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(54) **A COLLAPSIBLE CORE**

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NOYAU COMPRESSIBLE

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EP 0 855 951 B1

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Description

[0001] The present invention concerns a collapsible core for the casting of well articles or the like and comprising an annular shell which substantially forms a pipe having a longitudinal axis extending between the ends of the pipe, said shell being flexurally flexible about the longitudinal axis of the pipe, said shell having opposed side edges defining a slot along the longitudinal axis on one side of the pipe, said collapsible core additionally comprising an elongate wedge element, and means for moving the wedge element between an extended position in which it covers the slot and a retracted position in which it is pulled out of the slot and into the interior of the collapsible core, as well as means for pulling the two opposed side edges of the shell toward each other in the retracted position of the wedge element.

[0002] Such a collapsible core is known e.g. from US Patent No. 3 570 802 and from US Patent No. 1 101 204, in which the collapsible core is used for casting tubular articles in concrete, said collapsible core forming part of a complete mould and defining the mould cavity inwardly. The collapsible core hereby forms the inner contours of the cast article during the casting process.

[0003] A collapsible core is also known from DE 212 494 which discloses a collapsible core having three major parts. It has two first shell sections, said sections being hinged together and a third shell section which in casting position closes the remaining gap between the first sections and during stripping is retracted to allow the first sections to be rotated toward each other. When the first sections are rotated, the dimension of the core is effectively reduced in the direction perpendicular to the plane of symmetry (the small axis of the egg-shape), whereas the dimension is minimally reduced in the direction parallel to the plane of symmetry (the large axis of the egg-shape).

[0004] Also US 1540185 discloses a collapsible core having a longitudinally split shell. It is evident that the collapse is obtained by elastically deforming a little more than one longitudinal half of the shell. The deformation gives effective reduction of the dimension of the core in the direction of the collapse. In the transverse direction, the dimension is minimally reduced, since a little less than half the core remains undeformed.

[0005] When casting tubular articles in concrete it is frequently required that the cast article is stripped as quickly as possible to keep the production and investment costs as low as possible, so that the mould parts may be used again as quickly as possible for the casting of a new article.

[0006] The purpose of the collapsible cores is here that their cross-sectional dimension can be reduced prior to the stripping, so that the collapsible core essentially does not touch the cast article during stripping. In this respect, the above-mentioned collapsible cores are superior to other types using rigid mould sections which are mutually hinged, in that owing to the flexible shell

the use of separate hinges is not necessary to reduce the cross-sectional dimension of the collapsible core. Such hinges are relatively expensive to provide, as they must be capable of withstanding the aggressive environment usually involved by casting in concrete because of e.g. the vibrations which are imparted to the concrete and thereby the mould parts as well as the abrasive properties of the concrete, and as the hinges must be very tight to ensure that no concrete and water penetrate into the inner side of the mould core.

[0007] However, the flexible shell involves a problem, as, precisely because of its flexible properties, the shell may be deformed undesirably when concrete is filled into the mould in which it constitutes the mould core. Thus, deformation may occur undesirably because of pressure differences which occur during filling of concrete into the mould, and which vary in proportion to the depth of the concrete below the surface of the concrete, as the concrete behaves almost like a viscous liquid, or particularly in those cases where the mould core is not circularly cylindrical where a given pressure will deform the core most in the areas where the mould core has the least curvature or is plane.

[0008] The flexible shell in the stated collapsible cores is constructed such that it exclusively consists of one area, which is to have sufficient rigidity to avoid undesired deformation, while being flexible enough to be deformed sufficiently for the core to be stripped from the concrete article in practice. As mentioned, this will be extremely difficult when non-circular articles are involved, and in particular in case of small cross-sectional dimensions. The actual collapse must be of a certain size so that the core will clearly release the pipe during stripping, as, otherwise, stripping will be difficult without the concrete article being damaged by the core. If the core tips just slightly, particularly the pointed end may be damaged, which necessitates subsequent repair of the cast pipe article, which adds to the costs.

[0009] This results in a constructional compromise between on one hand making the shell of the core as flexible as possible owing to stripping, and on the other hand making it rigid owing to the stability, which becomes the more difficult, the smaller the cross-section of the shell and the greater the length of the core.

[0010] The present invention is intended to provide a collapsible core of the type stated in the opening paragraph, with the advantages involved by such a core, but with the undesired deformations in the mould core wall during the filling process being minimized.

[0011] This is achieved by a collapsible core of the type defined in the introductory portion of claim 1, wherein the shell has at least two first areas separated by at least two second areas, said areas extending between the ends of the pipe, said second areas having a flexural flexibility about the longitudinal axis of the pipe which is greater than the corresponding flexural flexibility in the two first areas, said first and second areas being provided in that the shell comprises a plate of sub-

stantially even thickness which is provided with a plurality of first and second sets of stiffening ribs on the side facing inwards, each of said ribs extending along the inner side of the shell, where the second sets of ribs are placed on each side of the wedge element and are extending toward the first set of ribs, leaving two second areas of the shell substantially un-reinforced, said second areas being provided to function as plate hinges, said first areas being provided respectively by the second sets of ribs along with the wedge element and by the first set of ribs, and where the second sets of ribs are preferably of substantially equal length, and where the circumferential area of the shell, reinforced by the second sets of ribs and the wedge element, is more than half of the total circumferential area of the shell.

