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(54) Releasable closure arrangement.

(57) A device for releasing a load (3) from a housing (1) on impact with water. The load is supported in the housing by an O-ring (7) which is stretched about the load and fits into a shaped recess (11). On impact with the water the load is forced upwards into the housing, but the O-ring is prevented from moving upwards by a stop. The O-ring relaxes when the load has moved up far enough to be clear of it, then falls free. The load itself is then free to fall from the housing under the force of gravity.

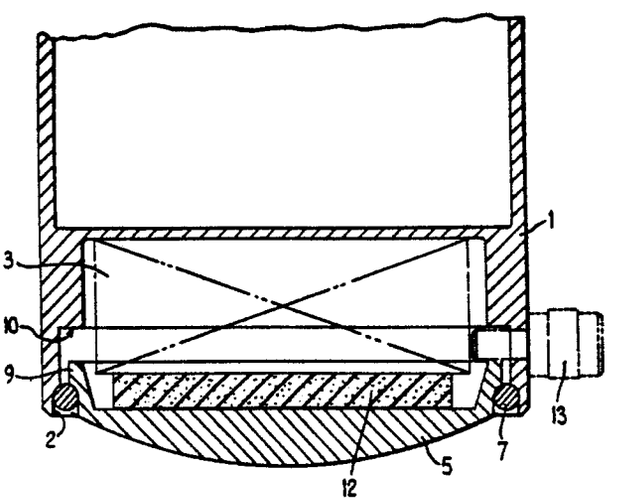

FIG.1

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Releasable Closure Arrangement.

This invention relates to a releasable closure arrangement and particularly to a closure arrangement designed to release on impact with a surface of water.

Present systems designed to release a load from a housing on impact with water rely on shearing pegs or pins whose breaking properties are prone to be variable, making deployment unpredictable. Other systems use stored energy devices, which may be costly.

An object of this invention is to provide a releasable closure arrangement which alleviates these problems.

According to the invention a releasable closure arrangment comprises a housing and a closure member adapted to fit loosely in the housing, resilient means adapted to fit in a compressed condition in a predetermined stable position between the closure member and the housing to hold the closure member in the housing, the inner surface of the housing and the outer surface of the closure member being of such formation that forcible displacement of the closure member into the housing causes said resilient means to be dislodged from said stable position into a relatively unstressed condition allowing the closure member to be released from the housing.

The inner surface of the housing or the outer surface of the closure member or both may be shaped so as to afford further support for said closure member. The resilient means may be prevented from moving from said stable position into the housing by a shoulder protruding from the inner surface of the housing. The closure member preferably moves from the housing under the force of gravity after release of the resilient means.

The resilient means is preferably an O-ring may be elastic and arranged to be stretched about the housed closure member and to relax to a smaller diameter when the closure member is forcibly displaced into the housing.

The arrangement preferably includes means to limit the movement of the closure member into the housing. The arrangement may comprise a removable spigot arranged to engage a hole in the housing to prevent release of the closure member. The spigot may be one of a number on a ring arranged to be placed about the housing and to be readily removable.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings of which:-

Figure 1 shows in cross section an arrangement in accordance with the invention prior to release; and

Figure 2 shows the arrangement on the point of release.

The arrangement shown in the drawings comprises a housing 1 containing sonar equipment 3 sealed with a nosecap 5 which is designed to be released on impact with the water, the whole system being deployed from an aircraft. Figure 1 shows the equipment 3 held in place by the closure member (nosecap 5) which is itself held in place by a stretched elastic O-ring 7. The housing 1, equipment 3 and nosecap 5 are all of circular cross section. On impact with the water the nosecap 5 is forced upwards, the O-ring is prevented from following by the formation of the inner wall 2 of the housing, snaps off the nosecap into a relaxed condition and the nosecap, equipment and O-ring are all then free to descend out of the housing 1 into the water.

A groove 11 is cut in the inner wall 2 near the mouth of the housing 1 whilst the nosecap 5 is formed with a roundcut shoulder or ridge 9. When the nosecap is assembled in the housing the hollow beneath the ridge 9 is aligned with the groove 11 so an annular channel is formed between the two members. Jigging pins 13 (one shown) are used in the assembly and then removed. The O-ring 7 is stretched about the nosecap to abut the ridge 9 and, when assembled, is compressed tightly in the channel between the two members. With the O-ring held in this stable position the nosecap is supported in the housing, and the nosecap 5 in turn supports the sonar equipment 3 which rests on a resilient foam pad 12.

