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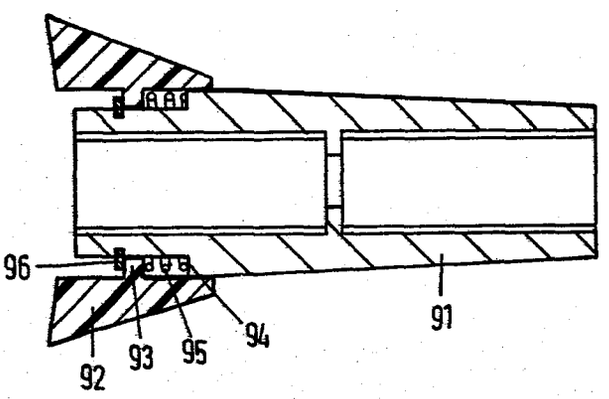
(54) A spacer for a concrete shuttering.

(57) A cone as part of a spacer for concrete shutterings, which cone comprises a metal bush provided with an essentially continuous axial hole wherein a nut thread adapted to an associated screwed rod is formed. There is provided a ring-shaped or cap-shaped supporting element which rests against a cam-shaped portion formed on the bush end directed towards the shuttering and which extends to beyond said bush end. There may be provided a resilient member positioned between the cap-shaped portion and the supporting element for biasing the supporting element towards the shuttering, while around the metal bush there may be provided a sleeve of concrete or the like mortar, hard synthetic plastics material or such like material.



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A spacer for a concrete shuttering.

The invention relates to a cone as part of a spacer for concrete shutterings, which cone comprises a metal bush provided with an essentially continuous axial hole wherein there is formed a nut thread adapted to an associated screwed rod.

On application of such spacers, usually two cones are provided on either side of a screwed rod, each on one end part thereof. The thus formed assembly, when placed between the opposite shutterings of a concrete wall to be poured, keeps said shutterings at the required interspace. In most cases each of the cones is connected to a further screwed rod extending across the shuttering in question. At the ends of the latter screwed rods projecting from the shuttering there are provided nuts which eventually press externally against the shuttering. This pressure is converted into pressure at the end face of the cone situated against the inside of the shuttering. Each of the two shutterings mentioned is thus clamped between on the one end the nut disposed on the outer screwed rod and on the other end the exterior end face of the cone in question.

In a prior art spacer embodiment of the above mentioned type the cone consists of hardened concrete or a similar mortar, which cone contains an axial hole for receiving the screwed rods. There extends from the inner cone end face, so facing away from the shuttering in question, as far as a part of the length of the axial hole in the cone, an internally threaded bush fixedly received in the cone material. At the location where said bush leaves the cone at the end averted from the shuttering, there is

attached a supporting plate on the periphery of the bush. When now the first mentioned screwed rod with its two ends is screwed in the bushes fixedly received in the cones in question, the complete spacer assembly can be formed. The two cones and the bushes which are received therein at that location along a part of their lengths, as well as the screwed rod connecting the two cones are eventually remaining, so called "permanent" elements in the completed concrete structure. The further outer screwed rods screwed-in on either side during the setting-up and positioning of the shutterings, are removed from the shuttering after hardening of the poured concrete and the hole ends released at the two concrete outer faces are filled up with an aggregate.

This prior art spacer has a number of drawbacks. From the viewpoint of cost, it is disadvantageous that the internally threaded bushes fixedly received in the cone are "permanent" elements, while also the attachment of the supporting plates to the nut thread is labour-intensive, elaborate and hence expensive.

A major further drawback consists in the risk that via the screw thread or nut thread of the first mentioned screwed rod and the bush in the cone and furthermore via the end portion of the axial hole traversing the cone adjoining the shuttering in question, moisture from the concrete penetrates during the pouring of a concrete wall. This leads in the first place to rusting of the screwed rods in the bush, which hampers disassembly during removal of the shuttering, and in the second place there is formed around the cone where most of the moisture is withdrawn from the concrete, an ugly spot at the exterior of the concrete shuttering formed as a result of the occurring dissociation of the concrete.

It is an object of the invention to provide a spacer lacking the above drawbacks and provides to that end a spacer of the above type, there being provided a ring-shaped or cap-shaped supporting element resting against a cam-shaped portion formed at the bush end directed towards the shuttering and extending to beyond said bush end.

According to the invention the actual supporting portion of the spacer is formed by the metal bush and the ring-shaped or cap-shaped supporting element resting against the cam-shaped portion on said bush. Around the metal internally threaded bush, as well as in the prior art cones, there may be provided a frusto-conical element of concrete or other mortar or of synthetic plastics or the like material in detachable fashion, but also a cylindrical sleeve of e.g. fibrous concrete can be employed. Said sleeve-like elements only serve to meet the requirements set by the users in respect of the form and the choice of material for the spacers, but are not of essential interest for the proper functioning thereof. When tightening the nuts situated externally of the shuttering, the inside of the shuttering initially only presses against the end of the supporting element projecting from the bush. When said supporting element, as in the preferred embodiment, is annular and made of synthetic plastics material, said element will be deformed during the further tightening of the nuts and be compressed between the shuttering and the cam-shaped portion on the bush, so that the shuttering eventually comes to rest against the front of the bush and the compressed supporting element provides a perfect sealing against the flow of concrete moisture towards the interior of the cone. As result, ugly spots in the concrete wall, after dismantling, are prevented. A further advantage is that

when the front face of the bush has come to lie slightly obliquely relative to the shuttering, there is still obtained a proper sealing, due to the flexibility of the supporting element.

Depending on the choice of material for the supporting element, and on the form of the cam-shaped portion of the bush, the supporting element will either have only a sealing function or a combination of a sealing function and a supporting function.

In order to take up variations in the lengths of the screwed rods, unevennesses in the shuttering and possible oblique position thereof relative to the screwed rods, it has been found favourable to place a resilient member, such as a coil spring or a rubber ring between the ring-or cap-shaped supporting element and the cam-shaped portion on the bush, so that the supporting element is capable of moving in axial direction along some distance relative to the bush and also capable of tilting relative to the front face of the bush. It is thus ensured that the supporting element with its front will always accurately abut against the shuttering, while also damage to the shuttering due to an oblique position of the supporting element is excluded.

After pouring the concrete and the dismantling, the shell-shaped elements of the above described type remain in the concrete wall as "permanent" elements, the metal bush, however, can be easily recovered by either removing first the ring-or cap-shaped element and subsequently removing the bush by means of a suitable tool, or by removing the ring-or cap-shaped portion together with the bush as an integral unit by means of a suitable tool. The remaining hole in the concrete wall can be sealed with mortar and, after a suitable choice thereof, will not exhibit a deviating appearance

as compared with the rest of the wall.

