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(54) **Multi-shell formed piece with flexible insulating plates disposed between the walls of said formed piece**

Multischalen-Element mit flexiblen Isolierplatten zwischen den Wänden von diesem Element

Pièce multi-enveloppe avec des plaques isolantes flexibles entre les parois de cette pièce

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Description

[0001] The invention addresses a multi-shell formed piece, in particular a pipe for restoring chimneys, comprising at least two concentric tubes with spaced-apart walls and insulating material being disposed therebetween, the insulating material consisting of at least one bent insulating plate and the fibers of the insulating material running approximately parallel to the surface of the insulating plate, such that they are also essentially parallel to the surfaces of the walls and, hence, transverse to the heat current.

[0002] Multi-shell formed pieces of the kind in question have been known for years in the most various embodiments. Most of them are formed pieces for chimneys. An example is given in German applications DE-OS 19 22 581 and DE-OS 31 39 338.

[0003] The insulating part of the formed piece known from DE-OS 19 22 581 consists of three shell segments forming a pipe-like shell in circumferential direction. Said segments are made of mineral wool and loosely inserted in the circular gap between the walls of the formed piece, with the interior walls or interior pipe being inserted after the pre-assembly of the insulating material. An alternative proposes to firmly attach the insulating material to the outer wall as a pre-made component. However, the shell segments used for insulating are expensive to manufacture and relatively large in size which in turn increases packaging, transportation and storage costs. Moreover, shell segments of this kind often have a thickness tolerance of several millimeteres and, therefore, usually require grinding of the surfaces to a given desired thickness to allow insertion of the segements between the walls of the formed pieces. This procedure further increases manufacturing and assembling costs.

[0004] The formed piece known from DE-OS 31 39 338 is also used to build chimneys, with the gap between the walls of the formed piece being filled with webs of mineral wool. The webs are first loosely fitted to the inner side of the external jacket of the formed piece. At their inner sides, the webs are then covered with thin sheet metal plates, said plates having portions which project over the edges of the formed piece and are bent toward the outsides. Once attached, the sheet metal plates form a type of gap whose opening is slightly larger than the cross section of the inner wall or pipe to be inserted. The so formed sheet metal gap then receives the inner pipe resulting in the compression of the insulating layer. Once the insulting material is inserted, the sheet metal plates are removed so that the insulating material comes in close contact with the walls of the circular gap which it fills.

[0005] However, the above described, known formed pieces per se have various disadvantages. A problem common to all formed pieces of this kind occurs during pre-assembly and insertion of the insulating material. With respect to insulation, the pipe-like shells or segments made of mineral wool have so far been the best possible solution as the direction of the fibers which runs almost transverse to the heat current to be insulated offers a highest possible degree of thermal insulation. The already described financial disadvantages occurring with respect to transporation and storage can, however, not be avoided without loosing the described advantage.

[0006] The DE-OS 37 05 725 describes a multi-shell formed piece comprising an inner tubular member, a supporting outer coat member and an insulating layer being disposed between the tubular member and the coat member and surrounding the tubular member. The insulating layer is formed by a flexible plate of insulating material which is folded or pleated radially in the gap between the tubular member and the coat member.

[0007] The DE 35 12 089 A1 describes a circumferential insulation for pipes and in particular for multi-shell chimneys. This insulation consists of two bendable plates of insulating material which are connected via two joint-strings positioned at two opposing edges. The plates forming a circumferential insulation are stored and transported lying face to face. By applying pressure to the two joined edges of a pair of plates the two plates arch in such a way that they can be disposed on the outside of a pipe. All examples shown and described in the DE 35 12 089 A1 use plates with wedge-shaped cuts in the opposing surfaces. As these cuts are parallel to the orientation of the joint-strings the wedge-shaped cuts are closed at least partially by arching the plates of insulating material.

[0008] Object of the invention is to further develop and configure a formed piece such that it exhibits good insulation qualities while manufacture and design remain simple.

