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Inserting device for inserting an elongated protective profile above a cable laid in a laying groove

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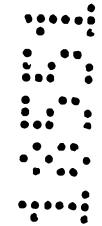
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**Inserting Device for Inserting an Elongated Protective Profile
Above a Cable Laid in a Laying Groove**

Abstract

5 The invention relates to an inserting device (EV) for pressing a protective profile (SP) into a laying groove (VN) in which a cable (K), preferably a microcable (MK), is inserted.



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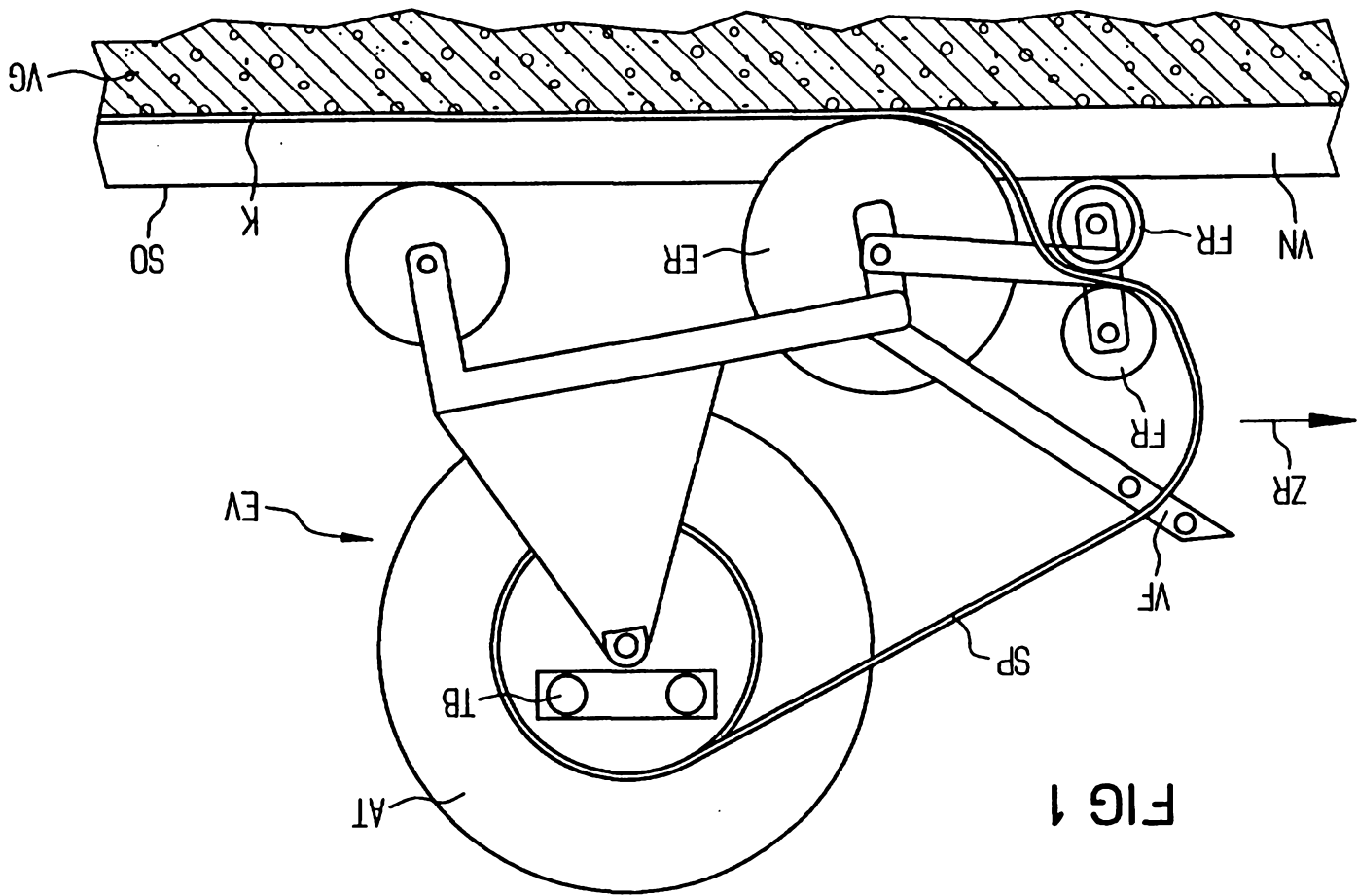