[0012] The shell of the collapsible core may hereby be considerably more rigid in the first areas than in the second areas, as the second areas may be without support or have just a small support. The deformation in the shell necessary for the stripping is hereby concentrated in the second areas of the shell, which thus serves as a plate hinges allowing the first areas in the shell of the collapsible core to turn with respect to each other.

[0013] The two second areas, as mentioned, are functioning as plate hinges which allow a large movement of the side edges. Due to the aspect that the circumferential area of the shell, reinforced by the second sets of ribs and the wedge element, is more than half of the total circumferential area, a high degree of collapse is obtained, said collapse being substantial both in the direction in which the wedge element is retracted and in the transverse direction. The stability is, however, maintained, since the widths of the second areas may be limited to only what is necessary to obtain the plate hinge functions. Further, the use of parts of the shell as plate hinges prevents concrete from leaking into the core, since no openings are introduced.

[0014] Also, this embodiment is particularly simple to produce, as the ribs may very easily be formed with e.g. different heights so as to provide different rigidity in the various areas on the shell of the mould core. In particular, the ribs may advantageously be constructed such that they are just secured to the plate at the first, relatively rigid areas.

[0015] In addition, the mould core may e.g. be constructed such that the first, relatively rigid areas are positioned where the load is greatest, and material may be saved in the second, relatively flexurally flexible areas, as a greater flexibility is desired precisely there.

[0016] In a preferred embodiment, the first, relatively rigid areas are wider transversely to the longitudinal direction of the pipe than the second, relatively flexurally flexible areas, as this results in a great stability, because the rigid areas are relatively close to each other and therefore cause some stiffening of the relatively flexurally flexible areas.

[0017] The means for moving the wedge element to an advanced position in which it covers the slot, and a

retracted position in which it is pulled out of the slot and into the interior of the collapsible core, may expediently be secured to one or more of the stiffening ribs, as then no separate means are needed for securing these moving means, which usually comprise one or more actuators with associated guides or mechanisms to guide the wedge element during the movement.

[0018] Similarly, the means for pulling the two opposed side edges of the shell toward each other in the retracted position of the wedge element, may be secured to the opposed side edges of the shell which define a slot along the longitudinal axis on one side of the pipe, thereby also obviating separate attachments for these on the shell itself, which is formed by a plate.

[0019] As, other things being equal, the invention provides relatively great degrees of collapse, the invention may of course be applied for mould cores of different cross-sectional shapes, such as circular cross-sections which are used most frequently today. Further, the invention is advantageous particularly in connection with mould cores having a cross-section of varying radius of curvature, such as an oval, an egg-shaped, a triangular or a quadrangular cross-section, as the possibility of concentrating the deformations in the second relatively flexurally flexible areas upon contraction of the mould core allows optimum stiffening of the areas along the cross-section of mould which have a relatively large radius of curvature, and which are therefore relatively weak.

[0020] In a particularly advantageous embodiment, a the first set of stiffening ribs is secured at the areas having a relatively small radius of curvature, and the second set of stiffening ribs at the areas having a relatively large radius of curvature, said first set of stiffening ribs having, at the ends thereof, a part which extends into the mould and which is provided with an engagement face facing toward the wall of the mould, said second set of stiffening ribs, at the ends thereof adjoining the first sets of stiffening ribs, having engagement faces which face inwards in the collapsible core, said engagement faces being positioned so as to engage each other in the advanced position of the wedge element and to be disengaged in the retracted position of the wedge element. This ensures a particularly good support of the areas having a large radius of curvature, as the ribs supporting these areas are supported by the intermediate ribs at their ends.

[0021] Particularly where the collapsible core has an egg-shaped cross-section, it may advantageously be constructed such that the first set of stiffening ribs are formed by ribs secured to the pointed end of the egg-shaped cross-section, and that the slot and the associated wedge element are positioned opposite the pointed end, said second set of stiffening ribs being secured to the egg-shaped cross-section between the slot and the pointed end. This allows the wedge element and the means for pulling the two opposed side edges of the shell toward each other in the retracted position of the

wedge element to be positioned in a simple manner at the end facing away from the pointed end, thereby providing maximum space for these.

[0022] Thus, when the means for moving the wedge element are formed by one or more linear actuators, whose one end is secured with respect to the collapsible core opposite the slot, and whose other end is secured to the wedge element, and the means for pulling the two opposed side edges of the shell toward each other in the retracted position of the wedge element are formed by a toggle mechanism, which extends between the opposed shell side edges defining the slot, and which is secured at the toggle with respect to the other end of the linear actuator, a particularly compact structure of maximum strength is obtained, as the linear actuators can extend along the greatest principal axis of the egg-shaped cross-section and may thus be relatively large with respect to the other dimensions of the collapsible core.

