial regions 34'a, 36'a, 42'a, 44'a of the safety net realized from helices 122a comprise a rectangular arrangement 120'a of net elements 10a.

Fig. 4 shows a section through part of the safety net along a section axis A (cf. fig. 1). The net element 10a shown on the left-hand side of fig. 4 lies inside the partial region 36a. The net element 10a shown on the right-hand side of fig. 4 lies outside the partial region 36a. The net element 10a shown in fig. 4 is realized as a wire rope 106a. The net element 10a comprises a net element cross section diameter 86a. The net element cross section diameter 86a is constant over a periphery 72a of the net element 10a. The wire rope 106a comprises a plurality of wire windings 48a. The wire windings 48a comprise a wire diameter 24a. The wire diameter 24a is constant over the periphery 72 of the net element 10a. The net element cross section diameter 86a corresponds to a multiple of the wire diameter 24a. The net element 10a comprises a wire strand 108a. The wire strand 108a comprises 19 wire windings 48a. The wire

strand 108a comprises a wire strand diameter 52a. The wire strand diameter 52a is constant over the periphery 72a of the net element 10a. The net element cross section diameter 86a corresponds to a multiple of the wire strand diameter 52a. The net element 10a comprises seven wire strand windings 50a.

Fig. 5 shows part of a net and rope construction 62a with the safety net. The safety net is used as a catch net 74a in the net and rope construction 62a. The catch net 74a is provided for catching a dynamic impact body in a catch area 38a of the catch net 74a. The catch net 74a is positioned such that a main impact direction of a dynamic impact body is perpendicular to the catch area 38a. The main impact direction of a dynamic impact body points into the image plane or out of the image plane in fig. 5. The net elements 10a of the partial regions 34a, 36a, 42a, 44a are pushed together in the assembled, non-loaded state. Net elements 10a of the safety net lying on the outside in the main extension direction 14a comprise shackles 82a at least in part. Net elements 10a of the safety net are shackled by means of the shackles 82a with net elements 10a of a further neighboring safety net. The net and rope construction 62a comprises a support 80a. The net and rope construction 62a comprises a wall fastening element 78a. The wall fastening element 78a is provided for the purpose of fastening the support 80a to a wall 76a.

The net and rope construction 62a comprises a first guide rope 64a. The first guide rope 64a is arranged on a side of the safety net remote from the wall 76a, in particular from the wall fastening element 78a. The first guide rope 64a is arranged on a side of the support 80a remote from the wall 76a, in particular from the wall fastening element 78a. The first guide rope 64a is connected to the support 80a. The net and rope construction 62a comprises a second guide rope 84a. The second guide rope 84a is arranged on a side of the safety net remote from the wall 76a, in particular from the wall fastening element 78a. The second guide rope 84a is arranged on a side of the support 80a remote from the wall 76a, in particular from the wall fastening element 78a. The second guide rope 84a is connected to the support 80a.

The safety net comprises two outer edges 66a, 110a in a direction perpendicular to the main extension direction 14a of the safety net. The net elements 10a on the outer edges 66a, 110a form the two outermost rows 16a, 96a. The first guide rope 64a is guided through the net elements 10a of the outermost row 16a. The second guide rope 84a is guided through the net elements 10a of the further outermost row 96a. The first guide rope 64a is realized as a support rope 68a. The second guide rope 84a is realized as a support rope 68a.

Figures 7 to 11 show five further exemplary embodiments of the invention. The following descriptions and the drawings are restricted substantially to the differences between the exemplary embodiments, reference also being possible, in principle, to the drawings and/or the description of the other exemplary embodiments, in particular of figures 1 to 6, with regard to identically designated components, in particular with regard to components with identical reference symbols. To differentiate between the exemplary embodiments, the letter a is placed after the reference symbol of the exemplary embodiment in figures 1 to 6. The letter a is replaced by the letters b to f in the exemplary embodiments in figures 7 to 11.

Fig. 7 shows a net element 10b. The net element 10b comprises an energy absorber 54b. The energy absorber 54b is realized integrally with the net element 10b. The energy absorber 54b is realized as a wavy region of the net element 10b. As an alternative to this, the energy absorber 54b could be realized as an, in particular helically, twisted region of the net element 10b and/or as a region with a material, in particular a highly resilient material, which deviates from the rest of the net element 10b. The net element 10b comprises a further energy absorber 112b. The further energy absorber 112b is realized separately from the net element 10b. The further energy absorber 112b is arranged between two neighboring, non-overlapping net elements 10b. The further energy absorber 112b is realized as a highly resilient, curved element. The net element 10b with the energy absorbers 54b, 112b is arranged in a partial region 34b, 36b, 42b, 44b of the safety net. As an alternative to this, it is conceivable for the net element 10b with the energy absorbers 54b, 112b to

be arranged in a region of the safety net which differs from the partial region 34b, 36b, 42b, 44b, for example an interior region 22b and/or a region of an exterior region 18b, 26b of the safety net which differs from the partial region 34b, 36b, 42b, 44b.

The detail of a safety net shown in a sectional view in fig. 8 shows two net elements 10c. The net element 10c shown on the left-hand side of fig. 8 lies inside the partial region 36c. The net element 10c shown on the right-hand side of fig. 8 lies outside the partial region 36c. The net element 10c inside the partial region 36c comprises a number of wire windings 48c which deviates from the number of wire windings 48c of the net element 10c outside the partial region 36c. The net element 10c inside the partial region 36c comprises a greater number of wire windings 48c than the net element 10c outside the partial region 36c. As an alternative to this, it is conceivable for the net element 10c inside the partial region 36c to comprise a smaller number of wire windings 48c than the net element 10c outside the partial region 36c. The net element 10c comprises a wire strand 108c. The wire strand 108c comprises a plurality of wire strand windings 50c. The wire strand winding 50c comprises a wire strand diameter 52c. The wire strand diameter 52c of the net element 10c in the partial region 36c is greater than a wire strand diameter 52'c of a net element 10c outside the partial region 36c. As an alternative to this, the wire strand diameter 52c of the net element 10c in the partial region 36c could be greater than the wire strand diameter 52'c of the net element 10c outside the partial region 36c.