FIG 1

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FOR A STANDARD PATENT

ORIGINAL

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Invention Title: Inserting Device for Inserting an Elongated Protective
Profile Above a Cable Laid in a Laying Groove

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

Description

Inserting device for inserting an elongated protective profile above a cable laid in a laying groove.

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The invention relates to an inserting device for inserting an elongated protective profile above a cable laid in a laying groove.

WO 97/20236 has disclosed a method for
10 inserting an optical cable into a firm laying ground, the cable to be laid being inserted into a milled laying groove. In this case, there is inserted above the cable an elongated hold-down which is of U-shaped construction and whose limbs are supported laterally
15 against the groove walls. Inserting the hold-down, which also serves as a protection, is performed more or less by manual operation.

It is the object of the present invention to create an inserting device for elongated protective
20 profiles with the aid of which pressing into the laying groove can be performed in a simple way. Another object is to configure a suitable protective profile for this inserting device. The object set is achieved with the aid of an inserting device of the type mentioned at the
25 beginning by virtue of the fact that a pay-off drum with the elongated protective profile is arranged on a movable inserting device, that guide rolls for positioning the protective profile to be inserted are into the laying groove arranged upstream of a
30 pressing-in roll engaging in the laying groove, and that the protective profile has flexible edges which can be spread against the walls of the laying groove during the inserting operation, the protective profile firstly being taken up on the pay-off drum.

35 When inserting the protective profile with the aid of an inserting device in accordance with the invention, advantages arise, in particular by virtue of the fact that the protective profile is inserted uniformly and continuously, use being made of profile

shapes which are particularly suitable for this, for example a U-shape with flexible limbs. Moreover, the protective profiles are configured such that they can be delivered wound on a pay-off drum and can be put in the inserting device. The pay-off drum used is provided with a brake, so that hauling off from the pay-off drum can be controlled. When the protective profile is being pressed in with the aid of a pressing-in roll, it is ensured that the protective profile is correctly positioned and fixed, the lateral edges of the protective profile being bent over such that they spread against the walls of the laying groove. This ensures that the protective profile can no longer move independently out of the laying groove. Before or during the insertion of the protective profile, filling is performed with aid of suitable filling means, for example flexible filling compounds or swelling agents such as swelling threads, swelling nonwovens or swelling filling compounds. This provides protection against the intrusion of water. For this type of laying, it is preferred to make use of so-called microcables which comprise a tube into which optical fibres are loosely inserted. The protective profile can consist both of metal and of plastic and also serves at the same time as mechanical protection against external influences.

Glass-fibre or aramid-yarn reinforced plastic, which is preferably injection-coated with high-density polyethylene (HDPE) is preferably used as protective profile. Such a protective profile can be produced in a substantial length and can be drummed in a simple way. If a protective profile made from metal or from plastic is used with elongated inserts made from metal wires, it can also be employed as an earthing strip or as an electric conductor. Furthermore, it is possible to insert in the protective profile, made from plastic, longitudinally running copper wires or optical fibres which are also suitable, for example, for monitoring the cable route. The following advantages are provided

with such a protective profile according to the invention:

- 5 - The cable inserted into the laying groove is fixed, the residual space of the laying groove preferably being filled with bituminous sand.
- The cable is protected against mechanical influences.
- 10 - The cable is protected against thermal influence when the laying groove is being filled with hot bitumen.
- In the case of repair, the laying groove can easily be opened by withdrawing the protective profile without subjecting the cable to stress.
- 15 - In the case of inserting additional wires into the protective profile, it is possible to perform corresponding transmissions.

 In the case of a microcable having a tube made from metal and appropriate external insulation, a protective profile made from metal or from plastic with
20 inserted wires can serve as return conductor.