[0009] The multi-shell formed piece accomplishes the aforementioned object with the features of claim 1. In said claim 1 the multi-shell formed piece is characterized in that at least in circumferential direction, the insulating material is configured as one single piece, i.e. in circumferential direction, it is one single insulating plate, in that the axially disposed edges of the insulating plate are in contact one another, and in that the edges are bevelled to form an acute angle such that the insulating material overlaps in the area of the contacting edges.

[0010] The invention combines the spatial advantages of insulating plates, i.e. transportation, with the thermal advantages of insulating shells or pipes in that the originally flat plates are bent to assume the shape of a pipe and disposed between the walls of the formed piece to act as insulating material. However, the properties of the insulating plates must be such that they do not break during the bending procedure. This is achieved by selecting an appropriate initial density and laminating a fleece to one side of the plate. Since the insulating plate is bent, the fibers run almost parallel to the surfaces of the walls to be insulated and, hence, transverse to the direction of the heat current. This fact account for an optimal heat conduction resistance once

the unit is fully assembled. Insulating plates with largely constant cross sections additionally account for an optimal heat current.

[0011] Such formed pieces are particularly suitable for restoring already existing chimneys, a fact for which there is an increasing demand on the market as more and more boilers with an energy-saving heat output or so called low-temperature boilers are offered. In boilers of this kind, e.g. in floor heating systems, the exhaust gas temperature is below the dew point allowing condensing water to precipitate at the interior walls of chimneys with poor thermal insulation. The wall thus become moist and flue gas exhaustion is impaired.

[0012] With respect to a particularly effective thermal insulation, it is advantageous that the insulating material be configured at least in circumferential direction as one single piece, i.e. one single insulating plate is used in circumferential direction. The dimensions of this insulating plate would have to be such that the edges which run coaxially to the formed piece contact each other to thus form an insulating pipe. In order to ensure proper insulation in the critical contact area, even if only minor dimensional tolerances occur, the contacting edges can be advantageously bevelled such that the portions of insulating material slightly overlap in the contact zone. In this case, the insulating plate may have a trapezoidal cross section. Dimensional tolerances at the edges do, hence, not have any negative effect as the wedge-like edges sufficiently overlap. It is also conceivable to configure the insulating plate as a pipe-like segment having a longitudinal slot. Said slot preferably runs tangentially to the inner wall of the pipe-like segment in order to advantageously account for tolerance differences even in pipe-like segments.

[0013] The thickness of the insulating material or the insulating plate could allow for a some play between the walls of the formed piece and the insulating material. With respect to a particularly high degree of insulating efficiency, it is advantageous if the insulating material is positioned form-fittingly and, if possible, also in a frictional connection, i.e. slightly compressed between the walls of the formed piece. Such a frictional connection between the walls of the formed piece also prevents the insulating material from moving out of position, rather it sits fittingly between the walls.

[0014] In order to make sure that the walls of the formed piece are correctly spaced apart, i.e. coaxial arrangement, already when inserting the insulating material, the walls can be provided with bars or spacers extending therebetween and preferably at the ends thereof. These spacers or bars thus firmly connect the walls to one another ensuring that a fixed distance is maintained throughout. Further, the walls cannot assume their coaxial position until the insulating material is inserted such that the insulating material itself acts as a spacer providing a largely constant distance between the walls. However, the latter possibility involves a higher degree of manufacturing complexity as the walls or pipes must be held in a coaxial arrangement during assembly.

[0015] With reference to the drawing

Fig. 1 shows, in a sectional view, a diagrammatic representation of an embodiment of the formed piece of the invention configured as a dual-shell pipe,

Fig. 2 is a diagrammatic representation the subject matter of Fig. 1 with a section taken along line II-II,

Fig. 3 shows, in a side view, a diagrammatic representation the subject matter of Fig. 2 when fully unrolled,

Fig. 4 shows, in a sectional view, a diagrammatic representation a device for disposing flexible insulating plates between the coaxial, spaced-apart walls of multi-shell formed pieces, i.e. the formed piece shown in Fig 1.

[0016] Fig. 1 shows a dual-shell formed piece, or more strictly speaking a dual-shell pipe 1 in accordance with the invention. Said pipe 1 has two coaxially disposed, spaced-apart walls 2, 3 and a piece of insulating material 4 provided between said walls 2, 3.

