

CLOSING DEVICE

The present invention relates to closing devices of the over-centre type, particularly for closing housings, especially cable splice closure housings, either as part of the housing itself or as part of a clamp for fastening together first and second parts of the housing.

EP 0 094 848B (Raychem) discloses an enclosure for protecting cable joints from the environment. The enclosure comprises two parts e.g. a closure and a base. The two parts are held together by a clamping ring which forces flanges on the two parts together. No details are given of the clamping ring.

US 5 059 748 (Raychem) discloses a butt splice cable splice closure comprising a dome and base held together by a clamping ring. The ring is in two parts, which are hinged together at their ends opposite the hinge by a threaded bolt acting in threaded portions adjoining the ends of the parts of the rings.

GB 2 193 605A discloses a cable joint comprising a two part hollow sleeve and two end caps which can be clamped together by a clamping ring at each end. The clamping ring is in two parts hinged together with the ends remote from the hinge being provided with threaded portions which enable them to be brought together by means of a bolt.

Cable splice closures, for example for optical fibre cables, in which a base and a cover are fastened together by means of a clamp, e.g. a split ring clamp, which is closed in its clamping position by means of an over-centre closing device are commercially available.

A problem with conventional clamps is that it is often difficult for an engineer in the field to close a clamp around a cable splice closure housing, particularly when



the clamp and/or the housing is/are new. Often the engineer has to resort to hitting the clamp with a hammer or a mallet (which may damage the housing and/or the cables, and generally makes installation difficult) in order to close it sufficiently so that the lever of the over-centre closing device of the clamp can be operated to close the clamp fully. It would therefore be desirable to make the initial stage of closing the clamp easier.

It is often necessary to re-open cable splice closure housings in order to gain access to the cable splices. Conventional cable splice closure clamps often suffer from the problem that they are difficult to remove from the housing of the closure once they have been closed, particularly when they have been closed for some time. At present, the engineer who opens a housing often has to use a separate tool (which, at least in some cases is a specially designed tool) to help him to open the clamp and remove it from the housing. It would be desirable to remove the need for the use of such tools.

According to a first aspect of the present invention, there is provided an over-centre closing device for closing together first and second parts of an article, comprising a lever pivotally attached to an arm which is pivotally mounted to the first part of the article, the lever having an engagement surface which engages the second part of the article and fastens the two parts of the article together when the lever is in its over-centre position in use, wherein the lever has an extension which extends beyond the engagement surface and which may cooperate with the second part of the article to provide initial closing leverage during an initial stage of closing the article and which allows the engagement surface to contact the second part of the article to provide final closing leverage during a final stage of closing the article.

The first aspect of the invention has the advantage that because the lever has an extension which may cooperate with the second part of the article (the article may, for example, comprise a clamp, or a housing itself) to provide initial closing leverage during an initial stage of closing the article, this initial stage of closing the article is





made easier and normally avoids the necessity of hitting the clamp, thereby solving the first problem mentioned above.

According to a second aspect of the invention, there is provided an over-centre closing device for closing together first and second parts of an article, comprising a lever pivotally attached to an arm which is pivotally mounted to the first part of the article, the lever having an engagement surface which engages the second part of the article and fastens the two parts of the article together when the lever is in its over-centre position in use, wherein the lever has an extension which extends beyond the engagement surface and which may cooperate with the second part of the article to provide an initial opening leverage during an initial stage of opening the article.

The second aspect of the invention has the advantage that because the lever has an extension which extends beyond the engagement surface and which may cooperate with the second part of the article to provide an initial opening leverage during an initial stage of opening the article, the necessity of using a separate tool to facilitate opening of the clamp is avoided, thereby solving the second problem mentioned above. Advantageously, the leverage provided by the closing device of the invention provides at least some radially outward movement of the clamp, e.g. radially away from a housing around which it is positioned. This normally enhances the ease with which the clamp may be opened and removed, and is particularly difficult to achieve without the extension of the lever according to the invention.

Preferably the first and second aspects of the invention are combined in a single over-centre closing device.

