



HU000035204T2

(19) **HU**(11) Lajstromszám: **E 035 204**(13) **T2****MAGYARORSZÁG**
Szellemi Tulajdon Nemzeti Hivatala**EURÓPAI SZABADALOM**
SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: E 15 003067	(51) Int. Cl.: E04H 7/06	(2006.01)
(22) A bejelentés napja: 2015. 10. 27.	B65D 1/16	(2006.01)
	B65D 1/40	(2006.01)
(96) Az európai bejelentés bejelentési száma: EP 20150003067	E04H 7/30	(2006.01)
	B65D 90/08	(2006.01)
(97) Az európai bejelentés közzétételi adatai: EP 3078790 A1 2016. 10. 12.	B21C 37/12	(2006.01)
	B65D 90/02	(2006.01)
(97) Az európai szabadalom megadásának meghirdetési adatai: EP 3078790 B1 2017. 04. 05.		

(30) Elsőbbségi adatok: 102015004281 2015. 04. 08. DE	(74) Képviselő: Advopatent Szabadalmi és Védjegy Iroda, Budapest
(72) (73) Feltaláló(k) és szabadalmas(ok): Lipp, Xaver, 73479 Ellwangen (DE)	

(54) **Tartály csavarvonal alakban hajlított lemezzsalagból**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.



LIXA-01
02. May 2017

DESCRIPTION

Container produced from a helically bent sheet metal
strip

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TECHNICAL FIELD

The present invention relates to a container produced
from a single-layered, helically bent sheet metal
10 strip, in the upper or in the lower border region of
the sheet metal strip a first helically running border
portion of the sheet metal strip being bent out via a
helically running outwardly bent edge with a curved
region toward the outside of the container as a
15 protruding flange, there being a second helically
running border portion in the lower/upper border region
of the sheet metal strip, and the helically running
border regions of the sheet metal strip, which each
border one another in a manner adjacent in terms of
20 height, being connected to one another in a fluid-tight
manner via a continuous, helically running welded
joint.

PRIOR ART

25

Containers produced from helically bent sheet metal
strip are known from DE 2 250 239 A or EP 1 181 115 B1.
In order to produce containers, a coil with a diameter
corresponding to the container diameter is shaped here
30 from a sheet metal strip. During the production of a
container of this type, the mutually assigned coil
sheet metal strip borders are first of all bent out and
are subsequently connected to one another in a fluid-
tight manner on the outside of the container by means
35 of a seam. For this purpose, the mutually opposite
longitudinal edges of the sheet metal strip are each
bent out in a U-shaped manner and the mutually assigned
sheet metal borders bent out in a U-shaped manner are

placed one inside another and are subsequently connected by seaming. This system is commercially known as the Lipp dual-seam system and has proven successful in diverse situations. By means of said Lipp dual-seam system, simple and rapid production of the containers with a variable diameter and variable height is possible. Transportable sheet metal bending and installation apparatuses ensure that the container can be installed at the respective erection site and the transport volume can be corresponding reduced.

It is known from DE 199 39 180 A1 to produce a container in such a manner that a first border portion is bent out toward the outside, forming a helically running outwardly bent edge, and a second border portion of the sheet metal strip, which is arranged adjacently thereabove, is bent over outward and is then connected to a first border portion by a seam.

For the previous applications of said container system, for example for storing bulk materials from agriculture and forestry, or biowaste, the containers have excellent stability, tightness and media resistance. However, for further applications, such as, for example, the storage of fluid media, such as vegetable oils, natural oil or the like, a significantly larger container volume is required, and in which applications the tightness has to be reliably ensured. The associated increased mechanical stability of the containers cannot be adequately ensured by the known seam systems. In particular, the seam system reaches its limits in the event of great sheet metal thicknesses.

In order to provide containers which are produced helically from bent sheet metal strip and the range of application of which is increased, in particular with

regard to the realization of a large storage volume and/or increased mechanical stability while ensuring nevertheless simple and rapid production capability and installation, solutions have been developed which
5 replace the seam connection with a welded joint.