[0017] The insulating material 4 may consist of insulating plates 5 with a largely constant cross section. In the present example, the insulating plates 5 are made of rock wool.

[0018] The diagrammatic representation of Fig. 2 indicates that the fibers 6 of the rock wool have a particular direction, i.e. they are uniformly oriented in one direction. The fibers 6 run approximately parallel to the surface of the insulating plate, thus also running approximately parallel to the surfaces of the walls 2, 3 and, hence, transversely to the direction of the heat current indicated by arrows 7 in Fig. 2.

[0019] In the embodiment of Figs. 1 and 2, the insulating material is configured as one single piece running circumferential direction, i.e. one single insulating plate 5 in circumferential direction. Fig. 2 indicates that the axially disposed edges 8 of the insulating plate 5 contact each other. The edges 8 are bevelled to form an acute angle which ensures a slight overlapping of the insulating material 4 in the area of the contacting edges 8 so as to account for dimensional tolerances. Fig. 2 is at the same time a cross section of the pipe-like segment having a slot running almost tangentially to its inner wall.

[0020] Fig. 3 clearly shows that the insulating plate 5, when unrolled, has a trapezoidal cross section in longitudial direction.

[0021] Fig. 1 also shows that at their lower ends the walls 2, 3 are held by bars 9. Said bars 9 extend between the two walls thus connecting them so as to be spaced apart from each other at a foxed distance. Once the in-

sulating material 4 is inserted the walls 2, 3 are further fixed in their positions by said insulating material 4. Thus, even the ends of the walls 2, 3 which do not have a cross-linking bar, i.e. the relative positions of the walls 2, 3, are quasi fixed.

[0022] Finally, with respect to the formed piece or pipe 1 of the invention, emphasis is placed on the fact that the walls 2, 3 of the pipe, i.e. the internal and external pipes, are made of special steel.

[0023] Fig. 4 shows an embodiment of a device for disposing the flexible insulating plate 5 between the coaxially disposed, spaced-apart walls 2, 3 of a dual-shell formed piece, i.e. the above discussed dual-shell pipe 1.

[0024] Further, Fig. 4 also shows that the internal tool 10 is provided with a circumferential, external enlargement 12 which, on the one hand, serves as an abutment and, on the other hand, as a transition to the inner wall 2.

[0025] The external enlargement 12 projects from the internal tool 10 by the thickness of the inner wall 2 and forms a transition from the internal tool 10 to the inner wall 2.

[0026] Further, Fig. 4 shows that the internal tool 10 projects form the area of the external tool 11 in a direction facing away from the formed piece or pipe 1. The internal tool 10 with the area projecting from pipe 1, hence, serves as a stop supporting the forming process for the insulating plates 5. Further, the internal tool 10 has a smooth external surface 13 to ensure smooth insertion.

[0027] Fig. 4 also shows that the external tool 11 has an approximately funnel-like configuration. The external tool 11 has an area 14 which expands toward the free end. Said area 14 together with its wall forms a stop for the external tool 11. It is understood that the inner surface 15 of the expanding area 14 of the external tool 11 is also smooth to support the smooth insertion of the insulating plate 5.

[0028] Fig. 4 may also serve to illustrate a process for disposing flexible insulating plates 5 between the walls 2, 3 of dual-shell pipes 1 using the above discussed device of the invention. First, the internal tool and the external tool 11 are detachably placed onto pipe 1 or between the walls 2, 3 of pipe 1. The internal tool 10 serves as an abutment and to bend the insultaing plates 5 while the external tool 11 acts as a guide.

[0029] The sequence of placing the tool during assembly of the internal tool 10 and external tool 11 is not of importance.

[0030] Together, the internal tool 10 and the external tool 12 serve as guides for the insulating plate 5, and, if ncessary, to compress the latter.

[0031] The insulating plate 5 is bent around the internal tool 10. Subsequently, the so bent insulating plate is inserted into the gap between the walls 2, 3. If necessary, the insulating plate 5 is compressed during its insertion. Once the insulating plate 5 is in its final position, i.e. completeley inserted, the internal tool 10 and the external tool 11 are removed again.

