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(56) Documents Cited

GB 2345606 A WO 98/11816 A1 JP 110030799 A
US 5558619 A US 4633304 A
Internet web page: <http://www.acal-auriema.co.uk/hire/visuspec/visumain.html>; 06.04.2000.

(58) Field of Search

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INTERNET.

(54) Abstract Title

Video camera on elongate support for viewing inaccessible locations.

(57) A camera arrangement for viewing inaccessible locations, such as loft spaces or the underside of cars, comprises a camera assembly 1 fixed to a tubular handle 20 via a flexible neck part 7. Flexible neck 7 comprises nesting, interlocking components as shown in Figure 2 and the handle 20 may be extensible as shown in Figure 5. A range of monochrome or colour CCD and CMOS imaging devices are specified for use in camera 1. The device comprises a further handle assembly (25, Figures 7 and 8) housing power and video transmission wiring, and including a battery box (30). Images from the camera 1 are relayed to video monitors via a microwave transmitter (40, Figure 9).

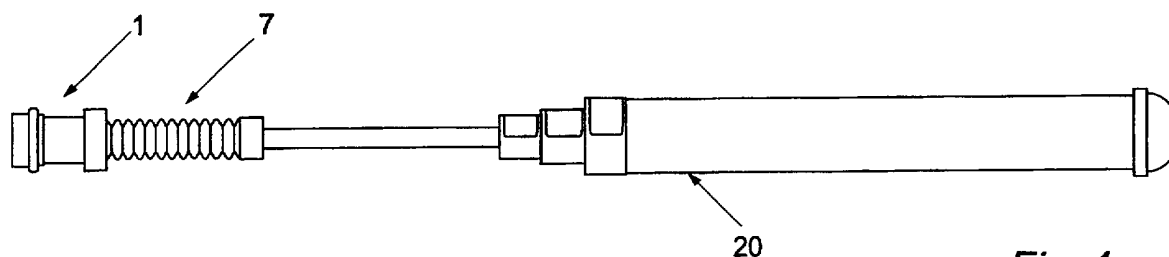


Fig. 4

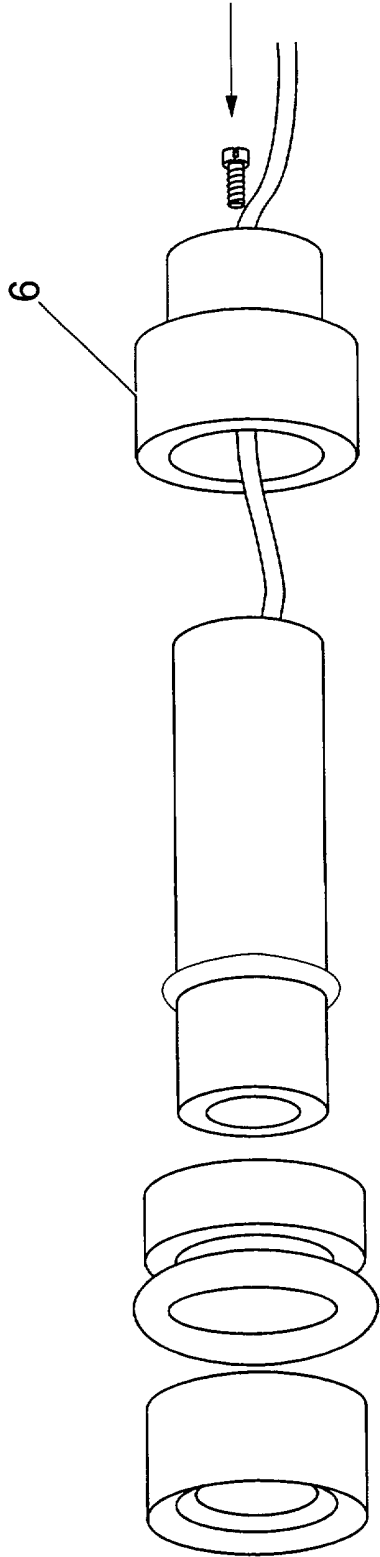


Fig. 1a

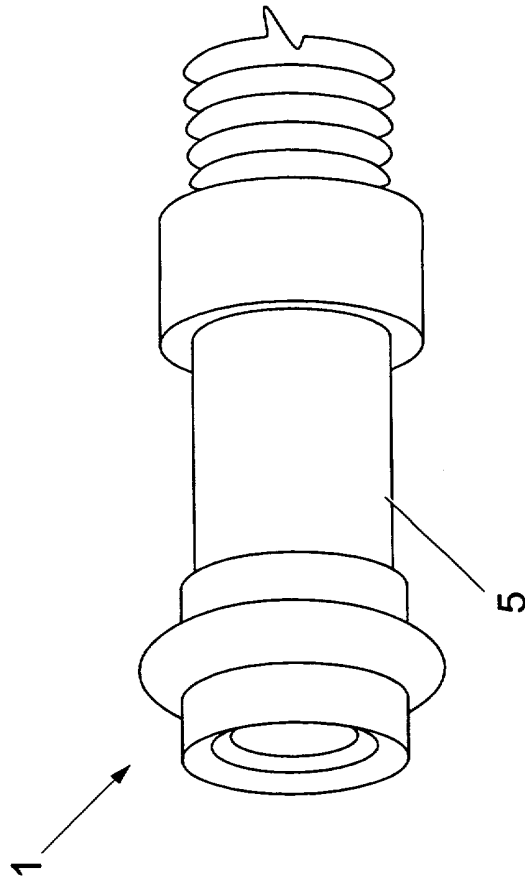
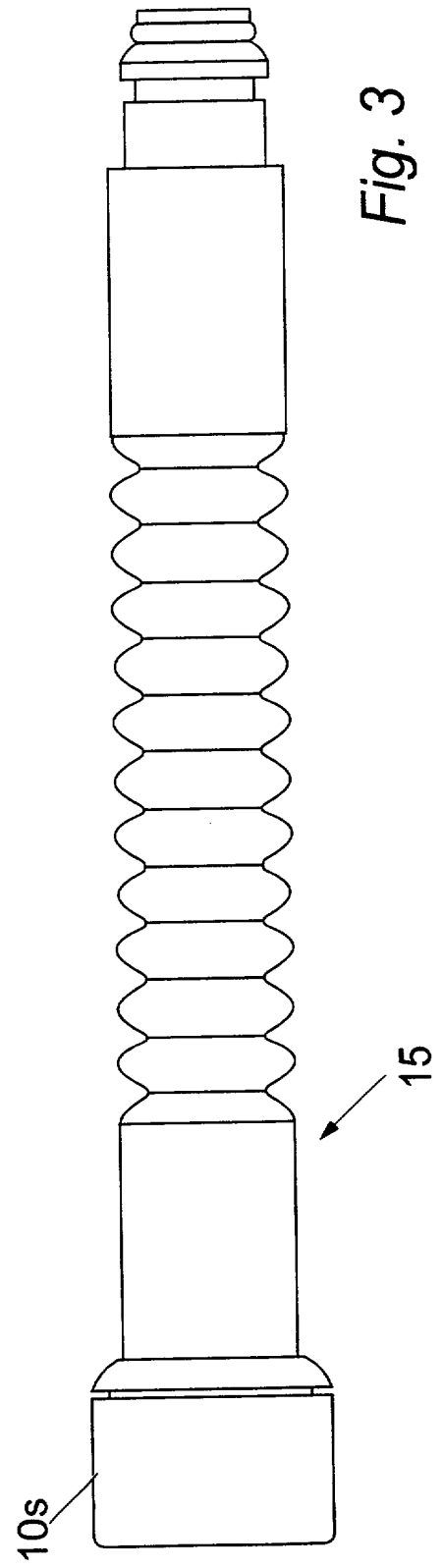
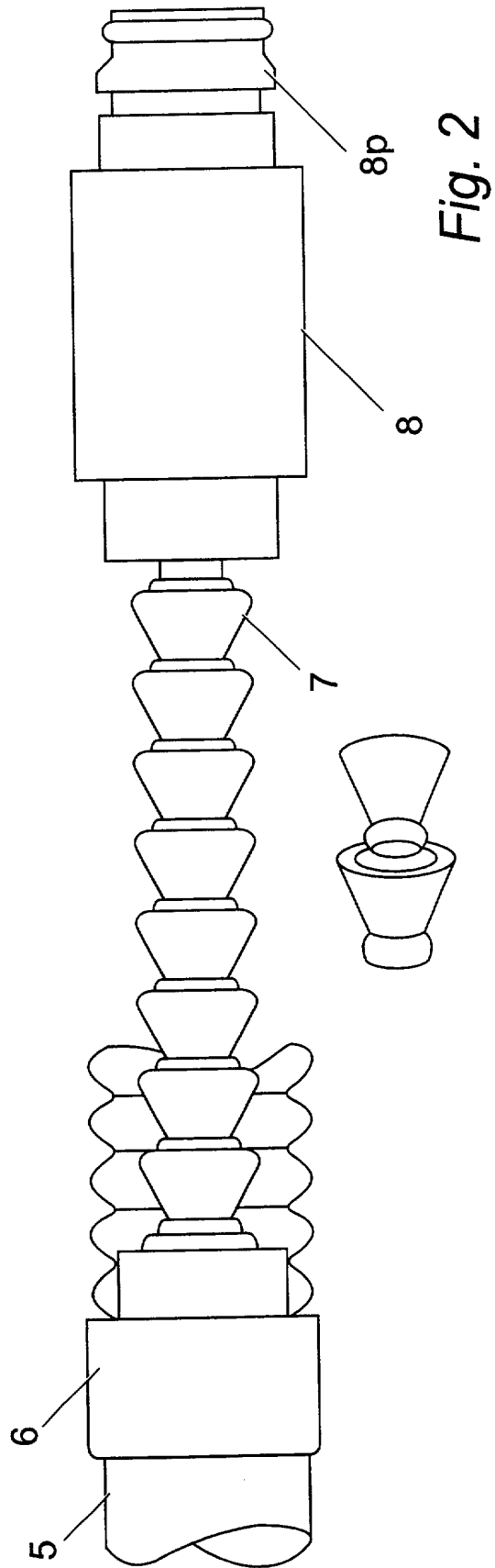
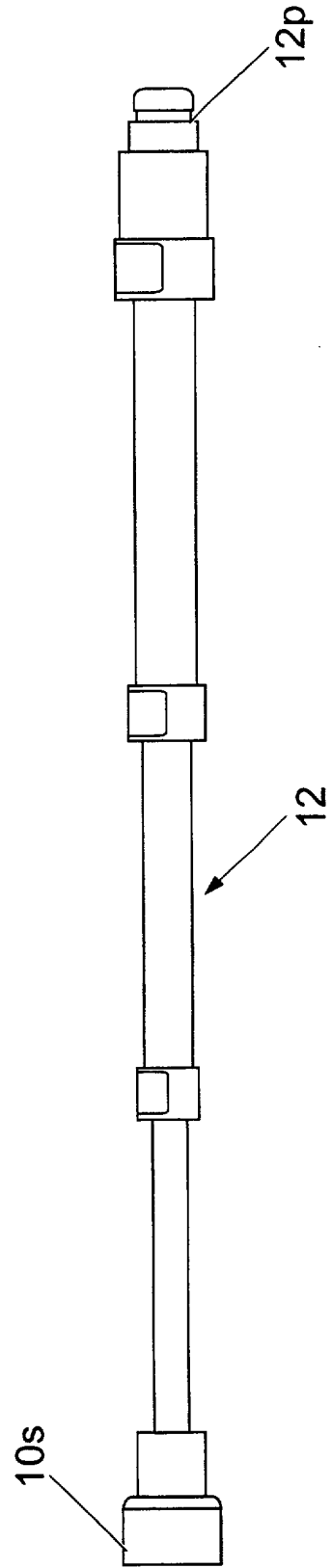
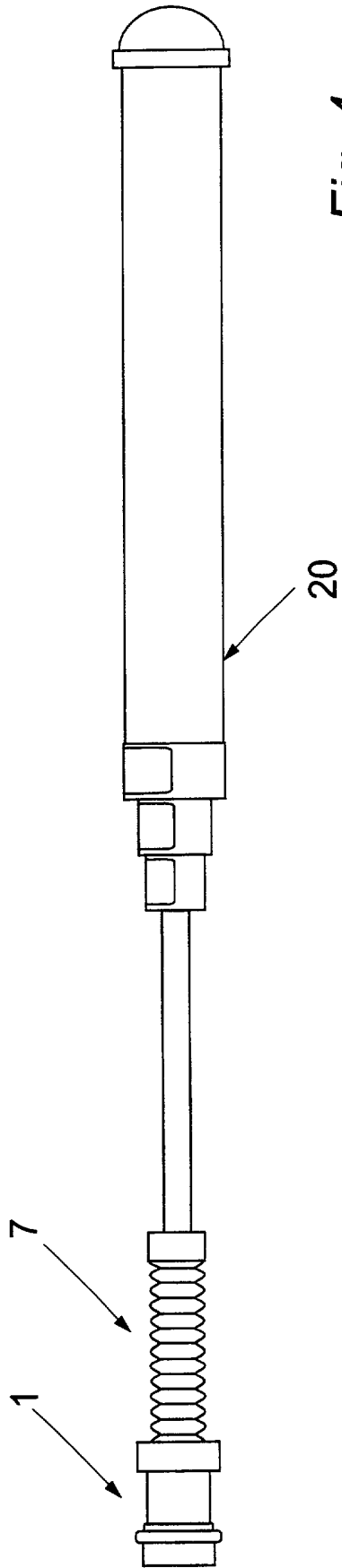