The detail of a safety net shown in a sectional view in fig. 9 shows two net elements 10d. The net element 10d shown on the left-hand side of fig. 9 lies inside a partial region 36d of the safety net. The net element 10d shown on the right-hand side of fig. 9 lies outside a partial region 36d. The net element 10d comprises a wire winding 48d. The wire winding 48d comprises a wire diameter 24d. The wire diameter 24d of a wire winding 48d inside the partial region 36d is greater than a mean wire diameter 24'd of wire windings 48d of net elements 10d outside the partial region 36d. As an alternative to this, it is conceivable for the net element 10d inside the partial region

36d to comprise a smaller wire diameter 24d of the wire winding 48d than the net element 10d outside the partial region 36d. The net element 10d comprises a net element cross section diameter 86d. The net element cross section diameter 86d of the net element 10d inside the partial region 36d is greater than a net element cross section diameter 86'd of a net element 10d outside the partial region 36d. As an alternative to this, the net element cross section diameter 86d of the net element 10d inside the partial region 36d could be smaller than the net element cross section diameter 86'd of the net element 10d outside the partial region 36d.

The detail of a safety net shown in a sectional view in fig. 10 shows two net elements 10e. The net element 10e shown on the left-hand side of fig. 10 lies inside a partial region 36e of the safety net. The net element 10e shown on the right-hand side of fig. 10 lies outside a partial region 36e. The net element 10e in the partial region 36e has a material composition 114e.The material composition 114e of net elements 10e in the partial region 36e is different to a material composition 114'e of the net elements 10e outside the partial region 36e.

Fig. 11 shows a safety net with net elements 10f. The net elements 10f comprise a periphery 72f. The net elements 10f comprise an outer form 116f. A periphery 72'f, 72"f of a net element 10f inside a partial region 34f, 42f of the safety net deviates substantially from a mean periphery 72f of net elements 10f outside the partial region 34f, 42f. The periphery 72'f of a net element 10f in the partial region 34f is smaller than the periphery 72f, 72"f of a net element 10f outside the partial region 34f. The periphery 72"f of a net element 10f in the partial region 42f is greater than the periphery 72f, 72'f of a net element 10f outside the partial region 42f. An outer form 116'f, 116"f of a net element 10f in the partial region 34f, 42f deviates substantially from a mean outer form 116f of the net elements 10f outside the partial region 34f, 42f.

Claims

1. A safety net for catching dynamic impact bodies, wherein the safety net is formed by mutually engaging net elements (10a-f), **characterized in that** a maximum overall extension (12a-f) of the safety net parallel to a main extension direction (14a-f) of the safety net is substantially greater in an exterior region (18a-f) of the safety net, which includes at least one outermost row (16a-f) of net elements (10a-f), than a minimum overall extension (20a-f) of the safety net parallel to the main extension direction (14a-f) in an interior region (22a-f) of the safety net which differs from the exterior region (18a-f), wherein each maximum overall extension (12a-f; 20a-f) is measured with the safety net spread-out in a completely flat manner devoid of inner stresses.

2. The safety net as claimed in claim 1, **characterized in that** the maximum overall extension (12a-f) of the safety net parallel to the main extension direction (14a-f) of the safety net is greater in the exterior region (18a-f) at least by a mean diameter of the net elements (10a-f) of the safety net than the minimum overall extension (20a-f) of the safety net parallel to the main extension direction (14a-f) in the interior region (22a-f) which differs from the exterior region (18a-f).

3. The safety net as claimed in claim 1 or 2, **characterized in that** a maximum overall extension (70a-f) of the safety net parallel to the main extension direction (14a-f) of the safety net is greater in a further exterior region (26a-f) of the safety net which differs from the exterior region (18a-f) than the minimum overall extension (20a-f) of the safety net parallel to the main extension direction (14a-f) in the interior region (22a-f) of the safety net which differs from the exterior region (18a-f) and from the further exterior region (26a-f).

4. The safety net as claimed in any one of claims 1 to 3, **characterized in that** the net elements (10a-f) are arranged in a mirror-symmetrical manner with respect to a mirror plane (30a-f, 32a-f), which is at least substantially perpendicular to a main extension plane (28a-f) of the safety net.

5. The safety net as claimed in any one of claims 1 to 4, **characterized in that** at least one partial region (34a-f, 36a-f, 42a-f, 44a-f) of the safety net which protrudes over the interior region (22a-f) in a direction parallel to the main extension direction (14a-f) of the safety net comprises at least four net elements (10a-f).

6. The safety net as claimed in any one of claims 1 to 5, **characterized in that** at least one partial region (34a-f, 36a-f, 42a-f, 44a-f) of the safety net, which protrudes over the interior region (22a-f) in a direction parallel to a main extension direction (14a-f) of the safety net, comprises a number of net elements (10a-f) arranged side by side in a row in the main extension direction (14a-f) of the safety net, which corresponds to at least a twentieth of a maximum number of all rows of net elements (10a-f) arranged side by side perpendicularly to the main extension direction (14a-f) of the safety net.

7. The safety net as claimed in any one of claims 1 to 6, **characterized in that** at least one partial region (34a-f, 36a-f, 42a-f, 44a-f) of the safety net, which protrudes over the interior region (22a-f) in a direction parallel to a main extension direction (14a-f) of the safety net, comprises a number of net elements (10a-f) arranged side by side in a row perpendicularly to the main extension direction (14a-f) of the safety net, which corresponds to at least a tenth of a maximum number of all rows of net elements (10a-f) arranged side by side perpendicularly to the main extension direction (14a-f) of the safety net.

8. The safety net as claimed in any one of claims 1 to 7, **characterized in that** at least one partial region (34a-f, 36a-f, 42a-f, 44a-f) of the safety net, which protrudes over the interior region (22a-f) in a direction parallel to a main extension direction (14a-f) of the safety net, comprises an at least substantially triangle-shaped arrangement (46a-f) of net elements (10a-f).

9. The safety net as claimed in any one of claims 1 to 8, **characterized in that** at least one net element (10f) of at least one partial region (34f, 36f, 42f, 44f) of the safety net, which protrudes over the interior region (22f) in a direction parallel to a main extension direction (14f) of the safety net, comprises a periphery (72f) which deviates substantially from a mean periphery of net elements (10f) outside the partial region (34f, 36f, 42f, 44f).

10. The safety net as claimed in any one of claims 1 to 9, **characterized in that** at least one net element (10a-f) of at least one partial region (34a-f, 36a-f, 42a-f, 44a-f) of the safety net, which protrudes over the interior region (22a-f) in a direction parallel to a main extension direction (14a-f) of the safety net, has in a test trial a tear resistance which deviates substantially from a mean tear resistance of net elements (10a-f) outside the partial region (34a-f, 36a-f, 42a-f, 44a-f).

11. The safety net as claimed in any one of claims 1 to 10, **characterized in that** at least one net element (10a-f) comprises a predetermined breaking point (40a-f).

