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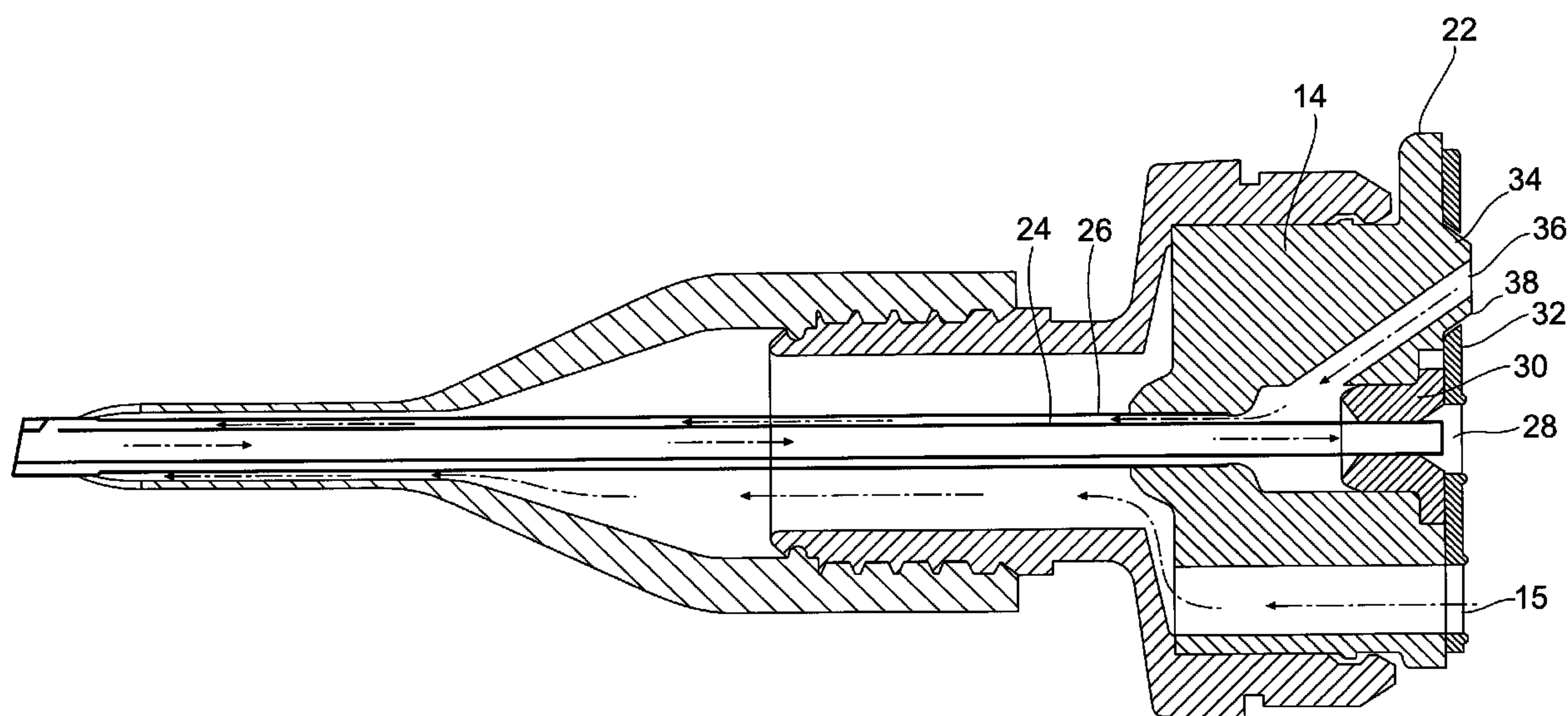
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(57) Abrégé/Abstract:

A tip assembly for a liquefaction surgical handpiece. The tip assembly has an inner connector and an outer cap. The outer cap contains an external thread for attaching the tip assembly to a handpiece. The inner housing contains an alignment tab and fits within the outer cap so as to allow rotation of the inner connector within the outer cap. The inner and outer liquefaction tip tubes are frictionally fit into a bore in the inner connector. The proximal end of the inner housing contains a gasket that seal the inner housing against the handpiece.

Abstract of the Disclosure

A tip assembly for a liquefaction surgical handpiece. The tip assembly has an inner connector and an outer cap. The outer cap contains an external thread for attaching the tip assembly to a handpiece. The inner housing contains an alignment tab and fits within the outer cap so as to allow rotation of the inner connector within the outer cap. The inner and outer liquefaction tip tubes are frictionally fit into a bore in the inner connector. The proximal end of the inner housing contains a gasket that seal the inner housing against the handpiece.

TIP ASSEMBLY

Background of the Invention

This invention relates generally to the field of cataract surgery and more particularly to a tip assembly for use on a liquefaction handpiece.