Fig. 1b





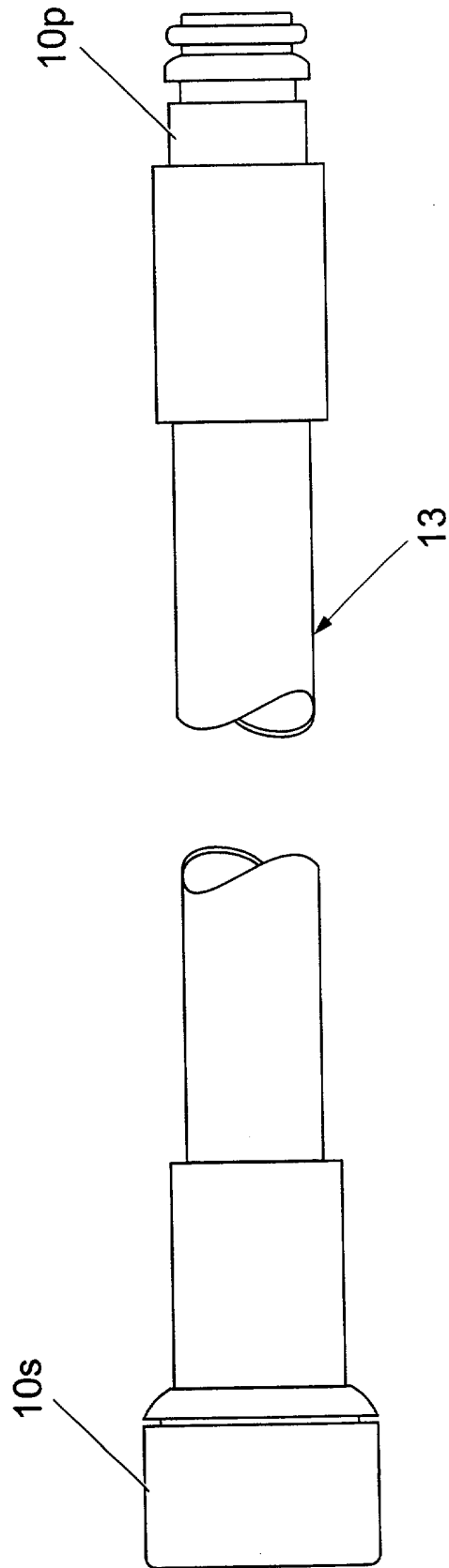
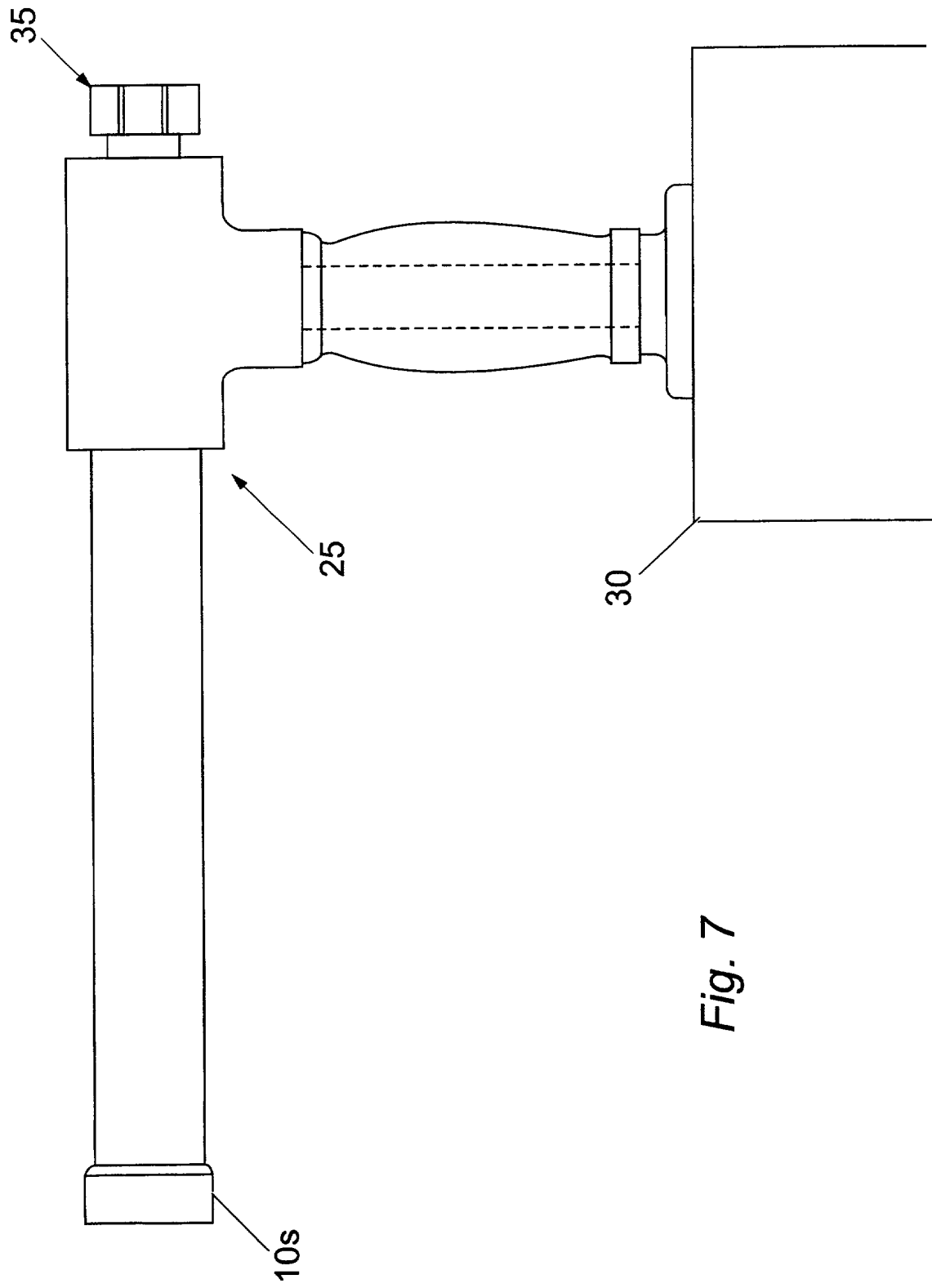


