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(54) Improvements in or relating to
 bone or cartilage cutters

(57) The invention relates to a cutter for bones or cartilages of the kind in which a distally closed shaft 1 and having lateral shaft perforations 1a acting as mating cutting edges has installed in it a hollow spindle 5 connected to a source of negative pressure via conduit 8, which spindle in the area of the shaft perforations has a cutter head. To secure a possibility of rapid replacement for the blunted cutter head, the cutting spindle 5 in accordance with the invention is subdivided in length and spring-loaded in the distal direction, the two sections 5a, 5b of the spindle 5 being provided at the joint 9 with coupling excisions and coupling projections for coupling and separating the two sections.

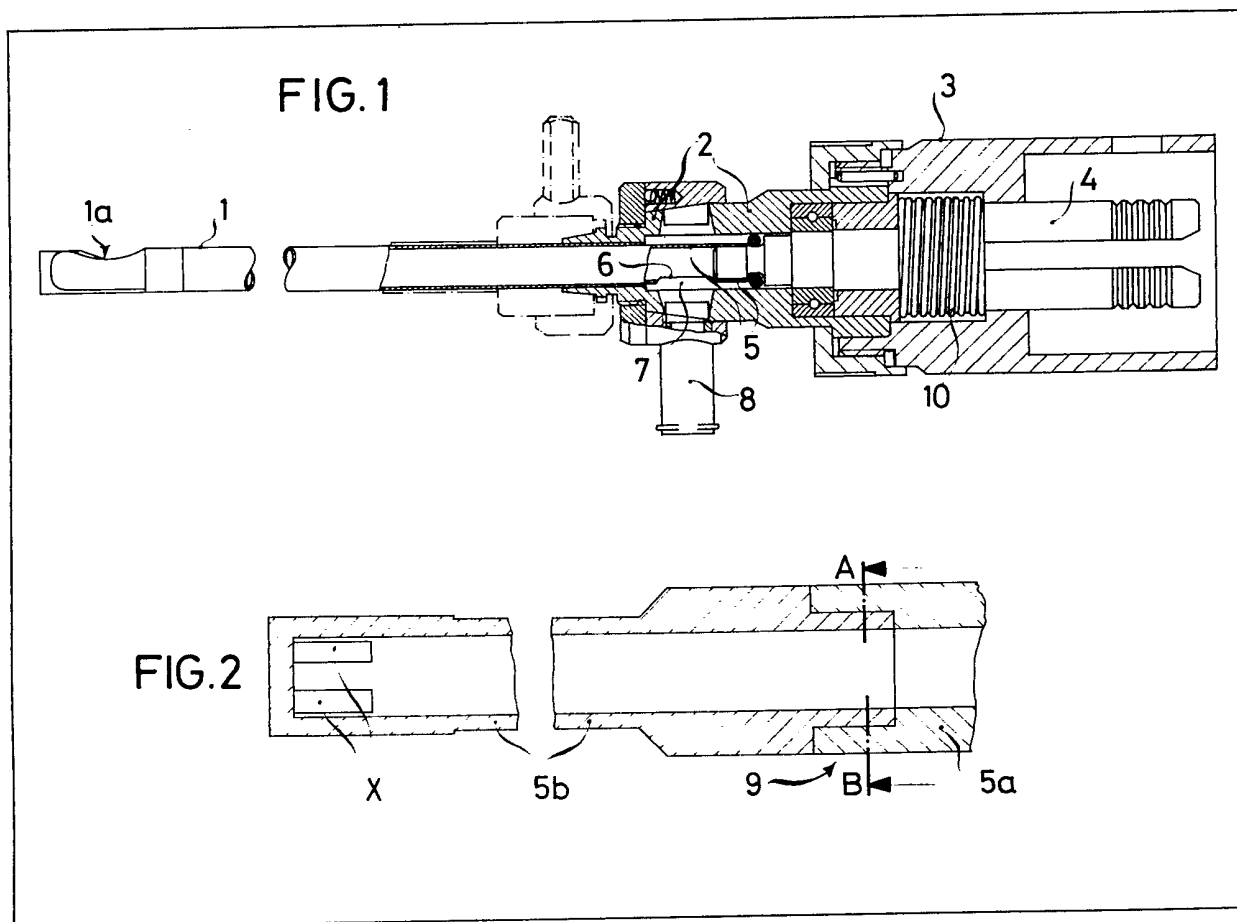
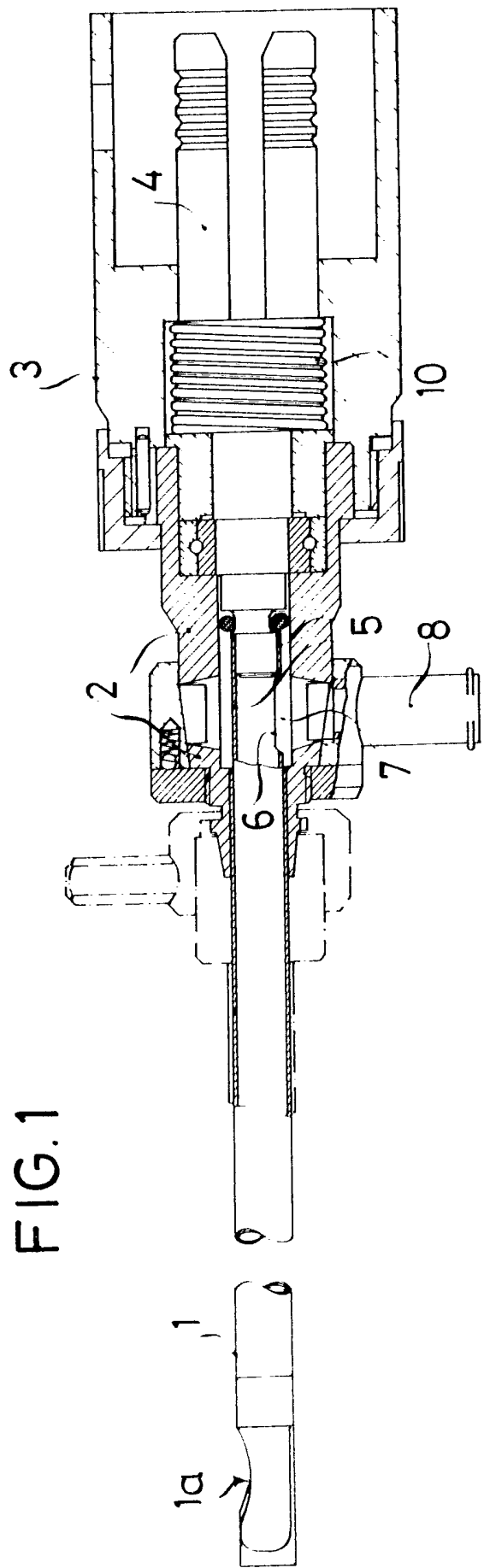