WO 2014/048515 A1 discloses a container produced from a helically bent sheet metal strip of the type described at the beginning, wherein the border portions of the
10 adjacent border regions, which run one above another in terms of height, of the sheet metal strip are connected to one another via a welded joint. The border regions overlap here and are connected to one another in a fluid-tight manner by means of two separate weld seams.
15 The distance present between the weld seams gives rise, in the overlapping region of adjacent border regions of the sheet metal strip, to a gap region between the overlapping walls, which gap region is not controllable in a simple manner with respect to possible risks of
20 corrosion or the like after the container has been produced.

SUMMARY OF THE INVENTION

25 Starting from the prior art mentioned with regard to the welded design, the present invention is based on the object or the technical problem of providing a container which further increases the range of application of containers of this type, in particular
30 ensures the same while retaining the economic production capability in situ by means of helical sheet metal strips, and which has wall thicknesses which cannot be realized by the known seam methods, meets very exactly requirements with regard to purity, media
35 resistance and tightness, and ensures a permanently reliable operation and permits container sizes to be

realized with regard to diameter and height that could not be realized hitherto.

The container according to the invention is provided by
5 the features of independent claim 1.

Advantageous refinements and developments are the subject matter of the claims which are dependent directly or indirectly on independent claim 1.

10

Accordingly, the container according to the invention of the type mentioned at the beginning is distinguished in that the second border portion of the sheet metal strip runs rectilinearly in the plane of the sheet
15 metal strip, the welded joint has a first and a second weld seam, the first weld seam, which is preferably produced first of all, being fused from the outside of the container to the outer-side wall of the second border portion and the wall of the curved region, the
20 second weld seam, which is preferably produced subsequently, being fused from the inside to the end surface of the second border portion of the sheet metal strip, and the weld routes of the first and second weld seam being fused to each other such that there is a
25 homogeneous fully fused welded joint running from the outside to the inside.

During the production of the welded joint, preferably the first weld seam is applied first of all from the
30 outside and then the second weld seam is applied from the inside.

However, it is also possible to apply the second weld seam first of all from the inside and then to apply the
35 first weld seam from the outside.

Alternatively, the two weld seams can also be applied simultaneously.

5 A particularly advantageous refinement ensuring high stability is distinguished in that the height level of the upper border of the first border portion and the height level of the end surface of the second border portion is substantially identical with regard to border regions of the sheet metal strip that are
10 arranged adjacent in terms of height.

Alternatively, an advantageous refinement is distinguished in that the height level of the upper border of the first border portion and the height level
15 of the end surface of the second border portion has a distance upward in terms of height with respect to border regions of the sheet metal strip that are arranged adjacent in terms of height.

20 A further advantageous refinement, by means of which an advantageous, continuous welded joint is made possible with little material consumption, is distinguished in that the height level of the upper border of the first border portion and the height level of the end surface
25 of the second border portion has a distance downward in terms of height with respect to border regions of the sheet metal strip that are arranged adjacent in terms of height.

30 In respect of the practical realization, a particularly advantageous refinement with respect to production and ensuring simple production and a reliable homogeneous welded joint has proven advantageous to form said joint in such a manner that the distance downward lies within
35 the range of between 50% and 100% of the sheet metal thickness of the sheet metal strip or alternatively the distance upward lies within the range of between 50%

and 200% of the sheet metal thickness of the sheet metal strip.

5 A variant embodiment which is particularly simple in practice and can be implemented reliably is distinguished in that the width of the first weld seam lies within the range of between 100% and 200% of the sheet metal thickness of the sheet metal strip, and/or
10 of between 100% and 300% of the sheet metal thickness of the sheet metal strip.

With regard to an economic and reliable implementation, a variant embodiment has proven advantageous in which
15 the radius of the curved region lies within the range between 2 mm and 20 mm, as a result of which the range can easily be met for the increased requirements in the case of containers with a large diameter and high carrying loads.

20 A particularly preferred refinement which ensures a "smooth" inner surface of the container is distinguished in that the second border portion and the third border portion lie in the center plane of the
25 sheet metal strips arranged in each case one above another in terms of height, and therefore a smooth inner surface is ensured within the proportion of the container, said inner surface, because of the welded joint provided, having high strength and not having any
30 edges present on the inner side at which filling material may accumulate.

A particularly preferred development which ensures high rigidity in the region of the joint is distinguished in
35 that the curved region of the outwardly bent edge has an increased radius and the curved region forms a

convex region which protrudes toward the inside and then merges into the projecting first border portion.