Preferably the second part of the article has a protrusion, and the cooperation of the extension of the lever with the second part of the article comprises contact between the extension and the protrusion. Advantageously, the extension may have a



hook-like part which engages the protrusion during the cooperation of the extension with the protrusion.

The article may comprise a housing, preferably a cable splice closure housing. Preferably, however, the article comprises a clamp, especially a clamp in the form of a split ring. The split ring may be non-circular, e.g. oval or angular, but normally it will be substantially circular when closed. The split ring is preferably hinged to enable it to be opened, placed around a housing etc., and closed in place. The invention may consequently provide a clamp for fastening together first and second parts of a housing, comprising a split ring and an over-centre closing device according to the invention, the split ring comprising the article and the over-centre closing device closing the split ring in a clamping position in use. The housing preferably comprises a cable splice closure housing. The clamp preferably fastens together peripheral flanges on the first and second parts of the housing. The clamp is preferably provided with means, e.g. angled portions, which cooperate with corresponding portions, e.g. flanges, on the parts to be clamped so that closing of the clamp urges the parts together.

Preferably a pair of extensions are provided on the lever, each of which preferably cooperates with a protrusion on the second part of the article (e.g. clamp).

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

Figure 1 is a perspective view of a clamp according to the invention prior to the initial stage of closing.

Figure 2 is a perspective view of the clamp of Figure 1 in the closed position prior to the initial stage of opening.

Figure 3 is an enlarged view of the clamp of Figure 2, showing the closing device in detail.

Figure 4 is an enlarged view of the clamp of figures 1 to 3 subsequent to the initial stage of opening.

Figure 1 is a perspective view of part of a clamp 1 according to the invention. The clamp comprises a split ring (e.g. for closing around peripheral flanges of a cable splice closure housing) having a first part 2 and a second part 3 (the entire clamp is shown in Figure 2). The closing device 6 of the clamp 1 comprises a lever 11 pivotally attached at 12 to an arm 9 which is pivotally mounted at 20 to the first part 2 of the clamp. The lever 11 has an engagement surface 21 which engages the second part 3 of the clamp at 8 and fastens the two parts 2, 3 of the clamp together when the lever is in its over-centre position in use (which is shown in dotted lines in Figure 2). The lever has two extensions 15 which extend beyond the engagement surface 8 and which, as shown in Figure 1, may cooperate with the second part 3 of the clamp by contacting protrusions 17 (which are preferably in the form of pins) to provide initial closing leverage during an initial stage of closing the clamp. In this mode of operation therefore, the extensions 15 increase the stroke of the lever 11 in comparison to conventional levers without such extensions. Although, in this mode of operation, the amount of leverage provided by the lever is reduced due to the use of the extensions, it is normally sufficient for this initial stage of closing the clamp. In conventional closing devices, this help during the initial stage of closing the clamp is not provided due to the absence of such extensions, and consequently closing the clamp sufficiently to enable the closing device to close the clamp fully may be difficult.

Figure 2 shows the clamp 1 of Figure in its closed position. The whole of the clamp is shown, and a hinge 4 between parts 2 and 3 is illustrated. The final over-centre position of the lever 11 is shown in dotted outline, and the fully drawn lever is

shown prior to its use as an initial opening leverage during an initial stage of opening the clamp. The closing device 6, including the lever 11, is shown in greater detail in Figure 3. Hook-like parts 16 on the end of extensions 15 are shown engaged with protrusions 17. In Figure 4, the lever 11 has been used to provide an initial opening leverage to open the split ring clamp, via the engagement of the extensions 15 with the protrusions 15. Preferably this leverage imparts at least some radially outward force to the clamp which helps to release it from the housing. Thus figures 2 to 4 illustrate the second advantageous feature of the invention, namely making the opening and removal of the clamp easier than is the case with conventional clamps.

Conventionally a separate tool is normally needed in order to enable the clamp to be opened. The invention removes the need for this separate tool and provides a simple and effective mechanism for opening the clamp.

The clamp, and particularly the closing device, shown in figures 1 to 4 illustrate how both advantageous features of the invention (i.e. ease of closing the clamp and ease of opening the clamp) may be combined in a single embodiment.