Various modifications may be made to this arrangement. For instance, the ridge 9 can be omitted if the frictional resistance is high enough or the equipment 3 light enough. On the other hand, if more support is required, the groove 11 may be formed with a protruding lower edge on which the O-ring can rest.

Figure 2 shows the system immediately after its impact on the surface of the water. The nosecap 5 is forced upwards into the housing. The O-ring, however, is trapped in its stable position by the upper edge of the groove 11 and cannot move with the nosecap. At a certain distance above the groove 11, the inner diameter of the housing 1 becomes less than the outer diameter of the nosecap 5. The shoulder 10 formed at this change of diameter limits the nosecap's upward travel but allows it to move far enough to release the O-ring as a part of the nosecap of decreased diameter moves adjacent the O-ring. This therefore relaxes, springing away from the housing wall. The equipment 3, nosecap 5 and O-ring 7 are then free to

descend under gravity into the water.

The nosecap may take a variety of shapes besides that shown in the drawings, though a rounded surface is preferable for smooth entry into the water. The O-ring is not necessarily released from the nosecap - it could simply snap on to a narrower part of it.

For security against accidental release before deployment, the jigging pins 13 shown in Figure 1 may be replaced with spigots or pins which prevent the nosecap from moving up into the housing. In an alternative arrangement these security pins could be arranged to penetrate the housing and the nosecap so as to hold the nosecap fixedly in the housing. The pins (or pin) may be replaced with a throwaway ring made of plastic, say, supporting a number of spigots which engage spigot holes in the housing. The ring is split in one place and snaps about the housing. It can then be quickly and easily removed immediately before launch.

Resilient balls or cylindrical blocks could be used instead of an O-ring. The force required to release the nosecap is determined by the degree of compression of the O-ring or other resilient means between the housing and the nosecap. For a system intended to be launched from an aircraft this force determines the minimum launch height.

Claims

1. A releasable closure arrangement comprising a housing (1) and a closure member (5) adapted to fit loosely in said housing, characterised in that a resilient means (7) is adapted to fit in a compressed condition in a predetermined stable position between the closure member and the housing to hold the closure member in the housing, the inner surface (2) of the housing and the outer surface of the closure member being of such formation that forcible displacement of the closure member into the housing causes said resilient means to be dislodged from said stable position into a relatively unstressed condition allowing the closure member to be released from the housing.

2. A closure arrangement according to Claim 1 wherein the inner surface of said housing is shaped (11) so as to afford further support for said closure member.

3. A closure arrangement according to Claim 1 or 2 wherein the outer surface of the closure member is shaped (9) so as to afford further support for said closure member.

4. A closure arrangement according to any preceding claim wherein said resilient means is prevented from moving from said stable position into the housing by a shoulder protruding from the inner surface of the housing.

5. A closure arrangement according to any preceding claim wherein the closure member moves from the housing under the force of gravity after release of the resilient means.

6. A closure arrangement according to any preceding claim wherein said resilient means is an elastic O-ring (7) arranged to be stretched about the housed closure member and to relax to a smaller diameter when the closure member is forcibly displaced into the housing.

7. A closure arrangement according to any preceding claim including means (10) to limit the movement of the closure member into the housing.

8. A closure arrangement according to any preceding claim comprising a removable spigot arranged to engage a hole in the housing to prevent release of the closure member.

9. A closure arrangement according to Claim 8 wherein said spigot is one of a number on a ring arranged to be placed about the housing and to be readily removable.

