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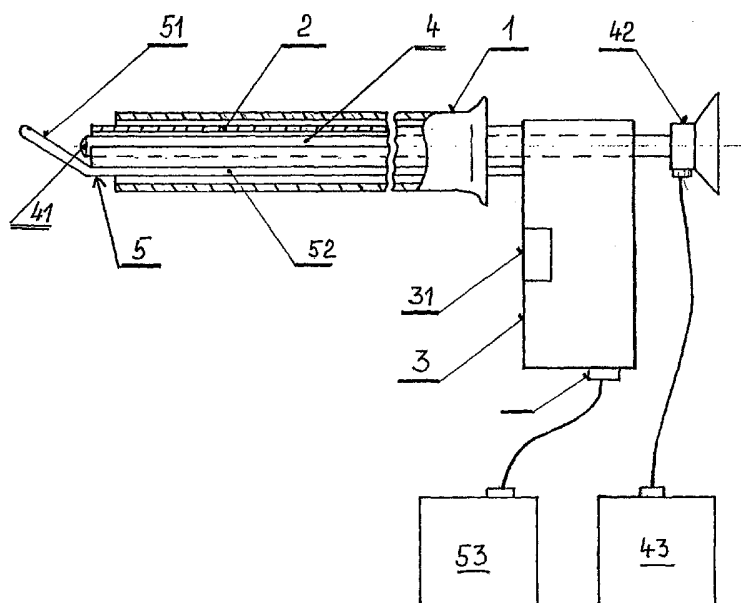
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(54) Title: EXTRACTOR OF THERMOPLASTIC BODIES STUCK IN THE BODY CAVITIES



(57) Abstract: Extractor of thermoplastic bodies, stuck in body cavities, mostly in lower airways, composed of hollow tubes containing standard endoscope, equipped with optical head connected to eye-piece powered with light supply. Essence of the invention is outer tube (1) into whose lumen is slid an inner tube (2) fixated to holder (3) and in lumen of inner tube (2) is inserted the endoscope (4) whose optical head (41) is brought out on the distal free end of inner tube (2), whereas to inner tube (2) is simultaneously fixated working implement (5) created with end-piece (51), placed in visual field of optical head (41) and attached to incoming cable (52), which is brought outside outer tube (1) and through holder (3) fitted with switch (31) is attached to source (53) of heat energy.

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Extractor of thermoplastic bodies stuck in the body cavities**Technical Field.**

This invention refers to the construction of an extractor of thermoplastic bodies stuck in body cavities, in most cases in the lower respiratory systems in both humans and animals.

Background art.

Foreign non-magnetic bodies which lodge in the body cavities are always a problem to remove and in almost all cases such situations are life threatening. As long as a mechanical instrument can grasp the foreign body, once located, the problem is solvable. There are cases, however, where it is impossible to extract the body by any mechanical method *per vias naturales*. In these cases surgery must be used to remove the body stuck in a cavity. This means opening the body cavity externally and this is always connected with the general risks of surgical intervention.

Examples of the former include, an endoscope according to file AU 1998/78557, which consists of an inner and outer tube and, several types of end-piece such as a loop or a bag designed for collection of extracted pieces. The disadvantage of this tool is the necessity to disrupt body tissue integrity and this means it is not possible to use it *per vias naturales* and it is not usable for intervention in the lower respiratory system. The integrity of body tissues is also disrupted using the tool described in file WO 94/12110. This uses an end-piece composed of an electrically heated element which melts the foreign body. A second disadvantage to this method is that it uses no endoscopic technique and hence it is only possible to observe and control the process of medical intervention through the open surgical wound.

Finally, is the solution described in file WO 02/19890. Here a tool is constructed of a cylindrical tube in whose walls are installed observation and illuminative optics and, guiding wires. Inside the tube a perforation element is fitted and this consists of an extensible mechanical endoscopic tool which has to disrupt the integrity of body tissues during medical intervention, for example by perforation of the abdominal wall (enterocoele). The disadvantages of this tool are its rather complicated construction and the fact that it cannot be used in the lower airways per vias naturales. This instrument is not an extractor and the observation optics are not placed in the middle of the inner tube.

Currently, there is no known or described device or implement rendering it possible to extract obstructive thermoplastic foreign bodies from the body cavities, especially from lower respiratory system by natural ways without the necessity of surgical intervention, thereby increasing the risk for patients which in the majority of cases are small children. There is in particular, no described solution that uses an integrated connection of heated extractor-tip with built-in optics.

Essence of the invention.