Claims:

1. An over-centre closing device for closing together first and second parts of an article, comprising a lever pivotally attached to an arm which is pivotally mounted to the first part of the article, the lever having an engagement surface which engages the second part of the article and fastens the two parts of the article together when the lever is in its over-centre position in use, wherein the lever has an extension which extends beyond the engagement surface and which may cooperate with the second part of the article to provide initial closing leverage during an initial stage of closing the article and which allows the engagement surface to contact the second part of the article to provide final closing leverage during a final stage of closing the article.
2. A device according to claim 1, in which the second part of the article has a protrusion, and the cooperation of the extension of the lever with the second part of the article comprises contact between the extension and the protrusion.
3. An over-centre closing device according to claim 1 or claim 2, in which the extension may cooperate with the second part of the article to provide an initial opening leverage during an initial stage of opening the article.
4. An over-centre closing device for closing together first and second parts of an article, comprising a lever pivotally attached to an arm which is pivotally mounted to the first part of the article, the lever having an engagement surface which engages the second part of the article and fastens the two parts of the article together when the lever is in its over-centre position in use, wherein the lever has an extension which extends beyond the engagement surface and which may cooperate with the second part of the article to provide an initial opening leverage during an initial stage of opening the article.

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5. A device according to claim 4, in which the second part of the article has a protrusion, and the cooperation of the extension of the lever with the second part of the article comprises contact between the extension and the protrusion.
6. A device according to claim 5, in which the extension has a hook-like part which engages the protrusion during the cooperation of the extension with the protrusion.
7. A device according to any preceding claim, the article comprising a housing, preferably a cable splice closure housing.
8. A clamp for fastening together first and second parts of a housing, comprising a split ring and an over-centre closing device according to any preceding claim, the split ring comprising the article and the over-centre closing device closing the split ring in a clamping position in use.
9. A clamp according to claim 8, the housing comprising a cable splice closure housing.

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Fig.2.

