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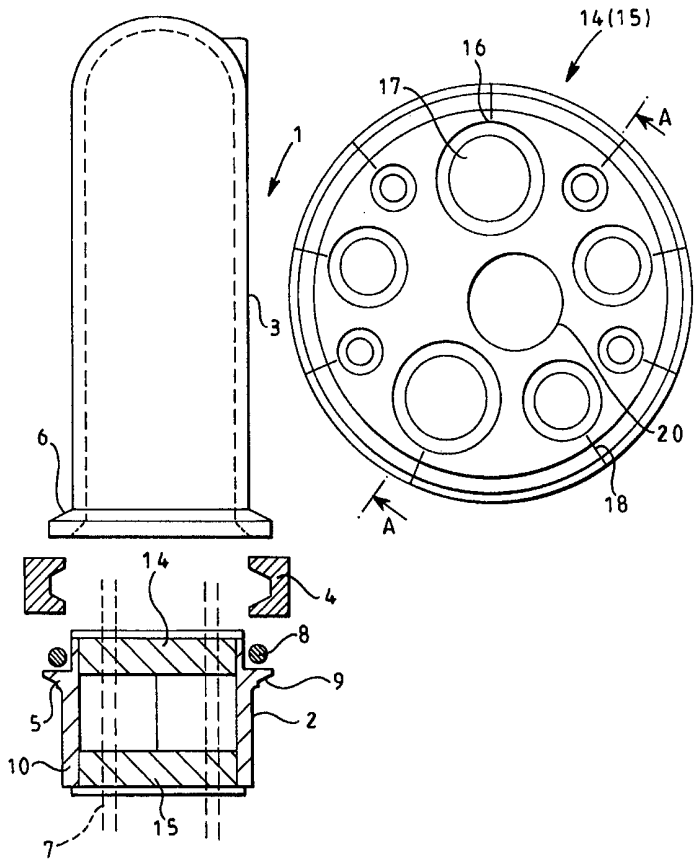
(54) Title: SINGLE-ENDED JOINT CABLE SEALING SYSTEM

(57) Abstract

A single-ended joint cable sealing system is provided either to replace a worn sealing plug in an existing closure or as part of the installation of a new closure, and comprises compression plugs (14 and 15) having recesses (16) into which the cables may be introduced from the side by way of slits (18) so that the compression plugs (14 and 15) are spaced apart along the cables. Two half shells (11 and 12) of a base (2) are then closed around the plugs (14 and 15) and locked in position by an integral toggle assembly (26) to form a cavity within the base (2) through which the cables extend. A sealant is then injected into the cavity through an injection port to provide a leak-proof seal surrounding the cables.



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"Single-ended Joint Cable Sealing System"

This invention relates to a cable sealing system for a single-ended joint in which the ends of two or more cables are connected together.

For many years single-ended joints between telecommunications cables have been installed within domed closures which may be located below the ground or above the ground, for example at the top of a telegraph pole. Conventionally the cables are sealed at the locations at which they enter the closure by means of a sealing plug formed in situ. However such sealing plugs require to be replaced after years of use when they are no longer fluid-impermeable, and there is no straightforward way in which such plugs can be replaced, or in which new cables can be introduced into the closures, without having to re-form the closures and the associated sealing plugs.

It is an object of the invention to provide a single-ended joint cable sealing system which may be used either to replace a worn sealing plug in an existing closure or as part of the installation of a new closure.

According to the present invention there is provided a single-ended joint cable sealing system for sealing the entry point of at least one cable into a single-ended joint closure, the sealing system comprising first and second compression plugs having inlets into which the cables may be introduced from the side by way of slits so that the compression plugs are spaced apart along the cables, detachable wall means for surrounding the compression plugs so as to define a cavity therebetween through which the cables extend, and an injection port for injection of sealant into the cavity so as to provide a leak-proof seal surrounding the cables.

Such a sealing system is particularly advantageous in use as it provides a non-flame mechanical system by means of which the entries of the cables into the joint closure can be sealed against ingress of moisture. This avoids problems associated with the application of heat such as is required in systems utilising heat shrinkage, and also enables such a sealing system to be fitted to an existing joint without requiring

disassembly of the joint. The system is suitable for use with cables of different diameters, and furthermore may be provided with a facility enabling extra cables to be fitted to an existing joint closure without disturbing the existing cables.