[0023] When the collapsible core is constructed such that one end of the linear actuators is rigidly mounted on ribs in the pointed end of the collapsible core in such a manner that the principal axis of the linear actuators is retained in the plane of symmetry of the collapsible core, it is ensured that the core is torsional stable both in its casting position and in its stripping position, so that the mould core is not twisted undesirably in the casting position because of possibly penetrating foreign matter between the wedge-shaped element and the lips, and because of a possible oblique pull in the mould during the stripping process.

[0024] The invention will be described more fully below with reference to the drawing, in which:

Fig. 1 shows a cross-section through a collapsible core according to the invention in the casting position of the collapsible core.

Fig. 2 shows the cross-section of fig. 1 in the stripping position of the collapsible core.

Fig. 3 shows a section through a collapsible core, as shown in figs. 1 and 2, seen from the side.

[0025] Fig. 1 thus shows a cross-section through an egg-shaped collapsible core according to the invention, it being shown that the collapsible core has an outer shell which consists of a plate 1 extending all the way round most of the periphery of the cross-section. However, the plate is terminated with two lips 2 which face each other, said two lips having interposed between them a wedge-shaped element 3.

[0026] The wedge-shaped element 3 hereby keeps the two lips 2 apart, and the plate 1 together with the wedge-shaped element 3 forms the wall of the mould core which forms the inner contours on the cast article during casting. Fig. 1 thus shows the position assumed by the plate 1 with the lips 2 and by the wedge-shaped

element 3, respectively, in the casting position of the mould core.

[0027] According to the invention, the mould core is provided with stiffening ribs 4 at the areas having the largest radius of curvature, and a further stiffening rib 5 at the pointed end of the egg-shaped cross-section, where the area of the smallest radius of curvature is present.

[0028] As shown, the stiffening rib 5 at the pointed end has flange parts 6 extending into the interior of the mould core and provided with engagement faces 7 which face outwards toward the plate 1. Correspondingly, the stiffening ribs 4 at the areas having the largest radius of curvature are provided with flange parts 8 extending between the plate 1 and the flange parts 6 on the stiffening rib 4 at the pointed end. As shown, also the flange parts 8 have engagement faces 9 which engage the engagement faces 7 on the flange parts 6 on the ribs 4 in the position of the mould core shown in fig. 1.

[0029] The engagement faces 7, 9 hereby ensure that the ribs 4 at the areas having the largest radius of curvature are fixed toward the plate 1 in these areas, and thus stiffen the mould core in the position shown.

[0030] In addition, a hydraulic cylinder 10 is provided in the interior of the mould core, and this cylinder is secured at one end to the rib 5 at the pointed end and secured at the other end to the wedge-shaped element 3, so that the hydraulic cylinder 10 is capable of moving and guiding the wedge-shaped element 3 into and out of slot between the lips 2 in determined and adjustable positions. This function will be described more fully with reference to fig. 2.

[0031] The hydraulic cylinder 10 is rigidly secured to the rib 5 by means of a mounting flange 14 by means of bolts at a distance from both sides of the hydraulic cylinder 10, so that the principal axis 15 of the hydraulic cylinder 10 will always define the plane of symmetry of the mould core, irrespective of whether the mould core is in its casting position or its stripping position.

[0032] Further, two rods 11 are secured at their one end via rotatable links to the other end of the hydraulic cylinder. The rods 11 are moreover secured at their other end with respect to the lips 2, so that the rods 11 form a toggle mechanism, said hydraulic cylinder 10 being secured the toggle itself.

[0033] The hydraulic cylinder 10 can hereby move the lips 2 away from and toward each other and away from and toward the wedge 3 and vary the width of the slot between the lips 2, while the wedge-shaped element 3 is moved into and out of the slot.

[0034] It will moreover be seen that the hydraulic cylinder 10 is secured to the rib 5 at the pointed end via a support element 12.

[0035] Fig. 2 shows the same cross-section as is shown in fig. 1, but with the difference that the wedge-shaped element 3 has been pulled into the mould core by the hydraulic cylinder 10, and the lips 2 have been pulled toward each other by means of the toggle formed

by the rods 11, so that the mould core has been deformed to assume a reduced cross-sectional area, the area marked in black showing how much the mould core collapses by this deformation.

[0036] According to the invention, the deformation is concentrated in the areas A, as the plate 1 is not secured at these areas A either to the ribs 4 or to the rib 5 at the pointed end.

[0037] Fig. 3 shows a sectional view longitudinally through the collapsible core of figs. 1 and 2, it being seen that there are two identical sets of ribs with associated hydraulic cylinders 10. Mounted between these are three further sets of ribs, which in principle operate in the same manner as the ribs 4, 5 of figs. 1 and 2, thereby additionally contributing to stiffening the mould.

[0038] Clearly, in addition to the embodiment shown, the invention may be applied in connection with mould cores of other cross-sections, such as circular and edged cross-sections. Further, the toggle formed by the rods 11 may be constructed in many other ways than the one shown and optionally be replaced by an entirely different structure, optionally using separate actuators for moving the wedge-shaped element 3 and the lips 2, respectively.

[0039] In view of the present invention, the skilled person will also be able to construct the stiffening ribs in many different ways, depending on the situation of use, such as e.g. the cross-sectional geometry of the mould core. It is also contemplated that it may be expedient to have more separate ribs than shown in connection with the embodiment concerned, which, however, is considered to be optimum for egg-shaped cross-sectional geometries.