Fig. 6



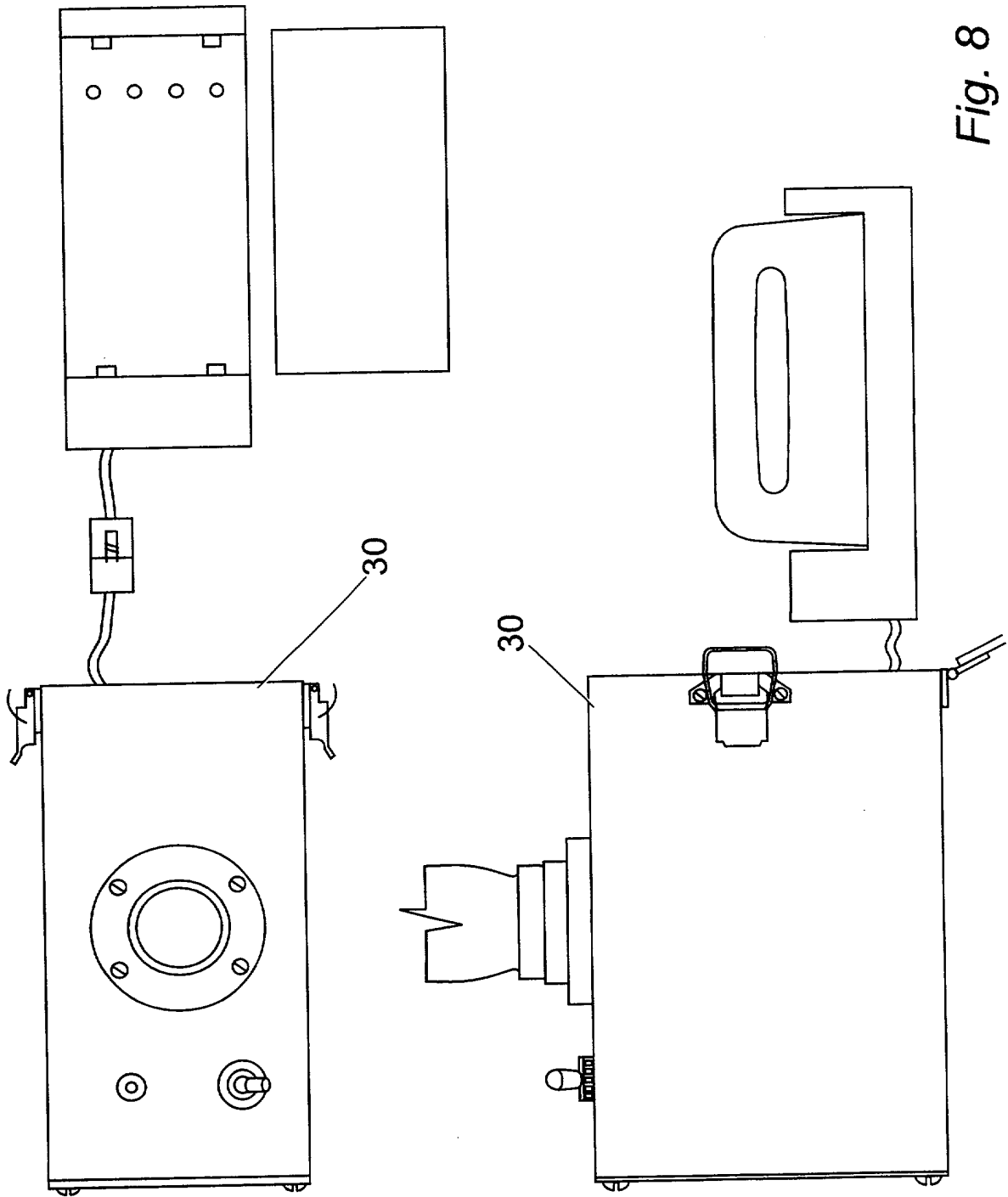


Fig. 8

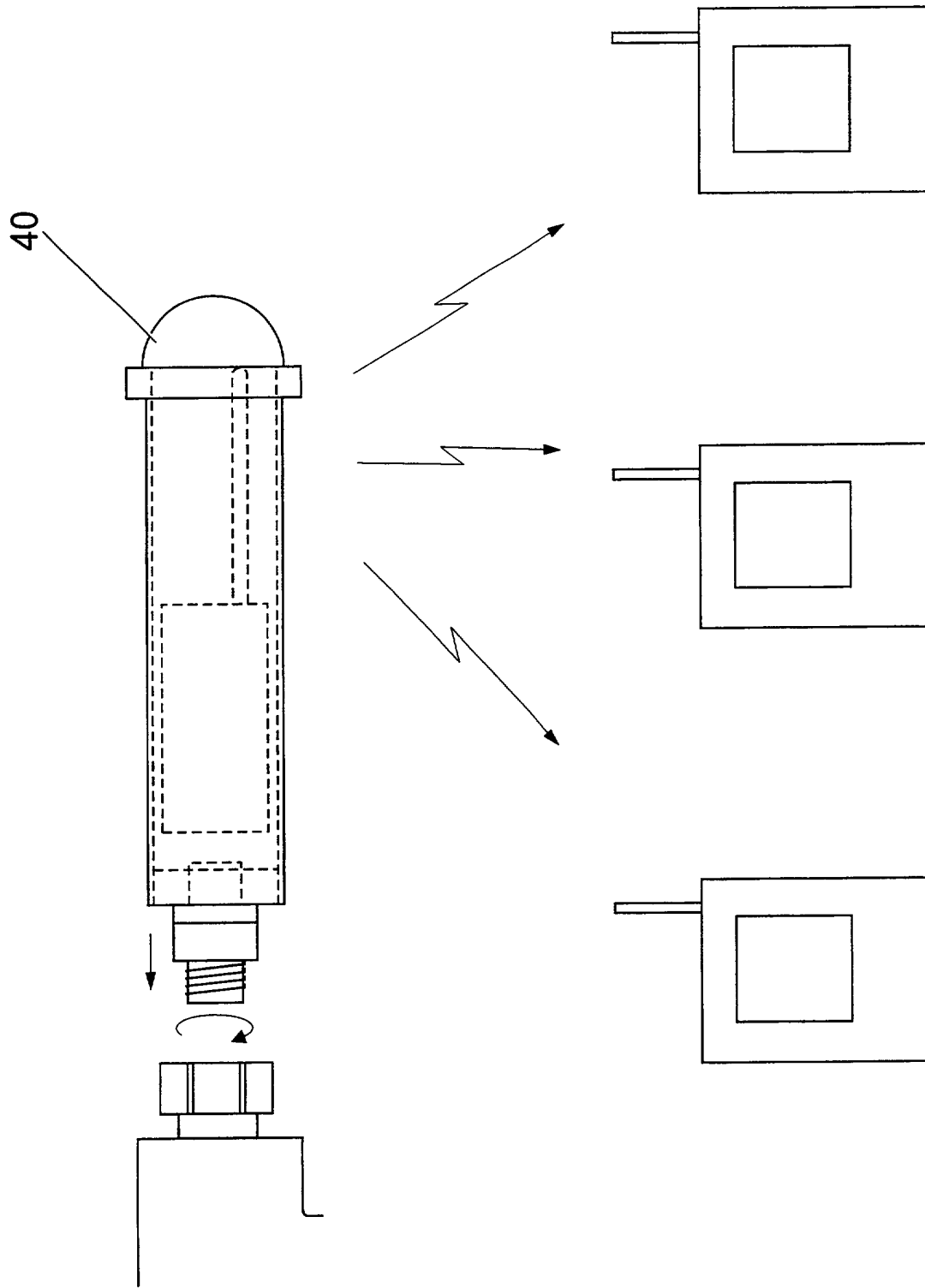


Fig. 9

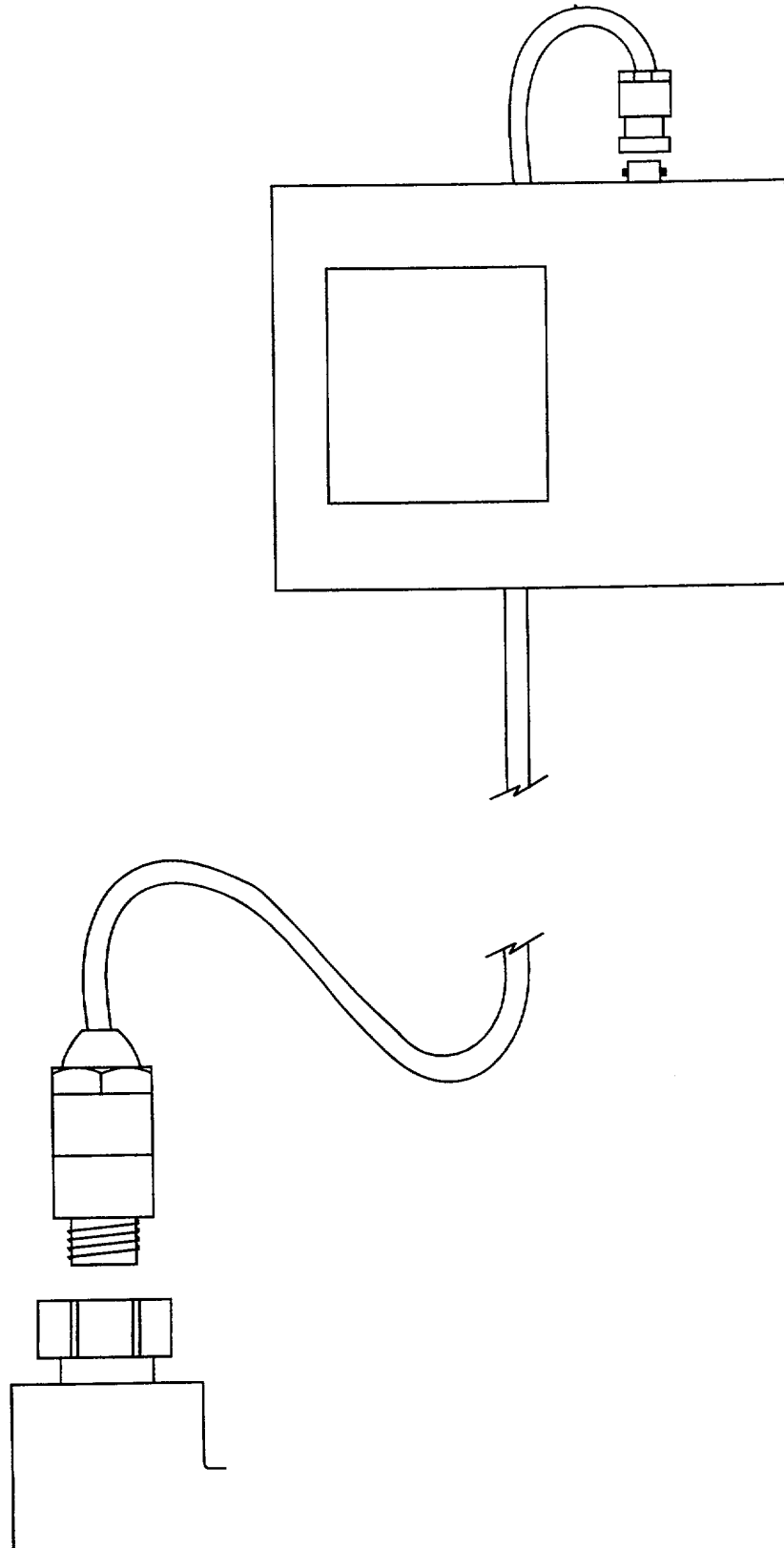


Fig. 10

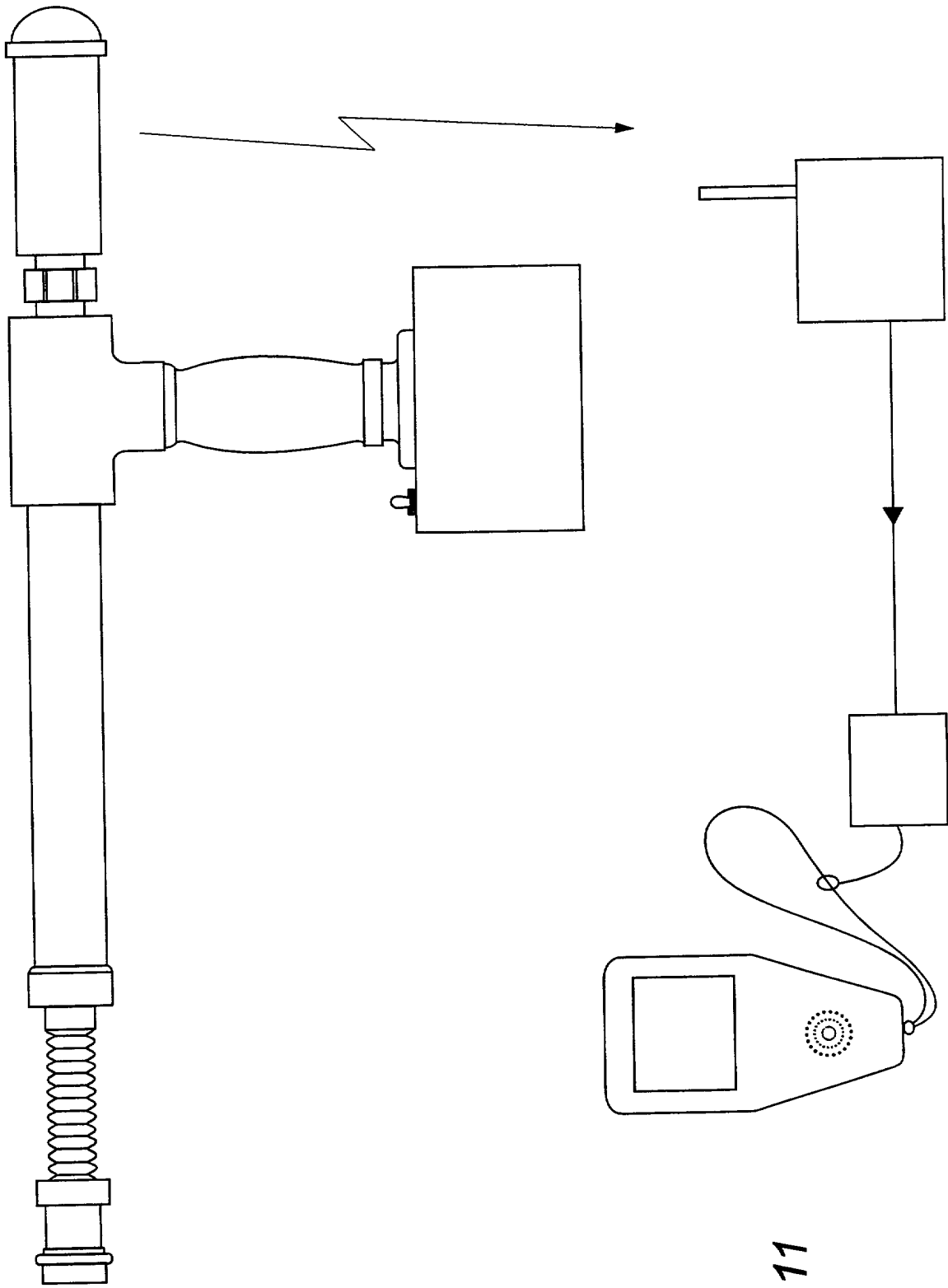


Fig. 11

1 **Camera**

2

3 This invention relates to a camera, particularly one
4 allowing the user to view subjects that would
5 normally be inaccessible or would otherwise present
6 difficulties in viewing directly.

7

8 Existing apparatus for viewing inaccessible subjects
9 such as loft spaces and the undersides of cars
10 typically rely on mirrors on the ends of poles etc
11 which can be manoeuvred into position to allow the
12 user to see the reflection of the subject in the
13 mirror.

14

15 According to the present invention there is provided
16 an imaging system comprising an imaging device and
17 having an elongate support member, a monitor, and a
18 wireless transmitter to transmit signals from the
19 imaging device to the monitor.

20

1 The elongate support member can be telescopic, or can
2 be provided in discreet lengths which have been
3 connected together to extend the elongate member or
4 reduce its length. The imaging device is typically a
5 camera, although any number of imaging devices can be
6 used. Different types of camera are suitable,
