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<p>(54) Title: CUTTERS</p>		
<p>(57) Abstract</p>		
<p>The invention relates to cutters for cutting connecting holes in plastics pipes. Predominantly the connection of a service to an existing plastics pipe is by way of an electro-fusible saddle being located on and sealed to the pipe and the cutter introduced down the stem of the saddle to cut a hole in the pipe and thereby connect the pipe to a spigot or branch on the saddle to which a service line is connected. The cutting of the hole in the pipe inevitably results in leakage that can be dangerous when the pipe is carrying gas. There are constructions of cutter that attend to the question of leakage at the point that a hole is cut but which still have a leakage problem at the point that the cutter is withdrawn and before a cap is applied to the stem. The object of the invention is to eliminate this problem, which objective is met by a cutter construction comprising a cylindrical blade, a threaded body portion attached to the blade, and there being an integral first length of rod or tube on the body portion to the opposite side of the cylindrical blade portion together with a second length of rod or tube extending from and detachably attached to the said first length, the junction between the said first and second lengths serving as a visual indicator means. Thus, once a hole in the pipe has been cut the said second length maintains its contact with a sealing ring in the stem during the retraction of the cutter until the visual indicator confirms that the cutter has been fully withdrawn following which the exposed second length is removed without the aid of additional tooling with the seal maintained against the first length of rod or tube, the fitting of the cap providing additional security against leakage.</p>		

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CUTTERS

This invention relates to cutters, and is particularly concerned with cutters for cutting a connecting hole in a plastics pipe.

In such as the gas and water industries plastics materials are used to a considerable degree
5 for both mains and branch supply lines. Frequently there is the need to connect another service to a pipe line. In some instances, it is not possible to switch off a supply of fluid to the pipe line and in others, switching off the supply would be highly inconvenient. Therefore connection to a live mains or branch line is commonplace.

Connection of another service has been greatly facilitated by the advent of electro-fusible
10 saddles, able to be positioned with accuracy on a pipe, and secured thereto by electro fusion. However, it still leaves the need to cut through the pipe at the location of the saddle, with the problem of leakage of the fluid involved, highly inconvenient when it is water, and relatively dangerous when it is gas.

Ordinarily, an electro-fusible saddle has a threaded stem extending from the saddle from
15 which a spigot or branch for the further service or branch pipe connection emerges. Into the stem is introduced a cylindrical cutter with a threaded body, the cutter being screwed down the stem and into contact with the pipe, further screwing down forcing the cutter through the pipe wall to cut a connecting hole. The slug of pipe material located in the cutter effectively seals its bore, but fluid, water or gas can escape past the threads of the cutter body. After the hole has been cut, the cutter
20 must be retracted to allow the clear passage of fluid from the main pipe to the spigot or branch, and only then can a sealing cap be applied to the top of the stem, by which time considerable volumes of gas or water can escape.

In an attempt to overcome this problem, it has been proposed to provide a rod or tube as a push fit in a recess in the upper end of the cutter body, along with a sealing ring in the contacting

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part of the rod or tube located in the cutter, and in the stem of the saddle to seal against the outside of the rod or tube. The rod or tube is fitted with a means to drive the cutter down to cut the hole in the pipe, when fluid escaping passed the threads is held in the stem. However, following the retraction of the cutter to allow the passage of fluid from the main pipe to the spigot or branch, the
5 rod or tube must be pulled clear of the cutter, allowing the escape of fluid from within the stem until such time as a sealing cap is located on the stem whilst such a construction reduces the escape of fluid, it leaves room for improvement.

The object of the present invention is to provide a cutter that allows the substantially leakproof cutting of a hole in a live mains or branch plastics pipeline.

10 According to the present invention, a cutter comprises a cylindrical blade, a threaded body portion attached to the blade, and there being an integral first length of rod or tube on the body portion to the opposite side of the cylindrical blade portion together with a second length of rod or tube extending from and detachably attached to the said first length, the second length serving as a sealing member and the junction between the said first and second lengths serving as a visual
15 indicator means.

Preferably the blade is a metal cylinder with a sharpened cutting rim, and the body portion and integral first length of rod or tube are of an appropriate plastics material moulded directly on to the cylindrical blade. The said second length of rod or tube may be formed integral with the said first length, and at the junction there between there is provided a zone of weakness allowing the said
20 second length to be detached from the said first length when required. Alternatively, the said second length of rod or tube may be formed separately from the said first length and detachably attached in fluid tight manner to the said first length.