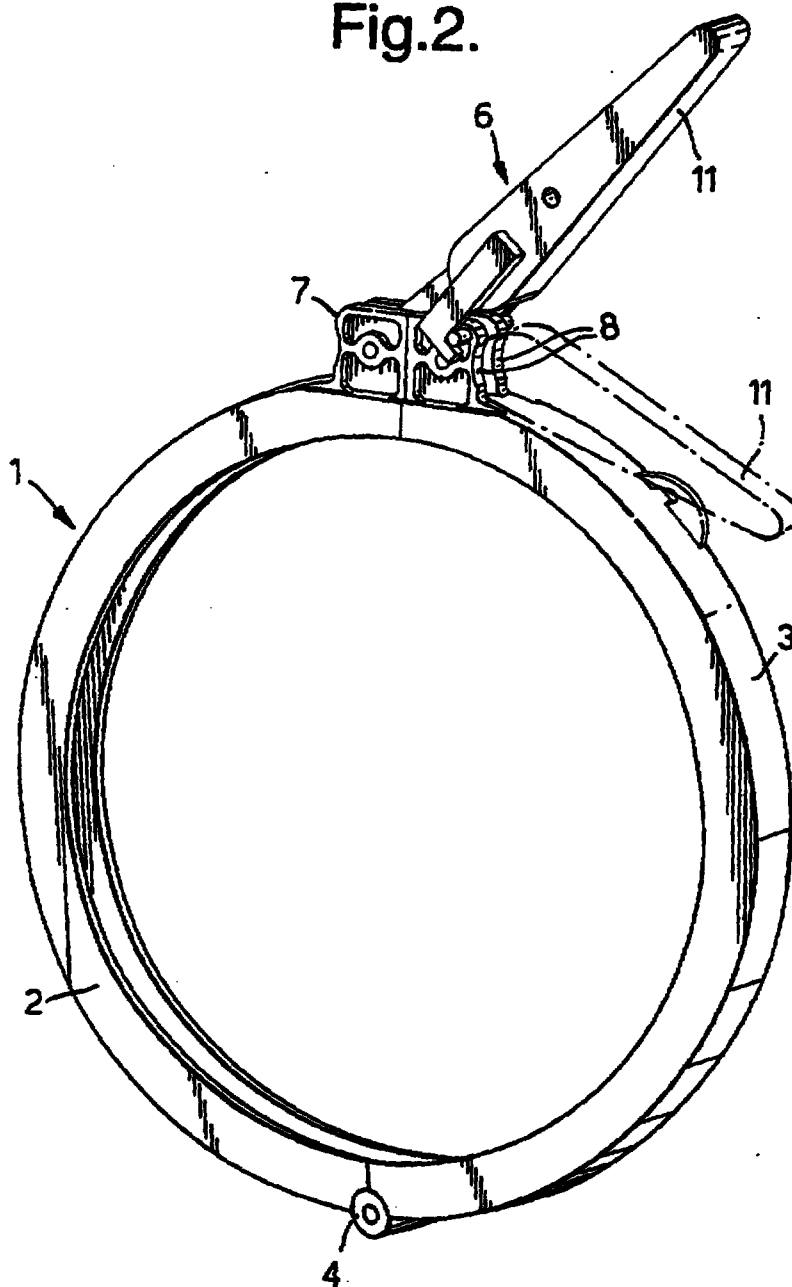


Fig.3.

