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(54) Title: A SLEEVE FOR PIPELINE REPAIRS

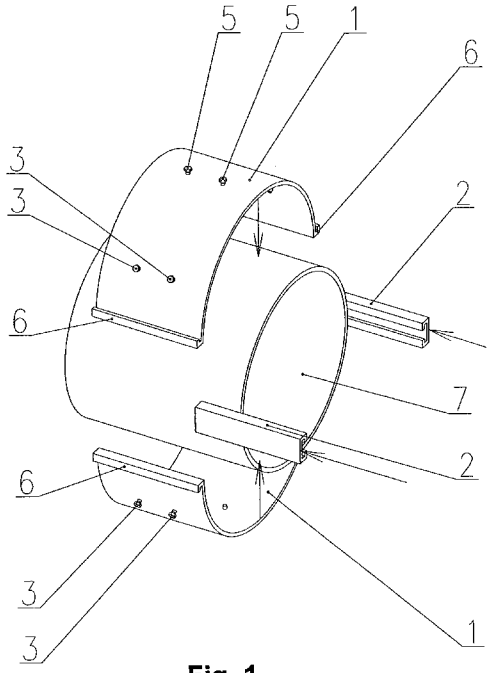

Fig. 1

(57) Abstract: A sleeve for pipeline repairs that is axially divided into at least two shell segments (1) and equipped with spacing elements for centring the sleeve on the repaired pipeline (7) as well as at least one filling opening (5) for introduction of hardenable filling into a gap (8) between the inner surface of the shell segments (1) and the outer surface of the repaired pipeline (7). In the place of the mutual connection of the shell segments (1) the edges of the shell segments (1) are provided with longitudinal protrusions (6) that are fixed with a common connection profile (2).

A sleeve for pipeline repairs

Technical Field

The invention relates to a sleeve for pipeline repairs that is axially divided into at least two shell segments and equipped with spacing elements for centring the sleeve on the repaired pipeline as well as at least one filling opening for introduction of hardenable filling into a gap between the inner surface of the shell segments and the outer surface of the repaired pipeline.

Background Art

Sleeves of such a type are used for repairs of defects of high-pressure pipelines without a shutdown or without interruption of operation of the pipeline. Various methods of pipeline repairs with the use of sleeves installed along the pipeline perimeter are known the objective of which is to increase the carrying capacity of a damaged or otherwise weakened pipeline. A common principle of repairs with sleeves is protection against buckling of the defect and partial relief of the defect to prevent propagation of the defect, which could lead to pipeline destruction.

The use of split sleeves welded to the repaired pipelines with perimeter welds is frequent; however, on high-pressure pipelines this method represents increased demands for the sleeve material, the execution method of perimeter welds and the necessity of their crack detection because such a sleeve must be considered as a pressure part of the pipeline.

A known type of sleeves is represented by split sleeves fitted tightly on the pipeline with the use of assembly fixtures with bolts that are disassembled after the connection of both the parts of the sleeve with a longitudinal weld. These sleeves are not attached by welding. A disadvantage of these sleeves is a low efficiency, which does not allow their use for permanent repairs of serious defects.

A more advanced type is represented by split sleeves that have special filling of the delimited space between the pipeline and the sleeve shell and are not

connected to the pipeline with the use of welds. This filling, which is generally based on epoxy resin, transmits parts of the load from the pipeline wall to the sleeve shell. The efficiency and reliability of the repair decisively depends on the filling type and observance of the specified filling application procedure.

In a known design the sleeve consists of two semi-shells. These semi-shells are placed on the pipeline and then welded to each other with longitudinal welds. The sleeve created like this is centred with the use of centring bolts that are evenly distributed on its perimeter. After centring of the sleeve the sleeve fronts, i.e. gaps between the pipeline and the sleeve are sealed with quick hardening sealant. After hardening of the sleeve fronts the space between the sleeve and the pipeline is filled with an epoxy composite material via filling openings. After hardening of the composite material the centring bolts are cut off on the sleeve surface plane.