When the said first and second lengths of rod or tube are integral, they may combine to form a drive means to allow the rotation of the threaded body. Alternatively, and when the said first

length is a tube the threaded body may be formed with an internal drive socket to be engaged by a separate drive tool. In the circumstance where the said second length is a rod, the end of the rod may be formed with a drive head to engage the socket, and where the said second length is a tube, a separate drive tool can be inserted along its length to engage the socket.

5 Thus, with an electro fusible saddle having a threaded stem and a spigot or branch emerging in the stem, and a sealing ring in the upper part of the stem, of the generally known type, the body portion can be located in the threaded stem with the cutter facing inwardly, and the rod or tube extending through the stem, past the sealing ring and out of the stem.

The saddle can then be located and secured to a pipe in the known manner, and the threaded
10 body rotated by an appropriate drive tool to drive the cutter down the stem into contact with the pipe and cut through the pipe. The threaded body can then be rotated oppositely to bring it and the cutter clear of the position of the spigot or branch on the saddle. During forward drive and retraction of the cutter, the sealing engagement of rod or tube and the sealing ring prevents the escape of fluid from within the stem, and with the cutter retracted as required, the protruding second length of rod
15 or tube beyond the top of the stem can be severed at its weakened zone or detached from the said first length to leave the end of the said first length substantially flush with the top of the stem, and a sealing cap fitted to the stem for added security against leakage of fluid from within the stem.

By having a weakened zone on the rod or tube or by having a separately formed second length suitably attached to the first length there are served the twin purposes of providing a means
20 to indicate that retraction of the body has been completed, i.e. when the weakened zone is or the point of attachment of the said second length to the said first length is aligned with the top of the stem, and enabling the second length of rod or tube to be removed the said first length within the stem, without the need for special cutting tools to be provided.

Where the said second length is a separate tube, the means of attachment of it to the said first

length may be by the provision of integral spring loaded fingers on the inner end of the said second length, the inner end of the said second length of tube having a section of reduced outside diameter to be a sliding fit within a tubular said first length, and preferably there being at least one sealing ring lying therebetween. When the said second length is a rod on which is provided an integral drive
5 head, the drive head may extend from an innermost section of rod of reduced diameter to allow it to be a sliding fit within the tubular said first length, with again there being provided at least one sealing ring therebetween.

Several embodiments of the invention will now be described with reference to the accompanying drawings, in which:-

10 Figure 1 is a sectional side elevation of a cutter in accordance with the invention;

Figure 2 is a sectional side elevation of part of a pipe and an attached saddle showing the cutter in a position ready to use;

Figure 3 corresponds to Figure 2 but shows the cutter penetrating the pipe;

15 Figure 4 corresponds to Figure 2 but shows the cutter retracted to align a weakened zone on the rod or tube with the top of the saddle stem;

Figure 5 corresponds to Figure 2 but shows the surplus length of rod or tube removed and a sealing cap fitted to the saddle stem;

Figure 6 corresponds to Figure 1 but shows an alternative construction of cutter in accordance with the invention; and

20 Figure 7 corresponds to Figure 1 but shows a further alternative construction of cutter in accordance with the invention.

In Figure 1 is shown a cutter 1 comprising a cylindrical metal cutter blade 2 to which is moulded a threaded cutter body 3 having an integral first tube length 4 from which extends an integral second tube length 4A, the first and second tube lengths being defined by a strategically

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positioned weakened zone in the form of a sharp recess 5, at which point the second tube length can readily be snapped from the first tube length.

With the cutter positioned in a correspondingly threaded stem 6 of an electro fusible saddle 7, the saddle 7 can, as is shown in Figure 2 be secured to a pipe 8, the tube extending out of the stem past a sealing ring 9 in the upper part of the stem.

By applying an appropriate drive tool to the tube, the body 3 can be rotated to urge the cutter down the threaded stem and into contact with the pipe, to cut through the pipe as is shown in Figure 3. Following this, body 3 is oppositely rotated by the drive means on the tube to retract the cutter 2 with a slug 10 of pipe material retained within the cutter, and connect a cut hole 11 in the pipe wall to a spigot or branch 12 on the stem, retraction continuing until the recess 5 is aligned with the top of the stem as is shown in Figure 4. Once in this position the second tube length can be snapped from the first tube length and a sealing cap 13 fitted to the top of the stem.