7 including monochrome, low-light monochrome, extended
8 infrared monochrome, CMOS colour, CCD colour, high-
9 resolution CCD colour, CCIR (European standard
10 monochrome), EIA (American standard monochrome), PAL
11 (European standard colour) and NTSC (American
12 standard colour) or any other types of camera.

13

14 The camera is preferably attached to the elongate
15 member by means of a flexible joint allowing the
16 camera to be manually adjusted to different viewing
17 angles relative to the elongate member. This can be
18 done before deploying the device by adjusting the
19 camera to the desired orientation, or can usefully be
20 done while the device is in use, for example by
21 resting the imaging device against an object and
22 pushing or pulling against the elongate member so as
23 to move the flexible joint and change the orientation
24 of the camera relative to the elongate member.

25 Typically when adjusted in this way the joint remains
26 in the chosen position until re-adjusted, and the
27 camera adjustment is thereby maintained.

28

29 The elongate member is preferably made up of a number
30 of tubular members, which are connectable together.

31 The tubular members can carry wiring to power the

1 camera and to relay signals from the camera or other
2 imaging device back to the transmitter which can
3 usefully be at the other end of the elongate member.
4

5 The monitor may be hand held by the user, or may in
6 preferred embodiments be at a remote location away
7 from the user.
8

9 The device can typically be sealed against ingress of
10 water so as to be useful underwater, and the
11 connections between the tubular members can typically
12 be watertight. We have used electrical conduit
13 lengths and garden lighting connectors very
14 successfully for certain embodiments of the
15 invention, along with a flexible sleeve over the
16 camera and flexible joint.
17

18 It should be noted that the flexible joint could be
19 provided at or near the camera end of the device,
20 and/or between connectable sections of the elongate
21 member, as required. Indeed, the entire elongate
22 member can comprise a flexible joint so as to allow
23 insertion of the camera along serpentine paths such
24 as pipework, which would otherwise be inaccessible.
25 Typical designs of flexible joints include locline
26 flexible hose and the like.
27

28 The elongate member or a handle thereon can also be
29 provided with a power source such a battery or can
30 have connections or junction boxes etc for connection
31 of power cables from extrinsic power supplies.