5 The human eye in its simplest terms functions to provide vision by transmitting light through a clear outer portion called the cornea, and focusing the image by way of the lens onto the retina. The quality of the focused image depends on many factors including the size and shape of the eye, and the transparency of the cornea and lens.

 When age or disease causes the lens to become less transparent, vision
10 deteriorates because of the diminished light which can be transmitted to the retina. This deficiency in the lens of the eye is medically known as a cataract. An accepted treatment for this condition is surgical removal of the lens and replacement of the lens function by an artificial intraocular lens (IOL).

 In the United States, the majority of cataractous lenses are removed by a surgical
15 technique called phacoemulsification. During this procedure, a thin phacoemulsification cutting tip is inserted into the diseased lens and vibrated ultrasonically. The vibrating cutting tip liquifies or emulsifies the lens so that the lens may be aspirated out of the eye. The diseased lens, once removed, is replaced by an artificial lens.

 Recently, a new cataract removal technique has been developed that involves the
20 injection of hot (approximately 45°C to 105°C) water or saline to liquefy or gellate the hard lens nucleus, thereby making it possible to aspirate the liquefied lens from the eye. Aspiration is conducted with the injection of the heated solution and the introduction of a relatively cool irrigating solution, thereby quickly cooling and removing the heated solution. This technique is more fully described in U.S. Patent No. 5,616,120 (Andrew,
25 et al.).

 Handpiece and tips suitable for practicing this technique are described in U.S. Patent Nos. 5,989,212, 5,997,499, 6,080,128, 6,110,162, 6,179,805 and 6,206,848 (Sussman, et al.). These patents do not disclose any details on how to connect the tip to the handpiece.

30 Therefore, a need continues to exist for an assembly for connecting a tip to a handpiece.

Brief Summary of the Invention

The present invention improves upon the prior art by providing a tip assembly for a liquefaction surgical handpiece. The tip assembly has an inner connector and an outer cap. The outer cap contains an external thread for attaching the assembly to a handpiece. The inner connector contains an alignment tab and fits within the outer cap so as to allow rotation of the inner connector within the outer cap. The inner and outer liquefaction tip tubes are frictionally fit into a bore in the inner connector. The proximal end of the inner connector contains a gasket that seals the inner connector against the handpiece.

Accordingly, one objective of the present invention is to provide a tip connector for a liquefaction surgical handpiece.

Another objective of the present invention is to provide a tip connector having an inner housing that rotates within an outer cap.

Another objective of the present invention is to provide a tip connector having an inner housing with an alignment tab.

These and other advantages and objectives of the present invention will become apparent from the detailed description and claims that follow.

Brief Description of the Drawings

Figure 1 is an exploded perspective view of a tip using the connector of the present invention; and

Figure 2 is a cut away view of the tip.

Detailed Description of the Invention

Tip assembly 10 of the present invention generally includes outer cap 12 and inner connector 14. Cap 12 is generally hollow and contains external thread 16 and internal groove 18. Thread 16 allows cap 12 to be screw-fitted to a handpiece (not shown) so as to hold assembly 10 to the handpiece. Inner connector 14 contains annular ridge 20 that snap fits within groove 18, thereby holding connector 14 within

cap 12, but allowing connector 14 to rotate within cap 12. Connector 14 also contains alignment tab 22 that fits within a corresponding slot in the handpiece (not shown), thereby aligning assembly 10 with the handpiece. Connector 14 may contain a bore for irrigation fluid 15 that permits cooled or ambient irrigation fluid to pass through connector 14. Cap 12 and connector 14 are preferably molded from a suitable thermoplastic.

Assembly 10 further contains inner injection tube 24 that telescopically fits within outer injection tube 26. Inner tube 24 and outer tube 26 are received in a first bore 28 in connector 14. Outer tube 26 is retained and sealed in connector 14 by ring plug 30. Inner tube 24 passes through and seals against plug 30. A second bore 36 in connector 14 fluidly communicates with the first bore 28 and the interior of outer tube 26. Raised boss 38 surrounds the second bore 36 and helps to insure a pressure tight seal by, for example, fitting within a mating countersink in the handpiece (not shown). Gasket 32 is applied to proximal end 34 of connector 14 by adhesive or other suitable method. Gasket 32 preferably is silicone rubber and seals assembly 10 to the handpiece.

The tip assembly 10 has three fluid paths as shown in Figure 2.

Both the inner tube 24 and the outer tube 26 are received by the first bore 28, which receives the plug 30. The plug 30 retains and seals the outer tube 26 but the inner tube 24 passes through and seals against the plug 30. Thus, when the assembly 10 is assembled, the first bore 28 can be in fluid communication with the inside of the inner tube 24 that has passed through the plug 30 retained in the first bore 28, but not in fluid communication with the outer tube 26 that is sealed against the plug 30.