12. The safety net as claimed in any one of claims 1 to 11, **characterized in that** at least one net element (10e) of at least one partial region (34e, 36e, 42e, 44e) of the safety net, which protrudes over the interior region (22e) in a direction parallel to a main extension direction (14e) of the safety net, at least has a material composition (114e) which differs substantially from a material composition (114'e) of the net elements (10e) outside the partial region (34e, 36e, 42e, 44e).

13. The safety net as claimed in any one of claims 1 to 12, **characterized in that** at least one net element (10d) of at least one partial region (34d, 36d, 42d, 44d) of the safety net, which protrudes over the interior region (22d) in a direction parallel to a main extension direction (14d) of the safety net, comprises at least one wire winding (48d), the wire diameter (24d) of which is substantially greater than a mean wire diameter of wire windings (48d) of net elements (10d) outside the partial region (34d, 36d, 42d, 44d).

14. The safety net as claimed in any one of claims 1 to 13, **characterized in that** at least one net element (10c) of at least one partial region (34c, 36c, 42c, 44c) of the safety net, which protrudes over the interior region (22c) in a direction parallel to a main extension direction (14c) of the safety net, comprises at least a number of wire windings (48c) which deviates substantially from a mean number of wire windings of net elements (10c) outside the partial region (34c, 36c, 42c, 44c).

15. The safety net as claimed in any one of claims 1 to 14, **characterized in that** at least one net element (10b) of at least one partial region (34b, 36b, 42b, 44b) of the safety net, which protrudes over the interior region (22b) in a direction parallel to a main extension direction (14b) of the safety net, comprises at least one energy absorber (54b).

16. The safety net as claimed in claim 15, **characterized in that** the energy absorber (54b) is realized integrally with the at least one net element (10b).

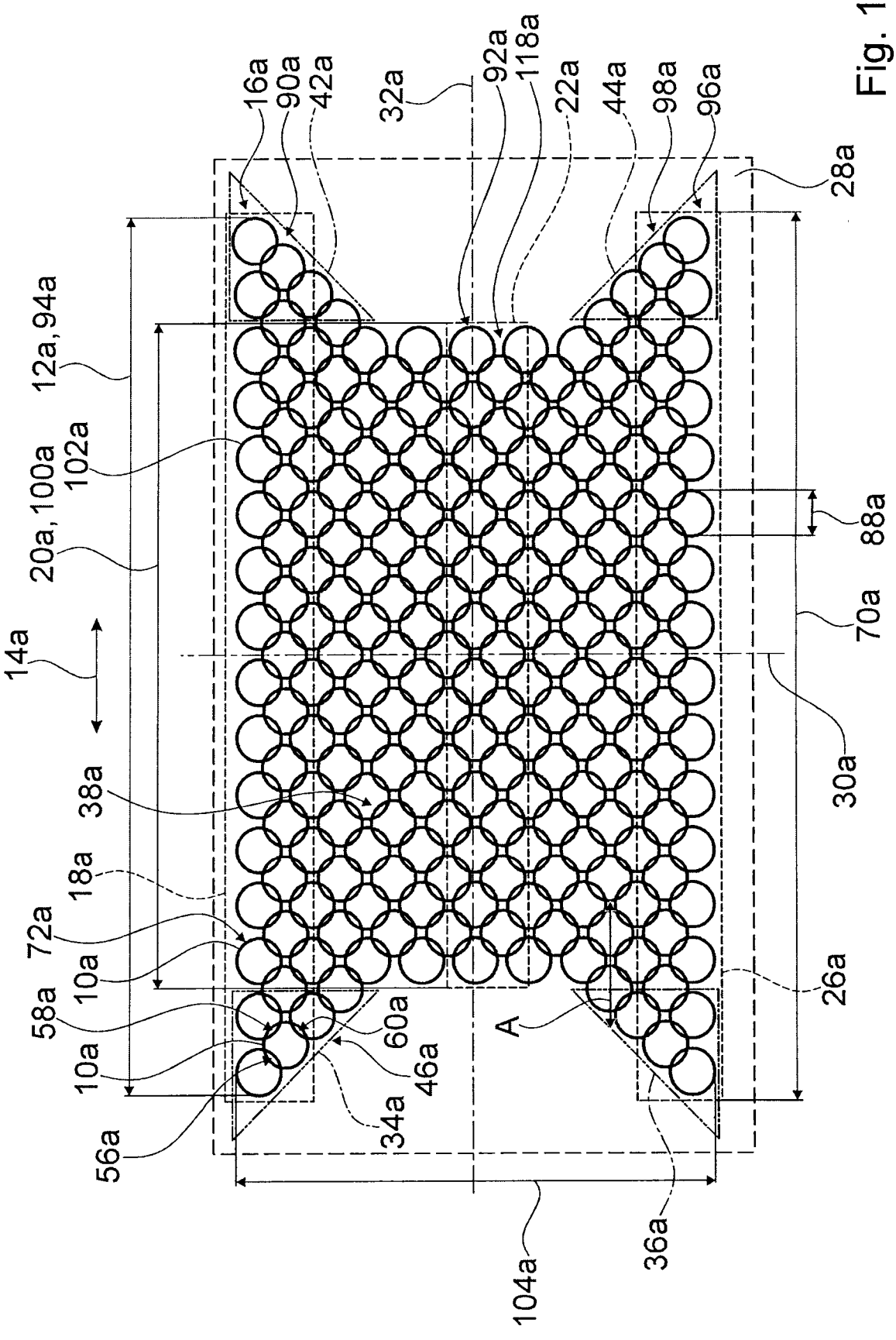
17. The safety net as claimed in any one of claims 1 to 16, **characterized in that** at least one net element (10a-f) realizes precisely three connection regions (56a-f, 58a-f, 60a-f) to neighboring net elements (10a-f).

18. A net and rope construction (62a-f) having a safety net as claimed in any one of claims 1 to 17.

19. The net and rope construction (62a-f) as claimed in claim 18, **characterized by** at least one guide rope (64a-f, 84a-f) which is guided through at least every third net element (10a-f) of a row of net elements (10a-f), which extends parallel to a main extension direction (14a-f) of the safety net, on at least one outer edge (66a-f, 110a-f) of the safety net.

20. The net and rope construction (62a-f) as claimed in claim 19, **characterized in that** the guide rope (64a-f, 84a-f) is realized as at least one support rope (68a-f).