[0032] Figs. 1 and 4 indicate that it is possible to successively insert as many insulating plates 5 as necessary into the gap between the walls 2, 3 until the gap is filled over the entire length of the formed piece. During their insertion into the gap between the walls 2, 3 in longitudinal direction, the insulating plates 5 were subject to compression which further improves thermal insulation.

[0033] The above discussed embodiment serves to provide a better understanding of the teaching of the present application, it does, however, not limit this application thereto.

Claims

1. Multi-shell formed piece, in particular a pipe (1) for restoring chimneys, comprising at least two concentric tubes with spaced-apart walls (2, 3) and insulating material (4) being disposed therebetween, the insulating material (4) consisting of at least one bent insulating plate (5) and the fibers (6) of the insulating material (4) running approximately parallel to the surface of the insulating plate (5), such that they are also essentially parallel to the surfaces of the walls (2, 3) and, hence, transverse to the heat current (7),
characterized in that at least in circumferential direction, the insulating material (4) is configured as one single piece, i.e. in circumferential direction, it is one single insulating plate (5), **in that** the axially disposed edges (8) of the insulating plate (5) are in contact one another, and **in that** the edges (8) are bevelled to form an acute angle such that the insulating material (4) overlaps in the area of the contacting edges (8).

2. Formed piece in accordance with claim 1, **characterized in that** the insulating plate (5) has a largely constant cross section, while it has a trapezoidal cross section in longitudinal direction.

3. Formed piece in accordance with claim 1 or 2, **characterized in that** the insulating plate (5) is made of rock wool.

4. Formed piece in accordance with one of claims 1 to 3, **characterized in that** the insulating plate (5) is configured as a pipe-like shell segment with a longitudinal slot preferably running tangentially to the inner wall of the pipe-like shell segment.

5. Formed piece in accordance with one of the claims 1 to 4, **characterized in that** the insulating material (4) is disposed between the walls (2, 3) in a frictional connection, i.e. slightly compressed.

6. Formed piece in accordance with one of the claims

1 to 5, **characterized in that** the walls (2, 3) are firmly connected to each other at a fixed distance by means of bars (9) or spacers or the like extending between said walls (2, 3) and preferably at one of the ends thereof.

Patentansprüche

1. Mehrschaliges Formstück, insbesondere ein Rohr (1) zum Sanieren von Schornsteinen, mit mindestens zwei konzentrisch angeordneten Röhren mit zueinander beabstandeten Wandungen (2, 3) und dazwischen angeordnetem Dämmmaterial (4), wobei das Dämmmaterial (4) aus mindestens einer gebogenen Dämmplatte (5) besteht und wobei die Fasern (6) des Dämmmaterials (4) in etwa parallel zur Oberfläche der Dämmplatte (5) verlaufen, so dass sie auch im Wesentlichen parallel zu den Oberflächen der Wandungen (2, 3) und somit quer zum Wärmestrom (7) verlaufen,
dadurch gekennzeichnet, dass das Dämmmaterial (4) zumindest in Umfangsrichtung einteilig ausgeführt ist, d.h. in Umfangsrichtung aus einer einzigen Dämmplatte (5) besteht, so dass die axial verlaufenden Kanten (8) der Dämmplatte (5) aneinander stoßen, und dass die Kanten (8) derart in einem spitzen Winkel abgeschrägt sind, dass das Dämmmaterial (4) im Bereich der aneinander liegenden Kanten (8) überlappt.

2. Formstück nach Anspruch 1, **dadurch gekennzeichnet, dass** die Dämmplatte (5) einen weitgehend konstanten Querschnitt aufweist, während sie in Längsrichtung einen trapezförmigen Querschnitt aufweist.

3. Formstück nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Dämmplatte (5) aus Mineralwolle gefertigt ist.

4. Formstück nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Dämmplatte (5) als rohrähnliches Schalensegment mit einem vorzugsweise tangential zur Innenwandung des rohrähnlichen Schalensegments verlaufenden Längsschlitz ausgebildet ist.