In another known version the sleeve consists of two semi-shells seated on two spacing strip that fully encircle the pipeline. Each strip consists of two parts connected to each other with longitudinal welds. The semi-shells are connected to each other with longitudinal welds. The joints between the pipeline, spacing strips and the sleeve are sealed with quick-hardening sealant. After the hardening of the sealant the space between the sleeve and the pipeline is filled with an epoxy composite material via filling/checking openings, which are gradually closed with plugs during the filling.

Then, there is a large group of split sleeves seated tightly directly on the pipeline with the use of a screw connection, e.g. EP 194 034, GB 2 119 893 that are not connected to the pipeline by welding. Their disadvantage is a high weight resulting from the rigid robust structure of the flange joint as well as the entire sleeve shell that is based on the requirement to eliminate excessive stress and possible risk of collapsing of the pipeline in the place of the flange joint. Another disadvantage is an uneven grip along the pipeline perimeter caused by the limited capability of the very rigid sleeve to adapt to the pipeline, which generally does not have a perfectly circular cross-section. Sleeves of this type differ from each other by the flange joint structure, rigidity of the sleeve and efficiency. The

efficiency of these sleeves mainly depends on the tightness of the contact of the sleeve with the pipeline and the force the sleeve exerts upon the pipeline.

The goal of the invention is to propose a sleeve that will have a simple assembly not requiring qualified personnel without compromising the quality of the joint.

Disclosure of Invention

The above mentioned goal is achieved with a sleeve for pipeline repairs that is axially divided into at least two shell segments and equipped with spacing elements for centring the sleeve on the repaired pipeline as well as at least one filling opening for introduction of hardenable filling into a gap between the inner surface of the shell segments and the outer surface of the repaired pipeline, in accordance with the invention the principle of which is that in the place of the mutual connection of the shell segments the edges of the shell segments are provided with longitudinal protrusions that are fixed with a common connection profile.

An advantage of the sleeve based on the presented invention as compared to sleeves with a welded joint is simpler assembly not requiring equipment and qualified personnel for welding, a higher security of the joint as compared to a welded joint, which cannot be subjected to a crack detection test, and a comparable total weight with the known joint while maintaining its strength.

An advantage of the sleeve based on the presented invention as compared to screwed joint sleeves is a considerably higher joint strength with a comparable total weight and simpler production.

In comparison to non-metallic integral sleeves the sleeve based on this invention has an approx. 3 times higher strength at a comparable price.

In a preferred embodiment the connection profile comprises of a C-profile.

In another preferred embodiment the connection profile is provided with a dovetail

groove and the protrusions on the shell segments have the corresponding shape.

To further increase the security the connection profile may be interconnected with the protrusions on the shell segment with locking screws and/or a pin.

The protrusions on the shell segments may be shaped from the material of the shell segment or they may be produced separately and subsequently welded to the shell segments.

In a preferred embodiment the spacing elements for centring the sleeve on the repaired pipeline may consist of spacing screws that are screwed in threaded openings of the shell segments, regularly distributed along the perimeter.

Brief Description of Drawings

The sleeve for pipeline repairs in accordance with the invention will be described in a more detailed way with the use of particular sample embodiments shown in the drawings where Fig. 1 presents the sleeve in the disassembled condition and Fig. 2 shows the same sleeve in the assembled condition. Figs 3 to 9 show various designs of the longitudinal protrusions on the adjacent edges of the shell segments and designs of the corresponding connection profile.

Modes for Carrying Out the Invention

The sleeve for pipeline repairs in accordance with Fig. 1 and 2 is axially divided into two equal semi-circular shell segments 1. The inner diameter of the sleeve is increased as compared to the outer diameter of the pipeline by the required gap between the sleeve and the repaired pipeline 7. In the place of mutual contact of the shell segments 1 the edges of the shell segments 1 are provided with longitudinal protrusion 6 that are fixed with a common connection profile 2 during the assembly. The connection profile 2 is made of a C-profile. A cross-section of the contact place of the protrusions 6 and connection profile 2 is shown in Fig. 3.

For centring of the sleeve on the repaired pipeline 7 spacing screws 3 are used that are screwed in threaded openings of the shell segments 1, regularly

distributed along the perimeter.