21. A use of a safety net as claimed in any one of claims 1 to 17 as a catch net (74a-f) in a net and rope construction (62a-f) as claimed in any one of claims 18 to 20.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30a
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56a
104a
36a

Fig. 1

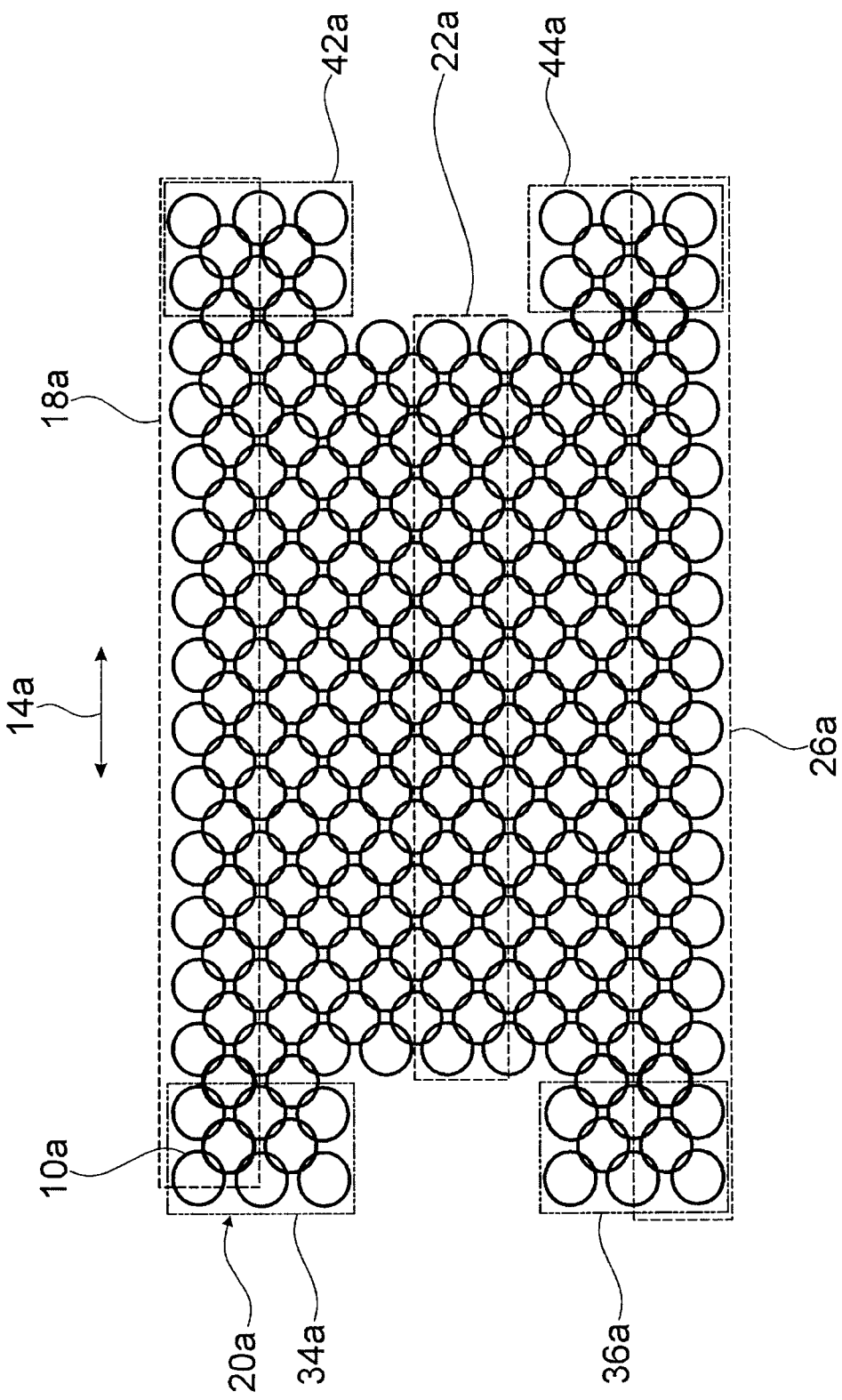

Fig. 2

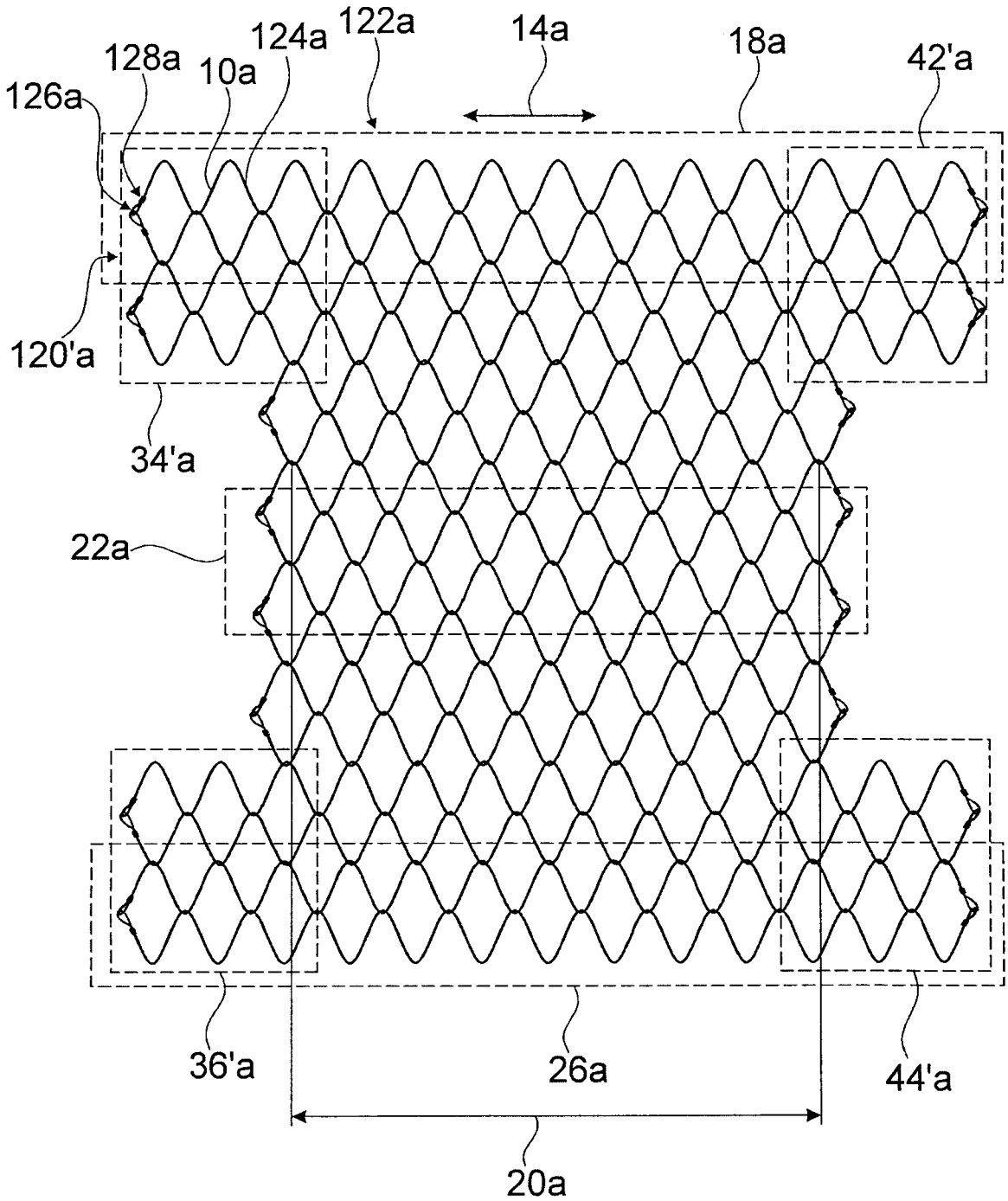
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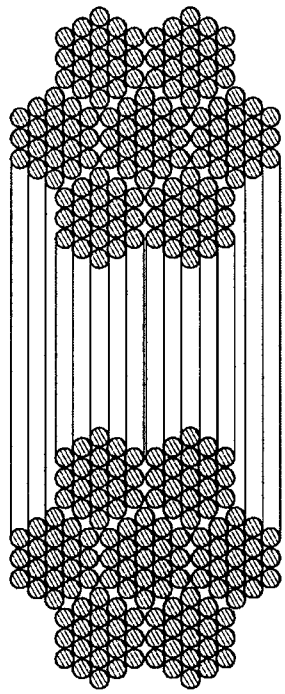
Fig. 3



