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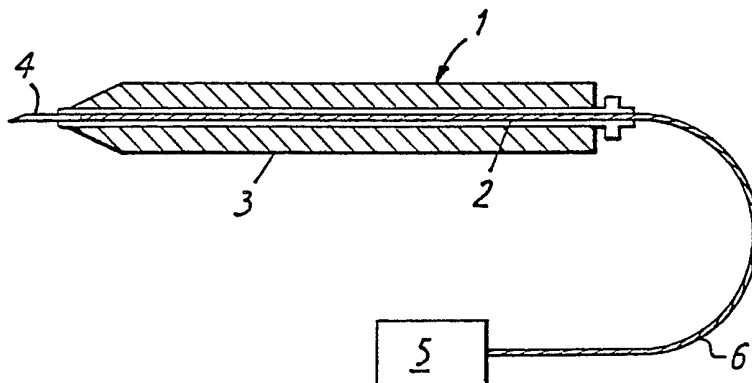
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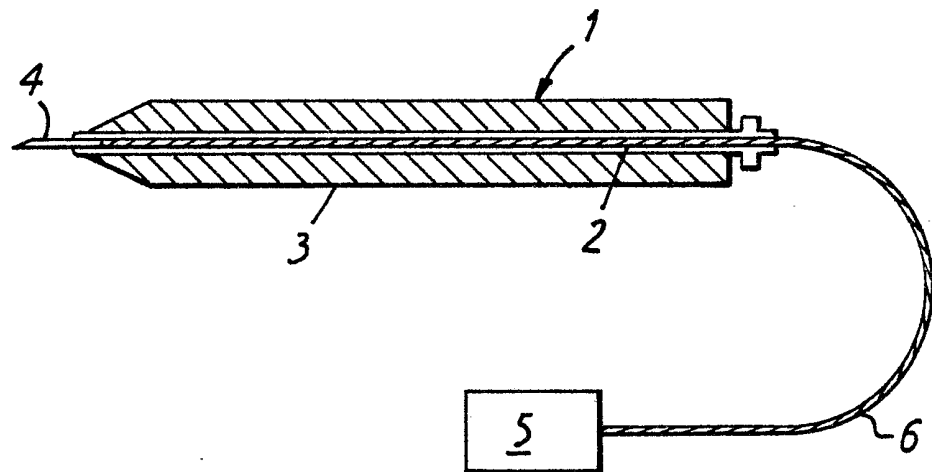
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(54) Surgical laser knives

(57) A laser knife includes a handle (3) supporting a diamond blade (4). An Nd/YAG laser (5) is optically coupled by a bundle of optical fibres (2) to the blade (4). The arrangement enables the blade to cauterise tissue being incised by the knife.



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SPECIFICATION

Laser knives

The present invention relates to laser knives.

Surgical scalpels have been proposed having a
5 sapphire blade. An argon laser is coupled to the
blade and energised to inject its high intensity
light output into the immediately adjacent region
of tissue being incised. The blue green light of the
laser is selectively absorbed by the red
10 haemoglobin of the blood in the walls of the
incised tissue and rapid coagulation occurs to seal
the walls of the incision.

A disadvantage of such scalpels is that the laser
subjects the sapphire to thermal shock and these
15 shocks promote cracks in the sapphire thereby
reducing the life of the blade.

The solution to this problem has been to
provide blades of softer material such as fused silica.
However, while this has tended to extend the life
20 of the blade with regard to cracking, blades of
softer material wear more rapidly than harder
materials and this in turn acts to limit the life of
the blade.

Thus, it is an object of the invention to provide
25 an improved laser blade.

Accordingly, the invention provides a laser knife
comprising a diamond blade, a Neodymium/
Yttrium Aluminium Garnet laser, and means
optically coupling the radiation output from
30 the laser to the vicinity of the cutting edge of the
blade, to enable the blade to cauterise tissue being
incised by the knife.

The invention may be further described, by way
of example only, by reference to the sole Figure of
35 the accompanying diagrammatic drawing which
shows a plan view of a laser knife.

As shown in the Figure a surgical diamond knife
1 has a handle 3 supporting a diamond blade 4.
An optical fibre bundle 2 located within the handle
40 3 abuts an optically smooth surface of the
diamond blade 4. A connector 6 couples the other
end of the optical fibre bundle 3 to a radiation
source in the form of a Neodymium/Yttrium
Aluminium Garnet (Nd/YAG) Laser 5.

45 The Nd/YAG laser 5 is in the form of a crystal
pumped by means of a flash tube which provides a
pulsed source of power.

To effect coagulation the laser is operated at a
high peak power (e.g. 25—100 watts output), and
50 either at a high repetition rate (e.g. at 1—10,000

pulses/second) or continuously.

With the above-described specific
arrangement, i.e. the combination of a diamond
blade and Nd/YAG laser, it has been found that the
55 blade has a significantly longer life when
compared with existing arrangements of radiation
transmitting blades and lasers.

The laser knife of the present invention may,
optionally, be combined with a conventional
60 visible light source to cause the blade to
luminesce (as disclosed in co-pending application
No. 8123635). This combination is particularly
useful when the knife is used, e.g. in brain surgery
where most incisions are made through small
65 holes which may be deep and therefore dark.

The cauterising action of the blade is
particularly valuable in removing cancerous tissue.
When cutting away such tissue the surfaces being
incised are speedily sealed against fluid loss as
70 they are traversed by the cutting edge of the
blade. The free flow of body fluids is thus
prevented and the chances of recovery from the
operation significantly improved.

In a modification radiation from the laser may
75 be coupled from the laser to the diamond blade by
means of alternative methods such as those
disclosed in co-pending Application No. 81 23635
(Published Specification No. 2 102 678).

CLAIMS

80 1. A laser knife comprising a diamond blade, a
Neodymium/Yttrium Aluminium Garnet laser, and
means optically coupling the radiation output from
the laser to the vicinity of the cutting edge of the
blade, to enable the blade to cauterise tissue being
85 incised by the knife.

2. A laser knife according to Claim 1 wherein
the optically coupling means comprises a bundle
of optical fibres extending from an optically
smooth surface of the diamond blade to the laser.

90 3. A laser knife according to Claim 2 including a
handle supporting the diamond blade and through
which said bundle of optical fibres pass.

4. A laser knife according to any one of Claims
1—3 including in combination therewith a source
95 of visible light which is transmitted to the diamond
blade.

5. A laser knife substantially as hereinbefore
described with reference to the accompanying
drawing.