 It is also possible to supply power via incorporated wires in the protective profile.

 The protective profile can also be fitted directly on a microcable, thus forming a single
25 inserting unit.

 Suitable first and foremost as profile shapes are shapes which spread out against the walls of the laying groove after being pressed into the laying groove, the result being immediate fixture.

30 The inserting device in accordance with the invention can be configured as a self-propelled unit, or be installed in cable carriages or in a carriage which contains the filling means. Bituminous sand, in particular, is suitable as filling means for the laying
35 groove.

 The inserting device expediently also contains devices for introducing swelling agents and/or filling means, with the result that it is possible to perform a

plurality of operations in one functional sequence but one after another.

Moreover, the pay-off drum is configured in each case such that it is suitable for taking up the individual variants of protective profile.

The invention will now be explained in more detail with the aid of eleven figures.

Figure 1 shows the inserting device.

Figure 2 shows a laying groove with inserted cable and protective profile arranged thereover.

Figure 3 shows a protective profile.

Figure 4 shows a protective profile with inserted longitudinal units.

Figure 5 shows a protective profile with an attached oval maxi-unit.

Figure 6 shows a protective profile with an appended optical fibre unit.

Figure 7 shows a protective profile with an attached microcable.

Figure 8 shows a multi-layer protective profile.

Figure 9 shows a protective profile with projecting edges.

Figure 10 shows a further protective profile with projecting edges.

Figure 11 shows a filled laying groove.

Figure 1 shows an inserting device in accordance with the invention. It comprises a movable frame on which a cable support is arranged for holding a pay-off drum AT. Taken up on this pay-off drum AT is the protective profile SP which is to be inserted into the laying groove VN and is hauld off during the inserting operation. In this process, this protective profile SP is guided via a preliminary guide VF to two guide rolls FR between which the protective profile SP runs through in an appropriately positioned fashion to the laying groove VN. Subsequently the protective profile SP is pressed into the laying groove VN by a pressing-in roll ER and fixed, by the edges, which bend away, by being spread against the walls of the laying

groove, inside this laying groove and above the already laid cable K. During this operation, the inserting device EV is pulled along or driven along over the laying groove VN on the road surface SO in the specified pulling direction ZR.

Figure 2 shows the cross section of a laying groove VN which is introduced into the road surface SO and into which a cable, for example a microcable comprising a tube and loosely inserted optical fibres, is laid, a protective profile SP1 with spread edges already being fixed above. The remaining cavities H are filled with an appropriate filling means.

Figure 3 shows a protective profile SP2 which comprises a middle part MT protecting the cable and lateral edges R, the edges R being flexible so that it is also possible to take up onto a pay-off drum. The edges are therefore also provided with slots S, for example, in order to improve the flexibility of the entire arrangement in relation to taking up.

Figure 4 shows a protective profile SP3 with incorporated longitudinal elements LE which serve to reinforce and, when suitably constructed, also as power conductors or transmitting conductors. The following dimensions are preferably provided for an exemplary embodiment which is used with a laying groove of width 10 mm. The width BMT of the middle part is 8 to 9 mm, the thickness SMT of the middle part MT is approximately 3 mm, the length LR of the flexible edges R is 7 mm, and the thickness SR of a flexible edge R is 0.5 to 1 mm. In this arrangement, a wide open spacing SR of the edges R is preferably 15 mm given a U-shaped cross section.

Figure 5 shows a protective profile SP4 in which an oval optical fibre maxi-unit MB is already fixed on its middle part.

Figure 6 shows a protective profile SP5 with a moulded-on optical fibre ribbon, the latter preferably being moulded on such that it can easily be separated from the protective profile SP5.

Figure 7 shows a protective profile SP5 with an optical fibre microcable MK fastened on the middle part.

Figure 8 shows a protective profile SP6 which
5 comprises a plurality of layers, the middle part SMT7 being constructed as a protective layer with inserted longitudinal elements. The layer S1 serves as damping layer and consists of physically blown polyurethane (PU) with spherically constructed cavities which
10 prevent the intrusion of water in the longitudinal direction. The layer S2 contains, for example, wires or optical fibres for transmission purposes, and the layer S3 is, in turn, constructed as a protective layer. The layer S4 is made from polyethylene (PE). Its effect,
15 when glass fibres are used in layer S2, is that the microcable M6 or another material located therebelow does not press through.