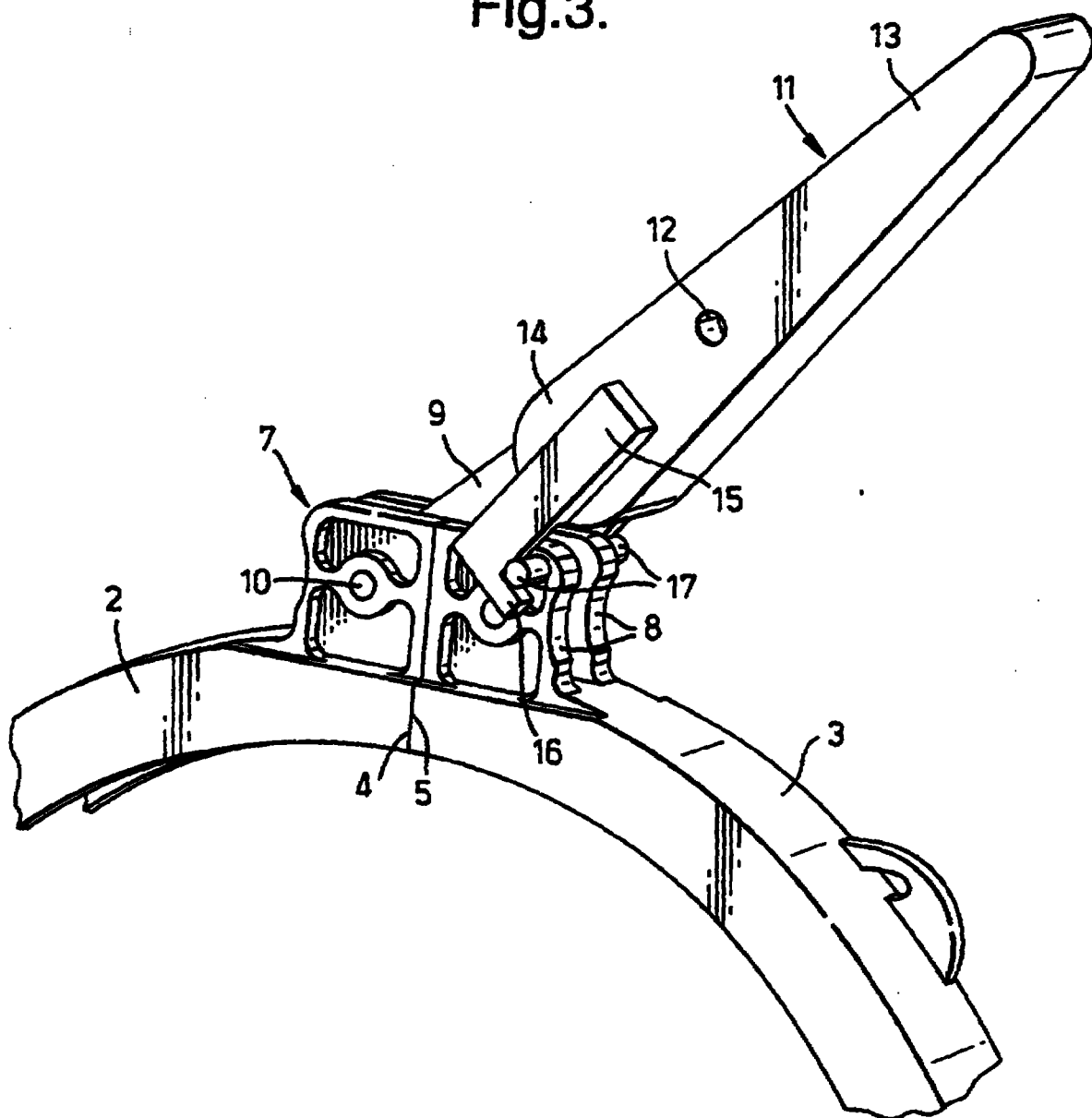
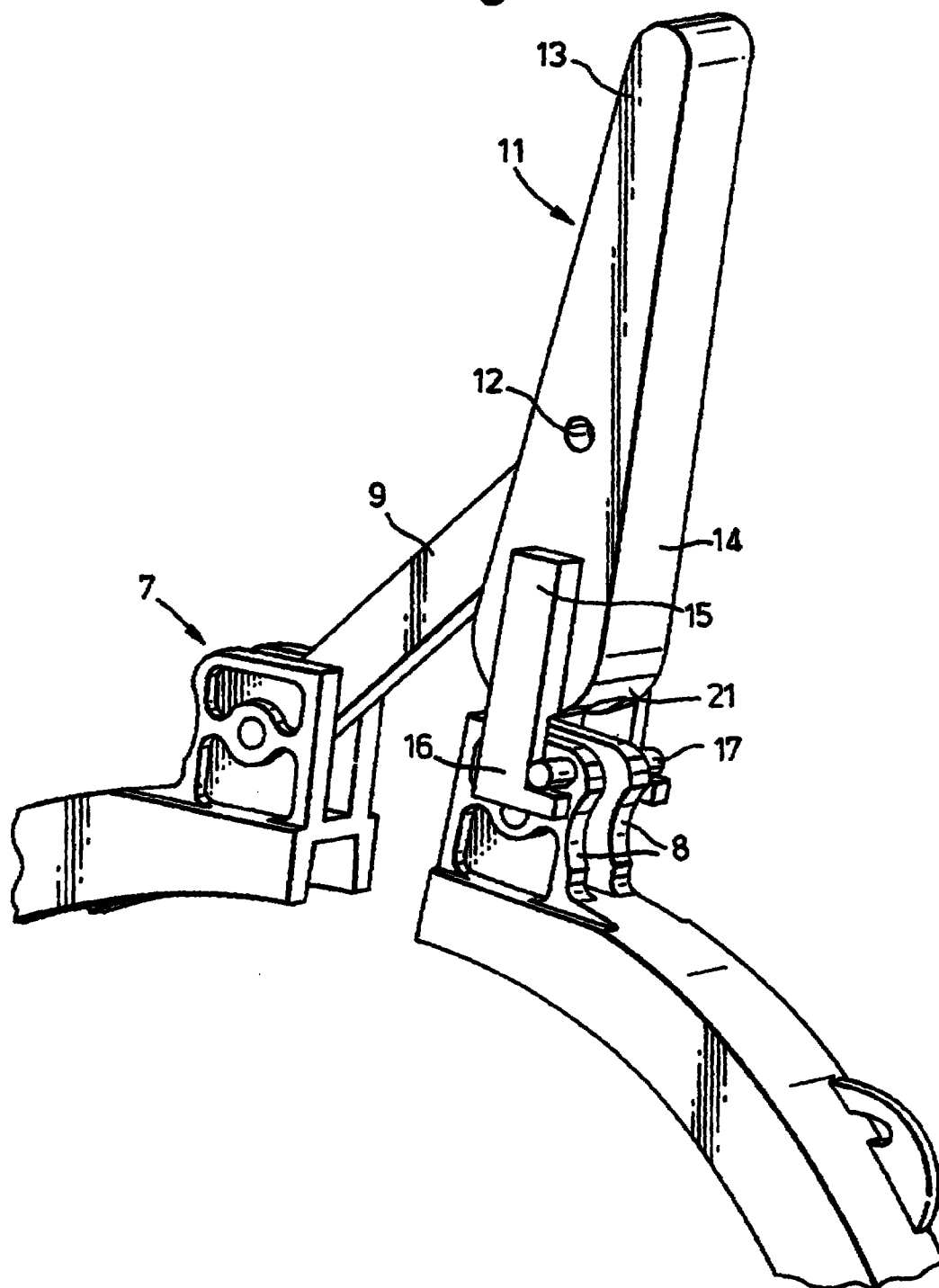


