Abstract Title: Ring-profile fastener with fingers and projections

A fastener in the form of a strip of material characterised by being, in plan view, in the form of a ring profiled to conform to an annular gap between a first component bounded by the fastener and a second component bounding the fastener. The ring in plan view defining ends bounding a gap in plan views. The strip of material having a first side and a second side; and having a series of integral fingers 36, 37, 38, 39, spaced along the length of the ring and projecting, in plan view, outwardly or inwardly from the ring. The fastener also including a further series of discrete projections 40, 41, 42, 43 formed integrally from the strip and lying around the ring member in between members of the series of fingers, 36, 37, 38, 39. The fastener may be used to fasten a pipe within a bore. The fastener may provide accurate alignment of one component within another while accomodating temporary changes in alignment such as can arise by differential heating or cooling.
FASTENER

TECHNICAL FIELD

This invention relates to a fastener. It is particularly concerned with a fastener providing for retention of a first component within a second component where there is a relatively wide clearance between the first and second components.

BACKGROUND ART

In our co-pending UK Application 0409690.5 (the ‘Earlier Application’) there is described a fastener comprising a strip of material in the form of a ring member which in plan view is profiled to conform to an annular gap between a first component bounded by the fastener and a second component bounding the fastener; the ring member having ends providing a gap in plan view; the strip of material having a first side and a second side; and having a series of integral fingers spaced along the length of the ring and projecting, in plan view, outwardly from the ring. Hereafter a fastener of a type described in the Earlier Application is referred to as being ‘of the type described’. The invention of the Earlier Application is not limited to a ring member with a plan view of circular profile. The ring member of the fastener can be formed with a profile in plan according to any required shape appropriate for location in a gap between first and second components to be joined by way of the fastener. In addition the integral fingers of the series can either all extend outwardly from either the first side or the second side; or one or more of the fingers of the series can extend outwardly from the first side and the remaining fingers of the series extend outwardly from the second side.
DISCLOSURE OF THE INVENTION

According to the present invention there is provided a fastener in the form of a ring member fabricated from a strip of material the ring member being characterised by being profiled, in plan view, to conform to an annular gap between a first component bounded by the fastener and a second component bounding the fastener; the ring member in plan view defining ends bounding a gap in plan view; the ring member having a first side and a second side; and having a series of integral fingers spaced along the length of the ring member and projecting, in plan view, outwardly or inwardly from the ring member; the ring member including a further series made up of discrete projections formed integrally from the strip and lying around the ring member in between members of the series of fingers.

According to a first preferred version of the present invention the discrete projections of the further series all extend outwardly from either the first side or the second side.

According to a second preferred version of the present invention at least one of the discrete projections of the further series extends outwardly from the first side and the remaining projections of the series extending outwardly from the second side.

BRIEF DESCRIPTION OF DRAWINGS

An exemplary embodiment of the invention will now be described with reference to the accompanying drawings of a fastener of which:
Figure 1 is a plan view; and
Figure 2 is a perspective view.

MODE FOR CARRYING OUT THE INVENTION

The drawings variously show a fastener 30 comprising a strip of spring steel formed into a ring member 31 which in plan view is profiled to conform to an annular gap H
(Figure 1) between a first component A bounded by the fastener 30 and a bore B' in a second component B (shown in dashed outline) bounding the fastener 30. The member 31 in this case is circular in plan (save for gap G) since it intended for location in the annular gap H. The member 31 has a first, outer, side 34 and a second, inner, side 35.

A series of four integral spring fingers 36 – 39 are spaced around member 31. Each finger 36 – 39 is parallel sided with shaped ends (typically end 37A) and are punched from the body of the strip to leave an elliptical aperture (typically aperture M) in the member 31.

A further series in this case of integral projections 40 - 44 are spaced around the member 31 and projecting from the outer side 34 of the member 31 that is to say projecting on the same side of the member 31 as the fingers 36 - 39.

The fingers 36 – 39 protrude from remainder of the outer side 34 by an amount greater than the than the maximum radial spacing in the annular space H between the assembled components A and B. On the insertion of the fastener 30 into the annular space H the fingers 36 – 39 are compressed against bore B' so providing frictional resistance to axial movement of the fastener 30 within the bore B' that is to say movement perpendicular to the plane of the paper in Figure 1.