During the installation of the sleeve both the semi-circular shell segments 1 are applied on the repaired pipeline 7 and the connection profiles 2 are slid onto the contacted protrusions 6. The sleeve created this way is centred by turning of the spacing screws 3 in the threaded openings of the shell segments 1.

Subsequently, the gap 8 between the inner surface of the shell segments 1 and the outer surface of the repaired pipeline 7 is sealed on both the sleeve fronts with quick-hardening sealant 4 after hardening of which hardenable filling, e.g. an epoxy composite material is introduced into the gap 8 via the filling openings 5. After hardening of the composite material the distance screws 3 are cut off on the sleeve surface plane.

The protrusions 6 on the shell segments 1 may also be moulded directly from the material of the shell segment 1. Such a design is shown e.g. in fig. 4 and 8.

In the versions shown in fig. 3, 5, 6, 7 and 9 the protrusions 6 are made separately and are welded to the shell segments 1 during the productions.

In the versions shown in fig. 5 and 6 the connection profile 2 is provided with a dovetail groove and the protrusions 6 on the shell segments 1 have the corresponding shape.

In the version shown in fig. 7 the connection profile 2 is interconnected with the protrusions 6 on the shell segments 1 with locking screws 9.

In the version shown in fig. 8 the connection profile 2 is interconnected with the protrusions 6 on the shell segments 1 with a pin 10.

In the version shown in fig. 9 the connection profile 2 is fitted with a locking strip 11 on the inner side for bearing on the inner side of the shell segments 1.

CLAIMS

1. A sleeve for pipeline repairs that is axially divided into at least two shell segments (1) and equipped with spacing elements for centring the sleeve on the repaired pipeline (7) as well as at least one filling opening (5) for introduction of hardenable filling into a gap (8) between the inner surface of the shell segments (1) and the outer surface of the repaired pipeline (7), **characterized in that** in the place of the mutual connection of the shell segments (1) the edges of the shell segments (1) are provided with longitudinal protrusions (6) that are fixed with a common connection profile (2).

2. The sleeve according to claim 1, **characterized in that** the connection profile (2) comprises of a C-profile.

3. The sleeve according to claim 2, **characterized in that** the connection profile (2) is provided with a dovetail groove and the protrusions (6) on the shell segments (1) have the corresponding shape.

4. The sleeve according to any of claims 1 to 3, **characterized in that** the connection profile (2) is interconnected with the protrusions (6) on the shell segments (1) with locking screws (9) and/or a pin (10).

5. The sleeve according to any of claims 1 to 4, **characterized in that** the protrusions (6) on the shell segments (1) are moulded from the material of the shell segment (1).

6. The sleeve according to any of claims 1 to 4, **characterized in that** the protrusions (6) are welded to the shell segments (1).

7. The sleeve according to any of claims 1 to 6, **characterized in that** the spacing elements for centring the sleeve on the repaired pipeline (7) comprise of spacing screws (3) that are screwed in the threaded openings of the shell segments (1) regularly distributed along the perimeter.