Claims

1. A collapsible core for casting e.g. tubular well articles, comprising an annular shell (1) which substantially forms a pipe having a longitudinal axis extending between the ends of the pipe, said shell (1) being flexurally flexible about the longitudinal axis of the pipe, said shell (1) having opposed side edges (2) defining a slot along the longitudinal axis on one side of the pipe, said collapsible core additionally comprising an elongate wedge element (3), and means (10) for moving the wedge element (3) between an advanced position in which it covers the slot, and a retracted position in which it is pulled out of the slot and into the interior of the collapsible core, as well as means (11) for pulling the two opposed side edges (2) of the shell (1) toward each other in the retracted position of the wedge element (3),
characterized in that the shell (1) has at least two first areas separated by at least two second areas (A), said areas extending between the ends of the pipe, said second areas (A) having a flexural flexi-

bility about the longitudinal axis of the pipe which is greater than the corresponding flexural flexibility in the two first areas, said first and second areas being provided **in that** the shell comprises a plate of substantially even thickness which is provided with a plurality of first and second sets of stiffening ribs (5, 4) on the side facing inwards, each said ribs (5, 4) extending along the inner side of the shell (1), where the second sets of ribs (4) are placed on each side of the wedge element (3) and are extending toward the first set of ribs (5), leaving two second areas (A) of the shell substantially unreinforced, said second areas (A) being provided to function as plate hinges, said first areas being provided respectively by the second sets of ribs (4) along with the wedge element (3) and by the first set of ribs (5), and where the second sets of ribs (4) are preferably of substantially equal length, and where the circumferential area of the shell, reinforced by the second sets of ribs (4) and the wedge element (3), is more than half the total circumferential area of the shell.

2. A collapsible core according to claim 1, **characterized in that** the second areas (A) are smaller transversely to the longitudinal direction of the pipe than the first areas.
3. A collapsible core according to claim 1 or 2, characterized in that the plate (1) is secured solely to the stiffening ribs (4, 5) at the first areas.
4. A collapsible core according to one of the preceding claims,
characterized in that the means for moving the wedge element (3) between an advanced position in which it covers the slot, and a retracted position in which it is pulled out of the slot and into the interior of the collapsible core, are secured to one or more of the stiffening ribs (5).
5. A collapsible core according to one of the preceding claims, **characterized in that** the means (11) for pulling the two opposed side edges (2) of the shell toward each other in the retracted position of the wedge element (3), are secured to the opposed side edges (2) of the shell which define a slot along the longitudinal axis on one side of the pipe.
6. A collapsible core according to one of the preceding claims, **characterized in that** the pipe has a cross-section of varying radius of curvature, such as an oval, an egg-shaped, a triangular or a quadrangular cross-section.
7. A collapsible core according to one of claims 3 and 6, **characterized in that** the first set of stiffening ribs (5) is secured at the areas having a relatively small radius of curvature, and the second set of stiff-

ening ribs (4) at the areas having a relatively large radius of curvature, said first set of stiffening ribs (5) having, at the ends thereof, a part (6) which extends into the mould and which is provided with an engagement face (7) facing toward the wall of the mould, said second set of stiffening ribs (4), at the ends (8) thereof adjoining the first sets of stiffening ribs (5), having engagement faces (9) which face inwards in the collapsible core, said engagement faces (8, 9) being positioned so as to engage each other in the advanced position of the wedge element (3) and to be disengaged in the retracted position of the wedge element (3).

8. A collapsible core according to claim 7, **characterized in that** it has an egg-shaped cross-section, said first set of stiffening ribs (5) being formed by ribs secured to the pointed end of the egg-shaped cross-section, and that the slot and the associated wedge element (3) are positioned opposite the pointed end, said second set of stiffening ribs (4) being secured to the egg-shaped cross-section between the slot and the pointed end.
9. A collapsible core according to claim 8, **characterized in that** the means for moving the wedge element are formed by one or more linear actuators (10), whose one end is secured with respect to the collapsible core opposite the slot, and whose other end is secured to the wedge element (3), and that the means for pulling the two opposed side edges of the shell toward each other in the retracted position of the wedge element are formed by a toggle mechanism which extends between the opposed side edges (2) of the shell defining the slot, and which is secured at the toggle with respect to the other end of the linear actuator (10).
10. A collapsible core according to claim 9, characterized in that one end of the linear actuators (10) is rigidly mounted on ribs (5) in the pointed end of the collapsible core in such a manner that the principal axis (15) of the linear actuators is retained in the plane of symmetry of the collapsible core.