5. Formstück nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** das Dämmmaterial (4) kraftschlüssig, d.h. in zumindest geringfügig gepresstem Zustand, zwischen den Wandungen (2, 3) angeordnet ist.

6. Formstück nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Wandungen (2, 3) mit Hilfe von Stegen (9) oder Abstandshaltern oder dergleichen, die sich zwischen den Wandungen (2, 3) und vorzugsweise an einem Ende der Wandungen (2, 3) erstrecken, in einem unveränderbaren Abstand fest miteinander verbunden sind.

Revendications

1. Pièce formée multi-enveloppe, en particulier tuyau (1) pour rénover des cheminées, comprenant au moins deux tubes concentriques avec des parois (2, 3) écartées l'une de l'autre et avec du matériau isolant (4) disposé entre les parois, le matériau isolant (4) consistant en au moins une plaque isolante (5) cintrée et les fibres (6) du matériau isolant (4) sont orientées sensiblement parallèlement à la surface de la plaque isolante (5), de manière telle qu'elles sont également sensiblement parallèles aux surfaces des parois (2, 3) et dès lors transversales au flux de chaleur (7),
caractérisée en ce qu'au moins en direction circonférentielle, le matériau isolant (4) est réalisé en une pièce, c'est-à-dire qu'en direction circonférentielle il est constitué par une seule plaque isolante (5), par le fait que les bords (8) se faisant axialement face de la plaque isolante (5) sont en contact l'un avec l'autre et les bords (8) sont biseautés pour former un angle aigu tel que le matériau isolant (4) se chevauche dans la région des bords (8) en contact.

2. Pièce formée suivant la revendication 1, **caractérisée en ce que** la plaque isolante (5) a une section transversale sensiblement constante et en direction longitudinale, la plaque isolante (5) a une section transversale trapézoïdale.

3. Pièce formée suivant la revendication 1 ou 2, **caractérisée en ce que** la plaque isolante (5) est fabriquée en laine de roche.

4. Pièce formée suivant l'une quelconque des revendications de 1 à 3, **caractérisée en ce que** la plaque isolante (5) a la forme d'un segment d'enveloppe de tuyau avec une fente longitudinale disposée préférentiellement tangentiellement à la paroi intérieure du segment d'enveloppe de tuyau.

5. Pièce formée suivant l'une quelconque des revendications de 1 à 4, **caractérisée en ce que** le matériau isolant (4) est disposé entre les parois (2, 3) en contact de friction, c'est-à-dire qu'il est légèrement comprimé.

6. Pièce formée suivant l'une quelconque des revendications de 1 à 5, **caractérisée en ce que** les parois (2, 3) sont solidement reliées l'une à l'autre à une distance déterminée au moyen de tiges (9) ou de pièces d'écartement ou similaires disposées entre lesdites parois (2, 3), et de préférence à l'une des extrémités de celles-ci.