The further series of projections 40 – 44 serve to provide for increased radial stiffness for the fastener 30 when in use. The projections 40 – 44 serve to almost fill the radial gap between the outer main surface of the member 12 and the inside of the bore B'. In the event a radial load is applied to the assembly the fastener will only be able to move a relatively small amount radially before the tops of one or more of the projections 40 – 44 contact the surface of bore B' after which further radial loading on the fastener will be resisted by the stiffness provided by projections 40 – 44 in the
further series. This stiffness will depend, upon other things, on the geometry of the projections 40 – 44.

The use of the series of spring fingers 36 – 39 and of the further series of projections 40 - 44 provide a two-stiffness fastener: relatively low for resisting sliding forces and provided by way of the spring fingers 36 – 39; relatively high for resisting radial deflection provided by way of the projections 40 – 44.

For a given application the fastener can be adapted to achieve a required performance by modifying one or more of the following characteristics:
profile and number of the fingers 36 – 39 and of the projections 40 - 44;
profile of the aperture formed in the body of the strip for each finger 36 - 39;
material from which the member 12 is made;
dimensions of the strip.

In the exemplary embodiment the fingers 36 – 39 project radially outwardly from the first, outer, side 34 of the member strip 12. Thus, as shown in Figure 1, the fastener 11 seats by way of second, inner, side 35 on first component A and engages the second component B by way of fingers 36 – 39.

In an alternate version the fingers can project radially inwardly from a second, inner side, of the strip so that the fastener seats by way of a first outer side on a bore wall in a second component and engages a first component by way of the inwardly projecting fingers.

The exemplary embodiment of this version makes use of a further series formed by discrete projections from the member. In an alternative version the further series can be formed of discrete waves or ripples formed as corrugations in the wall of the member between each individual member of the series of integral fingers. The waves
or ripples can either project outwardly from the member, inwardly or project on both sides of a path defined by an un-deformed region of the member.

It is also envisaged that a fastener can be manufactured with fingers projecting both radially inwardly and outwardly so that the body part of the fastener is positioned midway between the components being fastened with contact between the components being by way of some of the fingers in the series.

The profile, in plan view, of the fastener 30 is circular typically to provide for the fastening of a pipe (component A) within a bore B' (in component B) so as to accommodate variations in alignment, between the two components A, B while maintaining secure fastening. However the invention is not limited to a circular profile and the strip making up a fastener according to the invention can be formed to any plan shape in order to accommodate an annulus between non-circular profile of an inner component into a bore of complementary form in an outer component where there is a relatively wide clearance between the outside of the inner component and the bore in the outer component.

INDUSTRIAL APPLICABILITY
The fastener of the present invention provides for the accurate alignment of one component within another while accommodating temporary changes in alignment such as can arise by differential heating or cooling. In a particular application more than one fastener may be used to provide the required fastening characteristics.

It is envisaged that more than one fastener according to the present invention could be used to align a given first component with a second component.
CLAIMS

1. A fastener in the form of a ring member fabricated from a strip of material the ring member being characterised by being profiled, in plan view, to conform to an annular gap between a first component bounded by the fastener and a second component bounding the fastener; the ring member in plan view defining ends bounding a gap in plan view; the ring member having a first side and a second side; and having a series of integral fingers spaced along the length of the ring member and projecting, in plan view, outwardly or inwardly from the ring member; the ring member including a further series made up of discrete projections formed integrally from the strip and lying around the ring member in between members of the series of fingers.

2. A fastener as claimed in Claim 1 characterised in that the discrete projections of the further series all extend outwardly from either the first side or the second side.

3. A fastener as claimed in Claim 1 characterised by at least one of the discrete projections of the further series extending outwardly from the first side and the remaining projections of the series extending outwardly from the second side.

4. A fastener as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.
### Patents Act 1977: Search Report under Section 17

**Documents considered to be relevant:**

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<th>Category</th>
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<td>1-3</td>
<td>GB 1094610 A (PEUGEOT) - see particularly figures 21-25</td>
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<td>EP 1067336 A1 (ERLUS) - see particularly the figures</td>
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<td>DE 001855948 U (HAUSNER) - see particularly figures 1-6</td>
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<td>GB 1386738 A (STAR) - see particularly figures 1-8</td>
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**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

- E2A; F2P; F2X

Worldwide search of patent documents classified in the following areas of the IPC:

- F16B; F16L

The following online and other databases have been used in the preparation of this search report:

- EPDOC, WPI