The invention also provides a method of forming a sealing system at the entry point of at least one cable into a single-ended joint closure, the method comprising introducing cables into inlets in first and second compression plugs from the side by way of slits so that the compression plugs are spaced apart along the cables, surrounding the compression plugs by detachable wall means so as to define a cavity therebetween through which the cables extend, and injecting sealant into the cavity through the injection port so as to provide a leak-proof seal surrounding the cables.

In order that the invention may be more fully understood, a preferred embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a single-ended joint closure shown partly in section and having a base formed in accordance with the invention;

Figure 2 is an end view of a compression plug used in the base shown in Figure 1;

Figure 3 is a section taken along the line A-A in Figure 2;

Figure 4 is a perspective view of the collar of the base of Figure 1;

Figure 5 is a side view of the base of Figure 1.

The invention is concerned with a system for sealing the entry points of telecommunications cables into a single-ended joint closure within which connections are made between the cables using well-known jointing techniques. Such closures conventionally comprise a base through which the cables extend and within which a

leak-proof seal is formed around the cables, and a domed cap covering the joint and clamped to the base by a clamping collar.

The sealing system which will now be described with reference to the invention is designed to enable it to be used as the base of a new closure or alternatively to replace the sealing system of an existing closure without requiring the joint to be disassembled. Figure 1 shows a closure 1 consisting of a sealing base 2 in accordance with the invention and a domed cap 3 which is clamped to the base by a clamping collar 4 engaging flanges 5 and 6 on the base 2 and cap 3 respectively. The clamping collar 4 may comprise two arcuate parts which are hinged together and which may be secured together around the flanges 5 and 6 by means of an interconnecting screw. Cables 7 are shown, by way of example, in broken lines extending through the base 2 so that the cables may be interconnected in known manner within the space surrounded by the cap 3, and a description will be given below of the manner in which the base 2 may be formed around the cables 7 in situ (after removal of any existing sealing base) without having to disassemble the joint. Also shown in Figure 1 is an O-ring 8 which serves to form a seal between the base 2 and the cap 3.

The base 2 consists of a closed ring member 9 integrally formed with a split shell collar 10 consisting of two shell halves 11 and 12, as best seen in Figures 4 and 5. One of the shell halves 11 is fixedly connected to the ring member 9, and the other shell half 12 is hingedly connected to the shell half 11 along a hinge line 13 in which the material of the base is weakened so as to allow the required hinging action. Two compression plugs 14 and 15 are fitted within the base 2, and the shell halves 11 and 12 are then closed firmly around the compression plugs 14 and 15 and locked in position by an integral toggle assembly 26.

Referring to Figures 2 and 3, each of the compression plugs 14 or 15 is provided with a number of cable entry points in the form of recesses 16 which are initially closed off by thin membranes 17 which seal off any cable entry points which are not required for cables in use. Furthermore a partial cut 18 through the plugs 14 or 15 extends between the recess 16 and the outer diameter of the plug 14 or 15, the cut 18 terminating

slightly short of the recess 16 so that, in the event that a cable is not fitted in the recess in use, the membrane between the cut and the recess maintains the seal and helps to retain the shape of the plug. The recesses 16 consist of two recesses of 25mm diameter tapering to 20mm diameter at their ends 19, three recesses of 18mm diameter tapering to 12mm diameter at their ends, and four recesses of 10mm diameter tapering to 6mm diameter at their end, in order to accommodate cables of different diameters. In addition a recess 20 of 22mm diameter is provided towards the centre of each plug 14 or 15.