1 Preferably, the power supply can be a rechargeable
2 battery pack and usefully this can be provided in a
3 handle on the elongate member.

4
5 A typical video transmitter may comprise a miniature
6 microwave video transmitter, which can be provided in
7 a tubular unit in the handle, or may be inserted
8 between the extension tubes with an adapter. Like
9 the camera, the video transmitter can be selected in
10 accordance with microwave video transmission mediums
11 as appropriate in the area of use. We find that
12 embodiments of the invention work well with MPT1349
13 specifications for low power licence exempt
14 transmission in the 1.4GHz and 2.4GHz bands, or Home
15 Office specification MG-46 for Terrestrial Microwave
16 Transmission Systems for use by Home Office sponsored
17 services in the 2, 8 and 10GHz microwave emergency
18 service bands. However, any other design of video
19 transmitter can be used instead.

20
21 Optionally, a connector and cable can be used to plug
22 directly into the device to provide video signals to
23 a local transmitter (e.g. hand held or worn by the
24 user) which transmits signals to a remote monitor.

25
26 A video receiver and display for use as a monitor can
27 typically comprise a stand-alone and self-powered TFT
28 colour display optionally integrated with a video
29 receiver module to allow cableless operation at a
30 remote site.

31

1 A video modulator to mix the video signal up to a UHF
2 television channel and permit the use of a low cost
3 hand-held or portable television set for viewing the
4 pictures from the camera can also be very useful, and
5 this can be provided in certain embodiments.

6
7 A microphone can be incorporated e.g. adjacent to the
8 camera. The audio signals from the microphone can be
9 amplified and matched to the transmitter for
10 transmission with the video signals to the monitor,
11 which may have a loudspeaker or other device for
12 reproducing or recording the audio signals. The
13 audio signals can be received by a headset worn by a
14 user or remotely positioned. This embodiment can be
15 useful when searching for survivors in e.g. collapsed
16 buildings, earthquake debris or similar.

17
18 The camera and microphone can optionally be
19 detachable from the elongate member to be placed as a
20 unit with the transmitter in an inaccessible or other
21 location and left to operate autonomously or to
22 remain inactive until required. The elongate member
23 can be withdrawn and used elsewhere.

24
25 In order to conserve battery life the device may
26 incorporate a radio receiver similar to that used in
27 vehicle remote central locking systems to allow the
28 camera and/or microphone to operate in a quiescent
29 state until activated remotely.

30

1 Multiple cameras/microphones can be used at an
2 incident being selectively switched on and off as
3 required and optimising the utilisation of any
4 microwave transmitters available to the user.

5
6 The audio and video signals can be relayed to
7 anywhere in the world via satellite video/audio link;
8 PMR link; cellular telephone link; land line;
9 internet or similar video/audio transmission system.
10 This permits experts or other observers at remote
11 locations (i.e. doctors) to view an incident without
12 being physically present and to give advice to the
13 personnel on site. In certain cases, the signals
14 from the transmitter can be relayed by fixed
15 receivers and transmitters incorporated into a
16 building or other structure as described in our co-
17 pending application No 9921290.4, which is
18 incorporated herein by reference.

19
20 Referring now to the drawings, an embodiment of the
21 invention will now be described by way of an example
22 and with reference to the accompanying drawings in
23 which:-

24
25 Fig. 1 is camera head of a device of the present
26 invention shown in exploded (a) and assembled
27 (b) forms;

28 Fig. 2 is a side view of a camera head unit with
29 a flexible joint attached;

30 Fig. 3 is a side view of a flexible intermediate
31 joint;

1 Fig. 4 is a side view of a first embodiment of
2 the device according to the invention;
3 Fig. 5 is a side view of an elongate member used
4 in the Fig. 4 embodiment;
5 Fig. 6 is a side view of a typical elongate
6 member portion used in a second embodiment of
7 the invention;
8 Fig. 7 is a side view of a handle for use with
9 the Fig. 6 elongate portion;
10 Fig. 8 is a series of views with a power supply
11 for use with the Fig. 7 handle;
12 Fig. 9 is a series of views of a transmitter for
13 use with the Fig. 7 embodiment;
14 Fig. 10 is a side view of a hard wired video
15 display for use with the Fig. 7 embodiment; and
16 Fig. 11 is a side view of an assembled system
17 based on the Fig. 7 embodiment.

18
19 Referring now to the drawings, a camera head as shown
20 in Fig. 1 comprises a typical camera selected from
21 any of those mentioned previously, and contained in a
22 tubular UPVC member having an end cap with a viewer
23 and a seal to enclose the camera inside the UPVC tube
24 5. The tube 5 is faced at the opposite end from the
25 viewer with a cap 6 for connection to a flexible hose
26 typically comprising respectively nesting locline
27 components which are commercially available under the
28 trade mark locline for use as flexible hosing. The
29 flexible hose 7 connects the end cap 6 to an adapter
30 8 (we have successfully used garden lighting adapters
31 and electrical conduits typically used for protecting

1 buried electrical cables from moisture) for onwards
2 connection to elongate members such as are shown in
3 Figs. 3, 4 & 5. Adapter 8 has a plug 8p which can be
4 connected to a socket 10s on a telescopic adapter
5 shaft (Fig. 5) or a further intermediate flexible
6 joint 15 (Fig. 3) as desired.