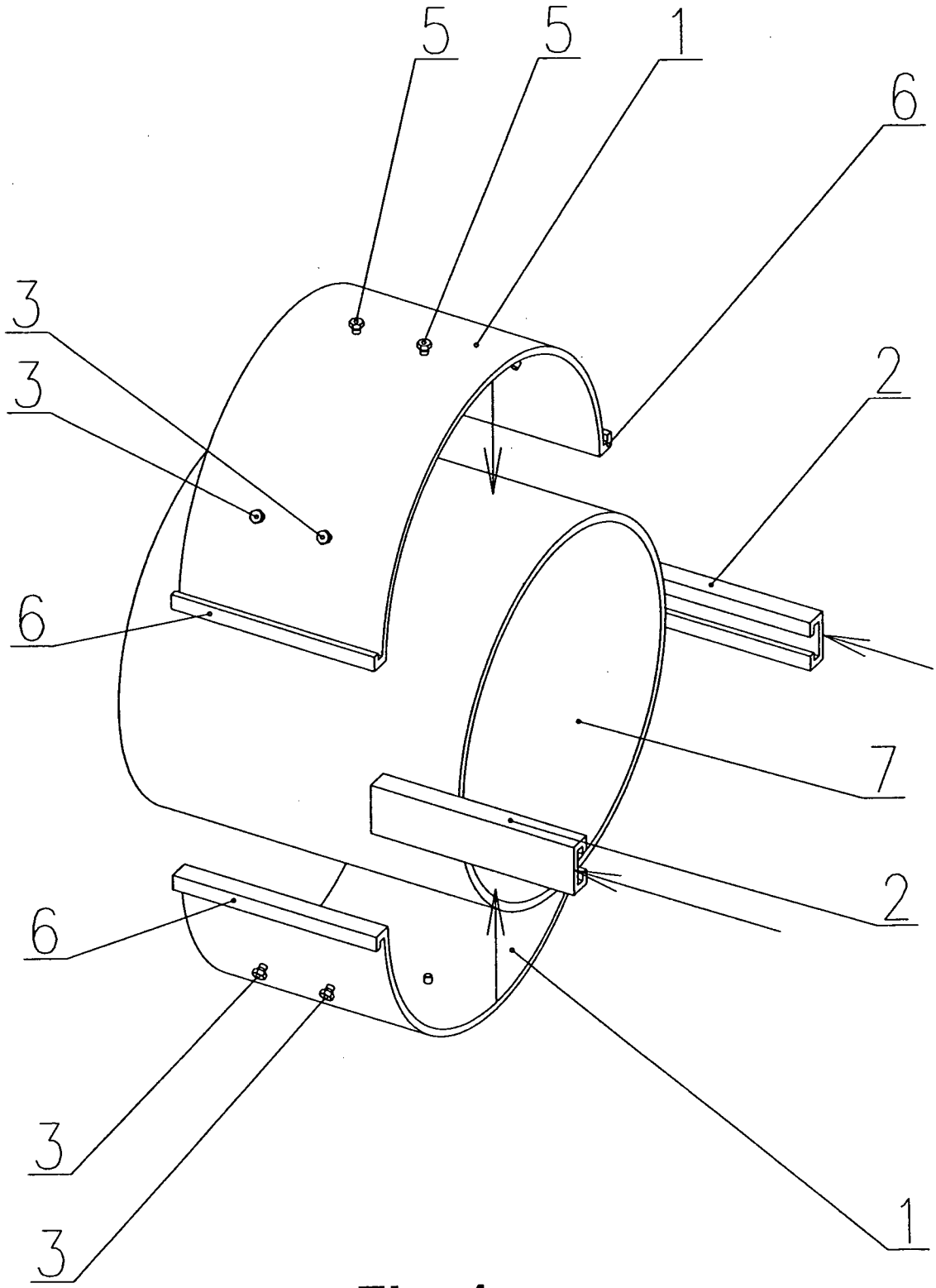

Fig. 1

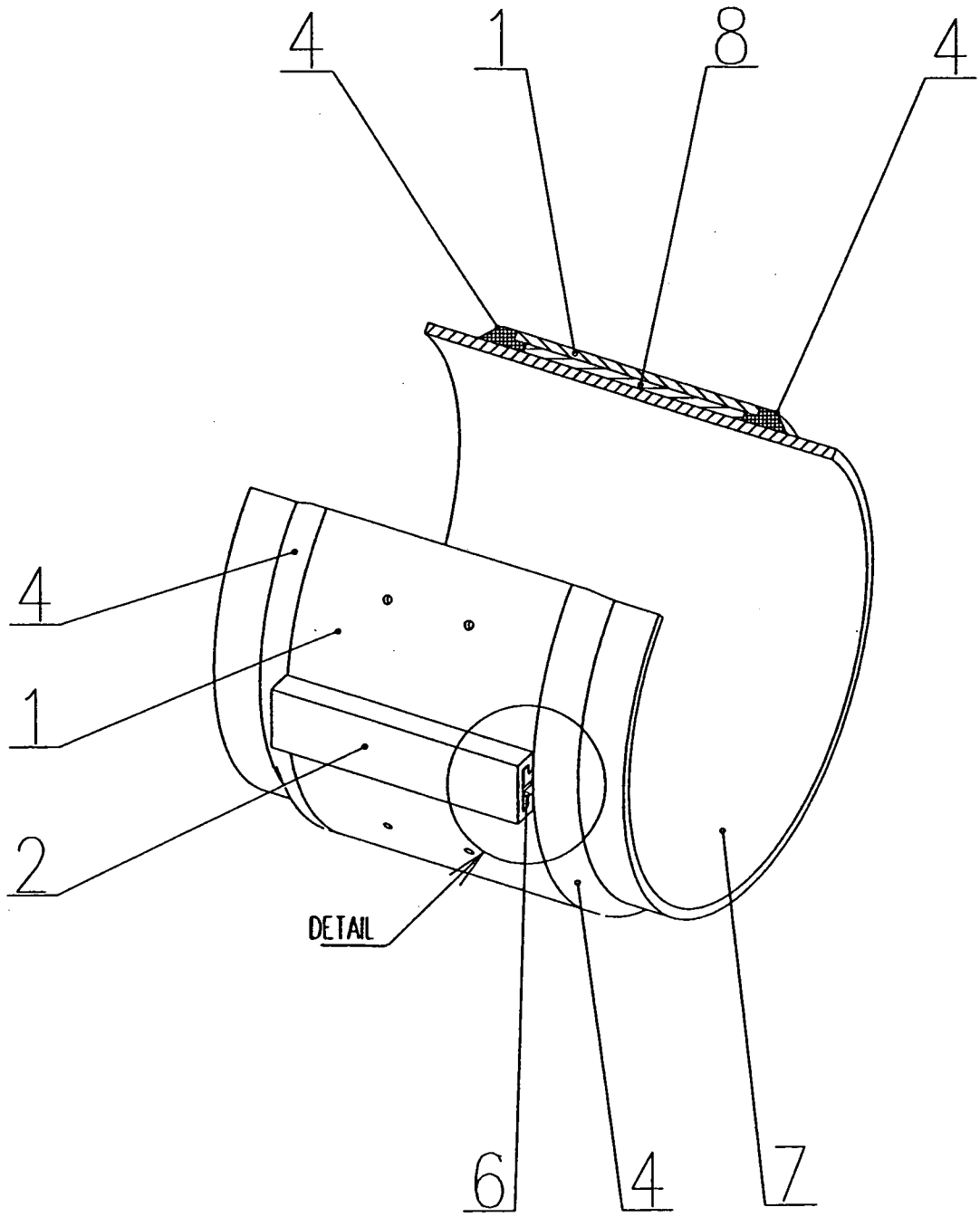

Fig. 2

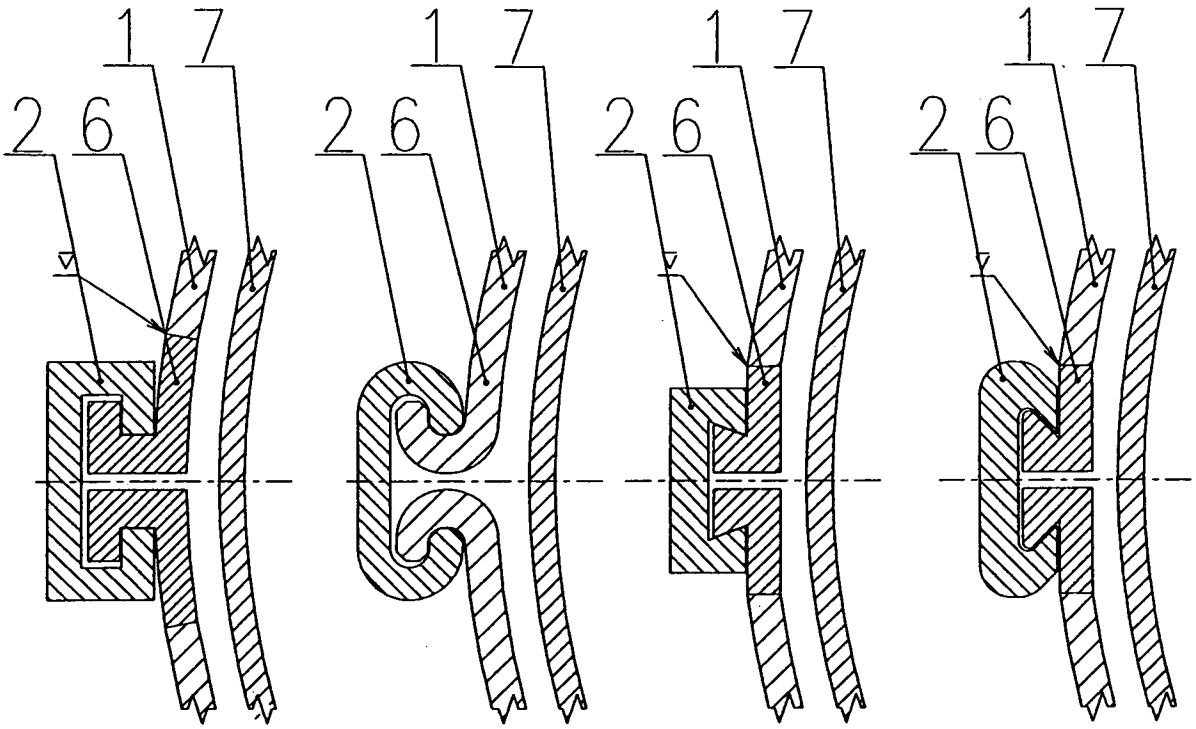

Fig. 3 Fig. 4 Fig. 5 Fig. 6

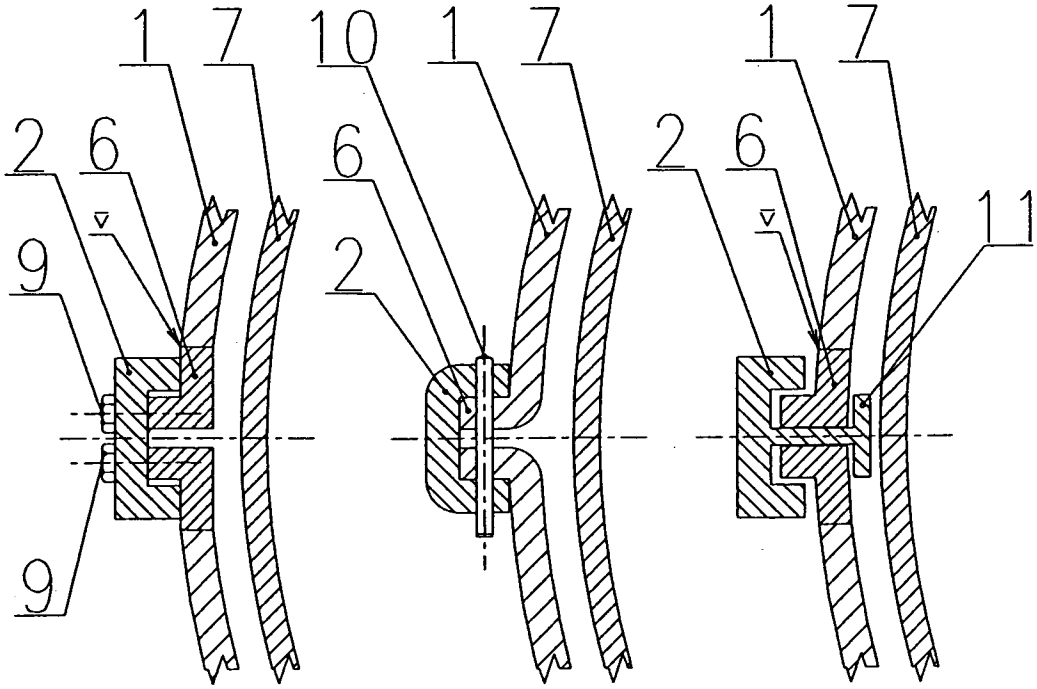

Fig. 7 Fig. 8 Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2010/000009

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16L55/17
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 018 379 A (WAVIN BV) 17 October 1979 (1979-10-17)	1-6
A	page 2, lines 12-20; figure 1	7
X	US 3 918 748 A (ACDA PETRUS MARINUS) 11 November 1975 (1975-11-11)	1-6
A	figure 1	7
X	EP 0 438 990 A1 (ALPRENE S A S DI BALDUSSI EZIO [IT]) 31 July 1991 (1991-07-31)	1-6
A	figure 1	7

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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