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(54) AN OVERLOAD-PROTECTED BUILDING ELEMENT FOR A CONSTRUCTIONAL BUILDING SET

**EIN VOR ÜBERLASTUNG GESCHÜTZTES BAUBLOCKELEMENT FÜR EINEN
KONSTRUKTIONSBAUSATZ**

ELEMENT ANTI-SURCHARGE POUR JEU DE CONSTRUCTION

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WO-A-93/08886 **DE-A- 3 305 518**
US-A- 5 322 466

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Description

The invention concerns a toy building set of the type defined in the introductory portion of claim 1. The invention moreover concerns a screw and a building element of the type defined in the introductory portion of claim 3 and in the introductory portion of claim 7, respectively.

Toy building sets having building elements of this type are known and are marketed under the trade mark DUPLO TOOL®. The elements in question are made of plastics, e.g. ABS, and it is intended to protect them against destruction caused by mechanical overloading. Thus, the applicant has previously filed an international patent application PCT/DK95/00198 on a torque limiting coupling used in a screw or nut.

The object of the invention is to provide a toy building set comprising an externally threaded screw and a building element having an internally threaded bushing, where the parts are protected against destruction, even if a great torque is applied to the parts screwed together.

This object is achieved in that either the screw shank or the bushing is made of plastics with longitudinal slots as stated in the characterizing portion of claim 1.

It is hereby ensured either that the screw shank can be compressed or that the bushing can be expanded if the parts are subjected to a torque above a certain size. It is noted that the parts will be released from each other if the screw is subjected to a transverse torque at a distance from the thread. It is moreover ensured that the threaded parts can be disengaged from each other if the screw is tightened beyond full tightening. This provides a torque limiting coupling against overloading caused by torsion.

As stated in claim 2, there are preferably several slots which segmentally divide the threaded part into several resilient beams.

If it is the screw that is provided with slots, these may advantageously be interconnected via a diagonally or radially branched slot in the usually blunt threaded end of the screw.

If the slots are provided in the bushing of a building element, the bushing is expediently arranged so as to extend at right angles into the building element from one of its plane sides.

The bushing is usually attached to the plane face of the building element through a snap connection irreversible to the user. Here, it will be the bushing end facing away from the plane face which is provided with slots for flexible deflection. Alternatively, both ends of the bushing may be interconnected peripherally, where it is then just the central, threaded portion of the bushing which is slotted to ensure flexible deflection.

The invention moreover concerns a screw which has a hollow shank of plastics with an externally threaded section. The screw is adapted to be received in a hole having a correspondingly threaded section on another element incorporated in the toy building set.

This hole is usually in the form of a plastics bushing made by injection moulding which is provided as an insert in the building element. Along part of the length of the screw shank the screw is formed with a slot which extends along the threaded section toward the end of the shank.

If the screw is loaded by a pull in its longitudinal direction caused by torsion or transverse forces, its slotted shank will serve as resilient beams which bend inwards when the force reaches a certain size, whereby the cooperating threaded sections are disengaged from each other and the screw is therefore released from the building element without being permanently damaged.

In a preferred embodiment, the screw has two slots positioned diametrically opposite each other. In a particularly expedient embodiment, the screw is formed with three longitudinal slots which divide the threaded section of the shank into three segments of the same size. The resulting resilient beams ensure that the screw is released by the same force irrespective of its direction of application.

In addition, the invention concerns a building element for a toy building set. The building element comprises a cylindrical plastics bushing having an internal thread to receive a shank of a screw with a correspondingly threaded section. The bushing is formed with at least one slot which extends along the threaded section.

If the screw is subjected to a load of a certain size, the slotted part of the bushing bends outwards, thereby releasing the screw from the bushing having a screw hole. The bushing will frequently be made from plastics by injection moulding and be subsequently assembled with the main body of the building element. If the slots are oriented in the same direction as the core removal of the mould, it is frequently an advantage for the bushing to be an integral part of the main body.

The bushing of the building element frequently has several longitudinal slots which have the same axial extent and which segmentally divide the bushing into resilient portions. Generally, it is easier to dimension the bushing such that the intended resilient properties are achieved if several resilient beams are formed. The same applies to the screw when it is formed with slots. If the slots are arranged equidistantly around the periphery, directionally independent compression and expansion, respectively, of screw and bushing, respectively, can be achieved most easily.