5 The container according to the invention is distinguished in the simplest manner in that a welded joint is provided in the region of the connection of border regions of the sheet metal region, which border regions are adjacent one above the other in terms of height, said welded joint having a homogeneous
10 structure and reliably connecting the bordering border regions to one another without - as in the prior art - there being gap regions between the border regions that contain potential with respect to possible risks of corrosion. The homogeneous penetration welding
15 in the border region of sheet metal strips bordering one another ensures a high load-bearing capacity and a permanently reliable operation.

At the same time, the design according to the invention
20 permits the production of containers with great wall thicknesses in order to be able economically to realize containers with large dimensions, maintaining the welded joint principle for the borders of a helically running sheet metal strip.

25 Further embodiments and advantages of the invention emerge from the features furthermore cited in the claims and from the exemplary embodiments indicated below. The features of the claims can be combined with
30 one another in any manner unless they clearly mutually exclude one another.

BRIEF DESCRIPTION OF THE DRAWING

35 The invention and advantageous embodiments and developments of same are described and explained in more detail below with reference to the examples

illustrated in the drawing. The features which can be gathered from the description and the drawing may be used, according to the invention, individually on their own or more than one together in any combination. In
5 the drawing:

- fig. 1 shows a side view of a container according to the invention,
- 10 fig. 2 shows an enlarged illustration of a cross section through the connecting point between border regions, which are adjacent in terms of height, of the sheet metal strip according to detail I from fig. 1, in a first exemplary
15 embodiment,
- fig. 3 shows an enlarged illustration of a cross section through the connecting point between border regions, which are adjacent in terms
20 of height, of the sheet metal strip according to detail II from fig. 1, in a second exemplary embodiment,
- fig. 4 shows an enlarged illustration of a cross
25 section through the connecting point between border regions, which are adjacent in terms of height, of the sheet metal strip according to detail III from fig. 1, in a third exemplary embodiment.

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WAYS OF IMPLEMENTING THE INVENTION

Fig. 1 shows a view of a container 10 according to the invention as may be used for storing bulk materials
35 from agricultural and forestry, for example cereals, wood chips or biowaste, or for storing water, wastewater or sewage sludge, or else for storing gas or

natural oil. The container 10 is substantially cylindrical, in particular circular-cylindrical, on the outside thereof and the inside thereof, with a vertically oriented longitudinal axis 12.

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The production of the container 10 takes place, preferably directly at the erection site of the container 10, using a helically bent sheet metal strip 20. The diameter 14 of the container 10 may be between 10 4 m and 20 m or more. The height 16 of the container 10 may be between 2 m and 20 m or more. The capacity of the container 10 may be, for example, between 15 m³ and 8000 m³. The preferably homogeneous thickness 50 (fig. 2) of the sheet metal strip 20 is between 2 mm 15 and 12 mm, in the present case may in particular be more than 5 mm, preferably more than 6 mm and less than 12 mm, for example between 8 mm and 10 mm. The width 18 of the sheet metal strip 20 may be between 20 cm and 100 cm, in particular between 30 cm and 80 cm and 20 preferably between 40 cm and 60 cm; in the exemplary embodiment illustrated, the width 18 of the sheet metal strip 20 is approximately 50 cm.

Fig. 2 illustrates the detail I from fig. 1 in the 25 connecting region. The outside of the container 10 is identified by the reference sign A and the inside by the reference sign I. The upper border region of a lower sheet metal strip 20.1 and of an upper sheet metal strip 20.2, which is adjacent vertically on the 30 upper side, is illustrated in each case. The two sheet metal strips 20.1, 20.2 are arranged running helically in a plane E, wherein the plane E is the center plane of the container 10. The lower sheet metal strip 20.1 has a first border portion 22 which is bent out toward 35 the outside via an outwardly bent edge 24 and forms a protruding flange. In the region of the outwardly bent edge 24, there is a curved region B with a bending

radius R which is adjoined by a third border portion 28 of the lower sheet metal strip 20.1, which lies in the plane E. The size of the radius R may be within the range of between 2 mm and 10 mm or more.

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The first border portion 22 is present substantially at a right angle to the third border portion 28. The first border portion 22 likewise runs helically. The respective height level of the first border portion 22 is identified in figure 2 by the arrow tip H1.