FIG. 1



2001233

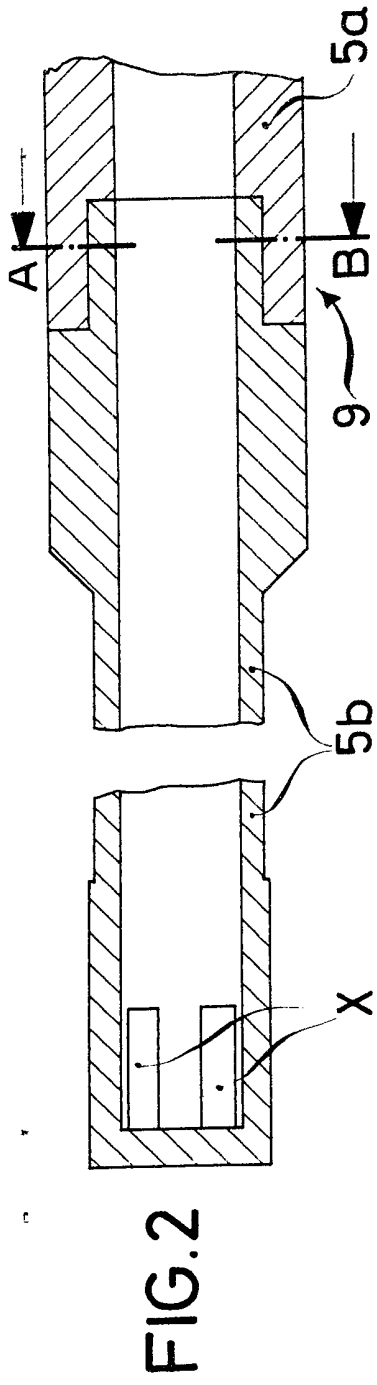


FIG.7

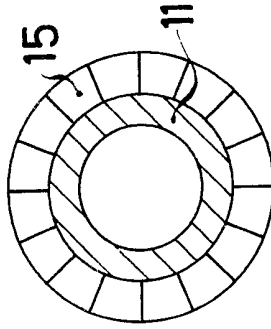


FIG.4

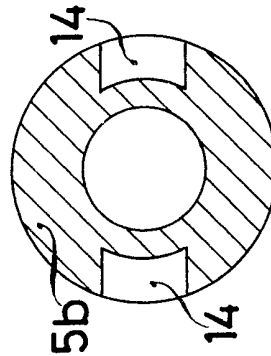


FIG.3

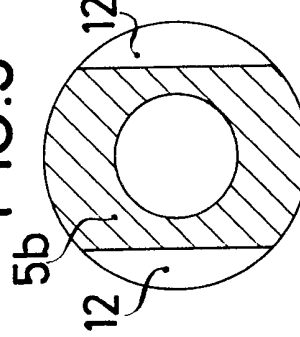


FIG.6

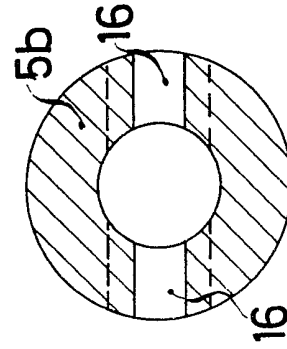
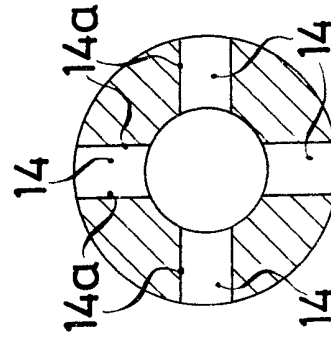


FIG.5



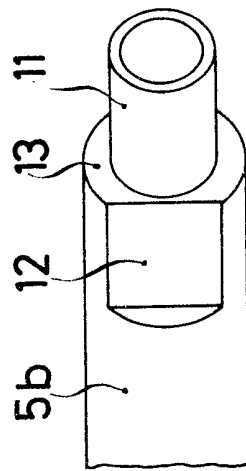


FIG. 3a

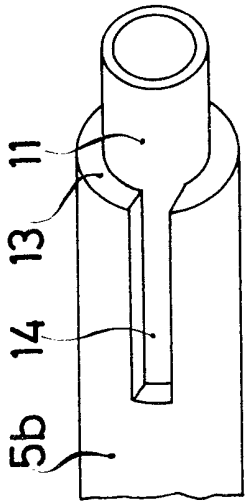


FIG. 4a

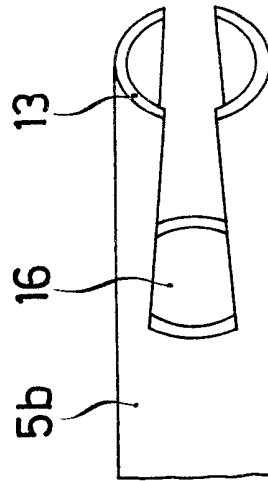


FIG. 7a

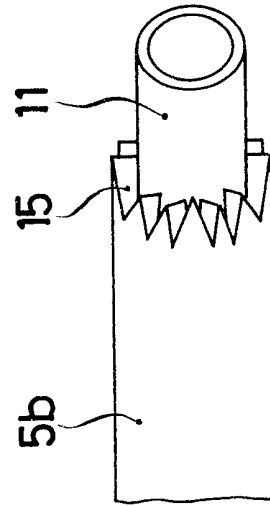
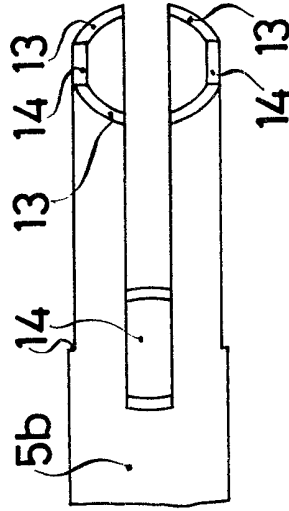


FIG. 5a

FIG. 6a



SPECIFICATION

Improvements in or relating to bone or cartilage cutters

5 The present invention relates to cartilage or bone cutters in which a hollow spindle connectible to a source of negative pressure and which may be proximally coupled to a driving mechanism, acts as
 10 a cutter spindle having a distal cutter head and is rotatably fitted in a distally-closed tubular shaft, which, with an edge of a tubular shaft perforation, forms a mating cutter for the cutter head in the area of the cutter head. Hereinafter such a cutter will be referred to as "of the kind described".

15 Cartilage or bone cutters of the kind described comprise an entrainable hollow cutting spindle rotatably installed in a tubular shaft, the distal end of which is constructed as a cutting or milling head by
 20 means of wall excisions with which the edge of an excision of the tubular shaft co-operates. The hollow spindle is a rigid component of a coupling situated within a proximal shaft enlargement and intended for coupling a driving mechanism and is provided at
 25 the far end of the proximal drive coupling with a wall perforation which may be connected to a source of negative pressure via a connector of the tubular shaft.

It will be appreciated that the cutting edges of the
 30 distal cutting or milling head become blunted by working on cartilages or bones, and the hollow spindle must therefore be replaced as a whole together with the drive coupling and a spring-loading system.