The cone according to the invention, however, also makes it possible to not only recover the metal bush but also the sleeve. To this end, it is made of rubber or synthetic plastics hose. This hose is connected to the bush through suitable means, thus automatically releasing the hose during unscrewing of the bush from the screwed rod after removal of the shuttering, or is pushed loosely around the bush, the hose being capable of removal out of the poured concrete wall with a suitable tool, after the unscrewing of the bush, which can always be effected easily due to the great flexibility of the hose. Also, the supporting element may be extended in such a way that the extended portion thereof lies around the outer surface of the bush.

It has been found that a supporting element, as used in the cone according to the invention, can also be successfully employed in existing concrete cones, such as the one described in Dutch application 78,12096. A drawback of the prior art concrete cones as a matter of fact is that the front faces thereof, after removal of the shuttering, remain visible and that around the concrete cone a region is often present in the concrete wall that has a different appearance as compared with the rest of the concrete wall. This other appearance is produced in that the concrete around the spacer is dissociated due to the leaking away of the concrete moisture towards the interior of the spacer, so that, after removal of the shuttering, there remains a region with excessive gravel and other solid concrete components, which region exhibits a deviating appearance and has less suitable properties which deviate from the rest of the wall. By placing according to the invention a synthetic plastics annular supporting element before

the concrete cone, there is obtained in the first place a better sealing towards the interior of the spacer, so that dissociation will less rapidly occur and so that no region of deviating appearance and deviating properties will be formed around the spacer, and in the second place, after removal of the shuttering, also the synthetic plastics supporting element can be removed, so that a hole having a given depth is produced which can be filled in a simple manner with concrete mortar in such a way that after drying, there is practically no or entirely no distinction any longer between the wall and the place where the spacer is received in the wall.

Some embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective cross-sectional view of two shutterings spaced apart by spacers according to the invention, in the condition wherein the concrete has been poured between the shutterings, but the shuttering has not yet been removed;

Fig. 2 is a cross-sectional view of a first embodiment of a cone according to the invention with an associated screwed rod;

Fig. 3 is a cross-sectional view of a second embodiment of a cone according to the invention with an associated screwed rod;

Fig. 4 is a cross-sectional view of a third embodiment of a cone according to the invention;

Fig. 5 is a cross-sectional view of a fourth embodiment of a cone according to the invention which can be completely recovered after use;

Fig. 6 is a cross-sectional view of a variant of the embodiment according to Fig. 5;

Fig. 7 is a cross-sectional view of a fifth embodiment of a cone according to the invention which can also be completely recovered;

Fig. 8 is a cross-sectional view of a sixth embodiment of the cone according to the invention, with the supporting element being resiliently biased relative to the metal bush and enclosing the same;

Fig. 9 is a cross-sectional view of a seventh embodiment of the cone according to the invention, with the supporting element being likewise resiliently biased relative to the metal bush;

Fig. 10 is a cross-sectional view of a variant of the embodiment according to Fig. 9; and

Figs. 11, 12 and 13 are cross-sectional views of embodiments of the cone according to the invention with a different type of metal bush and a resiliently biased supporting element.

In Fig. 1 two cones are indicated with reference numeral 1, provided with cones 2 of concrete mortar, which cones are attached to one end of a screwed rod 6, while the cone end faces 3 are averted from each other and the other end faces 4 face each other. The concrete cones are attached in the manner hereinafter described around a metal bush, as indicated e.g. at 21 and 31 in Fig. 2 and 3, respectively. At 5 is indicated an annular supporting element against which the cone 1 abuts with its end face facing towards the shuttering, which supporting element 5 contains a central round passage for the screwed rod 6 and which abuts with the end facing towards the cone against a cam-shaped raised portion formed at the circumference of the bush.

Each bush contains an axial continuous hole which e.g. is indicated in Fig. 2 at 27 and in Fig. 3 and 37. In Fig. 1 the screwed rod 6 with both cones 1 attached thereto, each having a supporting element 5, is represented in the condition placed between two shutterings 10 in front of a concrete wall 11. The two shutterings 10 link up against the outer end faces of the bushes and the supporting elements

provided thereon, which are indicated e.g. in Figs. 2 and 3 at 25, and 35, respectively.

The shutterings 10 and 11 are stiffened by an assembly of horizontal and vertical members, one of which being shown in Fig. 1 for each shuttering 10, i.e. one vertical member 15 and one horizontal member 16.

Screwed rods 14 are each inserted transversely through the assembly of horizontal members 16 and vertical members 15 and shutterings 10 in the outwardly oriented end of the bushes of the cones in question and subsequently screwed in said bushes. Subsequently, the nuts 17 are screwed on the ends of the further screwed rods 14 and via washers 18 tighten the shuttering construction disposed at the respective side, comprising the vertical members 15, the horizontal members 16 and the shuttering 10.

Each shuttering 10 thus eventually is supported against the end faces of supporting element 5. The force exerted outwardly on the end face of each supporting element tries to displace said element inwardly over the bush in the direction towards the center of the screwed rod 6, which, however, is counter-acted by the presence of the cam-shaped raised portion on the bushes, so that the supporting element is compressed and forms a perfect seal between the front face of the bush and the shuttering against the inflow of concrete moisture.

In the embodiment of Fig. 1, both concrete cones 2 on the screwed rod 6 with the narrowed end of the axial hole receiving the bush and provided in the cones, sealingly abut against the respective portion of the screwed rod, so that also the inflow of moisture from the poured concrete into the end faces averted from the shuttering is substantially avoided.

During the pouring of the concrete for the wall 11, hydrostatic pressure is built up from within against the shutterings 10, which has to be taken up by the assembly of the connected screwed rods 14-6-14 and the nuts 17 screwed onto the ends thereof. The initial powerful pressure from outside against the end faces of the supporting elements thereby gradually decreases.

Upon dismantling, after hardening of the concrete of the wall 11, finally the outer screwed rods 14 are removed by unscrewing these from the bushes. After dismantling, the supporting elements and the bushes can be recovered from the concrete wall either jointly or separately in the below described manner. The end portion of each of the resulting holes in the concrete wall is subsequently filled up with a sealing mortar and/or if desired, with a locking cap.