A fluid path is established from the second bore 36 between the inner tube 24 and the outer tube 26. The second bore 36 is in fluid communication with the interior of the outer tube 26. Since the plug 30 received by the first bore 28 has the inner tube 24 passing therethrough and the first bore 28 is separate from the second bore 36, then the second bore 36 cannot be in fluid communication with the inside of the inner tube 24. As the inner tube 24 is fitted within the outer tube 26, it follows that fluid from the second bore 36 flows inside the outer tube 26 but outside the inner tube 24.

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A path is established from the first bore 28 to inside the inner tube 24. The plug 30 separates the aspiration fluid path from the heated, pressurized water path.

Irrigation fluid flows into the connector 14 through the bore for irrigation fluid 15. The bore for irrigation fluid 15 goes through the connector 14. Irrigation
5 fluid flows inside the cap 12.

This description is given for purposes of illustration and explanation. For example, it will be recognized by those skilled in the art that the present invention may be combined with ultrasonic and/or rotating cutting tips to enhance performance.

Claims

1. A tip assembly, comprising:
 - a) a generally hollow outer cap;
 - b) an inner connector that is received and retained in the outer cap so as to
5 allow rotational movement of the inner connector within the outer cap, the inner
connector having an alignment tab, a generally planar exterior surface, a first bore,
and a second bore, the first bore in fluid communication with the second bore, the first
and second bores both terminating on the generally planar exterior surface of a
proximal end of the inner connector;
 - 10 c) an outer tube received in the first bore in the inner connector and
sealed within the inner connector by a plug located at the proximal end of the outer
tube, the outer tube terminating at the connector, an interior of the outer tube in fluid
communication with the second bore; and
 - d) an inner tube telescopically received in the outer tube, the inner tube
15 sealed against the plug.
2. The tip assembly of claim 1 wherein the inner connector further comprises a
sealing boss around the second bore.
3. The tip assembly of claim 1 wherein the inner tube passes through the plug.
4. The tip assembly of claim 1 further comprising a gasket on the proximal end
20 of the inner connector.