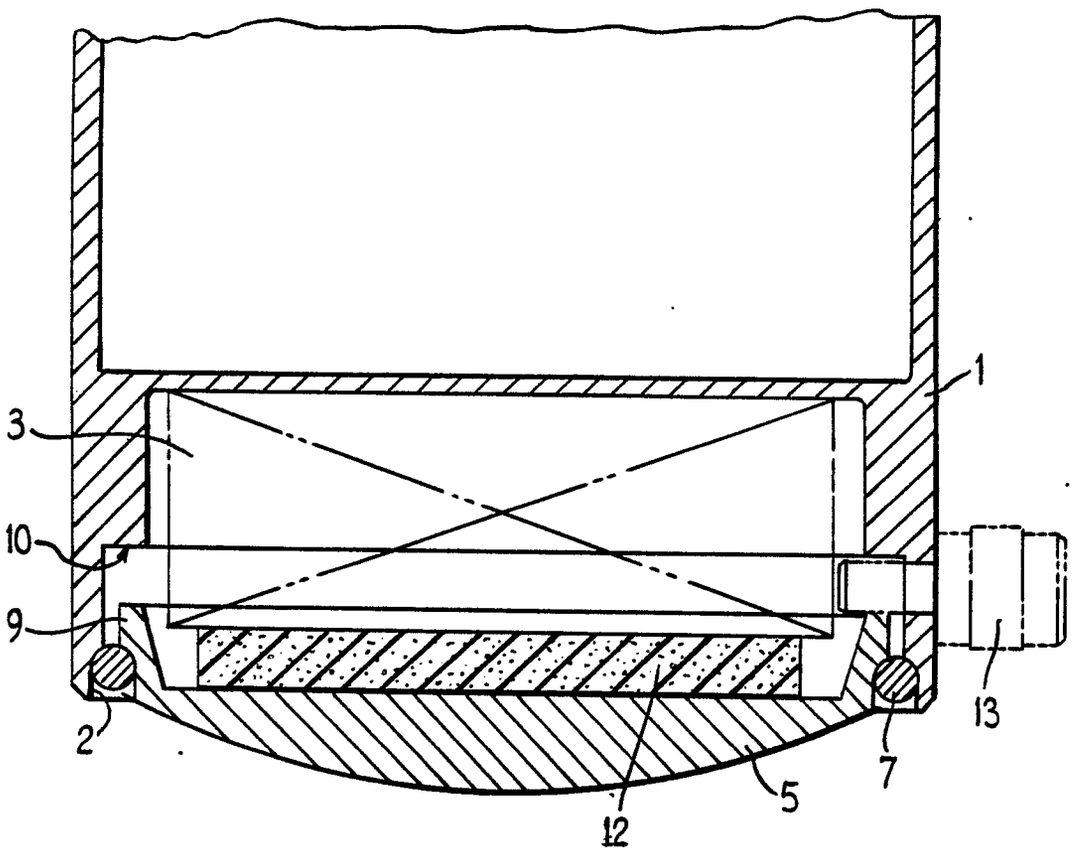

FIG.1

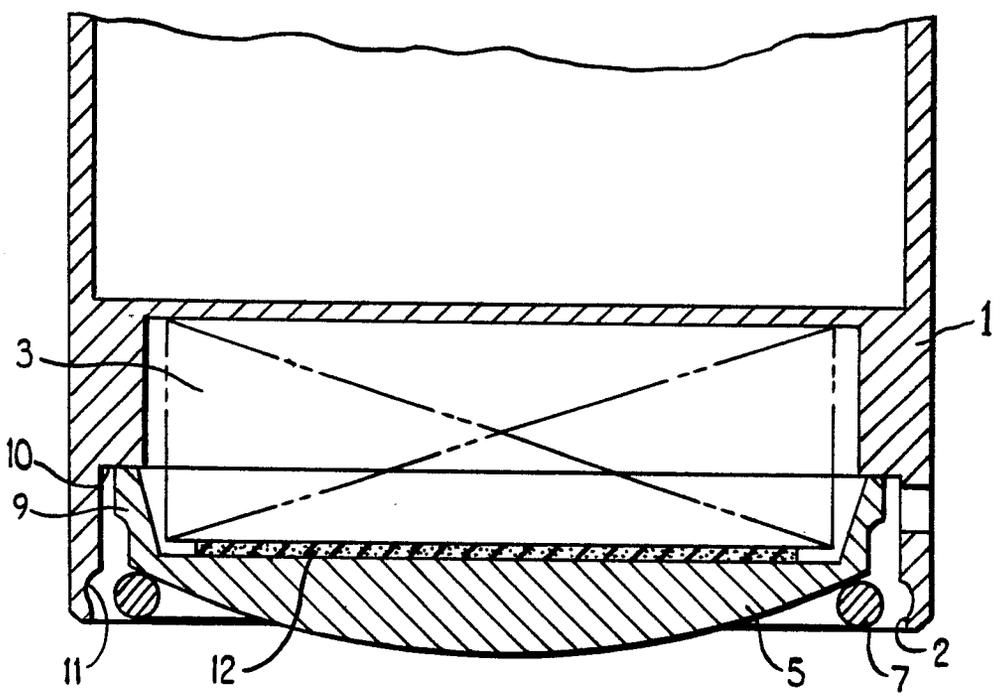

FIG.2