The invention will be described more fully below in connection with preferred embodiments and with reference to the drawing, in which:

fig. 1 is a schematic lateral view of two building elements having a screw and a bushing according to the invention;

fig. 2 is a lateral enlarged view of the slotted screw shown in fig. 1;

fig. 3 is a longitudinal section of the screw shown in fig. 2;

fig. 4 is a partly sectional view of an alternative embodiment of a screw according to the invention and building element in a connected position;

fig. 5 is a section of the connection shown in fig. 4 along the line V-V;

fig. 6 is a sectional view of a preferred embodiment of a bushing in a building element according to the invention, said bushing being shown in a connection corresponding to fig. 5;

fig. 7 is a sectional view of an alternative embodiment of a bushing in a building element according to the invention, said bushing being shown in a connection corresponding to fig. 5; and

fig. 8 is a sectional view of a further embodiment of a bushing according to the invention with axially terminated slots.

Fig. 1 shows two building elements 10 and 11 which are marketed under the trade mark DUPLO TOOLO®. Some of the possibilities of playing with the elements are described in EP-A-0 612 262, from which it also appears that the building element 10 has a rotatably mounted insert in the form of a screw 12 of plastics. The screw 12 is slidably mounted so that it can perform an axial movement between two stops. Screwing-in of the screw with a tool adapted for the purpose, which is included in the building set, strengthens the coupling that is achieved when connecting the building elements by means of their coupling studs on the upper side and the complementary coupling means or recesses on the underside.

The screw 12 itself is shown alone in figs. 2 and 3, i.e. it has been taken out of the building element 10 shown in fig. 1. The screw 12 is made as a hollow member of plastics and has a body part 13 with two rounded projections 18 and 19, which serve as stops in the above-mentioned axial displacement of the screw. A shank part 14 is integrated with the body part 13, and it has an external thread 16. In a preferred embodiment of the invention, the screw is unique by having an axially extending slot 17.

The shown embodiment actually involves two slots 17 which extend in the axial direction of the screw and meet in the blunt bottom end 20 of the screw member. It is important to the invention that the slot radially extends along the entire part of the thread which engages a correspondingly threaded section on a bushing or a threaded hole.

It will be seen from fig. 3 that the body part 13 is formed with a cavity 15 which is open at the end of the screw and which is adapted to receive and retain the tip

of the above-mentioned tool, so that the screw follows the rotation of the tool.

Fig. 4 shows the shank of the screw of figs. 2 and 3 screwed into a bushing 20 in the upper side of the building element 11 shown in fig. 1. The bushing 20 has an internal thread 21 which cooperates with the thread 16 of the shank. The invention has been found to be particularly expedient when the cooperating threaded sections have a relatively great pitch and few turns. In a particularly expedient embodiment of the invention, the screw has a little more than one turn, while the bushing has a little less than one turn. Hereby, the actual thread turn of the screw just has to pass a corresponding thread turn on the bushing when the beams formed by the slotting of the shank 13 bend or flex inwards.

It should also be noted that the thread turns may advantageously be rounded in cross-section since, otherwise, visible wear may occur on the thread if separation is effected repeatedly. However, the invention will work well even if the thread turns have a triangular cross-section, and even if several turns are present, provided that the threaded section is mounted with the necessary resiliency.

When a force is applied to the screw in the direction A, as shown in fig. 4, a capsizing point 22 will occur, causing the shank of the screw to act as an inwardly swinging beam, which is shown by the arrow a. The thread turns 16, 21 can hereby pass each other in an area 23.

Fig. 5 shows an alternative embodiment of a screw according to the invention, said figure showing a cross-section corresponding to a section taken along the line V-V in fig. 4. The screw differs from this in that its shank 13 has three slots 17 equidistantly spaced peripherally. Three substantially uniform beams are formed hereby, said threaded section 16 being provided on said beams. The bushing 11 having the internally threaded section 21 corresponds to the bushing shown in fig. 4.

Fig. 6 is a cross-sectional view of a further embodiment of the invention, where it is the bushing 11 which is formed with two longitudinal slots 24 ensuring that the parts of the bushing 11 on which the threaded section 21 is provided can bend or flex outwards, thereby enabling the screw to be released in the same manner as explained in connection with fig. 4.

Like fig. 6, fig. 7 shows a connection where it is the bushing which is provided with slots 24, there being three equidistantly arranged slots 24 in this embodiment. It will be seen from fig. 8, which shows the bushing 11 in longitudinal section, that the slots 24 do not necessarily extend right through the bushing, but may be terminated in bridges 25, which nevertheless provide the necessary flexibility.