Fig. 2 shows in more detail a first embodiment of the cone according to the invention. In that figure 22 indicates a concrete cone having a front face 23 and a rear face 24, and provided with a recess for receiving a metal bush 21 provided with an axial opening wherein a nut thread is provided that is adapted to coact with the screwed thread of a screwed rod 26 screwed along a part of the length of an axial opening 27 in the bush. The rear face 24 of the concrete cones extends beyond the end of the metal bush and tightly falls around the circumference of the screwed rod, in order to counteract the inflow of concrete moisture along the back of the spacer.
At the side of the metal bush facing in operation towards the shuttering, there is provided a cam-shaped raised portion 28 against which rests an annular, synthetic plastics supporting element 25.

This supporting element preferably flares slightly towards the side facing towards the shuttering, so that the removal of the supporting element from the concrete wall formed is facilitated. In the front face of the metal bush 21 there is formed a further cam-shaped recess adapted to coact with a suitable tool so as to remove the metal bush from the screwed rod after removal of the shuttering. It is then not necessary to first remove the synthetic plastics supporting element, since the tool is adapted to directly engage with the cam 29 via the axial opening in said supporting element.

It will be clear that in use, pressure of the shuttering is completely exerted on the front of the metal bush and that the concrete cone 22 is not subjected to pressure. Consequently, no special measures have to be taken to prevent the concrete cone from sliding towards the center of the screwed rod 26 by the pressure of the shuttering. To prevent displacement of the concrete cone during the positioning of the shuttering, the circumference of the metal bush within the cone may be provided with suitable means, e.g. an 0-ring or another flexible element clampingly coacting with the inner circumference of the concrete cone, retaining the same in such a manner that the concrete cone is not easily displaced, but after removal of the shuttering, the bush can be removed though from the concrete cone. This is shown in Fig. 4, on application of a cap-shaped supporting element 55.

In order to facilitate the removal of the metal bush after dismantling, it is possible to provide around the metal bush before it is pushed in the concrete cone, a thin rubber or synthetic plastics sleeve which prevents that any rust at the exterior of the metal

bush hampers the removal thereof. Such a rubber or synthetic plastics sleeve can be considered to be a disposable element, so that whenever the metal bush is used again, a new sleeve is provided thereover.

Fig. 3 is a cross-sectional view of a second embodiment of the cone according to the invention. In this figure, 31 indicates the metal bush, 32 a concrete cone having a front face 33 and a rear face 34. Reference numeral 36 shows the screwed rod adapted to coact with a screw thread in the continuous axial opening 37 of the bush 31. The bush 31 is provided at the front with a slotted opening 39 adapted to coact with a suitable tool. Around the front of the bush 31 there is placed a synthetic plastics supporting element 35 which tapers from the front facing towards the shuttering to the front face 33 of the concrete cone. The circumferential portion of the bush 31 situated within the concrete cone adjacent the front face 33 thereof is reduced as far as the front face of the bush in such a manner that an annular extension of the supporting element 35 can fall between the inner circumference of the concrete cone and the outer circumference of the metal bush, while the rear wall of said extension supports against the cam-shaped portion. The extended portion of the supporting element and the cam-shaped narrowing of the bush are dimensioned in such a manner that the inner circumference of the cone clampingly falls about the extension of the supporting element. As a result, it is prevented that during the placing of the shuttering, the concrete cone slides off the bush. Also in this embodiment of the spacer, the pressure of the shuttering is directly transmitted onto the metal bush without pressure being exerted on the front face of the concrete cone. To prevent inflow of concrete water, also in this embodiment the rear face of the concrete cone is enlarged, so that this can fall

tightly around the screwed rod 36.

In certain works it is desirable to prevent any flow of moisture along the rod 36. To this effect a cross plate may be welded onto the center of the shaft 36. However, welding is not possible with a given steel quality for the rod 36. According to an advantageous embodiment of the invention there is provided a cross plate 40 provided on one, but preferably on two sides with a bush-shaped extension 41, which bush is provided with an axial hole falling about the screwed rod 36. Within the bush or bushes there are received 0-rings or other suitable sealing rings or e.g. adhesive. After positioning of the plates 40, the bushes are compressed about the screwed rod 36 with a suitable tool, in such a manner that the bushes 41 fall entirely sealingly about the screwed rod 36 and any leakage is prevented. The opening at the back 34 of the cone 32 can also be formed during the pouring of thin walls in such a manner that this falls around the bush 41 and the back 34 rests against the plate 40. As a result, a proper moisture sealing and nevertheless a short spacer assembly can be realized.

Fig. 4 shows a different embodiment of the cone according to the invention, wherein the metal bush 51 is surrounded by a concrete cone 52. The metal bush, at the side facing towards the shuttering, is extended by a projecting portion 54 being integral with the bush. Around the projecting portion 54 there is provided a synthetic plastics cap 55 which ensures a proper sealing, while a larger abutting face for the shuttering is obtained by the projecting portion 54. In order to prevent movement of the concrete cone 52 during the placing of the shuttering, the bush 51, at the end adjacent the front of the cone situated therein,

is provided with an annular groove within which is received an 0-ring 56, clampingly coacting with the inner surface of the cone.
At the threaded inner surface of the bush 51 there is provided a cam-shaped raised portion 58. Said cam 58 defines a fixed distance along which a screwed rod, such as 6 in Fig. 1, can be turned in the bush 51. As a result, it is ensured in the first place that always at the end of the bush facing towards the shuttering there is sufficient thread for turning in the further screwed rods extending outwardly of the shuttering, while it is ensured on the other end that at a given length of screwed rod, the front faces of the cones come to lie at a fixed distance. The continuous opening in the bush 51 is preferably not entirely closed by the cam-shaped raised portion 58, so that any dirt can escape during the turning in of the screwed rods through the opening remaining between the cams.

Although the embodiments shown in Figs. 2, 3 and 5 are described in conjunction with a concrete cone, it will be clear that instead of concrete also other materials for forming a cone can be employed.
It is also possible to use cylindrical tube elements of e.g. fibrous concrete. In such case the metal bush may be cylindrical, instead of the conical embodiment shown. It is likewise possible to place no sleeve-like element at all about the metal bush, so that the concrete mixture comes to lie directly against the outer face of the bush.
The eventual choice depends on the specific application of the spacer and the preference of the user. In the embodiment shown in Fig. 5, the synthetic plastics cap 55 can be removed together with the bush 51 by engagement of a suitable tool with the e.g. hexagonal inside of the projecting portion 54.