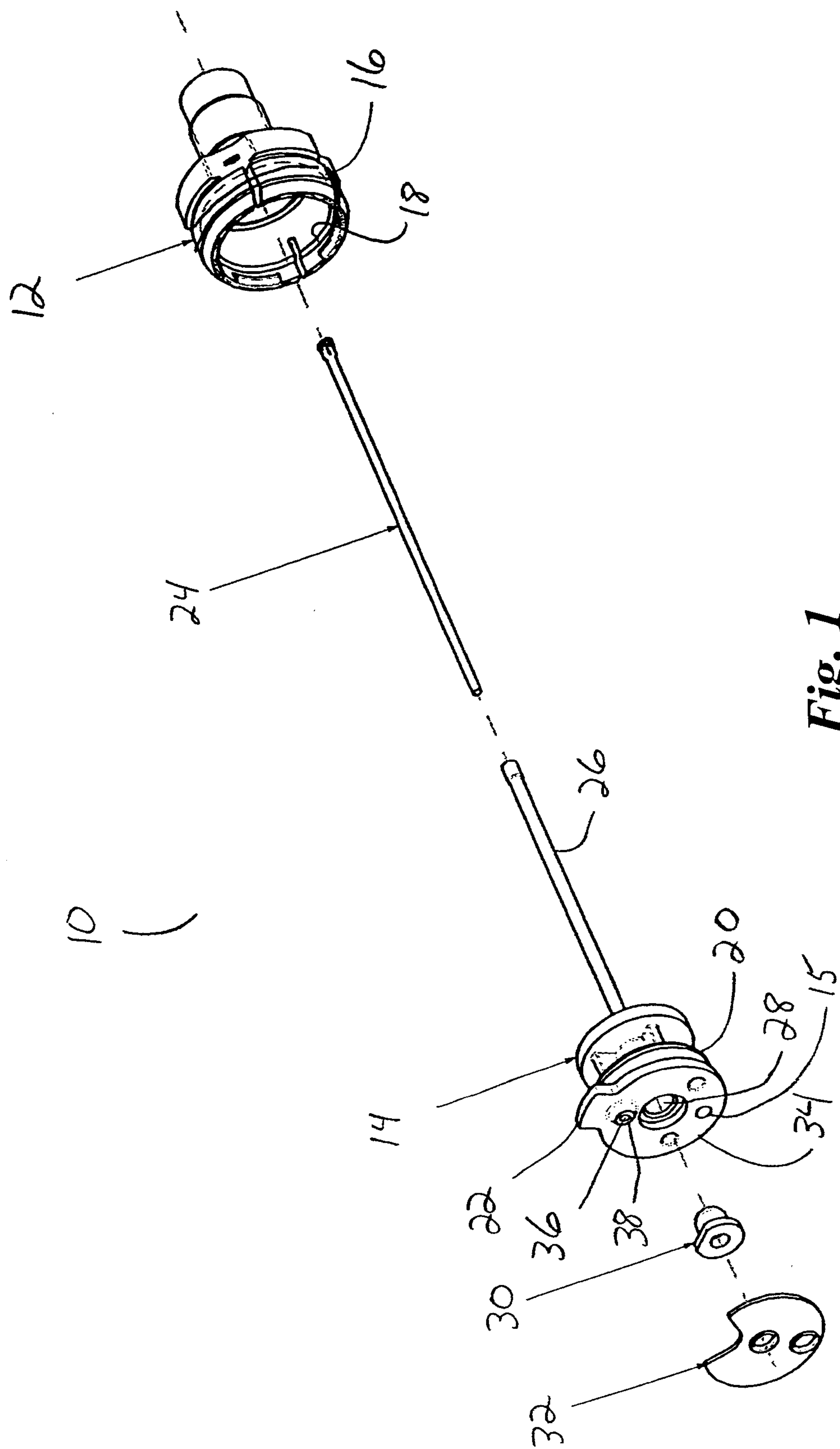


Fig. 1

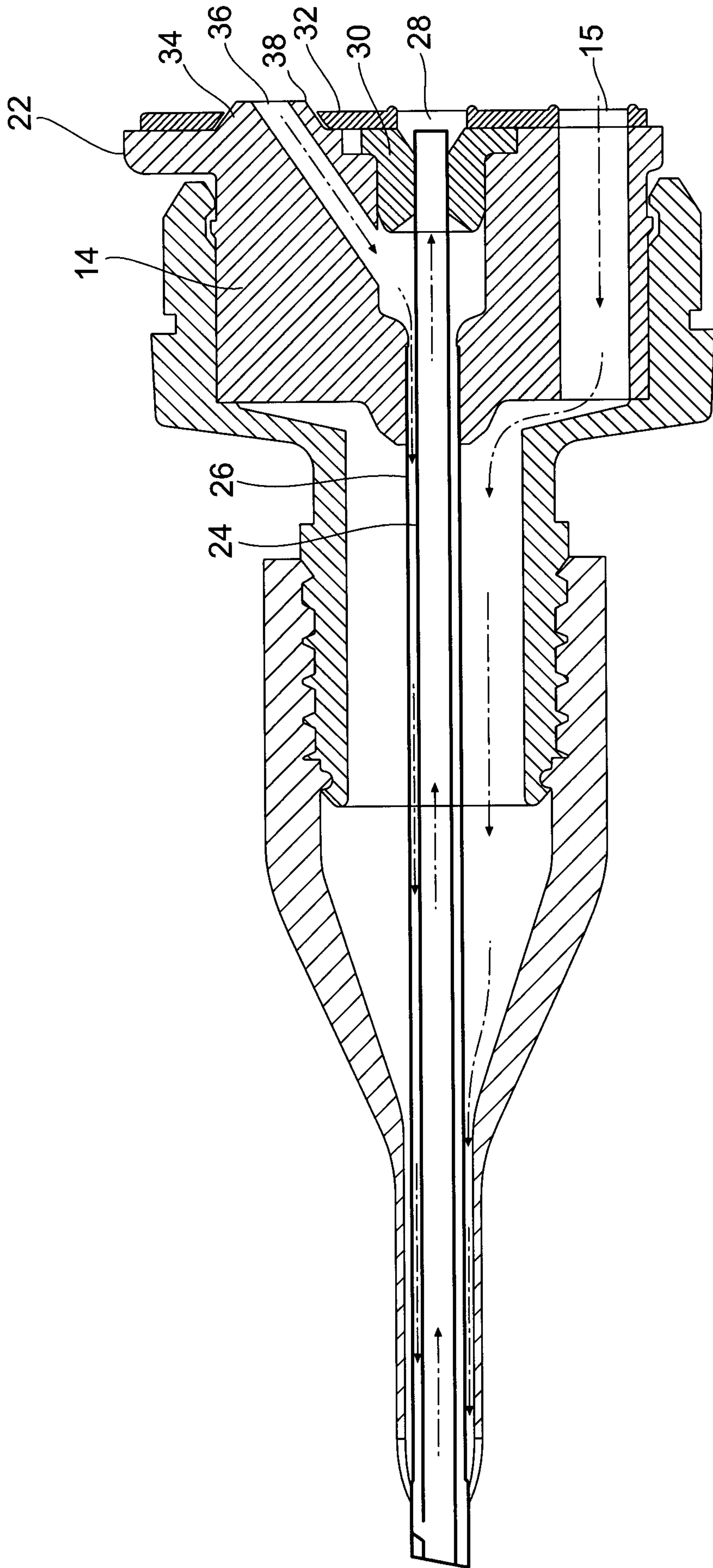


Fig. 2