Fig.4.



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The clamp and/or the housing is/are new. Often the engineer has to resort to hitting the clamp with a hammer or mallet (which may damage the housing and/or the cables, and generally makes installation difficult) in order to close it sufficiently so that the lever of the over-centre closing device of the clamp can be operated to close the clamp fully. It would therefore be desirable to make the initial stage of closing the clamp easier.

It is often necessary to re-open cable splice closure housings in order to gain access to the cable splices. Conventional cable splice closure clamps often suffer from the problem that they are difficult to remove from the housing of the closure once they have been closed, particularly when they have been closed for some time. At present, the engineer who opens a housing often has to use a separate tool (which, at least in some cases is a specially designed tool) to help him to open the clamp and remove it from the housing. It would be desirable to remove the need for the use of such tools.

US-A-5315489 describes a pressure clamp suitable for creating a pressure tight seal for a telecommunications closure. It comprises two hinged semicircular clamp members, which can be brought and held together by a clamp lock to form the seal. The clamp lock includes a rod having a first end connected to one end of one clamp member, and a second end connected to an over-centre rotatable latch. The latch has an end which can frictionally engage the outer side surface of one end of the other clamp member during an initial closing operation. On further rotation of the latch, the two clamp members are urged towards each other.

The present invention provides an article comprising first and second parts, which can be closed together, and an over-centre device for effecting said closure, the over-centre device comprising a lever pivotally attached to an arm which is pivotally mounted to the first part of the article, the lever having an engagement surface at a free end of the lever which engages the second part of the article and fastens the two parts of the article together when the lever is in its over-centre position in use, characterised in that the lever has an extension piece which extends, seen along the length of the lever, beyond the engagement surface at the said free end of the lever, and which is arranged to cooperate with the second part of the article to provide an initial closing leverage during an initial stage of closing the

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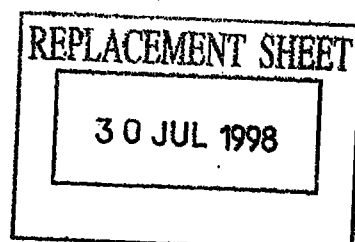
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article and which allows the engagement surface to contact the second part of the article to provide final closing leverage during a final stage of closing the article.

The invention has the advantage that because the lever has an extension piece which may cooperate with the second part of the article (the article may, for example, comprise a clamp, or a housing itself) to provide initial closing leverage during an initial stage of closing the article, this initial stage of closing the article is made easier and normally avoids the necessity of hitting the clamp, thereby solving the first problem mentioned above.

In a preferred embodiment of the invention, the extension piece on the lever is arranged so that when the first and second parts of the article are closed, it can cooperate with the second part of the article to provide an initial opening leverage during an initial stage of opening the article. This preferred embodiment of the invention has the advantage that because the lever has an extension piece which extends beyond the engagement surface and which may cooperate with the second part of the article to provide an initial opening leverage during an initial stage of opening the article, the necessity of using a separate tool to facilitate opening of the clamp is avoided, thereby solving the second problem mentioned above. Advantageously, the leverage provided by the closing device of the invention provides at least some radially outward movement of the clamp, e.g. radially away from a housing around which it is positioned. This normally enhances the ease with which the clamp may be opened and removed, and is particularly difficult to achieve without the extension piece of the lever according to the invention.