Once again it is pointed out that the various elements shown

in Figs. 2-4 can be used in any combination with each other, while always a cone is produced that is formed in such a manner that a perfect seal between the shuttering and the front face of the metal bush is ensured and a sleeve possibly placed about the metal bush is not subjected to pressure forces during the placing and securing of the shuttering, since said pressure forces, whether or not via a ring-or cap-shaped supporting element, are directly transmitted to a metal bush screwed around a screwed rod.

In the embodiments shown in Figs. 2-4 the sleeve placed around the bushes, such as the concrete cone, forms a permanent element after removal of the shuttering and the bush. Figs. 5, 6 and 7 show embodiments of cones wherein likewise the sleeve placed around the metal bush can be recovered, so that after the placing of the concrete wall, exclusively the screwed rod remains therein, which results in a further saving in cost.

Fig. 5 shows a metal bush 61 which slightly tapers from the side facing towards the shuttering, to facilitate its removal from the concrete wall. Around the bush 61 there is placed a rubber or synthetic plastics hose 62, the material and the thickness of the hose being chosen in such a manner that this properly abuts against the outer circumference of the bush. The bush 61, at the end facing towards the shuttering, is provided with a reduced portion around which there is positioned a synthetic plastics cap 65 as supporting and sealing element, which preferably also slightly tapers from the side facing towards the shuttering. The rear face of the cap abuts against a cam 69. The threaded axial longitudinal opening of the bush 61 is preferably again provided with cam-shaped raised portions 66, having the same function as the cam-shaped

raised portion 58 in the embodiment shown in Fig. 4. The synthetic plastics hose applied about the metal bush prevents the surface of the bush from rusting and facilitates the removal of the bush after dismantling. The front of the bush naturally is again formed in such a manner that a tool can engage therewith. The outer surface of the bush may for instance be fitted with a left-hand screw thread so that during the turning of the bush 61 off the screwed rod from the concrete wall formed, the synthetic plastics hose will be automatically entrained. The outer surface of the bush 61, however, may also be flat, so that the sleeve 62 remains in the wall during the loosening of the bush from the screwed rod. Since the sleeve is highly flexible, this can thereafter be removed from the wall by means of tongs. It is also possible to place a cylindrical sleeve 62 about the tapering bush 61, while the inner surface of the sleeve is provided with ribs filling up the variable space between the inner surface of the sleeve and the outer surface of the bush. The cylindrical opening remaining in the concrete after removal of the cone may then for instance be filled up with a cylindrical plug. The use of a tapering bush with a cylindrical sleeve has also the advantage that any eccentricity of the opening 67 in the bush does not provide problems during the removal of the cone from the concrete wall poured, since the ribs can be slightly deformed at the inner face of the sleeve.

In the embodiment shown in Fig. 6, identical parts are indicated with the same reference numerals as in Fig. 5. In this embodiment the hose applied around the metal bush, during the loosening of the bush, is released from the concrete wall poured simultaneously with the bush, since the synthetic plastics cap is slightly extended

rearwardly and the hose is clamped between the inner surface of said extended portion and the outer surface of the bush, while the front end of the hose extends over the cam 69. Preferably, the hose 62 also extends over the rear face of the bush 61 so as to entirely protect the same.

Fig. 7 shows a further embodiment of the cone shown in Figs. 5 and 6, which absolutely prevents penetration of moisture along the front of the bush between the sleeve and the outer circumference of the bush. The figure again shows a bush 71 about which there is installed a rubber or synthetic plastics hose portion 72. The bush is provided with a projecting portion 74 about which there is placed a synthetic plastics cap 75 which extends in longitudinal direction towards the back of the bush to beyond the recess. The outer circumference of the bush 71 is provided adjacent the projecting portion with an annular groove 73 wherein a metal or synthetic plastics O-ring is positioned. The cap 75 tightly fits around the O-ring, so that the sleeve 72 is pressed in the annular groove 73, so that a perfect seal is produced at the front between the bush and the sleeve. Instead of an annular groove, there may also be provided an annular raised portion around which the cap 75 fittingly engages, with the sleeve being clamped between the cap and the raised portion, so that also a proper seal is obtained. The front face of the cap 75 is slightly raised preferably along the circumference so as to realize a still better seal during the setting up of the shuttering. The cap-shaped portion shown in Fig. 7 can naturally also be made of thicker material and have a more tapering design, with the cap rather showing the form of the supporting element shown in Fig. 3, wherein the extended portion coacts with the outer circumference of the sleeve of hose-like material for obtaining a proper seal between

the outer circumference of the bush and the sleeve. Also in this embodiment the sleeve, however, remains rotatable relative to the bush.

If metal bushes with cam-shaped raised portions, such as 58 in Fig. 4 and 66 in Figs. 5 and 6, are used as stop for the screwed rod remaining in the concrete, a slight deviation in length between the various screwed rods and/or a not entirely identical positioning of the cams, such as 58 and 66, in the bushes may result in that the front faces of the bushes of different spacers are not entirely co-planar. As a result, either the wooden shuttering will be deformed during the tightening of the nuts shown at 17 in Fig. 1 so that a non-flat concrete wall is produced, or, on application of a metal shuttering, there will remain a space between the front face of the cones of one or more spacers and the shuttering, so that concrete water can nevertheless flow into the interior of the cone. On application of a metal shuttering, also leakage problems may be produced, when the front face of the spacer lies slightly obliquely relative to the plane of the shuttering, while in such case when a wooden shuttering is concerned, the front face of the cone can penetrate into the shuttering material, damaging the same. To solve the above problems and to further facilitate the loosening of the cone from the shuttering, there is provided in the embodiments shown in Figs. 8-13 a supporting element which is adapted not only for axial displacement relative to the metal bush, so that it always abuts completely against the shuttering, but also is adapted for tilting movement relative to the front face of the bush, in order to compensate an oblique position of the bush relative to the shuttering.

In the embodiment shown in Fig. 8, a sleeve 82 is provided around a metal bush 81, which sleeve carries a supporting element 83 at the front, being integral therewith. In the front face of bush 81 there are provided a plurality of axial bores wherein springs 85 are positioned. Between the front of the springs 85 and the rear face of the supporting element 83, there may be provided a metal ring 84 for uniformly distributing the compressive force of the springs 85. In the rest position, the supporting element 83 is slightly spaced apart from the front face of the bush 81 under the influence of the compressive force of the springs 85. When securing the shuttering, this distance will be reduced, since the springs 85 are compressed, while the front face of the supporting element 83 ensures a proper seal between said element and the shuttering, while the supporting element may also arrive in a slightly oblique position relative to the front face of the bush 81. In the cones of various spacers the springs 85 of the various cones need not be compressed to the same extent in order to nevertheless ensure a proper seal. As a result, differences in length between various spaces can be compensated. Instead of a plurality of springs 85, also a single helical spring can be employed which is received in a concentric groove formed in the front face of bush 81.