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A second border portion 26 of the upper sheet metal strip 20.2, which border portion runs rectilinearly in the plane E, is present adjacent upward in the vertical direction. The lower-side end surface 30 of the second border portion 26 of the upper sheet metal strip 20.2 is arranged in a height level H2, wherein the height level H2 runs in the vertical direction at a distance D1 below the height level H1. The right edge of the end surface 30 bears on the upper side against the curved region B. In the exemplary embodiment illustrated, the distance D1 between the height level H1 and the height level H2 substantially corresponds to the sheet metal thickness 50.

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The connection of the upper sheet metal strip 20.2 to the lower sheet metal strip 20.1 takes place via a helically running welded joint 40.

30 The welded joint 40 here comprises a first weld seam 42 which is applied first of all from the outside A and by means of which the outside of the second border portion 26 of the upper sheet metal strip 20.2 is fused to the upper side of the curved region B of the lower sheet metal strip 20.1. Furthermore, there is a second weld seam 44 which is applied from the inside I after the first weld seam 42 has been applied and which is fused

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to the end surface 30 of the second border portion 26 of the upper sheet metal strip 20.2 and the upper side of the curved region B of the lower sheet metal strip 20.1. During the welding, the weld routes of the first and second weld seam 42, 44 are also fused to each other, and therefore a welded joint 40 which is continuously homogeneous from the outside inward and has a high load-bearing capacity is present. At the same time, absolute seal tightness is ensured.

It is also possible to apply the second weld seam 44 first of all from the inside I and then to apply the first weld seam from the outside A.

In an alternative manner of production, the first and second weld seam 42, 44 are applied simultaneously.

Fig. 3 illustrates a second exemplary embodiment of the connecting structure of a lower border region of an upper sheet metal strip 20.2 to the upper border region of a lower sheet metal strip 20.1, wherein the sheet metal strips 20.1, 20.2 have the same geometry as the sheet metal strips 20.1, 20.2 illustrated in fig. 2. Identical components bear the same reference signs and are not explained once again.

The difference over fig. 2 consists in that the upper sheet metal strip 20.2 or the lower end surface 30 thereof is arranged at a height level H2 which runs at a distance D2 above the height level H1 of the upper side of the first border portion 22 of the lower sheet metal strip 20.1. In the exemplary embodiment, the distance D2 substantially corresponds to the sheet metal thickness 50. By means of the geometrical arrangement, it is possible to apply a welded joint to the first weld seam 42 and the second weld seam 44 that has an increased weld seam thickness, which permits a

particularly high load-bearing capacity of the welded joint construction while simultaneously ensuring absolute seal tightness.

5 In the exemplary embodiments according to fig. 2 and fig. 3, it is also possible for the second weld seam 44 to be applied in such a manner that it is fused not only to the end surface 30 of the second border portion 26 of the upper sheet metal strip 20.2, but is also
10 fused to the lower border region of the inner wall of the second border portion 26.

Fig. 4 illustrates a third exemplary embodiment according to detail III from fig. 1 in the connecting
15 region between an upper and a lower sheet metal strip 20.1, 20.2, in which the basic arrangement of the lower sheet metal strip and of the upper sheet metal strip corresponds to the arrangement according to the exemplary embodiments of fig. 3, but with the
20 difference that, in the region of the outwardly bent edge 24, the radius R1 of the curved region B1 is substantially increased, and the curved region B1 has a convex region 48 which protrudes toward the inside I and on the lower end region of which the third border portion 28.1 is integrally formed and in the upper end
25 region of which the second border portion 22 (protruding flange) is integrally formed. The height level H2 of the end surface 30 of the second border portion 26 of the upper sheet metal strip 20.2 is arranged offset upward by the distance size D2 in
30 relation to the height level H1 of the upper side of the first border portion 22 of the lower sheet metal strip 20.1. The connection of the two border regions of the sheet metal strips 20.1, 20.2 also takes place via
35 a welded joint 40 with a first weld seam 42 which is applied from the outside A and with a second weld seam 44 which is applied from the inside.

Here too, the first weld seam 42 is fused to the lower border region of the second border portion 26 of the upper sheet metal strip 20.2 and on the upper side to the end region of the curved region B1, the second weld seam 44 is fused in the lower border region to the inside I of the second border portion 26 and in regions to the upper side of the curved region B1, and at the same time the weld routes of the two weld seams 42, 44 are fused to each other and at the same time the end surface 30 and the upper-side region of the curved region B1, which upper-side region is opposite the end surface 30, are fused.