Patentansprüche

1. Zusammenklappbarer Kern zum Gießen z.B. röhrenförmiger Schachtartikel, umfassend eine ringförmige Ummantelung (1), die im Wesentlichen ein Rohr bildet, das eine Längsachse aufweist, die sich zwischen den Rohrenden erstreckt, wobei die Ummantelung (1) um die Längsachse des Rohres herum biegefähig elastisch ist, wobei die Ummantelung (1) gegenüberliegende Seitenränder (2) aufweist, die an der Längsachse entlang auf einer Seite des Rohrs einen Schlitz festlegen, wobei der zu-

sammenklappbare Kern zusätzlich ein längliches Keilelement (3) und Mittel (10), um das Keilelement (3) zwischen einer vorgerückten Stellung, in der es den Schlitz verdeckt, und einer zurückgezogenen Stellung, in der es aus dem Schlitz und in den zusammenklappbaren Kern hinein gezogen ist, zu bewegen, sowie Mittel (11), um die beiden gegenüberliegenden Seitenränder (2) der Ummantelung (1) auf einander zu in die zurückgezogene Stellung des Keilelements (3) zu ziehen, umfasst,

dadurch gekennzeichnet, dass die Ummantelung (1) mindestens zwei erste Bereiche umfasst, die durch mindestens zwei zweite Bereiche (A) getrennt sind, wobei die Bereiche sich zwischen den Rohrenden erstrecken, wobei die zweiten Bereiche (A) eine biegefähige Elastizität um die Längsachse des Rohres herum aufweisen, die größer ist als die entsprechende biegefähige Elastizität in den beiden ersten Bereichen, wobei die ersten und zweiten Bereiche bereitgestellt werden, indem die Ummantelung eine im Wesentlichen gleichmäßig dicke Platte umfasst, die mit einer Vielzahl erster und zweiter Gruppen von Versteifungsrippen (5, 4) auf der nach innen weisenden Seite bereitgestellt wird, wobei sich jede der Rippen (5, 4) an der Innenseite der Ummantelung (1) entlang erstreckt, wo die zweiten Rippengruppen (4) auf beiden Seiten des Keilelements (3) angeordnet sind und sich auf die erste Rippengruppe (5) zu erstrecken, wobei sie zwei zweite Bereiche (A) der Ummantelung im Wesentlichen unverstärkt lassen, wobei die zweiten Bereiche (A) bereitgestellt werden, um als Plattenscharniere zu dienen, wobei die ersten Bereiche jeweils durch die zweiten Rippengruppen (4) zusammen mit dem Keilelement (3) und durch die erste Rippengruppe (5) bereitgestellt werden, und wobei die zweiten Rippengruppen (4) bevorzugt im Wesentlichen gleich lang sind, und wobei der Umfangsbereich der Ummantelung, der von den zweiten Rippengruppen (4) und dem Keilelement (3) verstärkt wird, mehr als der Hälfte des gesamten Umfangsbereichs der Ummantelung entspricht.

2. Zusammenklappbarer Kern nach Anspruch 1, **dadurch gekennzeichnet, dass** die zweiten Bereiche (A) quer zu der Längsrichtung des Rohres kleiner sind als die ersten Bereiche.
3. Zusammenklappbarer Kern nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Platte (1) nur an den Versteifungsrippen (4, 5) in den ersten Bereichen befestigt ist.
4. Zusammenklappbarer Kern nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Mittel, um das Keilelement (3) zwischen einer vorgerückten Stellung, in der es den Schlitz verdeckt, und einer zurückgezogenen Stellung, in

der es aus dem Schlitz und in den zusammenklappbaren Kern hinein gezogen wird, zu bewegen, an einer oder mehreren der Versteifungsrippen (5) befestigt sind.

5. Zusammenklappbarer Kern nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Mittel (11), um die beiden gegenüberliegenden Seitenränder (2) der Ummantelung aufeinander zu in die zurückgezogene Stellung des Keilelements (3) zu ziehen, an den gegenüberliegenden Seitenrändern (2) der Ummantelung, die einen Schlitz an der Längsachse entlang auf einer Seite des Rohres festlegen, befestigt sind.

6. Zusammenklappbarer Kern nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Rohr einen Querschnitt mit veränderlichem Bogenradius, wie etwa einen ovalen, eiförmigen, dreieckigen oder viereckigen Querschnitt, aufweist.

7. Zusammenklappbarer Kern nach einem der Ansprüche 3 und 6, **dadurch gekennzeichnet, dass** die erste Gruppe von Versteifungsrippen (5) an den Bereichen, die einen relativ kleinen Bogenradius aufweisen, und die zweite Gruppe von Versteifungsrippen (4) an den Bereichen, die einen relativ großen Bogenradius aufweisen, befestigt ist, wobei die erste Gruppe von Versteifungsrippen (5) an ihren Enden einen Teil (6) aufweist, der sich in die Form hinein erstreckt und der mit einer Eingriffsfläche (7) bereitgestellt wird, die auf die Formwand weist, wobei die zweite Gruppe von Versteifungsrippen (4) an ihren Enden (8), die an die ersten Gruppen von Versteifungsrippen (5) grenzen, Eingriffsflächen (9) aufweist, die in den zusammenklappbaren Kern hinein weisen, wobei die Eingriffsflächen (8, 9) derart angeordnet sind, dass sie in der vorgerückten Stellung des Keilelements (3) ineinander eingreifen und in der zurückgezogenen Stellung des Keilelements (3) gelöst werden.