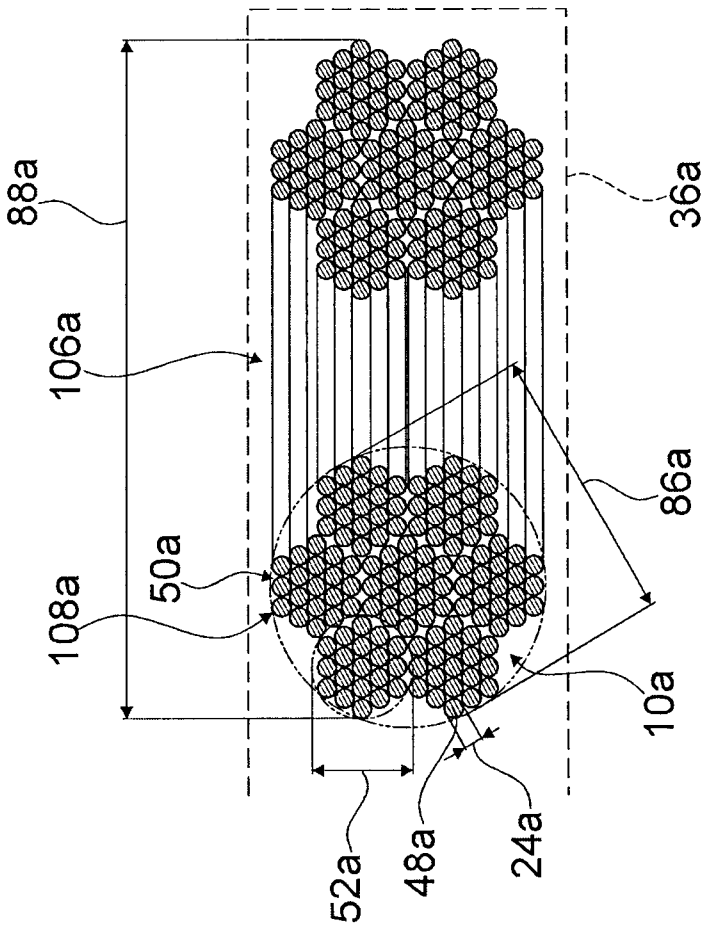
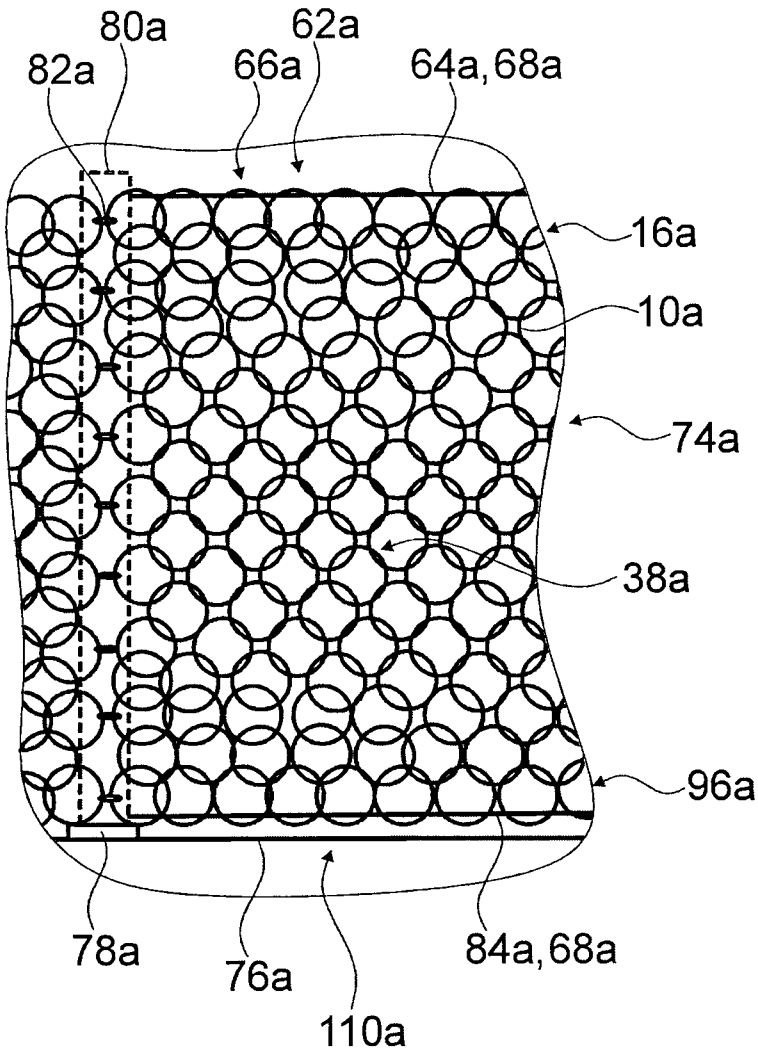