Thus, with the cutter of the invention, a mains or branch pipe can be filled and a saddle connected to a new service, without the need to shut down the supply of fluid to the pipe, and with the substantial elimination of the escape of fluid during the cutting of a hole in the pipe to connect it to a service attached to the spigot or branch outlet from the stem of the saddle.

In the alternative constructions illustrated in Figures 6 and 7, the cylindrical metal cutter blade 2 is again moulded with a threaded cutter body 3 having an integral first tube length 4, and the threaded cutter body formed with an internal drive socket 14. With both constructions, a separate second length of rod 15 (Figure 6) or tube 16 (Figure 7) is provided. With the second length in the form of a rod 15, the innermost end has a section 17 of reduced outside diameter from which extends an end portion formed as a drive tool 18. The section 17 and the drive tool 18 are inserted into the said first tube length 4, and there being sealing rings 19 provided between the section 17 and the wall of the first tube length 4. When the second length is in the form of tube 16

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it is provided with an end section 21 of reduced outside diameter from which extend spring loaded fingers 20. Thus the end section and the fingers can be inserted into the first tube length 4 for the fingers to grip against the inner wall of that length, and there is provided a sealing ring 19 between the end section 21 and the wall of the first tube length 4. With this construction a separate drive
5 tool can be inserted through the tubular length 16 to bring a drive head on the tool into engagement with the drive socket formed in the cutter body. With both forms of construction they provide, in common with the construction shown Figures 1 to 5, a sealed arrangement at the point that the cutter
2 penetrates the pipe with the seal maintained whilst the cutter body is retracted to a point beyond the spigot or branch 12 on the stem, the said second lengths of rod 15 or tube 16 being removable
10 once the cutter body has been withdrawn up the stem to a position where the end of the first tube length 4 lies flush with the end of the stem and following which a sealing cap 13 can be fitted to the stem.

With all three constructions there is not only provided an essential guarantee against any leakage of liquids or gases within the mains pipe, but also there is enabled the removal of the
15 integral or separate said second length of rod or tube without the need to provide special tools.

CLAIMS

1. A cutter characterised by a cylindrical blade 2, a threaded body portion 3 attached to the blade, and there being an integral first length 4 of rod or tube on the body portion to the opposite side of the cylindrical blade portion together with a second length 15,16 of rod or tube extending from and detachably attached to the said first length, the junction between the said first and second lengths serving as a visual indicator means.

2. A cutter as in Claim 1 characterised in that the blade 2 is a metal cylinder with a sharpened cutting rim and the body portion 3 and integral first length 4 of rod or tube of an appropriate plastics material moulded directly onto the cylindrical blade.

3. A cutter as in Claim 1 or Claim 2 characterised in that the said second length 15, 16 of rod or tube is formed integral with the said first length 4 and at the junction therebetween there is provided a visible zone of weakness 5 to serve as a visual indicator and to enable the snapping of the second length from the first length when required.

4. A cutter as in Claim 1 or Claim 2 characterised in that the second length 15,16 of rod or tube is separately formed from the said first length 4 and is detachably attached in fluid tight manner to the said first length 4, the point of attachment serving as a visual indicator.

5. A cutter as in Claims 1 to 3 characterised in that the first and second lengths 4,15,16 of rod or tube combine to form a drive means to allow the rotation of the threaded body 3.

6. A cutter as in any of Claims 1 to 4 characterised in that with the said first length 4 in the form of a tube, the threaded body is formed with an internal drive socket 14 to be engaged with a separate drive tool.

7. A cutter as in Claim 6 characterised in that the second length 15 is a rod on one end of which is a drive means, and a section of reduced outside diameter to fit inside the said first length 4 and there being a sealing means interposed between the said reduced outside diameter and the

internal wall of the first length 4.

8. A cutter as in Claim 6 characterised in that the second hollow length 16 has provided on one end thereof a number of spring loaded fingers extending from an end section of reduced outside diameter whereby to enable the end section and the fingers to be inserted into the said first hollow length 4, and there being sealing means between the said end section and the internal wall of the said first length 4.