8. Zusammenklappbarer Kern nach Anspruch 7, **dadurch gekennzeichnet, dass** er einen eiförmigen Querschnitt aufweist, wobei die erste Gruppe von Versteifungsrippen (5) aus Rippen gebildet ist, die an dem spitzen Ende des eiförmigen Querschnitts befestigt sind, und dass der Schlitz und das dazugehörige Keilelement (3) dem spitzen Ende gegenüber angeordnet sind, wobei die zweite Gruppe von Versteifungsrippen (4) an dem eiförmigen Querschnitt zwischen dem Schlitz und dem spitzen Ende befestigt ist.

9. Zusammenklappbarer Kern nach Anspruch 8, **dadurch gekennzeichnet, dass** die Mittel, um das Keilelement zu bewegen, aus einem oder mehreren

linearen Stellgliedern (10) bestehen, deren eines Ende im Verhältnis zu dem zusammenklappbaren Kern dem Schlitz gegenüber befestigt ist, und deren anderes Ende an dem Keilelement (3) befestigt ist, und dass die Mittel, um die beiden gegenüberliegenden Seitenränder der Ummantelung aufeinander zu in die zurückgezogene Stellung des Keilelements zu ziehen, aus einem Umschaltmechanismus bestehen, der sich zwischen den gegenüberliegenden Seitenrändern (2) der Ummantelung, die den Schlitz festlegen, erstreckt, und der an der Umschaltung im Verhältnis zu dem anderen Ende des linearen Stellglieds (10) befestigt ist.

10. Zusammenklappbarer Kern nach Anspruch 9, **dadurch gekennzeichnet, dass** das eine Ende der linearen Stellglieder (10) in dem spitzen Ende des zusammenklappbaren Kerns derart fest an den Rippen (5) angebracht ist, dass die Hauptachse (15) der linearen Stellglieder in der Symmetrieebene des zusammenklappbaren Kerns gehalten wird.

Revendications

1. Noyau déformable pour couler, par exemple, des articles d'ouvrage tubulaires, comprenant une coquille annulaire (1) qui forme sensiblement un tuyau ayant un axe longitudinal s'étendant entre les extrémités du tuyau, ladite coquille (1) étant souple en flexion autour de l'axe longitudinal du tuyau, ladite coquille (1) ayant des bords latéraux opposés (2) définissant une fente le long de l'axe longitudinal sur un côté du tuyau, ledit noyau déformable comprenant de façon additionnelle un élément en coin allongé (3), et des moyens (10) pour déplacer l'élément en coin (3) entre une position avancée dans laquelle il recouvre la fente, et une position rétractée dans laquelle il est tiré hors de la fente et à l'intérieur du noyau déformable, ainsi que des moyens (11) pour tirer les deux bords latéraux opposés (2) de la coquille (1) l'un vers l'autre dans la position rétractée de l'élément en coin (3), **caractérisé en ce que** la coquille (1) présente au moins deux premières zones séparées par au moins deux secondes zones (A), lesdites zones se trouvant entre les extrémités du tuyau, lesdites secondes zones (A) ayant une élasticité en flexion autour de l'axe longitudinal du tuyau qui est plus grande que l'élasticité en flexion correspondante dans les deux premières zones, lesdites premières et secondes zones étant prévues **en ce que** la coquille comprend une plaque de même épaisseur sensiblement qui est munie d'une pluralité de premiers et de seconds jeux de nervures de renforcement (5, 4) sur le côté faisant face vers l'intérieur, chacune desdites nervures (5, 4) s'étendant le long du côté interne de la coquille (1), où les seconds