Fig. 4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76a
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Fig. 5

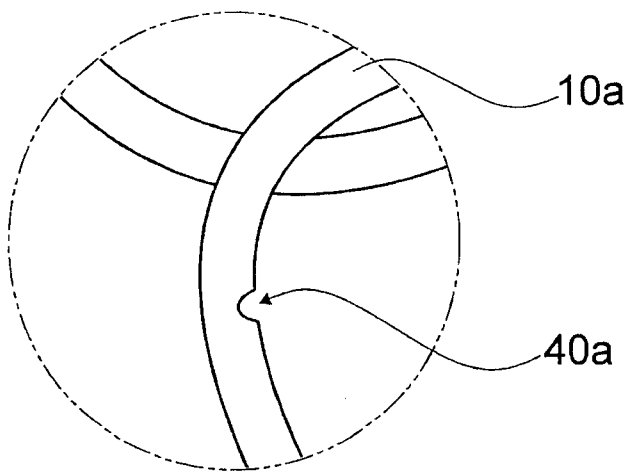

10a
40a

Fig. 6

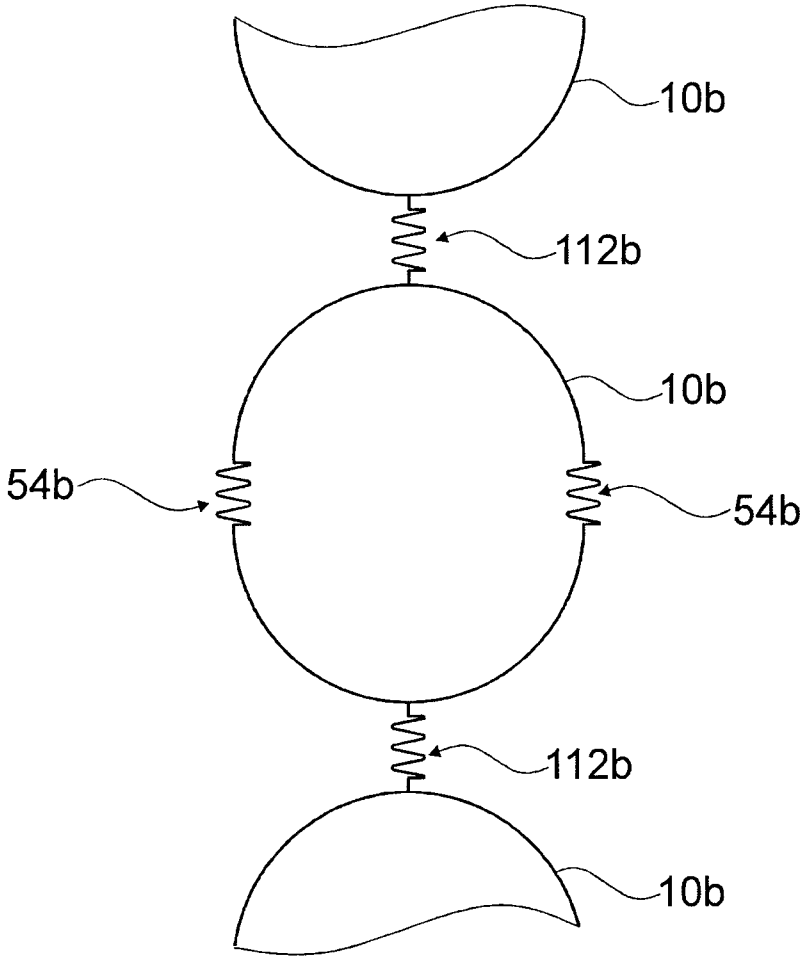
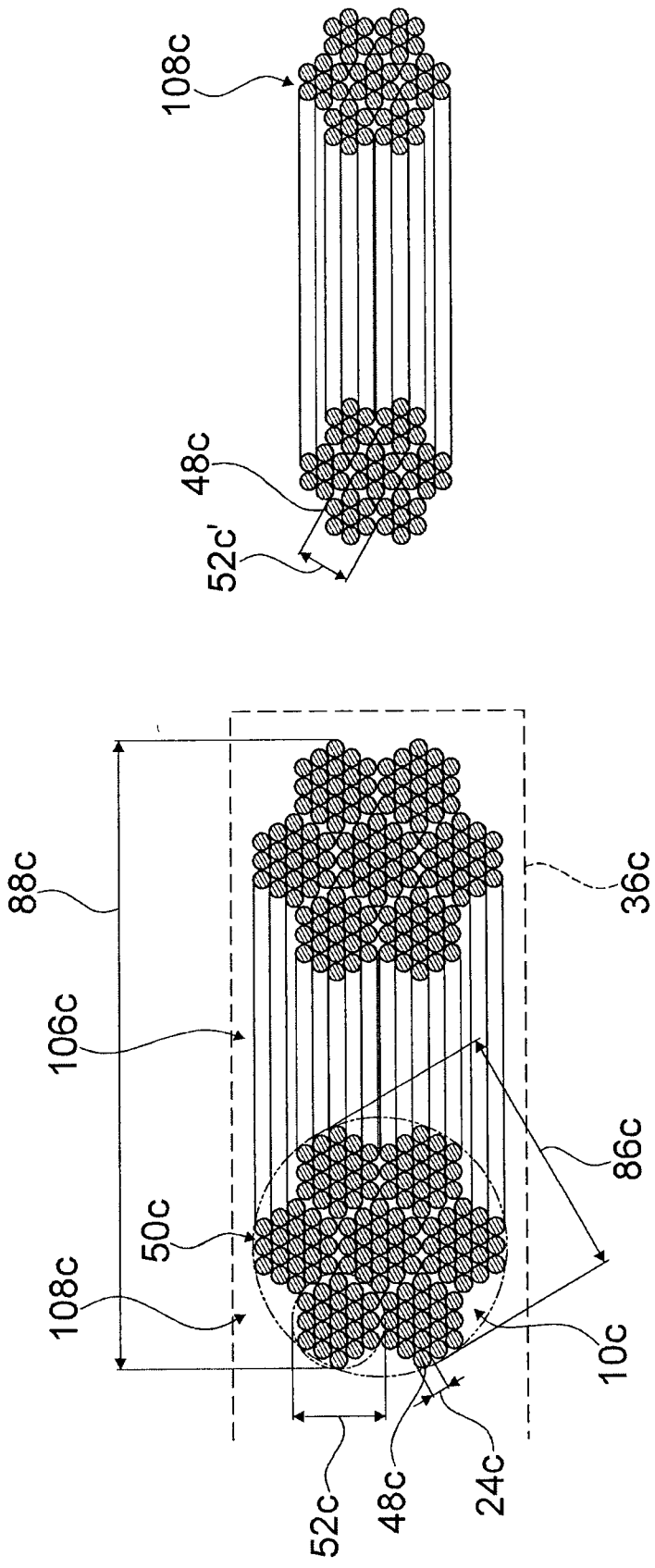