Figure 9 shows a protective profile SP8 which can be wound particularly effectively and in the case
20 of which the flexible edges R8 project from the middle part SMT8 in a plane without stepping in the form of lamellar, flexible strips.

Figure 10 shows a protective profile SP9 with flexible edges R9 projecting in the middle from the
25 middle part on both sides, a protective profile with longitudinal elements being selected here again as an example.

Figure 11 shows a fully fitted laying groove VN which has been inserted into a road surface SO of a
30 laying round VG. To be seen at the base of the laying groove VN is the laid cable K over which there is arranged a protective profile SP10 which spreads with its edges against the walls of the laying groove VN. The remaining cavities of the laying groove VN are
35 filled with a filling means, for example with bituminous sand BS. However, it is also possible to introduce additional filling means which exhibit a swelling action upon the intrusion of water and thus prevent further intrusion of water.

~~Patent Claims~~ The claims defining the invention are as follows:

1. Inserting device for inserting an elongated protective profile above a cable laid in a laying groove, characterized in that a pay-off drum (AT) with the elongated protective profile (SP) is arranged on a movable inserting device (EV), in that guide rolls (FR) for positioning the protective profile (SP) to be inserted into the laying groove (VN) are arranged upstream of a pressing-in roll (ER) engaging in the laying groove (VN), and in that the protective profile (SP) has flexible edges (R) which can be spread against the walls of the laying groove (VN) during the inserting operation, the protective profile (SP) firstly being taken up on the pay-off drum (AT).
2. Inserting device according to Claim 1, characterized in that a preliminary guide (VF) is arranged upstream of the guide rolls (FR).
3. Inserting device according to one of the preceding claims, characterized in that the pay-off drum (AT) is provided with a brake (TB).
4. Inserting device according to one of the preceding claims, characterized in that the edges (R8) of the protective profile (SP8) taken up on the pay-off drum run continuously in a plane without stepping.
5. Inserting device according to one of Claims 1 to 3, characterized in that the edges (R) of the protective profile (SP2) taken up on the pay-off drum are provided with transversely running slots.
6. Inserting device according to one of the preceding claims, characterized in that the edges of the protective profile taken up on the pay-off drum are formed projecting in a flat fashion in each case in the drummed state.
7. Inserting device according to one of the preceding claims, characterized in that the protective profile (SP3, SP4, SP5, SP6, SP7, SP9) taken up on the pay-off drum has longitudinally running elements (LE), in particular electric wires or optical fibres, in the respective middle part.

8. Inserting device according to one of the preceding claims, characterized in that the protective profile (SP4, SP5) taken up on the pay-off drum is provided with an optical fibre maxi-unit (MB) or an optical fibre ribbon (LWLB).
9. Inserting device according to one of Claims 1 to 7, characterized in that the protective profile (SP6) taken up on the pay-off drum is arranged on a micro-cable (MK) comprising a tube and optical fibres inserted therein.
10. Inserting device according to one of the preceding claims, characterized in that the protective profile (SP7) taken up on the pay-off drum comprises a plurality of layers.
11. Inserting device according to Claim 10, characterized in that one layer or more layers contain optical fibres.
12. Inserting device according to Claim 10 or 11, characterized in that one layer (S1) is constructed as a damping layer and preferably consists of foamed plastic material.
13. Inserting device according to one of Claims 10 to 12, characterized in that at least one layer is completely water tight.
14. Inserting device according to one of the preceding claims, characterized in that in the middle part (MT) the protective profile (SP3) taken up on the pay-off drum has a thickness (SMT) of 1.5 to 3 mm, in that the edges (R) have a thickness (SR) of 0.5 to 1 mm, and in that the flexible edges (R) have a length (LR) of 5 to 10 mm.
15. Inserting device according to one of the preceding claims, characterized in that for a laying groove of width 10 mm the protective profile (SP3) taken up on the pay-off drum has a middle part (MT) with a width (BMT) of 8 to 9 mm, and in that the wide spacing of the edges (R) has a spacing width (AR) of 15mm.