The torque required to disengage the threaded sections is determined i.a. by the overlap of the threads, i.e. the displacement required for the thread turns to pass each other, and by the number of thread turns. The easy with which the displacements can take place, depends

on the resilient properties of the beams formed in the shank or the bushing. These properties depend i.e. on wall thickness, selection of material, width in the peripheral direction, length and location of the slots with respect to the threaded section, and on whether the slots extend axially or are twisted. Thus, nothing prevents the slots from extending in the longitudinal direction, but e.g. with an opposite pitch with respect to the thread turns.

The invention has been explained in the foregoing in connection with a bushing; but as long as it is the screw which is provided with slots, it can be used within the scope of the invention in a solid member having a hole which is provided with threads, it being just the threaded opening that is required.

When the threaded part has two diametrically positioned longitudinal slots, it may be advantageous in some cases to interrupt or remove the thread turns in areas offset about one fourth of a turn with respect to the slots. Both screws and bushings are preferably made of a plastics material such as ABS, HI-POM or a material having similar properties.

Claims

1. A toy building set comprising a screw (12) having a hollow shank (14) of plastics whose outer side is formed with a threaded section, as well as a building element (11) having a plastics bushing (20) with a corresponding, internally threaded section **characterized** in that either the bushing (20) or the screw shank (14) is formed with at least one slot (17,24) along part of its length, said slot (17,24) extending along the threaded section.
2. A toy building set according to claim 1, **characterized** in that the bushing (20) and/or the screw shank (14) is formed with several longitudinal slots (17,24) which have the same axial extent and which segmentally divide the screw shank (14) and/or the bushing (20) into resilient portions.
3. A screw (12) for a toy building set, comprising a hollow shank (14) of plastics whose outer side is formed with a threaded section to be received in a hole having a correspondingly threaded section on another element (11) incorporated in the toy building set, **characterized** in that the screw shank (14) is formed with at least one slot (17) along part of its length, said slot (17) extending through the threaded section.
4. A screw (12) according to claim 3, **characterized** in that the screw shank (14) is formed with several longitudinal slots (17) which have the same axial extent and which segmentally divide the screw shank (14) into resilient portions.

5. A screw (12) according to claim 3 or 4, **characterized** in that the shank (14) has two slots (17), thereby making the resilient portions semi-cylindrical.
6. A screw (12) according to claim 3 or 4, **characterized** in that the shank (14) has three equidistantly arranged slots (17) in the peripheral direction.
7. A building element (11) for a toy building set, comprising a cylindrical plastics bushing (20) having an internally threaded section to receive a shank (14) of a screw (12) having a correspondingly threaded section, **characterized** in that the bushing (20) is formed with at least one slot (24) along part of this length, said slot (24) extending through the threaded section.
8. A building element (11) according to claim 7, **characterized** in that the bushing (20) is formed with several longitudinal slots (24) which have the same axial extent and which segmentally divide the bushing (20) into resilient portions.
9. A building element (11) according to claim 7 or 8, **characterized** in that the bushing (20) has two slots (24), thereby making the resilient portions semi-cylindrical.
10. A building element (11) according to claim 7 or 8, **characterized** in that the bushing (20) has three equidistantly arranged slots (24) in the peripheral direction.

Patentansprüche

1. Bauspielsatz, aufweisend eine Schraube (12) mit einem hohlen Schaft (14) aus Kunststoff, dessen Aussenseite mit einem Gewindeteil ausgebildet ist, und ein Bauelement (11) mit einer Kunststoffbuchse (20) mit einem entsprechenden Innengewindeteil, dadurch gekennzeichnet, dass entweder die Buchse oder der Gewinde- oder Schraubenschaft (14) mit wenigstens einem sich über einen Teil der Länge erstreckenden Schlitz (17, 24) ausgebildet ist, wobei der Schlitz (12, 24) sich über den Gewindeabschnitt erstreckt.
2. Bauelementsatz nach Anspruch 1, dadurch gekennzeichnet, dass die Buchse (20) und/oder der Schraubenschaft (14) mit mehreren Längsschlitzen (24) ausgebildet sind/ist, welche die gleiche axiale Erstreckung haben und welche segmentmässig den Schraubenschaft (14) und/oder die Buchse in nachgiebige oder federnde Bereiche aufteilen.
3. Schraube (12) für einen Bauspielsatz, aufweisend

einen hohlen Schaft (14) aus Kunststoff, dessen Aussenseite mit einem Gewindeteil ausgebildet ist, der in einer entsprechend ausgebildeten Gewindebohrung an einem anderen Element aufgenommen werden kann, welches zu dem Bauspielsatz gehört, dadurch gekennzeichnet, dass der Schraubenschaft (14) mit wenigstens einem Schlitz (12) längs seiner Längserstreckung ausgebildet ist, wobei der Schlitz (12) sich durch den Gewindeteil hindurcherstreckt.