In the embodiment shown in Fig. 9 there is formed adjacent the front of a metal bush 91, an annular groove wherein a clamping ring 96 rests. Said clamping ring confines a cam-shaped portion 93 of a supporting element 92 between said ring and a cam-shaped thickening 94 on the periphery of bush 91. Between the cam 93 of the supporting element 92 and the cam 94 of the bush there is provided a helical spring 95 biasing the cam 93 against the ring 96, while the

supporting element projects along some distance to beyond the front face of bush 91. For protecting the spring 91 against moisture and the like, the supporting element 92 has an extended rear portion which in the figure embraces the metal bush 91 partially, but also adapted to entirely embrace said bush as far as the rear face thereof.

Fig. 10 shows a variant of the embodiment shown in Fig. 9, wherein a supporting element 102 clampingly abuts around a reduced front portion 106 of a metal bush 101. The supporting element 102 has a nick at the back, so that the cap can also fall entirely or partly over the thicker rear portion of the bush 101. A helical spring 105 is situated between a cam 104 forming the transition between the thinner front portion and the thicker rear portion of bush 101 and the face 103 forming the boundary of the nick.

In the embodiment shown in Figs. 9 and 10, the supporting element can be moved in axial direction to the metal bushes and it can also be tilted slightly relatively to the front face thereof. Moreover, this embodimenthas the advantage that during the loosening of the shuttering, the supporting element, under the influence of the spring force, will spring outwardly from the concrete wall formed, thus facilitating the loosening of the cone from the concrete wall. The caps 92 and 102 may be made of synthetic plastics material, but also of metal.

In the embodiments shown in Figs. 11-13, identical parts are indicated with identical reference numerals.

A metal bush 111 is provided with an annular groove 113 at the end facing towards the shuttering. This groove receives an end portion of a preferably metal cap-shaped supporting element 112.

The cap-shaped element is locked around the bush by means of a ring 115, while the bush is extended at the end facing towards the shuttering with a hexagonal nut portion 117 with which a tool can engage.

The cap-shaped portion 112 extends to beyond the front face of the nut portion 117 in such a manner that the shuttering can rest against the front of the cap-shaped portion 112, thus transferring the entire pressure of the shuttering to the metal bush.

The groove 113, between the cap-shaped element 112 and the metal bush in the embodiments shown in Figs. 11 and 12, receives a resilient rubber ring enabling the cap to be displaced relatively to the bush both in axial direction and to be tilted relatively to the bush.

In the embodiment shown in Fig. 13, a helical spring 119 is received in the groove 113 for the same purpose.

In the embodiment shown in Fig. 12, there is provided around bush 111 and cap 112 a continuous synthetic plastics sleeve which protects the bush and cap against contamination, and prevents dirt from penetrating into groove 113. Moreover, the sleeve at the front of the cap provides a still better seal between the cap and the shuttering. The sleeve 118 need not continue entirely as far as the rear end of bush 111 but may terminate also a short distance beyond the groove 113.

In the embodiment shown in Fig. 13, there is positioned in groove 113 a synthetic plastics cap 119 falling over the spring 120 and a part of bush 111 for protection of the spring against contamination.

Also in the embodiment shown in Figs. 11-13, the loosening of the cone from the concrete wall formed is facilitated because the cap-shaped portion 112 will spring forwardly under the influence

of the spring force during the loosening of the shuttering from the wall formed.

It will be clear that a great many modifications will be possible within the scope of the invention, a number of which is obvious to those skilled in the art, and a number of which is obtained by combination of the various aspects of the invention shown in the figures.

CLAIMS

1. A cone as part of a spacer for concrete shutterings, which cone comprises a metal bush fitted with an essentially continuous axial hole wherein a nut thread adapted to an associated screwed rod is formed, characterized in that there is provided a ring-shaped or cap-shaped supporting element resting against a cam-shaped portion formed at the bush end facing the shuttering and which extends to beyond said end of the bush.

2. A cone according to claim 1, characterized in that the cam-shaped portion is formed by a reduction in diameter of the bush towards its end facing the shuttering.

3. A cone according to claim 2 characterized in that there is provided a resilient member situated between the cam-shaped portion and a stop formed at the inner surface of the supporting element or by the rear face thereof, in such a manner that the supporting element is biased towards the shuttering.

4. A cone according to claim 3, characterized in that the supporting element is made of synthetic plastics material and extends to over at least a part of the portion of the metal bush between the cam-shaped portion and the back of the bush.

5. A cone according to claim 1, characterized in that at the front of the bush facing the shuttering there are provided means with which a tool can engage and that the supporting element is a cap-shaped element rotatably secured on one side in the groove formed on the periphery of the bush, while the open front face of the cap-shaped supporting element extends to beyond the front face of the means with

which a tool can engage.

6. A cone according to claim 5, characterized in that the cap-shaped element is made of metal.

7. A cone according to claim 5 or 6, characterized in that the groove accommodates a resilient member which biases the cap-shaped element towards the shuttering.

8. A cone according to claim 7, characterized in that the cap-shaped supporting element is made of synthetic plastics material and extends to over at least a portion of the metal bush between the groove and the back of the bush.

9. A cone according to claim 7, characterized in that the resilient member is a rubber ring.

10. A cone according to claim 9, characterized in that there is provided a synthetic plastics socket which embraces at least the cap-shaped supporting element and a portion of the metal bush between the groove and the back of the bush.

11. A cone according to claim 7, characterized in that there is provided a synthetic plastics cap resting in the groove and extending towards the back of the bush to at least over the resilient member.

12. A cone according to claim 1, characterized in that the cam-shaped portion is formed at the front by an increase in diameter thereof along a relatively slight length adjacent said front, while the supporting element rests against one side of said raised portion, which supporting element is frusto-conical and faces the shuttering with the face of larger diameter.

13. A cone according to at least any one of claims 1-12, while around the outer circumference of the metal bush there is provided a sleeve, characterized in that the sleeve is a frusto-conical element of concrete or the like mortar, hard synthetic plastics material or similar material and extends at least from the bush end averted from the shuttering to adjacent the opposite end and is rotatable at least relatively to the bush.

14. A cone according to claim 3, characterized in that the sleeve extends to beyond the back of the bush and essentially closely abuts against the outer circumference of the screwed rod.