When the base 2 is to be fitted, possibly after removal of an existing sealing base from the entry points of the cables into an existing single-ended joint, the two compression plugs 14 and 15 are fitted into position by introducing the cables into the necessary recesses 16 in the plugs 14 and 15 after cutting through the relevant cuts 18 and membranes 17. When both plugs 14 and 15 have been fitted to the cables at the appropriate spacing apart, the half shells 11 and 12 are closed around the plugs 14 and 15 and secured together by the tamper-proof toggle assembly 26 to form a cavity within the base 2 through which the cables extend. As best seen in Figure 3, each of the compression plugs 14 and 15 is provided with peripheral ribs 30 and 31, as well as a wider base portion 32, and these engage within appropriately positioned grooves 33, 34 and 35 on the inside surfaces of the half shells 11 and 12 as shown in broken lines in Figure 5. This ensures the necessary tight sealing of the plugs 14 and 15 with respect to the shells 11 and 12. The necessary sealant is then injected into the cavity through an injection port 22 extending through the half shell 11 until monitoring by way of an inspection port 23 extending through the half shell 12 indicates that the cavity has been filled with the sealant.

Once the cavity has been filled with sealant and the domed cap 3 has been secured to the base 2 by the clamp collar 4, the joint is sealed in a leak-proof manner from the ingress of moisture, and the compression plugs 14 and 15 provide strain relief for the cables and holds the cables firmly in place. Due to the range of sizes of the different recesses 16 and the tapering ends of the recesses, a large range of diameter of cables can be accommodated using only a single plug design, and furthermore those

recesses 16 which are not used for cables are closed off by the integral membranes 17. Such a non-flame sealing system does not require the application of heat to perform heat shrinking or for any other purpose and thus avoids potential problems associated with the application of such heat.

In a variant of the system described above with reference to the drawings the compression plugs may be provided with one or more tubes which extend through the recess 20 and which are interconnected so that, after the sealant has been introduced into the cavity, the tubes provide a passage extending through the sealant between the two plugs 14 and 15. These tubes are normally closed at their ends by membranes, where necessary, but can be used for the fitting of extra cables to an existing joint by passing the cables through the tubes without disturbing the existing sealant within the cavity. Where such tubes are not fitted, a membrane covers the end of the recess 20 in each plug, as clearly shown in Figure 3.

The material from which the compression plugs are made is preferably an ethylene-propylene rubber, either in the form of a copolymer (EPM) which is crosslinked with peroxides or in the form of a terpolymer (EPDM) which is crosslinked with sulphur. The material from which the domed cap and base are made is preferably a very high impact polypropylene block copolymer designed for injection moulding applications, such as the material known as Stamylan P 83MF10 supplied by DSM. This material combines excellent impact strength, even at low temperatures, with good stiffness and flow properties.

CLAIMS:

1. A single-ended joint cable sealing system for sealing the entry point of at least one cable into a single-ended joint closure, the sealing system comprising first and second compression plugs having inlets into which the cables may be introduced from the side by way of slits so that the compression plugs are spaced apart along the cables, detachable wall means for surrounding the compression plugs so as to define a cavity therebetween through which the cables extend, and an injection port for injection of sealant into the cavity so as to provide a leak-proof seal surrounding the cables.

2. A sealing system according to claim 1, wherein the wall means comprises two arcuate shield parts which are adapted to be secured together around the compression plugs.

3. A sealing system according to claim 2, wherein the shield parts are secured together by a clamping member.

4. A sealing system according to claim 2 or 3, wherein the shield parts are hinged together.

5. A sealing system according to claim 2, 3 or 4, wherein the wall means incorporates a ring member for surrounding the cables and from which one of the shield parts fixedly depends.

6. A sealing system according to any preceding claim, wherein the injection port extends through the wall means.

7. A sealing system according to any preceding claim, wherein an inspection port extends through the wall means for indicating when the cavity has been filled with sealant.

8. A sealing system according to any preceding claim, wherein each of the inlets comprises a recess which is closed off by a membrane when no cable extends through the inlet.

9. A sealing system according to any preceding claim, wherein at least some of the inlets are of different diameters to accommodate cables of different sizes.

10. A sealing system according to any preceding claim, wherein at least some of the inlets are tapered to accommodate cables of different sizes.

11. A sealing system according to any preceding claim, wherein the compression plugs are interconnected by a tubular passage extending through the seal to enable a further cable to be passed through the passage without disturbing the seal.