The rigidity in the region of the connecting structure is increased by the inwardly protruding convex region 48 of the curved region B1. Also in this embodiment, there is a welded joint 40 which is fully fused from the outside A to the inside I and which ensures high load-bearing capacity with simultaneously absolute tightness.



EP 3 078 790

TARTÁLY CSAVARVONAL ALAKBAN HAJLÍTOTT LEMEZZSZALAGBÓL

Szabadalmi igénypontok

1. Tartály (10) egyrétegű, csavarvonal alakban hajlított lemezzszalagból (20; 20.1, 20.2), amelynél
 - a lemezzszalag (20; 20.1, 20.2) felső vagy alsó szélén a lemezzszalag (20; 20.1, 20.2) egy első, csavarvonal alakban futó peremrésze (22) egy hajlított szakasszal (B) kialakított, csavarvonal alakban futó hajlítási élen (24) át a tartály (10) külső oldala (A) felé karimaként van kihajlítva,
 - a lemezzszalag (20; 20.1, 20.2) alsó/felső szélén egy második, csavarvonal alakban futó peremrész (26) van, és a lemezzszalag (20; 20.1, 20.2) csavarvonal alakban futó, magassági irányban szomszédosan egymással határos szélei egy folytonos, csavarvonal alakban futó hegesztett kötésen (40) át folyadék- és gáztömören össze vannak kötve egymással,
 - **azzal jellemezve, hogy**
 - a lemezzszalag (20; 20.1, 20.2) második peremrésze (26) egyenes vonalban a lemezzszalag (20; 20.1, 20.2) síkjában (E) fut,
 - a hegesztett kötés (40) egy első és egy második hegesztési varratot (42, 44) tartalmaz, ahol
 - az első, előnyösen először előállított hegesztési varrat (42) a tartály (10) külső oldala (A) felől össze van

olvasztva a második peremrész (26) falának külső oldalával és a hajlított szakasz (B) falával,

- a második, előnyösen az előző után előállított hegesztési varrat (44) a belső oldal (I) felől össze van olvasztva a lemezzsalag (20; 20.1, 20.2) második peremrészének (26) homlokfelületével (30), és

- az első és második hegesztési varrat (42, 44) varratgyöke össze van olvasztva, úgyhogy a külső oldaltól (A) a belső oldalig (I) homogén, összeolvasztott hegesztett kötés (40) van jelen.

2. Az 1. igénypont szerinti tartály,

- **azzal jellemezve, hogy**

- az első peremrész (22) felső szélének magassági szintje (H1) és a második peremrész (26) homlokfelületének (30) magassági szintje (H2) a lemezzsalag (20) magassági irányban szomszédosan elhelyezett peremrészeire vonatkoztatva lényegében egyenlő.

3. Az 1. igénypont szerinti tartály,

- **azzal jellemezve, hogy**

- az első peremrész (22) felső szélének magassági szintje (H1) és a második peremrész (26) homlokfelületének (30) magassági szintje (H2) között a lemezzsalag (20) magassági irányban szomszédosan elhelyezett peremrészeire vonatkoztatva magassági irányban felfelé távolság (D1) van.

4. Az 1. igénypont szerinti tartály,

- azzal jellemezve, hogy

- az első peremrész (22) felső szélének magassági szintje (H1) és a második peremrész (26) homlokfelületének (30) magassági szintje (H2) között a lemezszalag (20) magassági irányban szomszédosan elhelyezett peremrészeire vonatkoztatva magassági irányban lefelé távolság (D2) van.

5. A 3. igénypont szerinti tartály,

- azzal jellemezve, hogy

- a távolság (D1) a lemezszalag (20) lemezvastagságának (50) 50%-a és 100%-a között van.

6. A 4. igénypont szerinti tartály,

- azzal jellemezve, hogy

- a távolság (D2) a lemezszalag (20) lemezvastagságának (50) 50%-a és 100%-a között van.

7. Tartály az előző igénypontok közül egy vagy több szerint,

- azzal jellemezve, hogy

- az első hegesztési varrat (42) szélessége a lemezszalag (20) lemezvastagságának (50) 100%-a és 200%-a között van.