Preferably the second part of the article has a protrusion, and the cooperation of the extension piece of the lever with the second part of the article comprises contact between the extension piece and the protrusion. Advantageously, the extension piece may have a





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Claims:

1. An article comprising first and second parts (2,3), which can be closed together, and an over-centre device (6) for effecting said closure, the over-centre device(6) comprising a lever (11) pivotally attached to an arm (9) which is pivotally mounted to the first part (2) of the article, the lever (11) having an engagement surface (21) at a free end of the lever (11) which engages the second part (3) of the article and fastens the two parts (2,3) of the article together when the lever (11) is in its over-centre position in use, characterised in that the lever (11) has an extension piece (15) which extends, seen along the length of the lever (11), beyond the engagement surface (21) at the said free end of the lever (11), and which is arranged to cooperate with the second part (3) of the article to provide an initial closing leverage during an initial stage of closing the article (2,3), and which allows the engagement surface (21) to contact the second part (3) of the article to provide final closing leverage during a final stage of closing the article.
2. An article and over-centre device according to claim 1, wherein the extension piece (15) on the lever (11) is arranged so that when the first and second parts (2,3) of the article are closed, it can cooperate with the second part (3) of the article to provide an initial opening leverage during an initial stage of opening the article.
3. An article and over-centre device according to claim 1 or 2, in which the second part (3) of the article has a protrusion (17), and the cooperation of the extension piece (15) of the lever (11) with the second part (3) of the article comprises contact between the extension piece (15) and the protrusion (17).
4. An article and over-centre device according to any preceding claim, in which the extension piece (15) has a hook-like part (16) which engages the protrusion (17) during the cooperation of the extension piece (15) with the protrusion (17).



5. An article and over-centre device according to any preceding claim, the article comprising a housing, preferably a cable splice closure housing.
6. An article and over-centre device according to any preceding claim, wherein the article is a housing, the first and second parts of the article (2,3) comprise two portions of a split ring, and the over-centre device (6) closes the split ring in a clamping position in use.
7. An article and over-centre device according to claim 6, wherein the housing comprising a cable splice closure.

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(21) International Application Number: PCT/GB96/00967 (22) International Filing Date: 23 April 1996 (23.04.96) (30) Priority Data: 9508295.4 24 April 1995 (24.04.95) GB (71) Applicant (for all designated States except MG US): N. V. RAYCHEM S.A. [BE/BE]; Diestsesteenweg 692, B-3010 Kessel-Lo (BE). (71) Applicant (for MG only): RAYCHEM LIMITED [GB/GB]; Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): DAMS, Francis [BE/BE]; Buizegemlei 46/1, B-2650 Edegem (BE). CLITS, Patrick [BE/BE]; Roeselberg 291, B-3390 Houwaart (BE). DE COSTER, Pieter [BE/BE]; Wolvendreef 52, B-3210 Linden (BE). DEMESMAEKER, Marc [BE/BE]; Zaanstraat 25, B-2020 Antwerpen (BE). (74) Agents: CLAYTON, Anthony, Nicholas et al.; Raychem Limited, Faraday Road, Dorcan, Swindon, Wiltshire SN3 5HH (GB).	(81) Designated States: AU, BB, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LT, LV, MD, MG, MK, MX, NO, NZ, PL, RO, RU, SC, SI, SK, TJ, TM, TR, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.	

(54) Title: CLOSING DEVICE

(57) Abstract

An over-centre closing device for closing together first and second parts of an article, comprising a lever pivotally attached to an arm which is pivotally mounted to the first part of the article, the lever having an engagement surface which engages the second part of the article and fastens the two parts of the article together when the lever is in its over-centre position in use, wherein the lever has an extension which extends beyond the engagement surface and which may cooperate with the second part of the article to provide initial closing leverage during an initial stage of closing the article and which allows the engagement surface to contact the second part of the article to provide final closing leverage during a final stage of closing the article.