- jeux de nervures (4) sont placés sur chaque côté de l'élément en coin (3) et s'étendent vers le premier jeu de nervures (5), laissant deux secondes zones (A) de ladite coquille sensiblement non renforcées, lesdites secondes zones (A) étant prévues pour fonctionner comme des charnières de plaque, lesdites premières zones étant pourvues respectivement des seconds jeux de nervures (4) en même temps que de l'élément en coin (3) et du premier jeu de nervures (5), et où les seconds jeux de nervures (4) ont de préférence une longueur sensiblement identique, et où la zone circonférentielle de la coquille, renforcée par les seconds jeux de nervures (4) et l'élément en coin (3), est supérieure à la moitié de la zone circonférentielle totale de la coquille.
2. Noyau déformable selon la revendication 1, **caractérisé en ce que** les secondes zones (A) sont plus petites transversalement à la direction longitudinale du tuyau que les premières zones.
 3. Noyau déformable selon la revendication 1 ou 2, **caractérisé en ce que** la plaque (1) est fixée uniquement aux nervures de renforcement (4, 5) au niveau des premières zones.
 4. Noyau déformable selon l'une des revendications précédentes, **caractérisé en ce que** les moyens pour déplacer l'élément en coin (3) entre une position avancée dans laquelle il recouvre la fente, et une position rétractée dans laquelle il est tiré hors de la fente et à l'intérieur du noyau déformable, sont fixés à une ou plusieurs des nervures de renforcement (5).
 5. Noyau déformable selon l'une des revendications précédentes, **caractérisé en ce que** les moyens (11) pour tirer les deux bords latéraux opposés (2) de la coquille l'un vers l'autre dans la position rétractée de l'élément en coin (3), sont fixés aux bords latéraux opposés (2) de la coquille qui définissent une fente le long de l'axe longitudinal sur un côté du tuyau.
 6. Noyau déformable selon l'une des revendications précédentes, **caractérisé en ce que** le tuyau a une section transversale à rayon de courbure évolutif, telle qu'une section transversale ovale, en forme d'oeuf, une section transversale triangulaire ou quadrangulaire.
 7. Noyau déformable selon l'une des revendications 3 et 6, **caractérisé en ce que** le premier jeu de nervures de renforcement (5) est fixé au niveau des zones ayant un rayon de courbure relativement faible, et le second jeu de nervures de renforcement (4) au niveau des zones ayant un rayon de courbure relativement grand, ledit premier jeu de nervures de renforcement (5) ayant, à ses extrémités, une partie (6) qui s'étend dans le moule et qui est munie d'une face d'engagement (7) en vis-à-vis de la paroi du moule, ledit second jeu de nervures de renforcement (4), au niveau de ses extrémités (8) étant contigu aux premiers jeux de nervures de renforcement (5), ayant des faces d'engagement (9) qui font face vers l'intérieur du noyau déformable, lesdites faces d'engagement (8, 9) étant positionnées de façon à s'engager l'une l'autre dans la position avancée de l'élément en coin (3) et à se désengager dans la position rétractée de l'élément en coin (3).
 8. Noyau déformable selon la revendication 7, **caractérisé en ce qu'il** présente une section transversale en forme d'oeuf, ledit premier jeu de nervures de renforcement (5) étant formé par des nervures fixées à l'extrémité pointue de la section transversale en forme d'oeuf, et **en ce que** la fente et l'élément en coin associé (3) sont positionnés à l'opposé de l'extrémité pointue, ledit second jeu de nervures de renforcement (4) étant fixé à la section transversale en forme d'oeuf entre la fente et l'extrémité pointue.
 9. Noyau déformable selon la revendication 8, **caractérisé en ce que** les moyens pour déplacer l'élément en coin sont formés par un ou plusieurs actionneurs linéaires (10), dont une extrémité est fixée par rapport au noyau déformable opposé à la fente, et dont l'autre extrémité est fixée à l'élément en coin (3), et **en ce que** les moyens pour tirer les deux bords latéraux opposés de la coquille l'un vers l'autre dans la position rétractée de l'élément en coin sont formés par un mécanisme à genouillère qui se trouve entre les bords latéraux opposés (2) de la coquille définissant la fente, et qui est fixé au niveau de la genouillère relativement à l'autre extrémité de l'actionneur linéaire (10).
 10. Noyau déformable selon la revendication 9, **caractérisé en ce qu'une** extrémité des actionneurs linéaires (10) est rigidement montée sur des nervures (5) dans l'extrémité pointue du noyau déformable de telle manière que l'axe principal (15) des actionneurs linéaires soit maintenu dans le plan de symétrie du noyau déformable.