8. Tartály az előző igénypontok közül egy vagy több szerint,

- azzal jellemezve, hogy

- a második hegesztési varrat (44) szélessége a lemezszalag (20) lemezvastagságának (50) 100%-a és 300%-a között van.

9. Tartály az előző igénypontok közül egy vagy több szerint,

- **azzal jellemezve, hogy**

- a hajlítási él (24) hajlított szakaszának (B) hajlítási sugara (R) a 2 mm és 20 mm, különösen a 2 mm és 10 mm közötti tartományban van.

10. Tartály az előző igénypontok közül egy vagy több szerint,

- **azzal jellemezve, hogy**

- a lemezszalag (20) második peremrésze (26) és a hajlított szakaszhoz (B) csatlakozó harmadik peremrésze (28) a szomszédos, magassági irányban egymással határos lemezszalagokra (20; 20.1, 20.2) vonatkoztatva egy síkban (E) van.

11. Tartály az előző 1-8. és 10. igénypontok közül egy vagy több szerint,

- **azzal jellemezve, hogy**

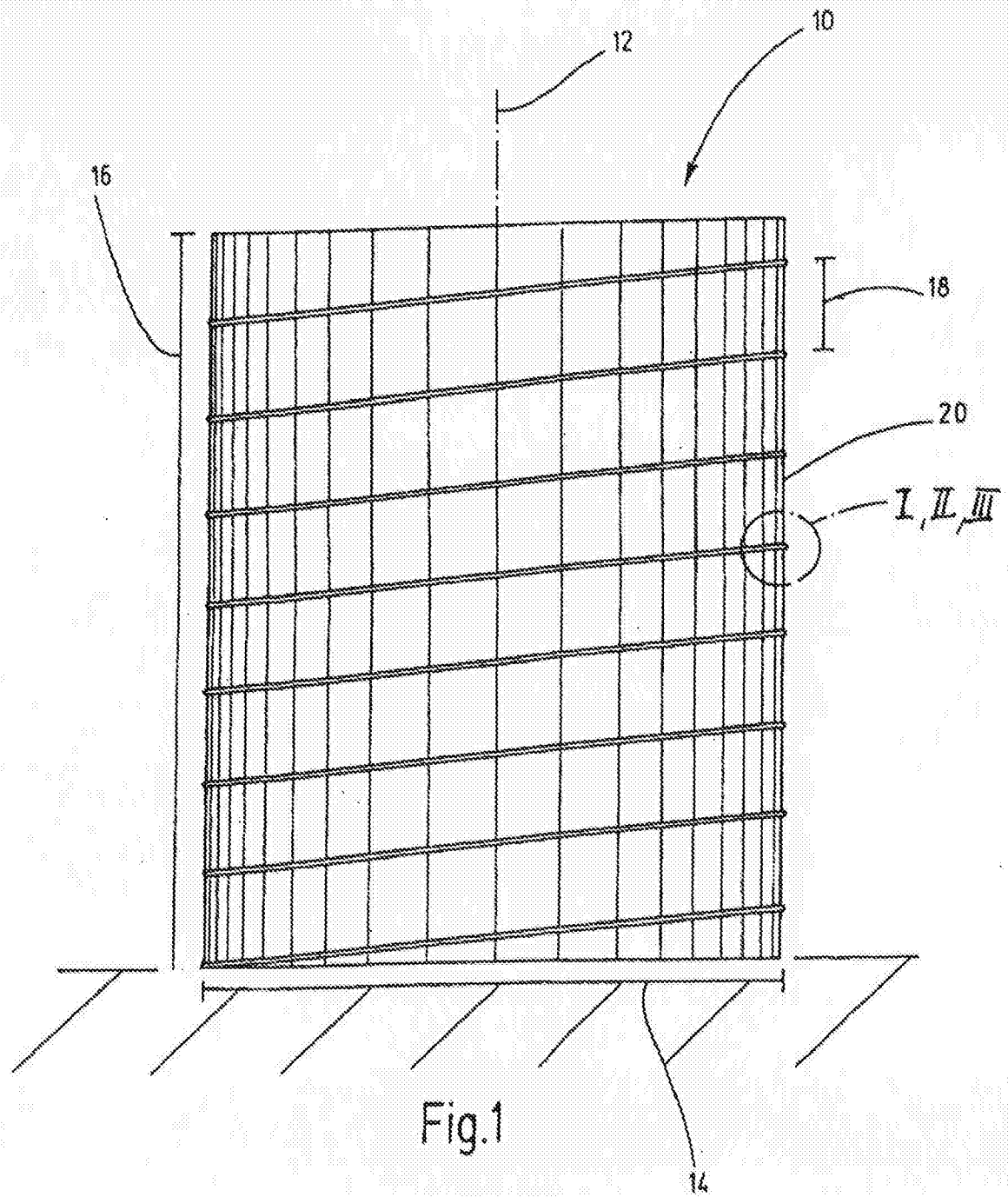
- a hajlítási él (24) hajlított szakaszának (B1) megnövelt sugara (R1) van, és a hajlított szakasz (B1) a belső oldal (I) felé kiálló domború szakaszt (48) alkot.