16. Inserting device according to one of the preceding claims, characterized in that the protective profile taken up on the pay-off drum can be folded up in a U shape fashion during insertion in each case, and
5 in that the two folded-up edges are set obliquely outwards at the ends.

17. Inserting device according to one of the preceding claims, characterized in that the protective profile taken up on the pay-off drum consists of glass-
10 fibre reinforced polyester.

18. Inserting device according to one of Claims 1 to 16, characterized in that the protective profile taken up on the pay-off drum consists of polyvinylchloride (PVC).

15 19. Inserting device according to one of Claims 1 to 16, characterized in that the protective profile taken up on the pay-off drum consists of high-density polyethylene (HDPE).

20 20. Inserting device according to one of the preceding claims, characterized in that before the insertion of the protective profile a device for introducing a swelling agent in the form of swelling threads, a swelling nonwoven or a swelling filling compound is arranged in the laying groove (VN).

25 21. Inserting device according to one of Claims 1 to 19, characterized in that before the insertion of the protective profile a device for inserting a flexible filling compound is arranged in the laying groove (VN).

30 22. Inserting device according to one of the preceding claims, characterized in that a take-off drum is arranged with a microcable (MK) which comprises a tube and optical fibres inserted therein.

35 23. Inserting device according to one of the preceding claims, characterized in that the inserting device is equipped to be self-propelled.

24. Inserting device according to one of the preceding claims, characterized in that the inserting device is integrated on a cable laying carriage.

25. Inserting device for inserting an elongated protective profile above a cable laid in a laying groove, said inserting device substantially as described herein with reference to Fig. 1 of the accompanying drawings.

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DATED this Second Day of March 1999

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Patent Attorneys for the Applicant

SPRUSON & FERGUSON



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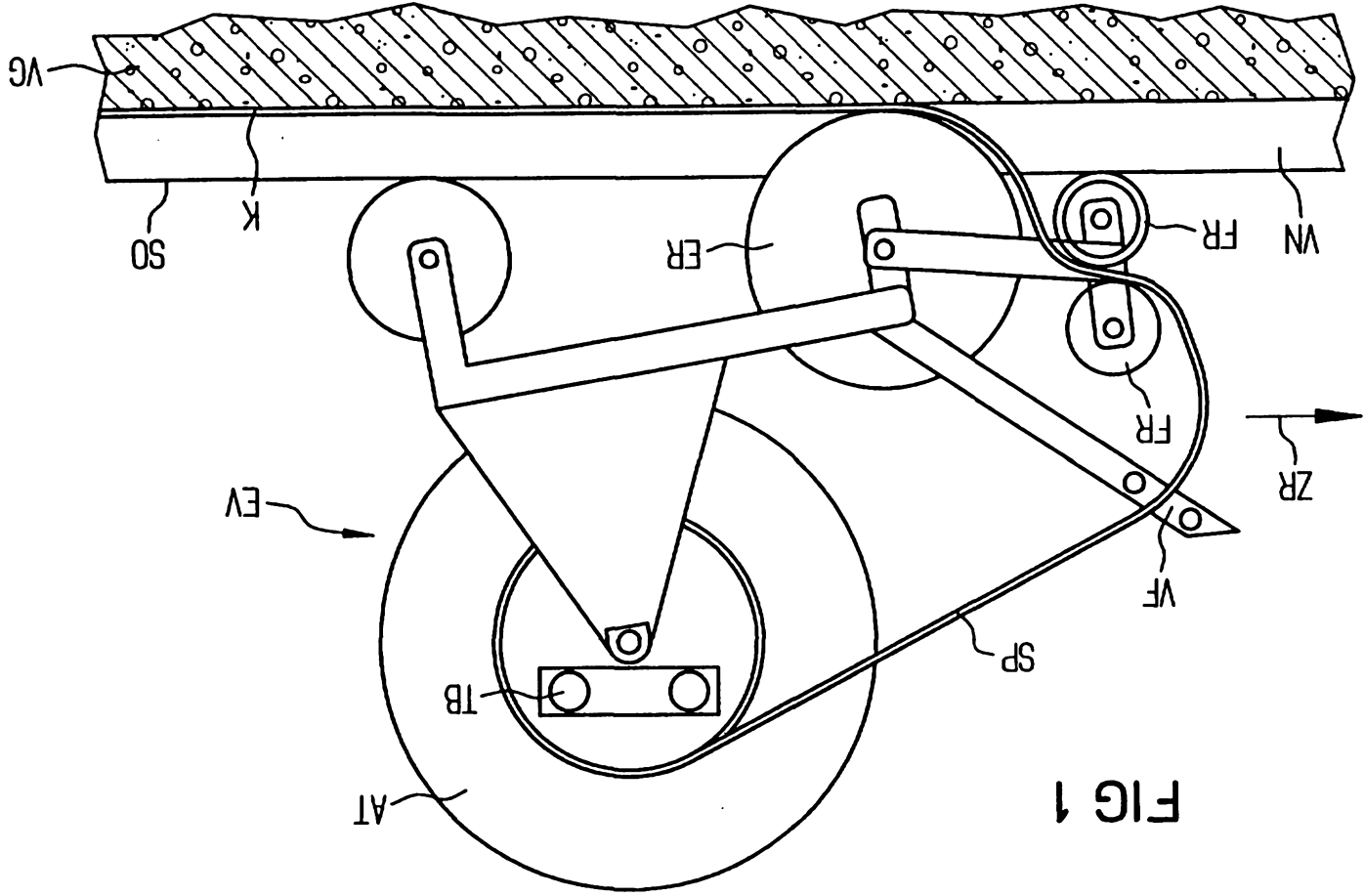