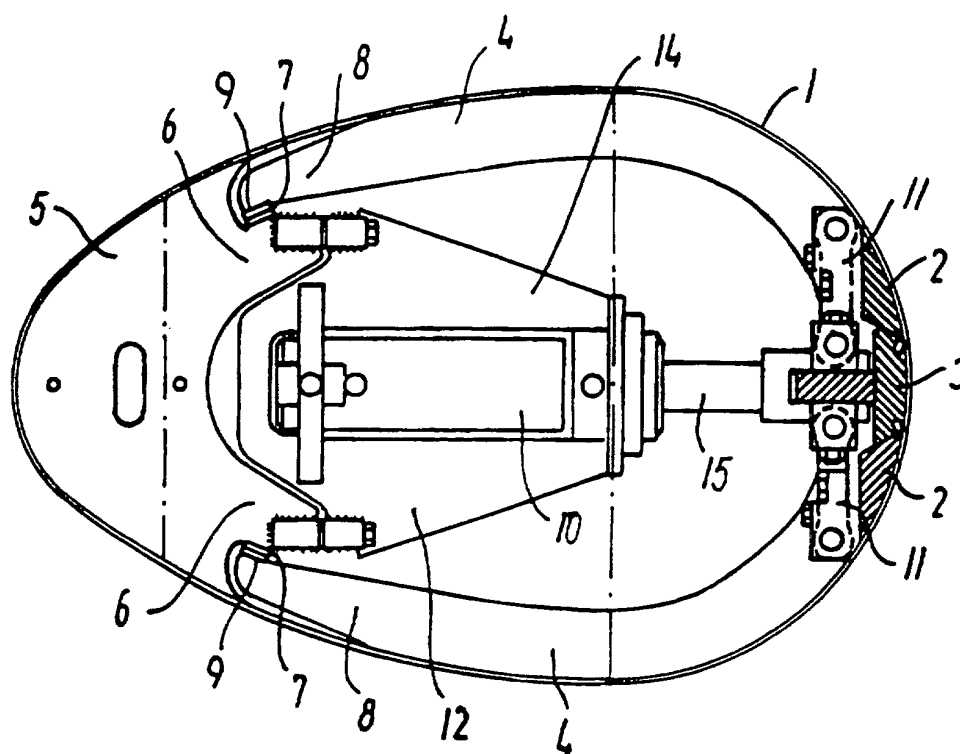


FIG. 1

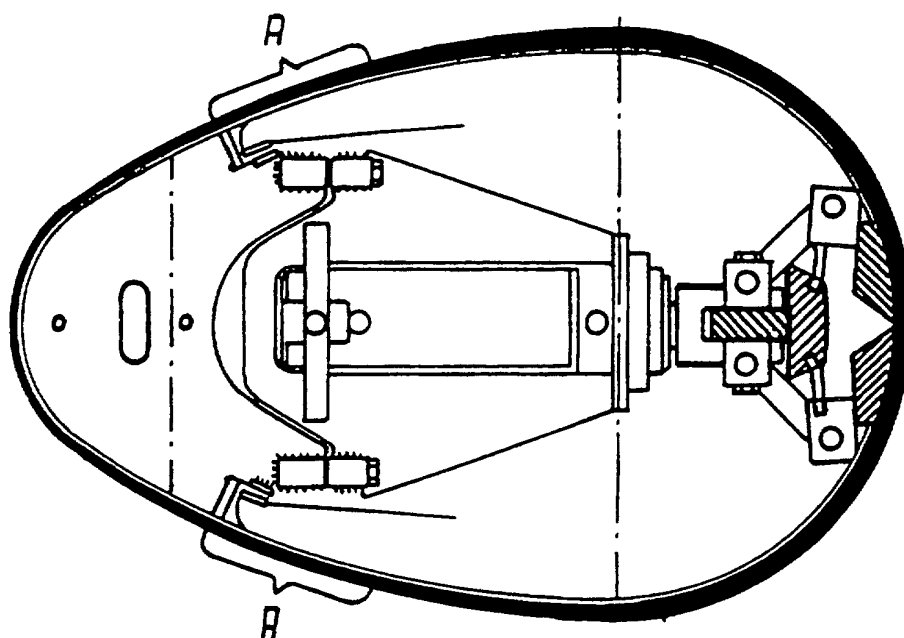


FIG. 2

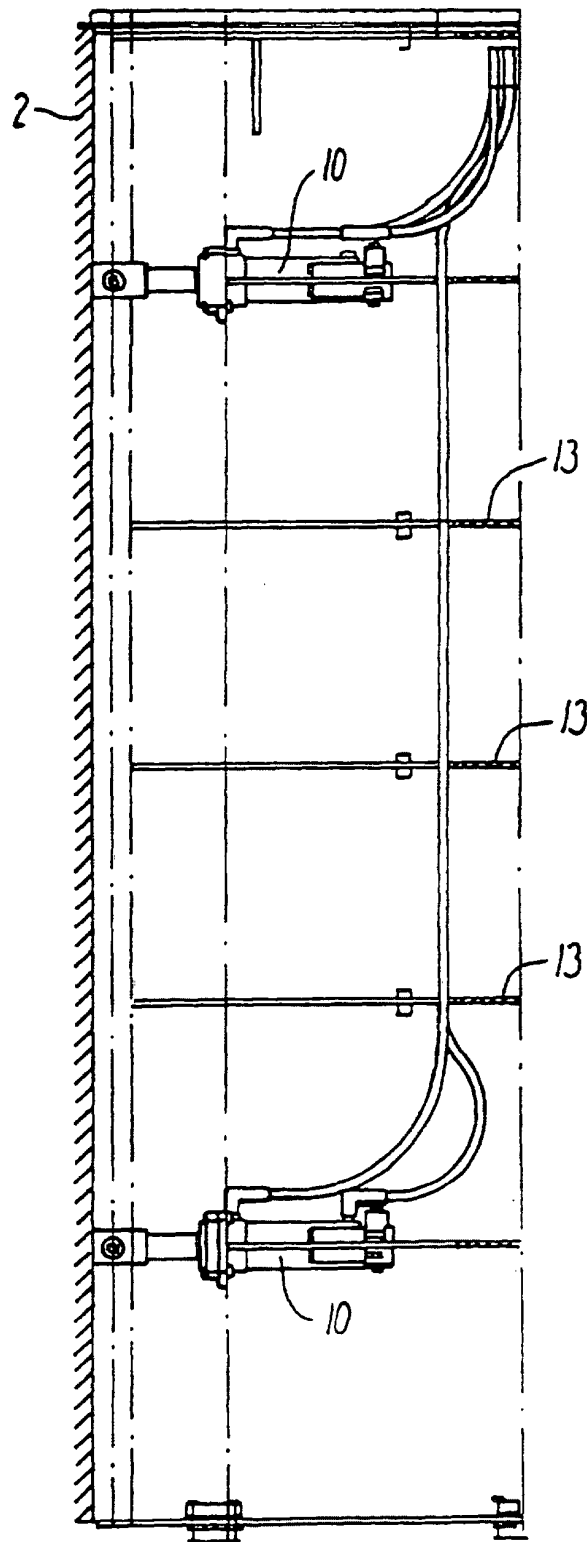


FIG. 3