Fig. 7

Fig. 8



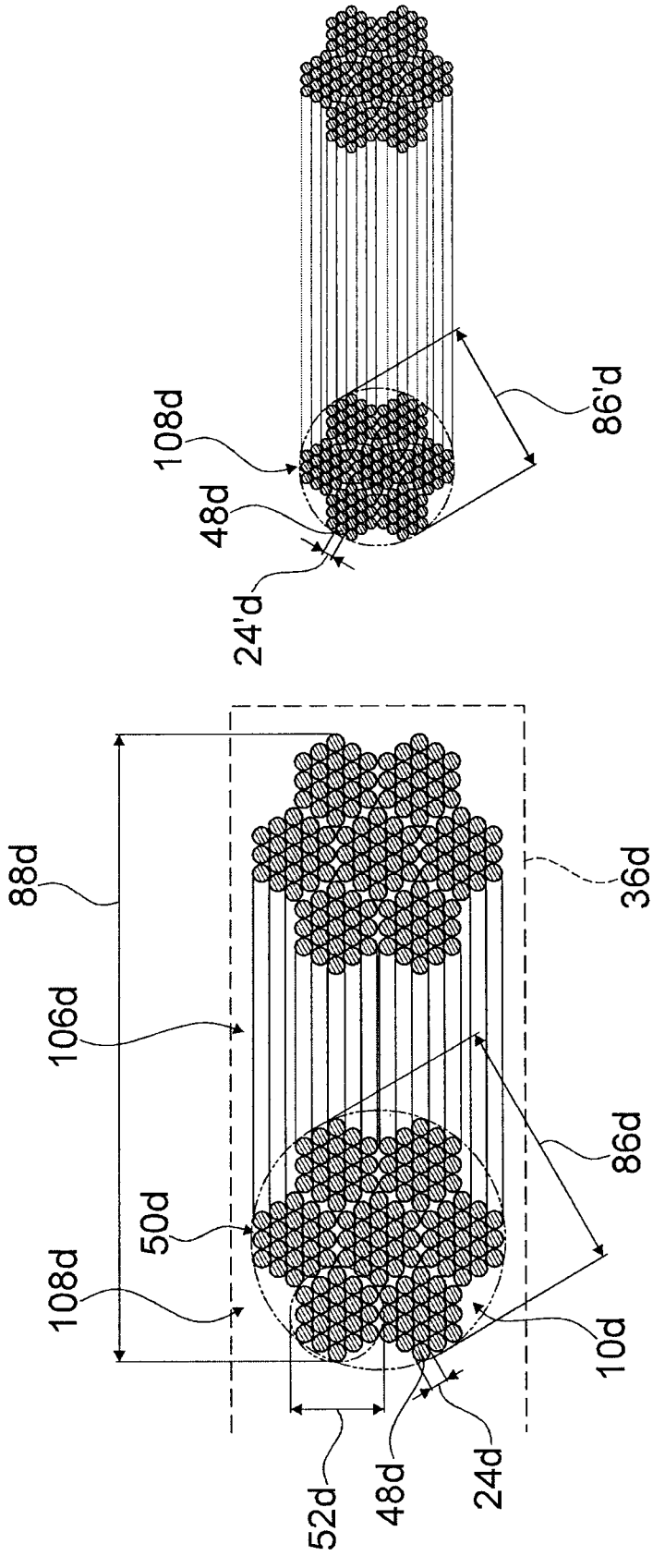
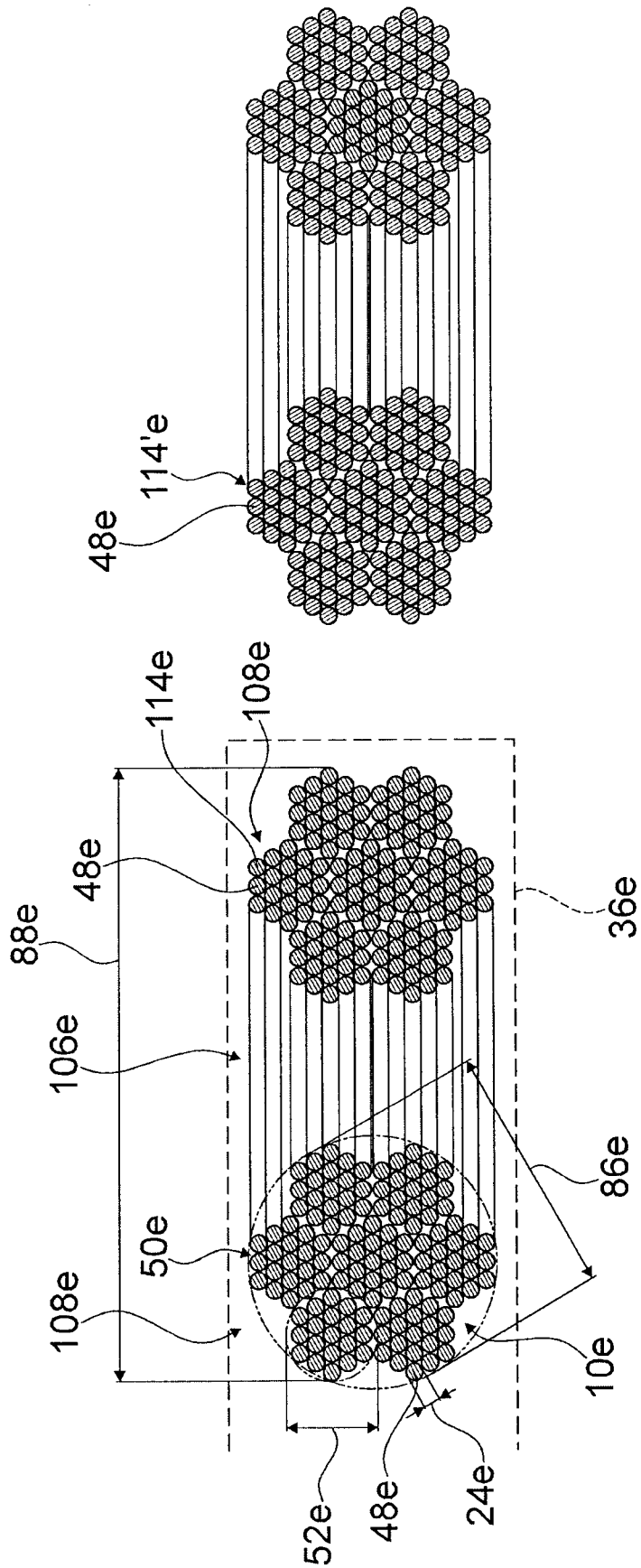