FIG 1

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FIG 2

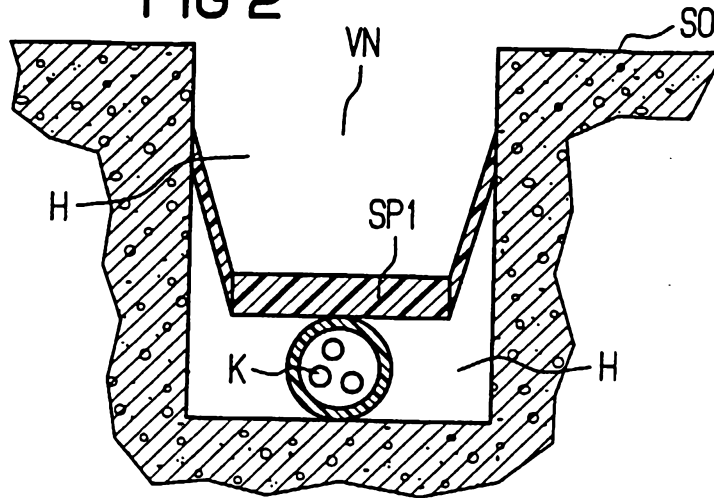


FIG 3

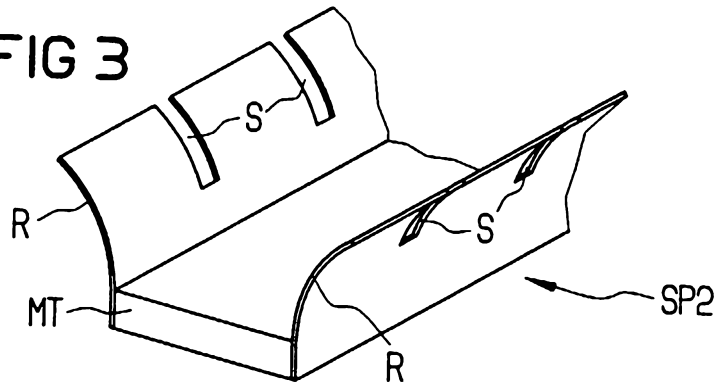


FIG 4

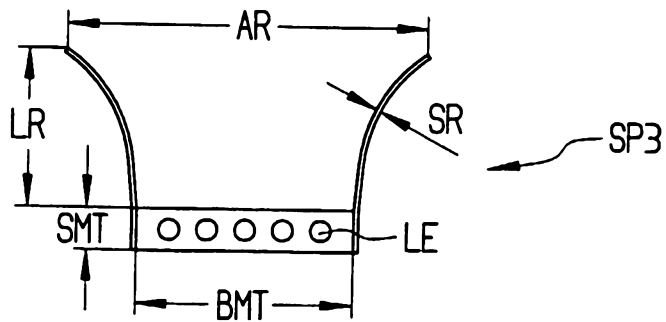


FIG 5

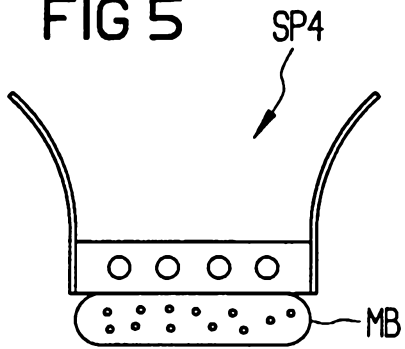


FIG 8