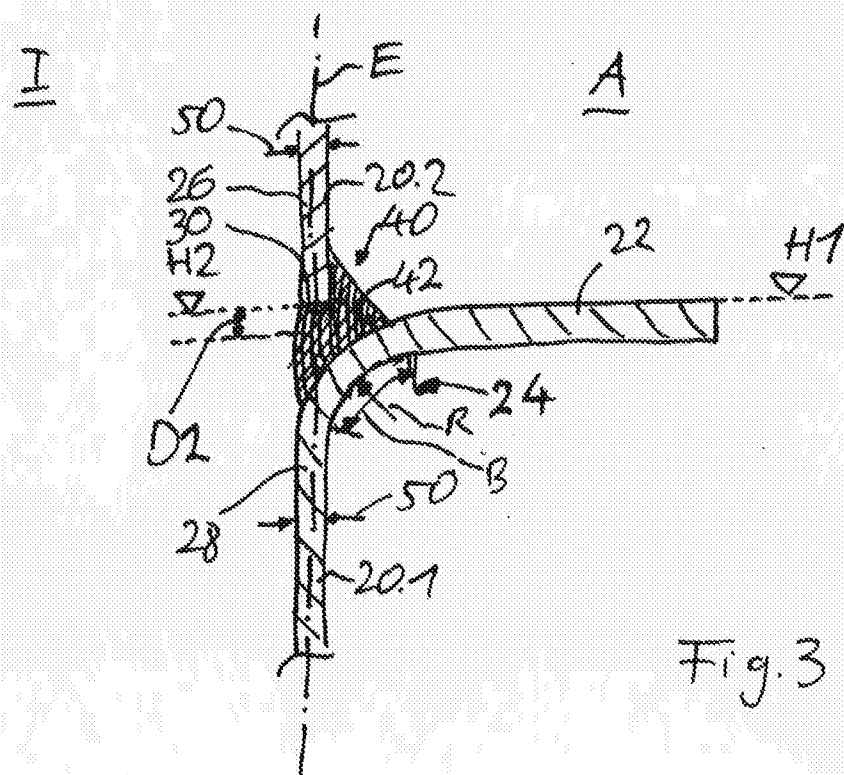
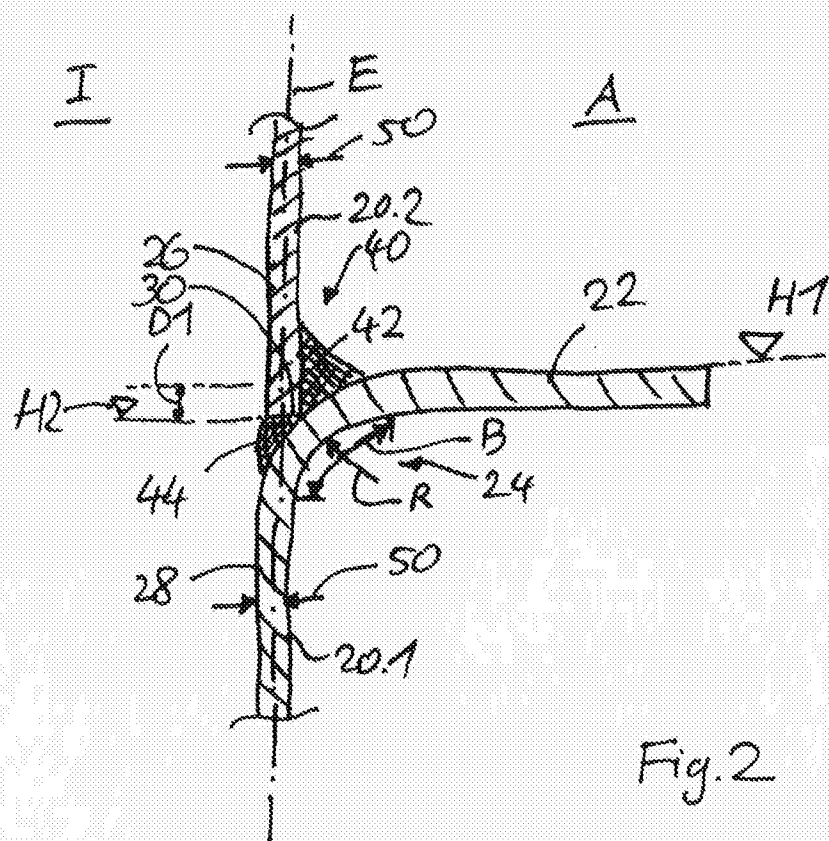
A meghatalmazott:

ADVOPATENT
SZABADALMI ÉS VÉDJEY IRODA
1255 Budapest, Pf.: 80.

3.







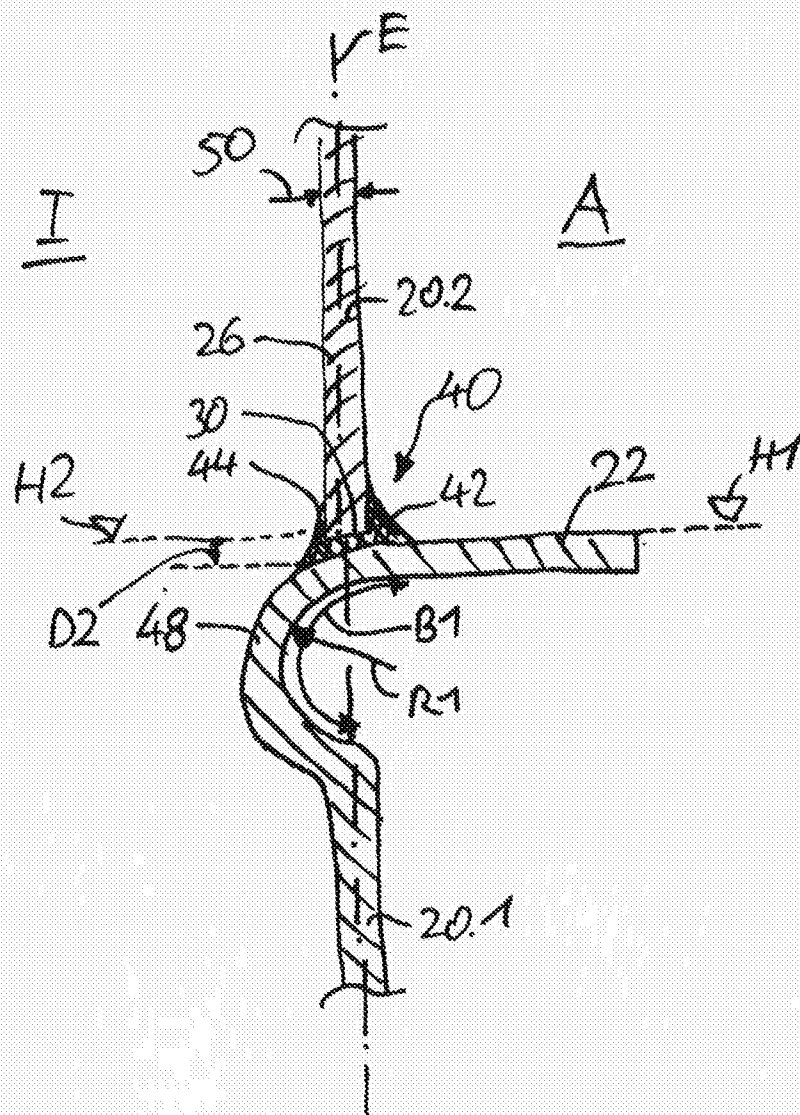


Fig. 4