Fig. 9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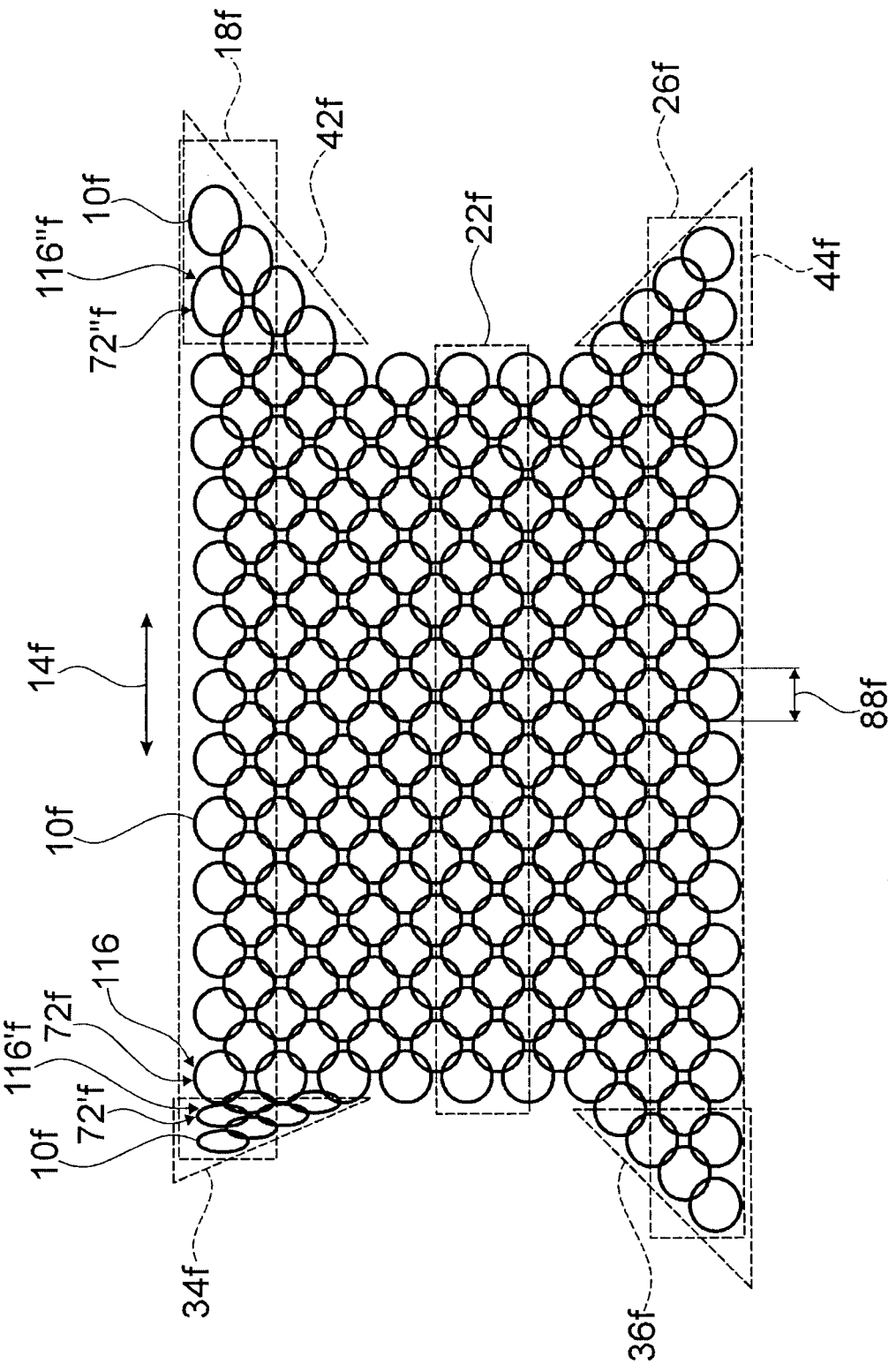
24e

Fig. 10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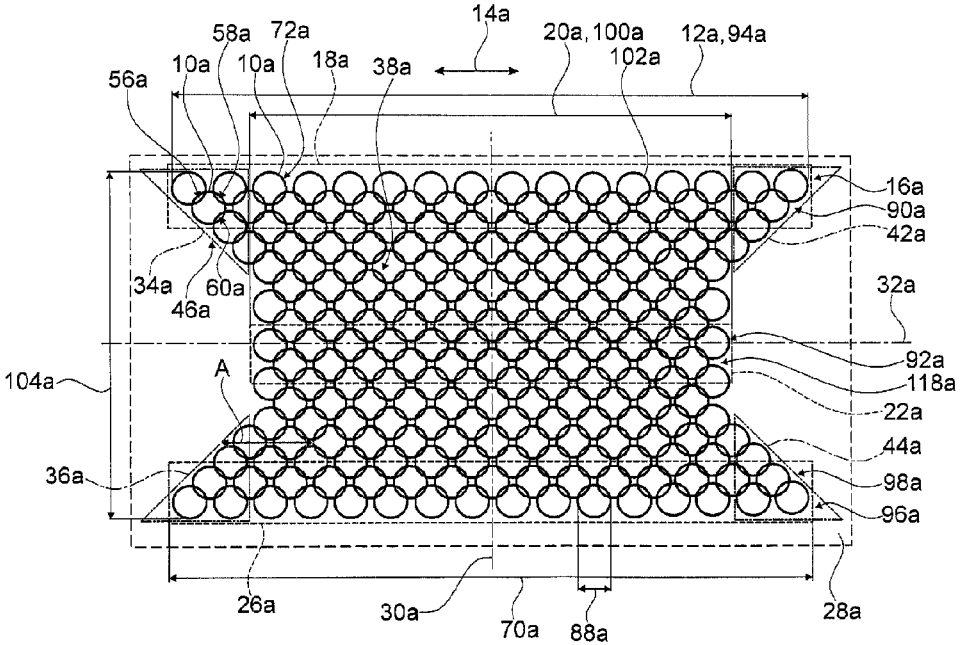
36f

Fig. 11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