12. A method of forming a sealing system at the entry point of at least one cable into a single-ended joint closure, the method comprising introducing cables into inlets in first and second compression plugs from the side by way of slits so that the compression plugs are spaced apart along the cables, surrounding the compression plugs by detachable wall means so as to define a cavity therebetween through which the cables extend, and injecting sealant into the cavity through the injection port so as to provide a leak-proof seal surrounding the cables.

13. A method according to claim 11, wherein a domed cap is engaged with the sealing system by means of a clamp collar to form the joint closure.

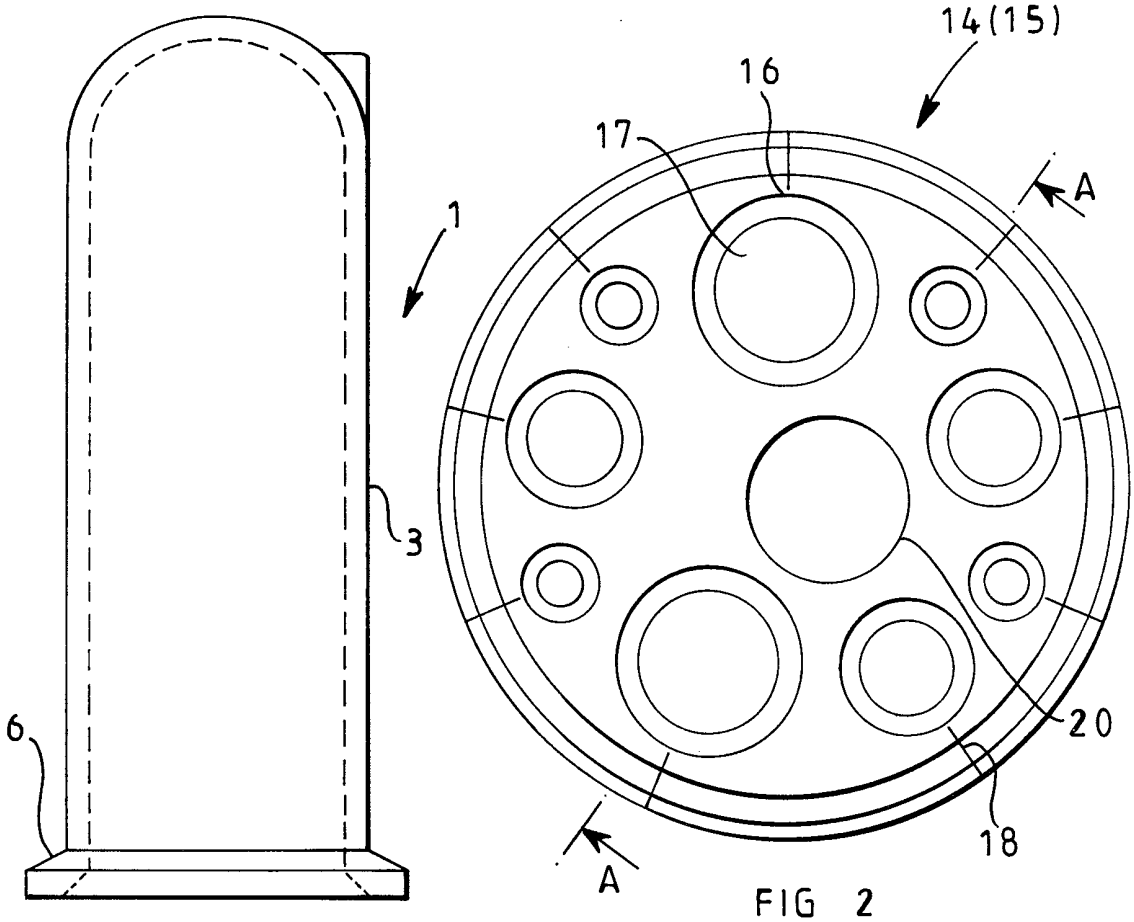


FIG 2

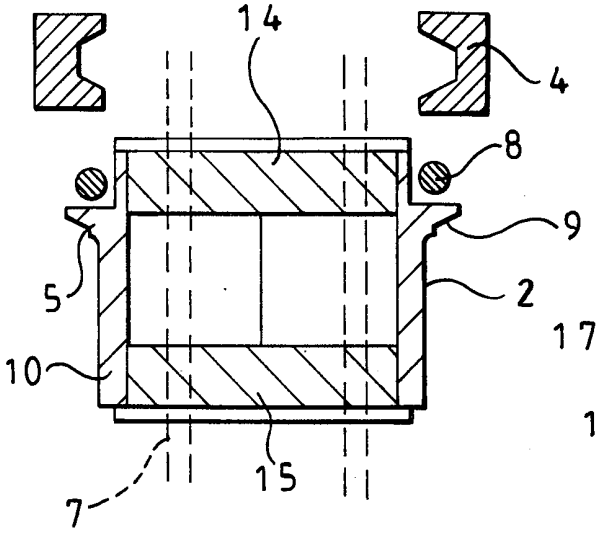


FIG 1

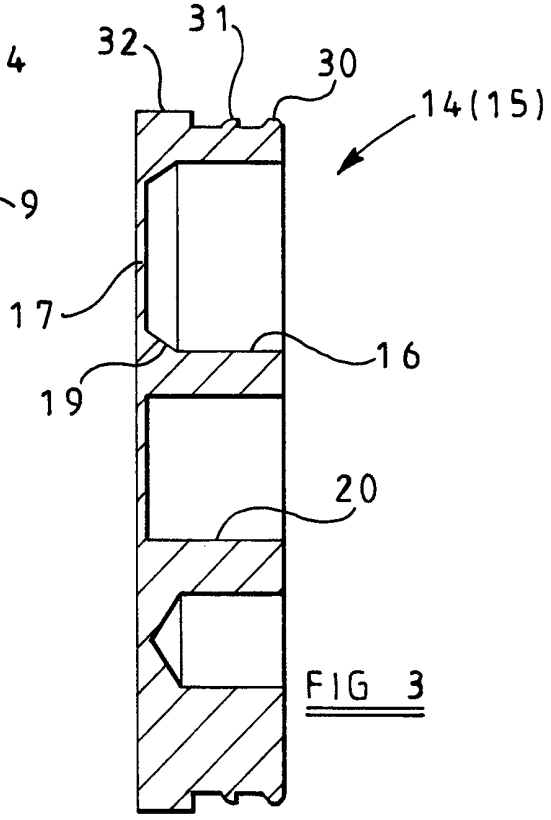


FIG 3

FIG 4

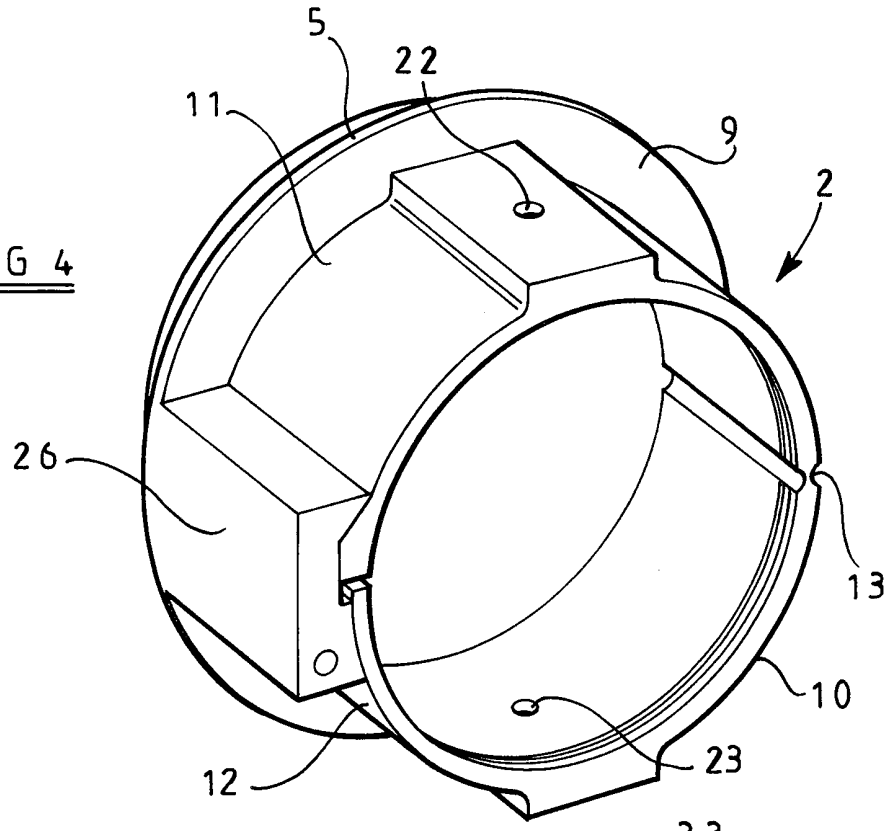
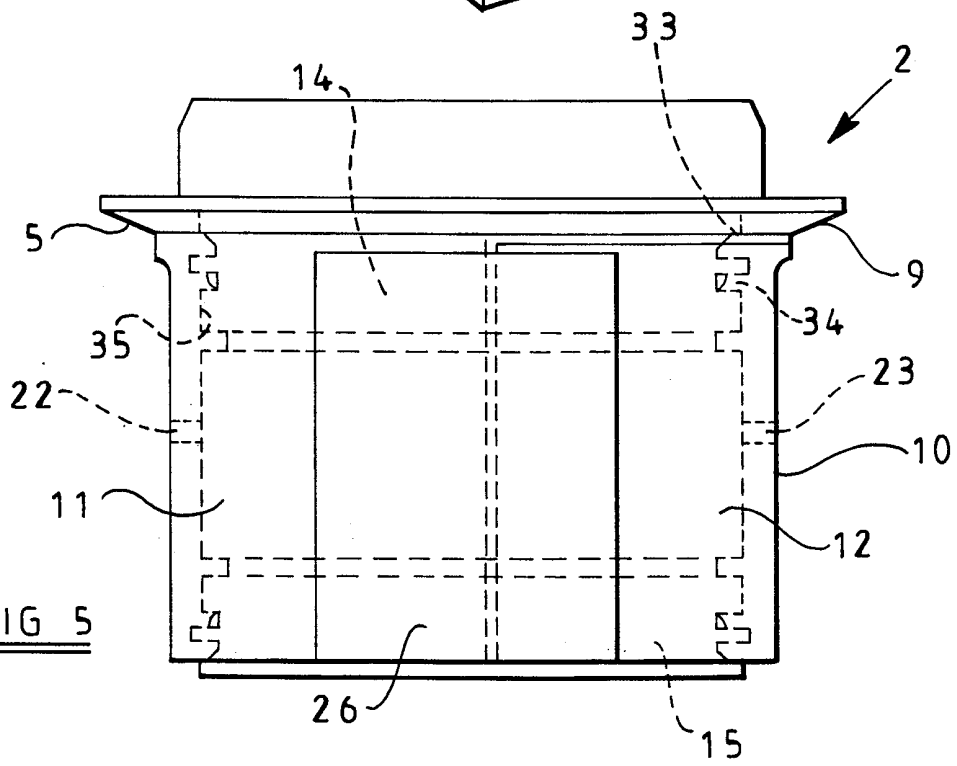


FIG 5



INTERNATIONAL SEARCH REPORT

In ational Application No
PCT/GB 99/00865

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H02G15/076 G02B6/44

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B. FIELDS SEARCHED

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 657 756 A (STEWING KUNSTSTOFF) 14 June 1995 (1995-06-14) column 5, line 45 - column 6, line 41 column 7, line 42 - line 53 column 8, line 28 - line 40 claims 3,10,24; figures 1,5,6,8,9,17	1,6,12
X	EP 0 499 754 A (MOREL ATEL ELECTROMEC) 26 August 1992 (1992-08-26) column 3, line 24 - column 5, line 53; figures 1-5	1-3,6,12
A	US 3 848 074 A (CHANNELL W) 12 November 1974 (1974-11-12) column 2, line 21 - column 3, line 63; figures 1-4	1,8,9

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[X] Further documents are listed in the continuation of box C.

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Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 596 215 A (KERBOUL MICHEL) 25 September 1987 (1987-09-25) abstract; figure 1	1,6,12
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