4. Schraube (12) nach Anspruch 3, dadurch gekennzeichnet, dass der Schraubenschaft (14) mit mehreren Längsschlitzen (17) ausgebildet ist, welche die gleiche axiale Erstreckung haben und welche den Schraubenschaft (14) in nachgiebige oder federnde Bereiche segmentmässig unterteilen.

5. Schraube (12) nach einem der Ansprüche 3 oder 4, dadurch gekennzeichnet, dass der Schaft (14) zwei Schlitz (12) aufweist, um dadurch die nachgiebigen oder federnden Bereiche halbzylindrisch auszubilden.

6. Schraube (12) nach einem der Ansprüche 3 oder 4, dadurch gekennzeichnet, dass der Schaft (14) drei mit gleichem Abstand über den Umfang verteilte Schlitz (17) aufweist.

7. Bauelement (11) für einen Bauspielsatz, aufweisend eine zylindrische Kunststoffbuchse mit Innengewinde, um einen Schaft (14) einer Schraube (12) mit dem entsprechenden Gewinde aufzunehmen, dadurch gekennzeichnet, dass die Buchse (20) mit wenigstens einem Schlitz (24) längs eines Teiles dieser Längserstreckung ausgebildet ist, wobei der Schlitz (24) sich durch den Gewindeteil hindurcherstreckt.

8. Bauelement nach Anspruch 7, dadurch gekennzeichnet, dass die Buchse (20) mit mehreren Längsschlitzen (24) ausgebildet ist, welche die gleiche Axialerstreckung haben und die die Buchse (20) in nachgiebige oder federnde Bereiche segmentmässig unterteilen.

9. Bauelement nach Anspruch 7 oder 8, dadurch gekennzeichnet, dass die Buchse zwei Schlitz (24) aufweist, um dadurch die nachgiebigen oder federnden Bereiche zylinderförmig auszugestalten.

10. Bauelement nach Anspruch 7 oder 8, dadurch gekennzeichnet, dass die Buchse (20) drei in Umfangsrichtung im gleichen Abstand angeordnete Schlitz (24) aufweist.

Revendications

1. Jeu de construction comportant une vis (12) ayant une tige creuse (14) constituée de matière plastique dont le côté extérieur est muni d'un tronçon fileté, ainsi qu'un élément de construction (11) ayant une douille en matière plastique (20) munie d'un tronçon fileté intérieurement de manière complémentaire, caractérisé en ce que la douille (20) ou la tige de vis (14) est munie d'au moins une fente (17, 24) le long d'une partie de sa longueur, ladite fente (17, 24) s'étendant le long du tronçon fileté.

2. Jeu de construction selon la revendication 1, caractérisé en ce que la douille (20) et/ou la tige de vis (14) est munie de plusieurs fentes longitudinales (17, 24) qui ont la même étendue axiale et qui divisent en segments la tige de vis (14) et/ou la douille (20) en parties élastiques.

3. Vis (12) pour jeu de construction, comportant une tige creuse (14) constituée de matière plastique dont le côté extérieur est muni d'un tronçon fileté destiné à être reçu dans un trou ayant un tronçon fileté de manière complémentaire existant dans un autre élément (11) incorporé dans le jeu de construction, caractérisée en ce que la tige de vis (14) est munie d'au moins une fente (17) le long d'une partie de sa longueur, ladite fente (17) s'étendant à travers le tronçon fileté.

4. Vis (12) selon la revendication 3, caractérisée en ce que la tige de vis (14) est munie de plusieurs fentes longitudinales (17) qui ont la même étendue axiale et qui divisent en segments la tige de vis (14) en parties élastiques.

5. Vis (12) selon la revendication 3 ou 4, caractérisée en ce que la tige (14) a deux fentes (17), de manière à rendre les parties élastiques semi-cylindriques.

6. Vis (12) selon la revendication 3 ou 4, caractérisée en ce que la tige (14) a trois fentes agencées de manière équidistante (17) dans la direction périphérique.