The above mentioned disadvantages are circumvented using an extractor of thermoplastic bodies stuck in the body cavities, mostly in the lower airways, constructed of multiple cylindrical tubes and a standard endoscope of known construction provided with optical head connected to eyepiece equipped with light supply, inserted inside that. The essence of the invention is in the fact that into the cavity of the inner tube, which is fixed to the handle and slid into the outer tube, the endoscope whose optical head exits via the free end of the inner tube, is inserted, while into the inner tube the working tool is fixed and whose distal tip can be heated in a controlled manner while a proximal handle can control the positioning of the device. Second, the tip of the endoscope whose optical head lies on the distal free end of the inner tube allowing for visual guidance: is placed in the visual field of the optical head and connected to an incoming cable which is

brought outside the outer tube and through to the holder equipped with a switch controlling a heat energy source.

Other features of the invention are a working end-piece with electrical heating element and the design of the outer tube, which is in the shape of a hollow bilaterally open cylinder which can be made of solid or flexible material.

With the construction of this new type of extractor a novel effect is achieved in the fact that its use in removing undesirable objects from the airways presents appreciably lower risk for the patient and it avoids the complications of surgical intervention. Another advantage is the possibility of repeated usage after sterilization using procedures common to endoscope implements.

Description of enclosed drawings.

A sample of extractor construction is illustrated in the enclosed drawing. Fig.1 shows the side view of extractor including endoscope, endoscope optics and light supply and fig. 2 is the front view of extractor from the side of the end-piece of the working implement.

Examples for carry out the invention.

According to the invention, the extractor is composed of an outer tube 1, constructed in the shape of a hollow bilaterally open cylinder made of solid or flexible material, and into which is slid a hollow inner tube 2, also made from solid or flexible material fixed to holder 3. In the lumen of the inner tube 2 is inserted a standard endoscope 4 whose optical head 41 is brought out on the distal free end of the inner tube 2 and on the proximal end optically connected with eye-piece 42 equipped with light supply 43. To distal end of inner tube 2 is further fixed working implement 5, which

is composed of end-piece 51, for example heating element, placed in visual field of optical head and attached to incoming cable 52. Incoming cable 52 is brought outside outer tube 1 and through holder 3 fitted with switch 31 attached to source 53 of heat energy, controlling heating of the end-piece 51.

In case of necessity, to extract a foreign thermoplastic body from an inaccessible body cavity in a patient, the extractor is pushed in per vias naturales and by the help of optical head 41 of endoscope 4, the position of the body is located and the right place for applying the end-piece 51 of the working implement 5 is determined. Upon contact of the end-piece 51 with the body, using switch 31 on the holder 3, the tip is heated. This proceeds under the visual control of the physician while he/she gently pushes the tip into the body, sealing the end-piece 51 to the body. Subsequently switch 31 turns off the warming-up of the end-piece 51 which starts to cool down, while the melted body fastens itself to working implement 5 and can be safely extracted from the body cavity under endoscopic control. Following extraction, the body is removed from end-piece 51 by heating the working implement 5 once again and, after cleaning and standard sterilization, the extractor is ready to be used again.

The construction described above is not the only one possible: the working implement 5 can be provided for example with a unit for temperature regulation of the end-piece 51 or with an arrangement for its temperature measurement. Likewise, the shape of the end-piece 51 can vary depending on the size and weight of the foreign thermoplastic bodies to be extracted. Further, the shape and design of the endoscope 4 or holder 3 and attachment to light supply 43 or source 53 of heat energy can be changed without influencing the instrument's functionality

Industrial application.

This invention has applicability in the manufacture of endoscopic instruments and in medicine, namely for the extraction of thermoplastic bodies stuck in the body cavities per vias naturales when it is impossible to grab them using other implements.

Patent claims.

1. Extractor of thermoplastic bodies, stuck in body cavities, mostly in lower airways, composed of hollow tubes containing standard endoscope, equipped with optical head connected to eye-piece powered with light supply, **wherein** outer tube (1) into whose lumen is slid an inner tube (2) fixated to holder (3) and in lumen of inner tube (2) is inserted the endoscope (4) whose optical head (41) is brought out on the distal free end of inner tube (2), whereas to inner tube (2) is simultaneously fixated working implement (5) created with end-piece (51), placed in visual field of optical head (41) and attached to incoming cable (52), which is brought outside outer tube (1) and through holder (3) fitted with switch (31) is attached to source (53) of heat energy.
2. Extractor according to claim 1, **wherein** end-piece (51) of working implement (5) is fitted with electrical heating element.
3. Extractor according to claims 1 and 2, **wherein** outer tube (1) is in the shape of a hollow bilaterally open cylinder, made of solid or flexible material.