15. A cone according to at least any one of claims 1-12, a sleeve being provided around the outer circumference of the metal bush, characterized in that the sleeve is a cylindrical element of fibrous concrete or the like material which extends at least from the bush end averted from the shuttering to adjacent the opposite end and is rotatable at least relatively to the bush.

16. A cone according to at least any one of claims 13-15, characterized in that a thin, rubber or synthetic plastics socket is installed around the bush, essentially along the entire length thereof.

17. A cone according to at least any one of claims 13-16, characterized in that adjacent the front of the bush, parallel thereto, there is formed a groove for receiving a sealing ring which abuts against the inner face of the axial hole of the sleeve.

18. A cone according to claim 17, characterized in that the sealing ring is integral with the supporting element.

19. A cone according to at least any one of claims 1-12, a sleeve being installed around the outer circumference of the metal bush,

characterized in that the sleeve comprises a rubber or synthetic plastics hose which abuts against the outer circumference of the bush and extends at least from the bush end averted from the shuttering to adjacent the opposite end and is rotatable at least relatively to the bush.

20. A cone according to claim 19, characterized in that the synthetic plastics or rubber hose is installed loosely around the bush and that the outer circumference of the bush is provided with a screw thread having a pitch that is opposite to that of the nut thread in the interior of the bush.

21. A cone according to claim 19, characterized in that the synthetic plastics or rubber hose, at the one end of the bush, is rotatably secured by means of a clamping ring in a groove formed on the periphery of the bush.

22. A cone according to claim 19, characterized in that the synthetic plastics or rubber hose, at the one end of the bush, is rotatably clamped around the cam-shaped raised portion formed on the periphery of the bush.

23. A cone according to claim 22, characterized in that the annular supporting element is extended backwardly, which extension extends to over the synthetic plastics or rubber hose.

24. A cone according to at least any one of claims 13-22, characterized in that at the one end of the bush there is formed a projecting portion integral therewith, which portion forms a stop for the sleeve at the side facing the bush and around the front and outer face of which there is provided a cap-shaped supporting element of rubber or synthetic plastics material.

25. A cone according to claims 21 or 22 and 24, characterized in that the cap-shaped element extends to over the end of the synthetic plastics sleeve facing the shuttering and the attachment means thereof.

26. A cone according to claim 1, characterized in that the supporting element is integral with a synthetic plastics sleeve extending at least over a part of the bush to the back thereof, while the supporting element falls over the front face of the bush, while the front face of the bush accommodates at least one resilient member biasing the supporting member towards the shuttering.

27. A cone according to claim 26, characterized in that the resilient member comprises a plurality of helical springs which are provided in axial bores in the front face of the metal bush.

28. A cone according to claim 26, characterized in that the resilient member is a helical spring situated in a concentric groove formed in the front face of the bush.

29. A ring-shaped or cap-shaped synthetic plastics supporting element for use in a cone according to any one of the preceding claims.

30. A cone according to claim 1, characterized in that a metal cross-plate is attached transversely to the screwed rod, between the bushes, which cross-plate is provided at least on one side with a bush positioned around the screwed rod, while between the inside of the bush and the screwed rod there is received a sealing means, which bush can be compressed after attachment around the screwed rod.