7. Élément de construction (11) d'un jeu de construction, comportant une douille en matière plastique cylindrique (20) ayant un tronçon fileté intérieurement destiné à recevoir une tige (14) d'une vis (12) ayant un tronçon fileté de manière complémentaire, caractérisé en ce que la douille (20) est munie d'au moins une fente (24) le long d'une partie de sa longueur, ladite fente (24) s'étendant à travers le tronçon fileté.

8. Élément de construction (11) selon la revendication

7, caractérisé en ce que la douille (20) est munie de plusieurs fentes longitudinales (24) qui ont la même étendue axiale et qui divisent en segments la douille (20) en parties élastiques.

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9. Élément de construction (11) selon la revendication 7 ou 8, caractérisé en ce que la douille (20) a deux fentes (24), de manière à rendre les parties élastiques semi-cylindriques.

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10. Élément de construction (11) selon la revendication 7 ou 8, caractérisé en ce que la douille (20) a trois fentes agencées de manière équidistante (24) dans la direction périphérique.

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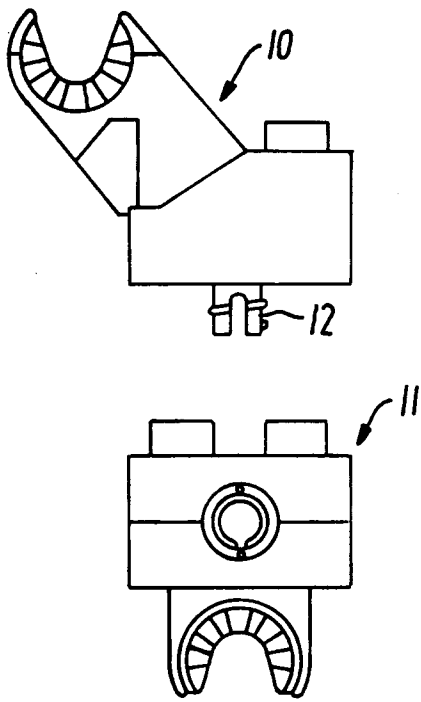