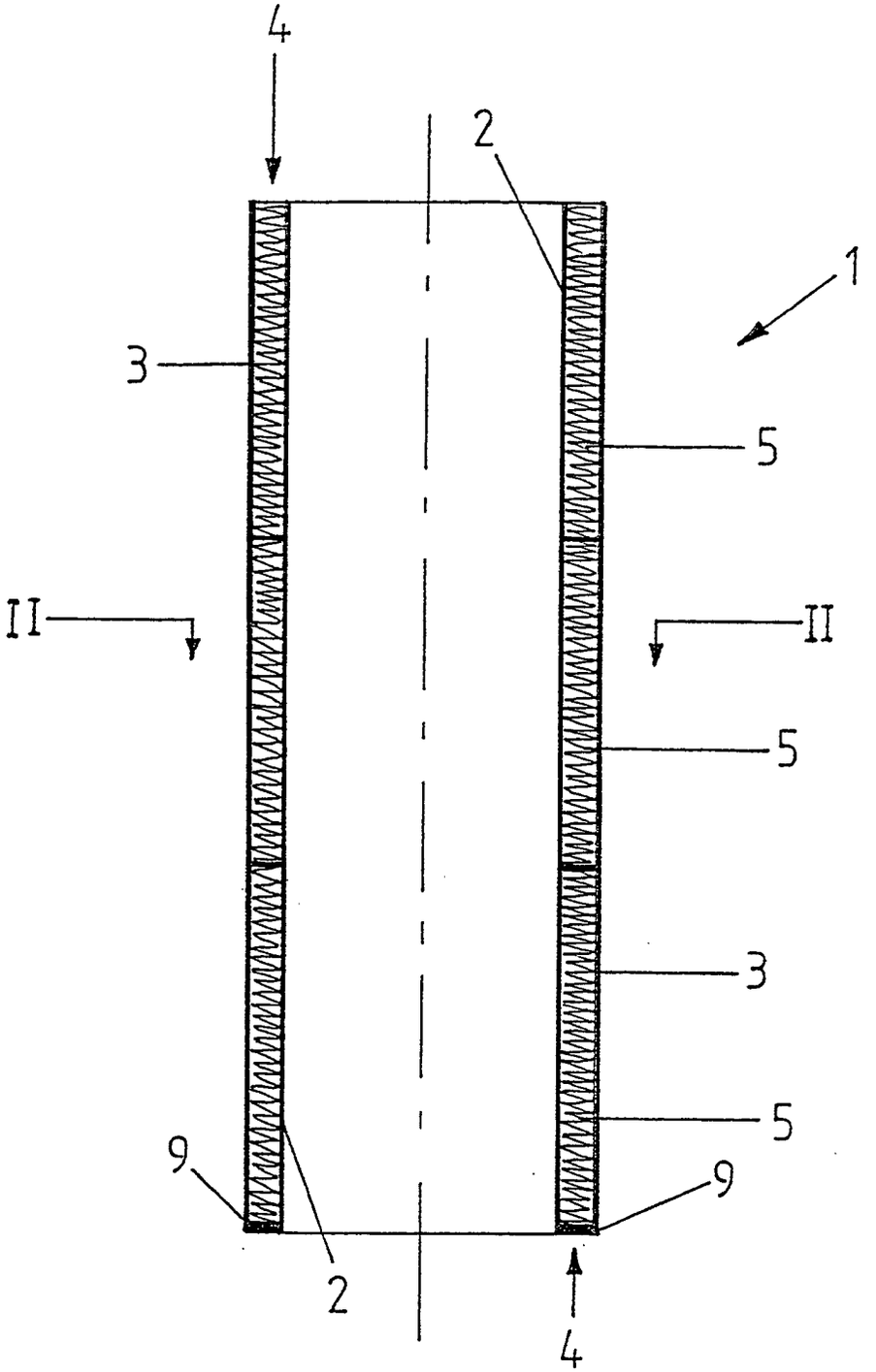

Fig. 1

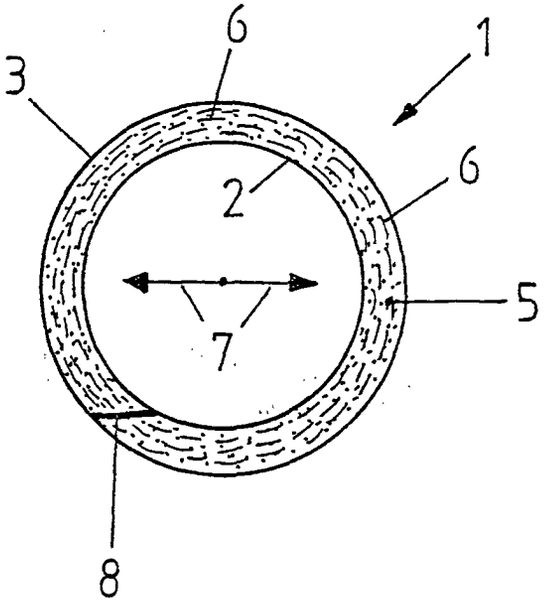

Fig. 2