31. A cone according to claim 23, characterized in that the sealing means is a rubber ring.

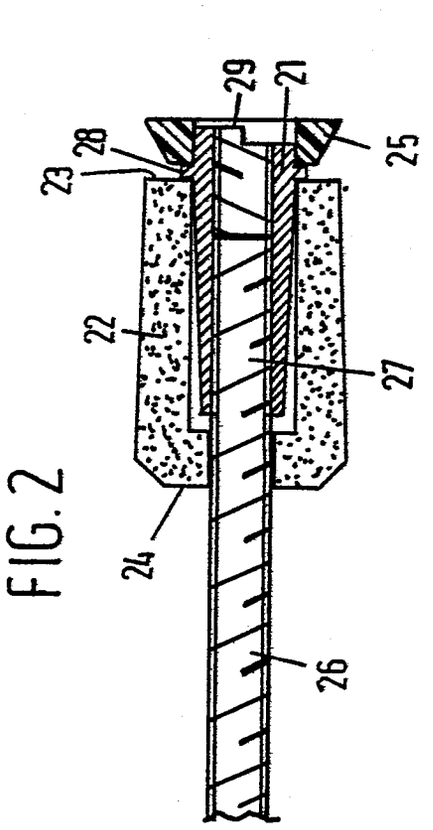


FIG. 2

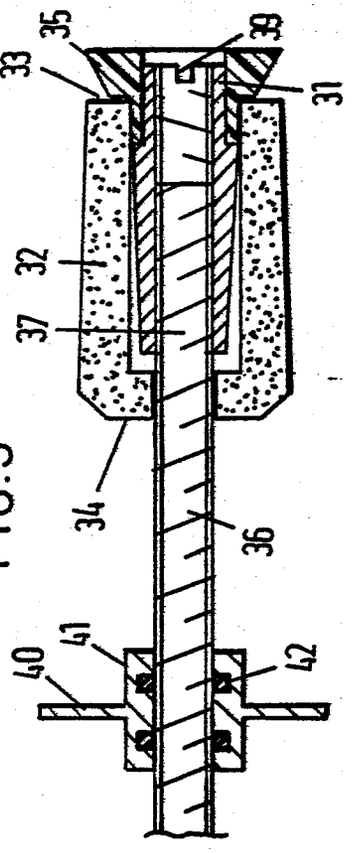


FIG. 3

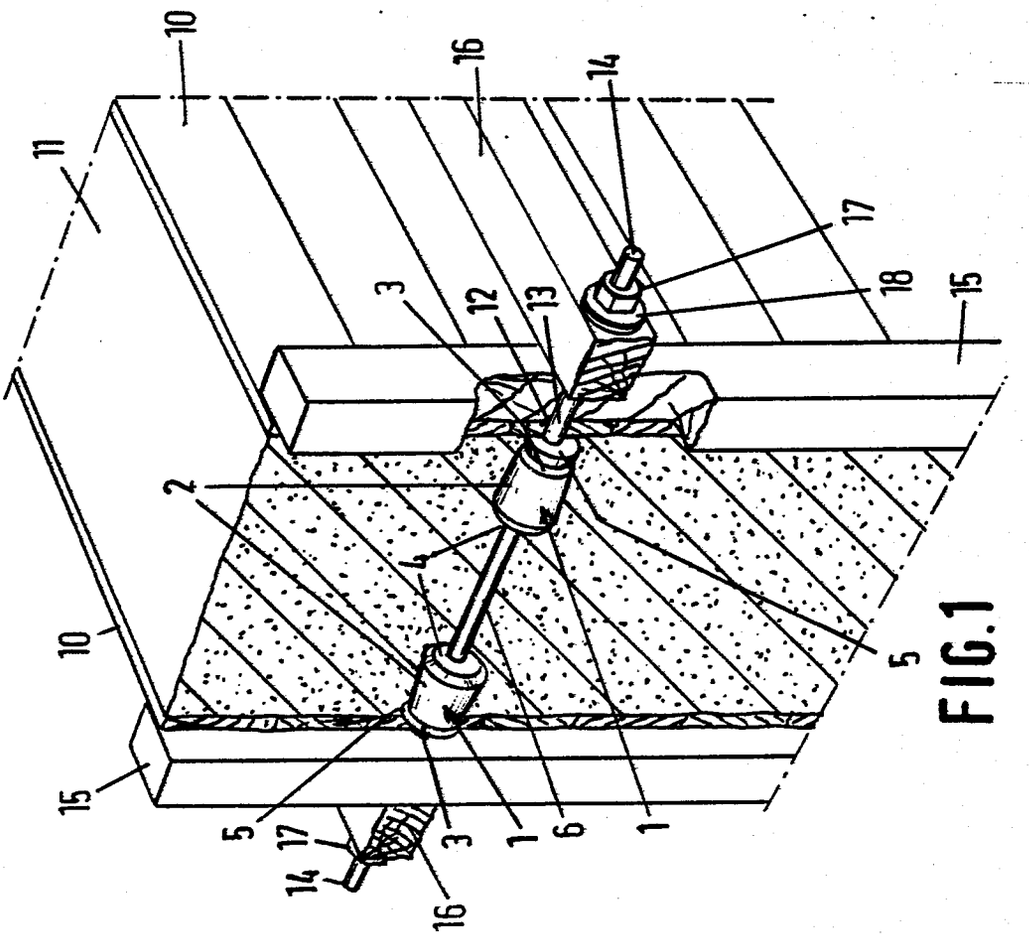


FIG. 1

FIG.6

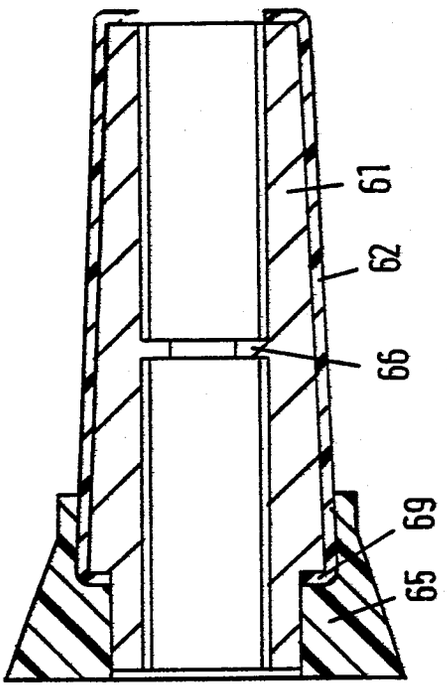


FIG.7

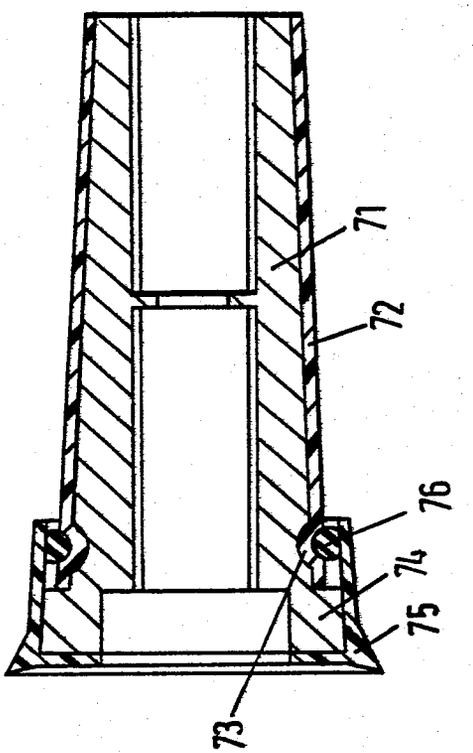


FIG.4

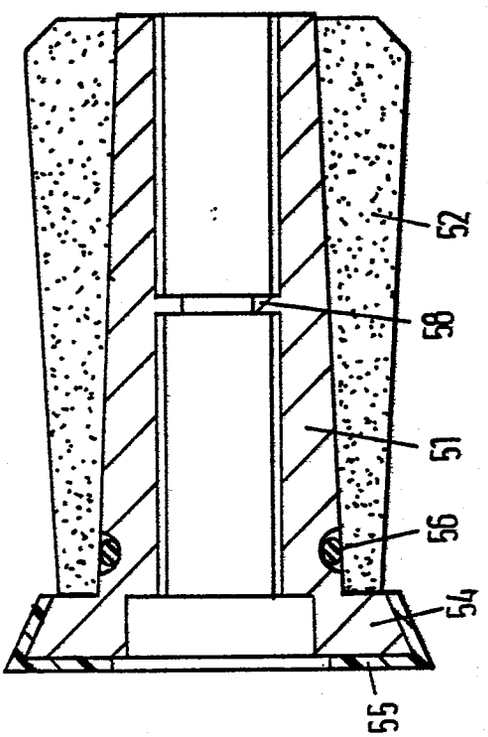
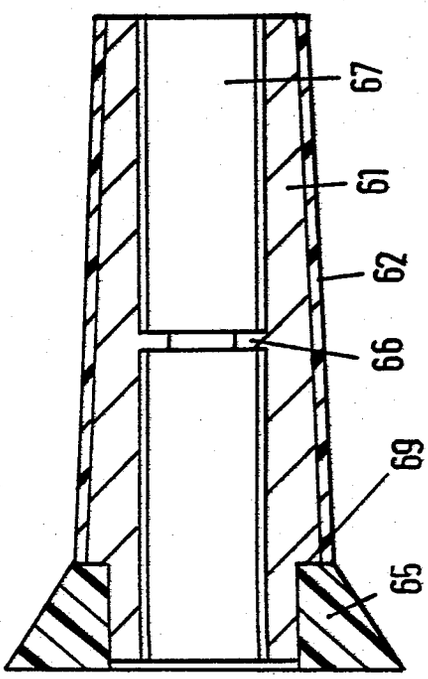