FIG. 1

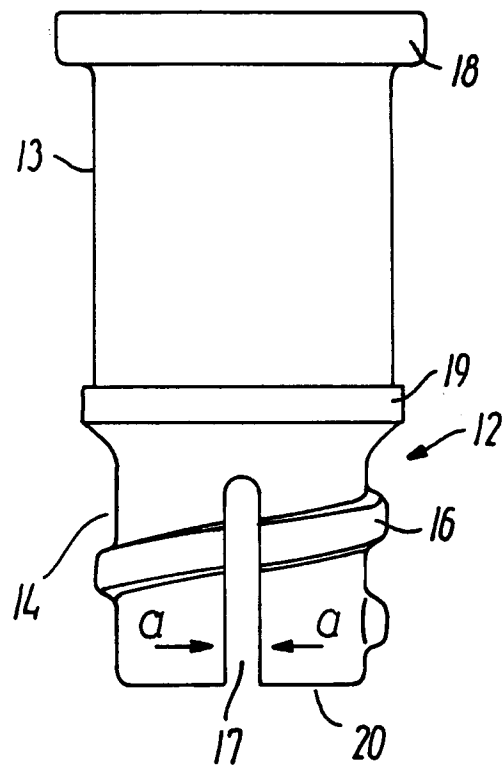


FIG. 2

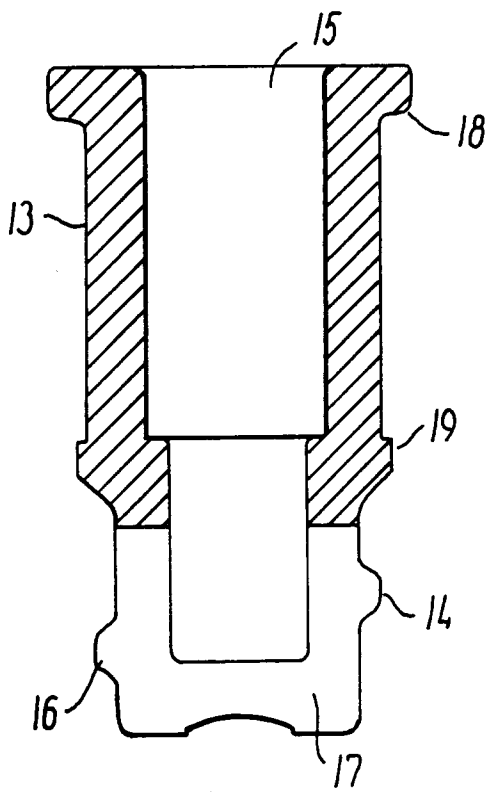


FIG. 3

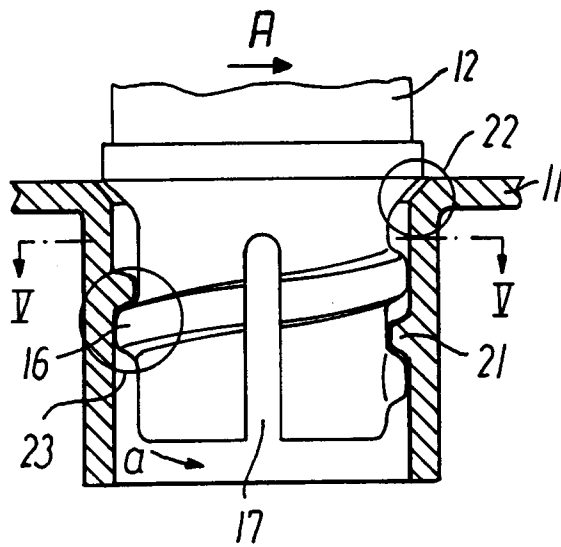


FIG. 4

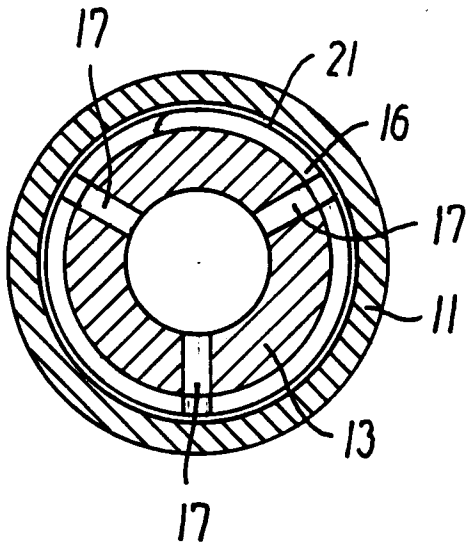


FIG. 5

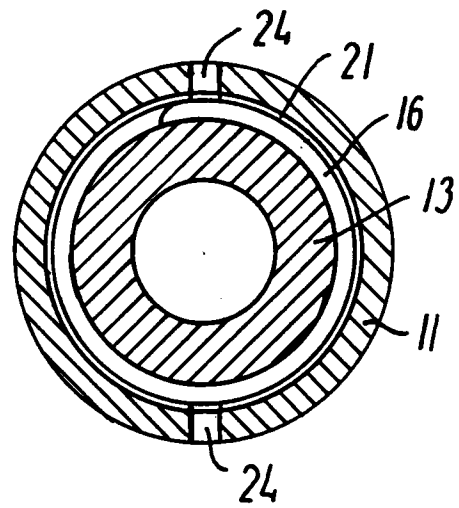


FIG. 6

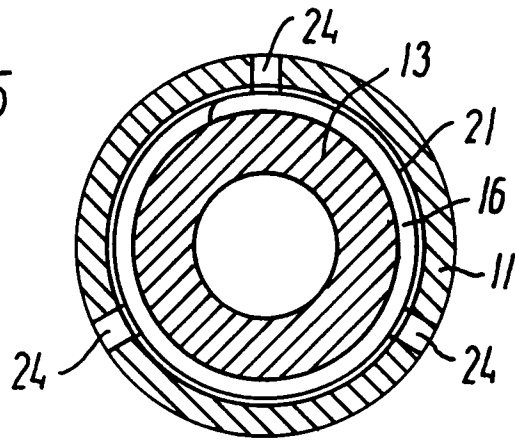


FIG. 7

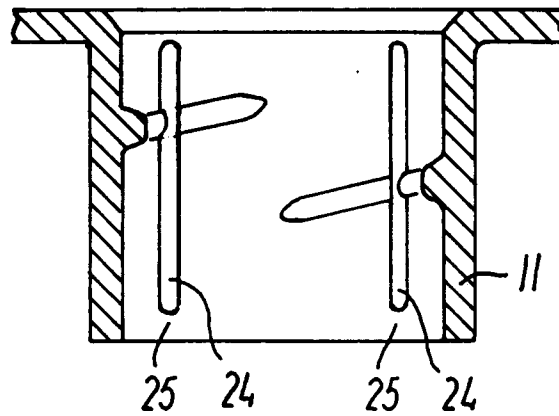


FIG. 8