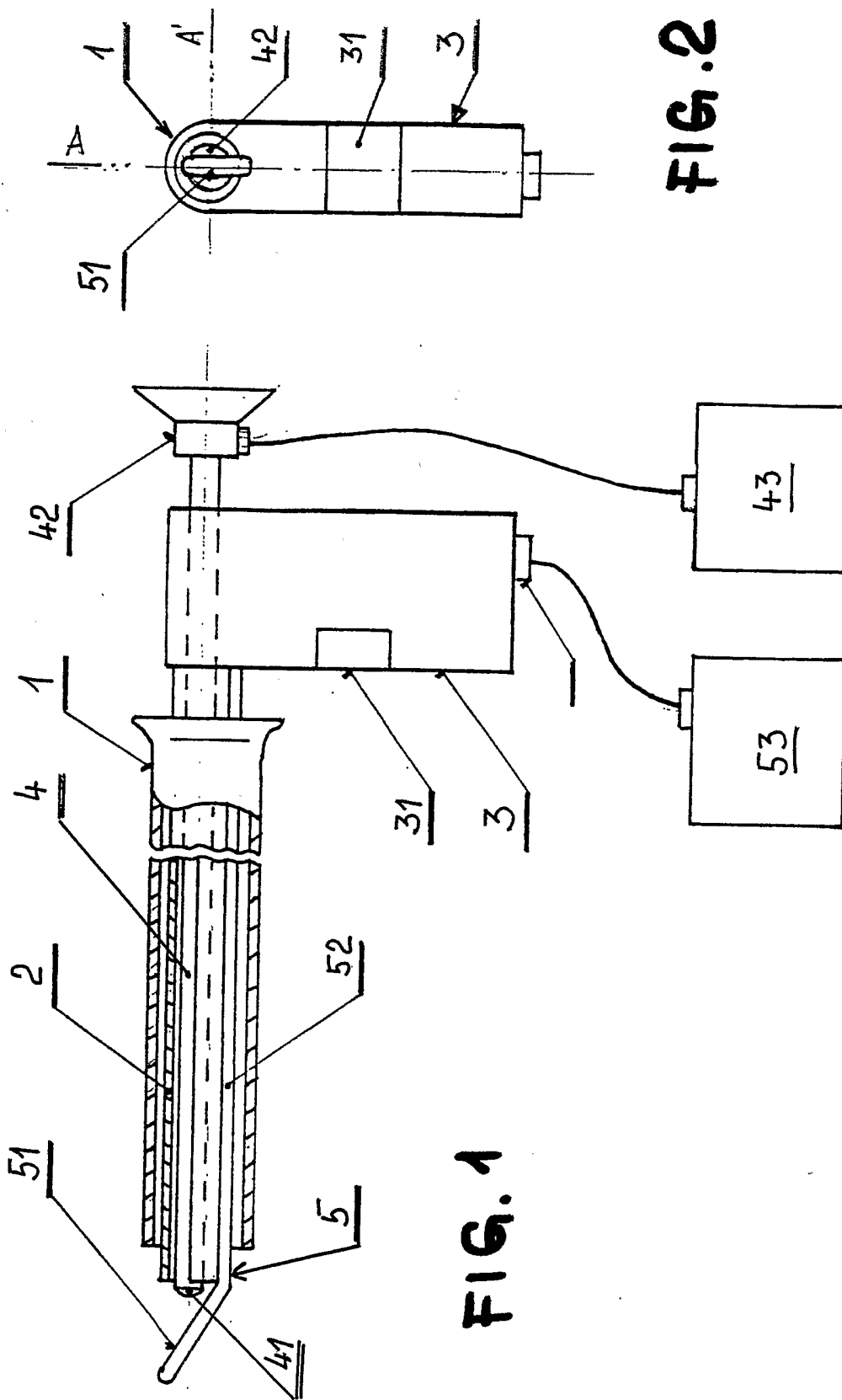


FIG. 2

FIG. 1

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61B17/50 A61B1/00 A61M25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4 454 887 A (KRUEGER CHRISTIAN) 19 June 1984 (1984-06-19) abstract; figures 9,15	
A	US 5 779 716 A (CANO GERALD G ET AL) 14 July 1998 (1998-07-14) abstract; figure 10	1-3
A	US 5 632 717 A (YOON INBAE) 27 May 1997 (1997-05-27) abstract; figure 1	1-3

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

formation on patent family members

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