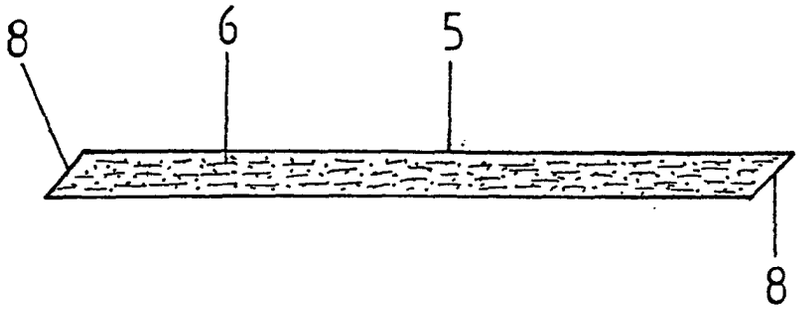

Fig. 3

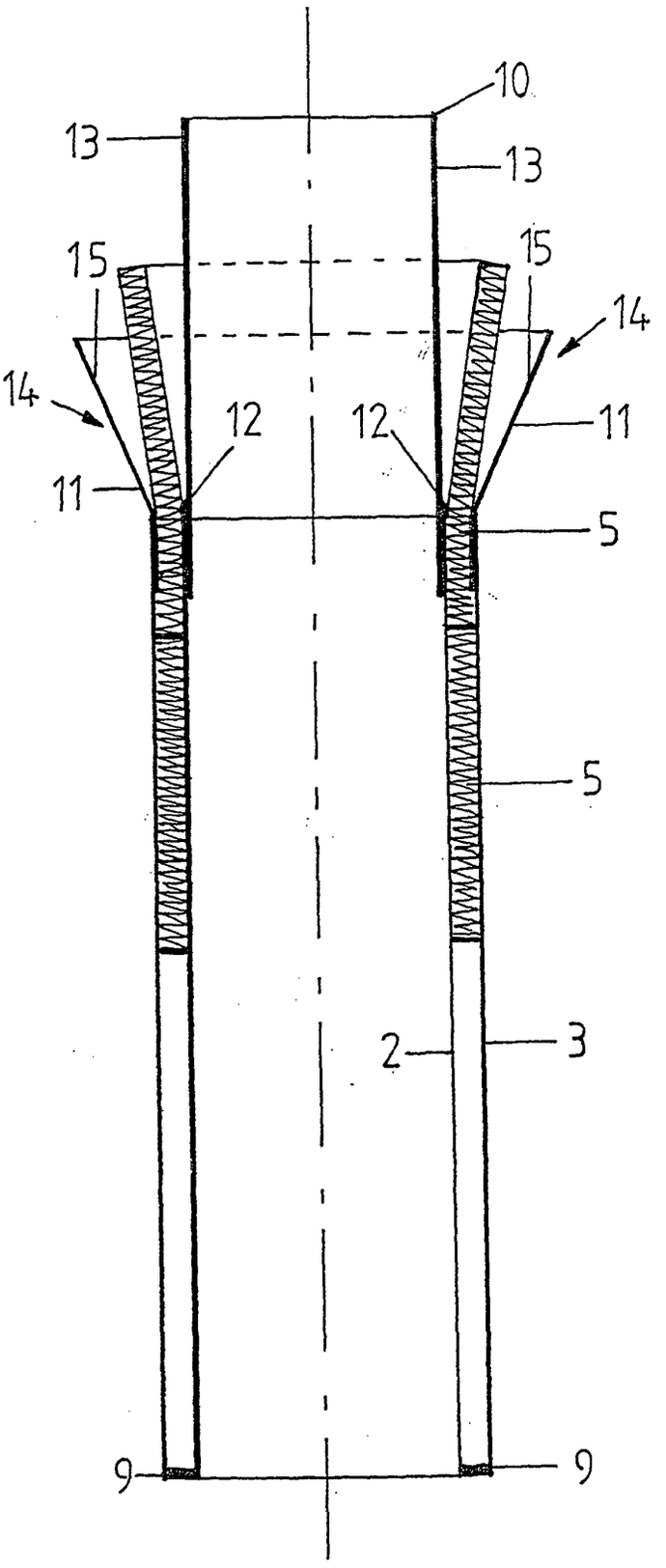

Fig. 4