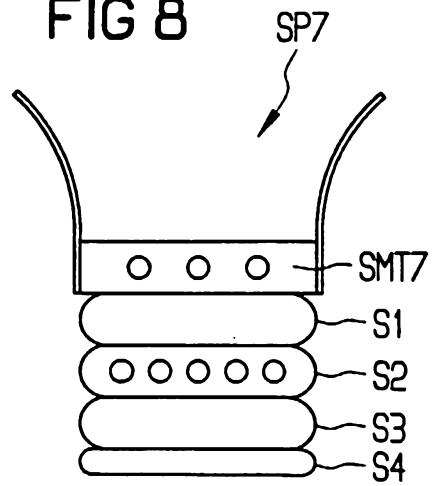


FIG 6

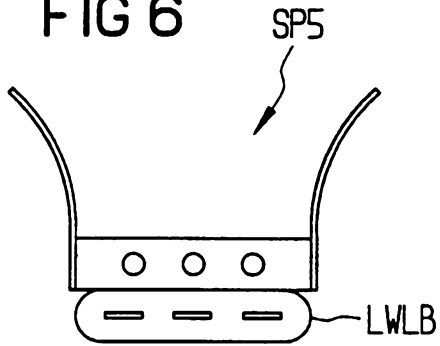


FIG 9

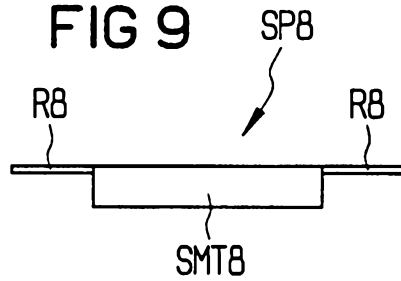


FIG 7

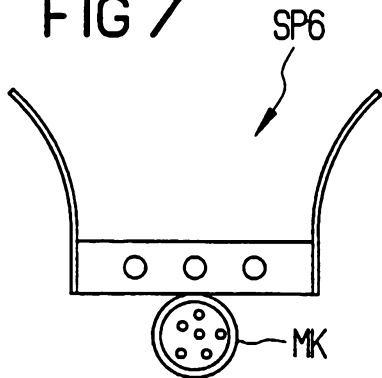


FIG 10

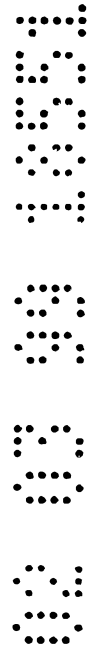
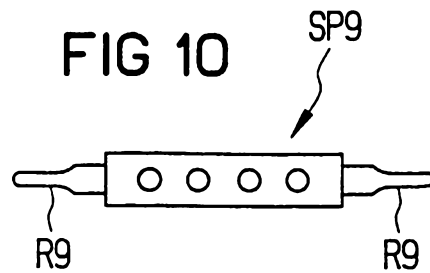


FIG 11