FIG.5



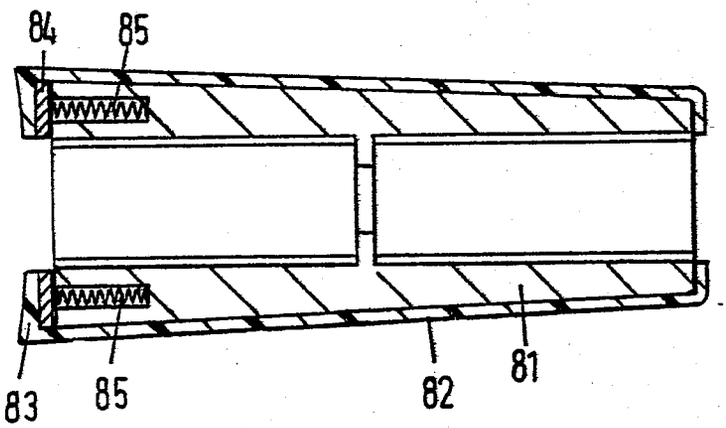


FIG.8

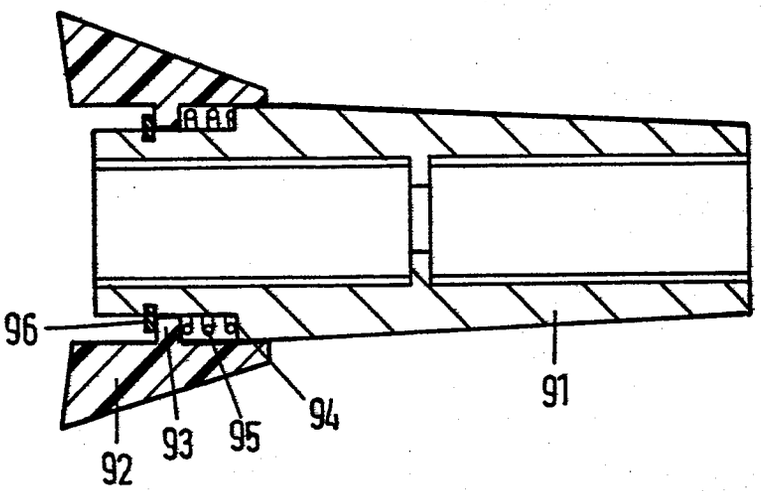


FIG.9

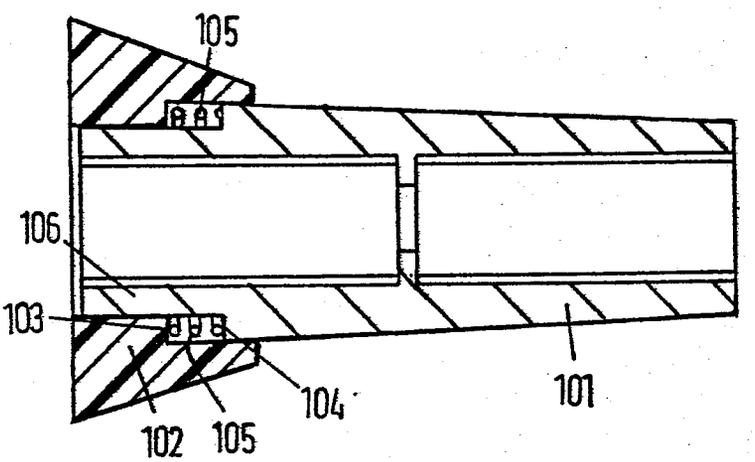


FIG.10

FIG. 11

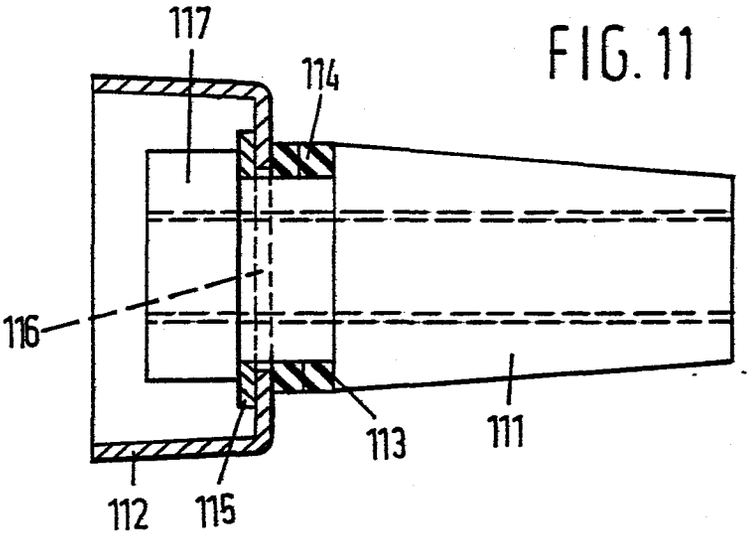


FIG. 12

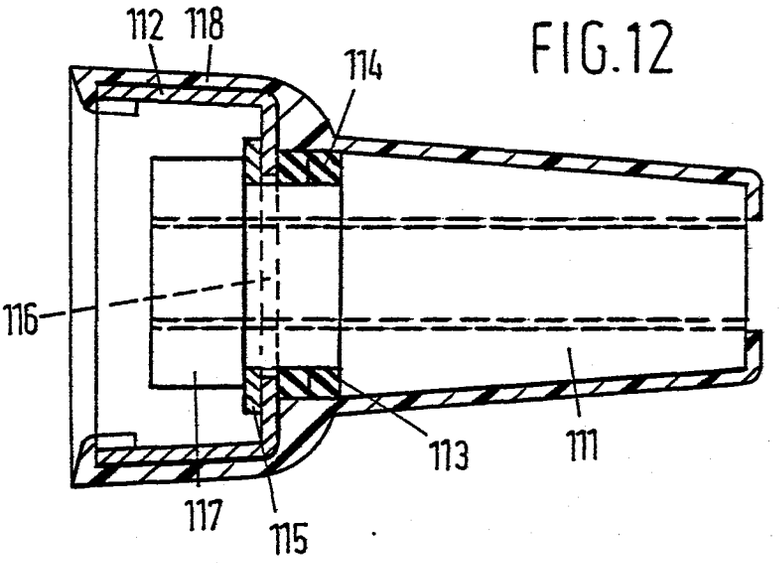


FIG. 13