7
8 The camera head 1 and flexible neck 7 can be
9 connected to the Fig. 5 telescopic shaft 12 as
10 described and via plug 12p can be connected to a
11 tubular UPVC handle 20 (Fig. 4) housing a power
12 source and transmitter. Alternatively, if a
13 waterproof system is desired, the camera head 1 and
14 flexible neck 7 can be connected to the Fig. 6
15 extension tube comprising 25mm UPVC pipe which is
16 hermetically sealed to socket 10s at one end and to
17 plug 10p at the other. Numerous sections of
18 extension tube 13 can be connected together and can
19 incorporate wiring and power transmission means to
20 transmit power and camera signals up and down the
21 lengths of tubing 13 as desired. The connectors 10s
22 and 10p are sealed to the tubing 13 and are
23 respectively watertight so as to allow the use of the
24 system thus constructed in water up to 2 bar pressure
25 quite safely. The system so constructed can be used
26 with a handle assembly 25 as is shown in Fig. 7
27 having connector socket 10s to accommodate plug 10p
28 on the terminal end of the last extension tube 13 in
29 the device. The handle assembly 25 comprises a 1"
30 diameter pipe housing the electrical and video wiring
31 and having a suitable handgrip on a T piece and

1 connections for a battery box 30 on the base of the
2 handgrip and a further 4-way connector 35 for
3 connection of the video cabling to a transmitter
4 module for transmission to a monitor to be described
5 below.

6
7 The battery box 30 can house a typical camcorder
8 battery as can be conventionally obtained, or
9 alternatively the handle or main tube of the handle
10 assembly 25 can house rechargeable batteries which
11 can be recharged in situ or removed as desired.

12
13 The connector 35 does not mate with the connector
14 plugs 10p in order to prevent accidental connection
15 of the handle in the middle of the elongate member,
16 but instead connects to a clipper industrial
17 connector on the end of a transmitter module 40 as
18 shown in Fig. 9 for relay of the video signal to any
19 number of remote or hand held receivers via any one
20 of the transmitters previously described.

21 Alternatively, the connector 35 can connect to a
22 clipper industrial cable mount connector attached to
23 a video cable passing to a hand held video
24 transmitter if desired.

25
26 Fig. 11 shows a further embodiment of the invention
27 which also utilises a low cost portable TV or
28 domestic TV tuned to a signal from a video modulator
29 connected to the receiver. By incorporating a video
30 modulator such as the Modulator VAM 24 available from
31 VTQ Videotronik GmbH the use of dedicated monitor

1 equipment specific to the function of the receiver
2 can be avoided and the cost of the system can be
3 reduced.

4

5 Modifications and improvements can be incorporated
6 without departing from the scope of the invention.
7 For example, the apparatus can be adapted to be
8 intrinsically safe for use in hazardous or explosive
9 environments such as refineries, petroleum storage
10 depots, factories and commercial premises, mines and
11 the scenes of traffic and rail accidents, as well as
12 oil or gas production platforms. Such embodiments
13 are suitable for use in fire fighting and search and
14 rescue, and generally for use in any areas where
15 there exists a risk of ignition of flammable
16 material. Typically such embodiments can have low
17 voltage and current electronics and low microwave
18 power so that components do not overheat in use, or
19 can be hermetically sealed to resist the ingress into
20 the device of inflammable gasses. Other embodiments
21 can be purged with inert gas such as Nitrogen before
22 being sealed in order to combat ignition of gas in
23 the device. Various other methods of making articles
24 intrinsically safe are well known in the art.

1 Claims

2

3 1. An imaging system comprising an imaging device
4 having elongate support member, a monitor and a
5 transmitter to transmit the signals from the
6 imaging device to the monitor.

7

8 2. A system as claimed in Claim 1, wherein the
9 monitor is remote from the imaging device and
10 the support member.

11

12 3. A system as claimed in Claim 1 or Claim 2,
13 wherein the transmitter is provided on the
14 elongate support member.

15

16 4. A system as claimed in Claim 1 or Claim 2,
17 wherein the transmitter is separate from the
18 elongate support member.

19

20 5. A system as claimed in any preceding claim
21 wherein the transmitter is a microwave
22 transmitter.

23

24 6. A system as claimed in any preceding claim
25 having more than one monitor.

26

27 7. A system as claimed in any preceding claim
28 having an image-recording device adapted to
29 record images displayed on the monitor.

30

- 1 8. A system as claimed in any preceding claim
2 wherein the camera comprises a monochrome, low-
3 light monochrome, extended infrared monochrome,
4 CMOS colour, CCD colour, high-resolution CCD
5 colour, CCIR (European standard monochrome), EIA
6 (American standard monochrome), PAL (European
7 standard colour) or an NTSC camera.
8
- 9 9. A system as claimed in any preceding claim,
10 wherein the camera is attached to the elongate
11 member by means of a flexible joint allowing the
12 camera to be manually adjusted to different
13 viewing angles relative to the elongate member.
14
- 15 10. A system as claimed in claim 9, wherein the
16 device is hermetically sealed.
17
- 18 11. A system as claimed in claim 9 or claim 10,
19 having the flexible joint at or near the imaging
20 device.
21
- 22 12. A system as claimed in any preceding claim,
23 wherein the elongate support member is made up
24 of a number of tubular members, which are
25 connectable together.
26
- 27 13. A system as claimed in any preceding claim
28 having an on-board power supply.
29

- 1 14. A system as claimed in any preceding claim,
2 having a video modulator to mix the video signal
3 to the monitor to a UHF TV channel.
4
- 5 15. An imaging system as hereinbefore described.



Application No: GB 0024471.5
Claims searched: 1-15

Examiner: Matthew Males
Date of search: 23 May 2001

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.S): H4F FAAA

Int CI (Ed.7): H04N 7/18

Other: Online databases: WPI, EPODOC, JAPIO; Internet.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X, P	GB 2345606 A TOKENDO - whole document but see abstract.	1-3, 7-13 at least
X	WO 98/11816 A1 UNIVERSITY COLLEGE LONDON - see abstract; paragraph bridging pages 4/5; page 5, last paragraph onward; Figures 3, 4.	1-3, 5, 8-12 at least
X	US 5558619 KAMI et al - whole document but see abstract.	1, 2, 4, 8-11 at least
X	US 4633304 NAGASAKI - whole document but see abstract, Figures 1-3; note transmitter 13.	1-4, 6-8, 13 at least
X	JP 110030799 A (TECHNOPORT KK) 02.02.1999 (see Figures, WPI Abstract Accession No. 1999-176727, and associated PAJ abstract).	1, 2, 4, 8-12 at least
X, P	Internet web page: ACAL Auriema - Visual Inspection Product Overview at: http://www.acal-auriema.co.uk/hire/visuspec/visumain.html (page last modified: 06.04.2000; see 'Twizzle' inspection/search system).	1-3, 8-13 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.