35 It is an object of the invention to avoid the necessity of completely replacing the hollow spindle with the drive coupling and springing system so far as is possible and accordingly, in a cutter of the kind described, the invention consists in that the hollow
 40 spindle whose distal end is held under spring loading against the distal base of the tubular shaft, is subdivided at an optional point along its length by a coupling which comprises peripherally distributed or end incisions or excisions of the wall of the one
 45 longitudinal section and complementary projections or the like of the wall of the other longitudinal section which may be brought into engagement therewith.

50 The thin-walled hollow spindle is consequently subdivided along its length, that is to say into a distal longitudinal section comprising the cutter head, and a proximal longitudinal section which remains constantly joined rigidly to the drive coupling, and these two longitudinal sections are joined together by
 55 means of a force-locked or form-locked coupling in the area of the mutually confronting ends of the two longitudinal spindle sections, the force lock in the case of a force-locked coupling being maintained by the fact that the distal end of the hollow or cutting
 60 spindle is held against the base of the tubular shaft by means of an axial springing system. When the cutter head cutting edges become blunt, only the distal longitudinal section of the hollow spindle need therefore be replaced by a new longitudinal section,
 65 the coupling being established automatically by

means of the axial springing system acting in the direction towards the distal end.

In order that the invention may be more clearly understood, reference will now be made to the
 70 accompanying drawings which show certain embodiments thereof by way of example and in which:-

Figure 1 shows a longitudinal cross-section through the cartilage or bone cutter with a lateral elevation of the distal end,

75 *Figure 2* shows an enlarged longitudinal cross-section through a part length of the subdivided hollow spindle together with the joint,

Figures 3 to 7 show cross-sections along the line A to B through the joint, with different kinds of
 80 couplings, and

Figures 3a to 7a show reduced partial views in perspective of the one coupling element at the joint of the subdivided hollow spindle.

Referring now to the drawings, the cartilage or
 85 bone cutter shown comprises a tubular shaft 1 whose distal end is closed off by a base and which is connected at the proximal end via a rotary part 2 to the enlarged proximal housing 3. The tubular shaft 1 is provided close to the distal end with a lateral
 90 perforation one end of which forms a mating cutting edge for a cutter head which will shortly be described, and is rotatably fitted in the shaft tube.

A coupling 4 is rotatably mounted in the housing 3 for connection of an external driving mechanism and
 95 this coupling is connected to a hollow cutting spindle 5 fitting into the tubular shaft 1, which is provided at the distal end with wall perforations x as shown in *Figure 2*, the edges of which form cutting edges which co-operate with the edge of the tubular
 100 shaft perforation 1a. It will be understood that the shape and position of the excisions x as well as of the excision 1a are arranged to suit prevailing requirements at the proximal end and before the connection to the drive coupling 4, the hollow
 105 spindle 5 is provided with a wall perforation 6 through which the hollow spindle 5 is connected via an annular space 7 to a stub pipe 8 connectible to a source of negative pressure.

In the construction shown, the hollow spindle 5 is
 110 subdivided beyond the area of the drive coupling 4 at an optional point along its length into lengths 5a and 5b, and these longitudinal sections 5a and 5b are coupled to each other at this subdividing joint 9 in releasable and force-locked manner. This force-
 115 locked coupling is established by the fact that the mutually confronting end walls of the two sections 5a and 5b are provided with intermeshing complementary excisions and projections which are held in constant coupling engagement by virtue of the
 120 fact that the distal end of the hollow cutting spindle 5a, 5b is thrust against the distal base of the tubular shaft 1 by means of a spring 10 as shown in *Figure 1*.

In principle, it is advantageous for the tubular shaft
 125 1 to be constructed with a minimum diameter so that the wall thickness of the hollow cutting spindle 5a, 5b is also very small accordingly, in view of the internal diameter required for removal by suction of the cuttings or detritus. The intermeshing coupling projections and excisions should consequently be
 130 formed at the mutually confronting extremities of

the two cutting spindle sections, and several appropriate constructions are possible.

In one embodiment of the coupling according to Figures 2, 3 and 3a, the wall thickness of the spindle sections 5a and 5b is increased at the joint 9 in the area of the coupling, if this is displaced as close as possible to the drive coupling, and the longitudinal section 5b may then be provided by reduction or necking, with a cylindrical projection 11 which is brought into guiding engagement in a corresponding cylindrical recess in the confronting extremity of the longitudinal section 5a. The wall of the cutting spindle section 5b is provided - for example at two mutually opposed points - with flat portions 12 which start from the end face 13 of the wall and the confronting extremity of the longitudinal section 5a is correspondingly provided with two longitudinally extending projections complementary to the flat portions 12, which come into engagement with the flat portions so that they may be coupled together. In particular cases, the cylindrical projection 11 may also be omitted.

As will be apparent from the embodiment according to Figures 4 and 4a as well as according to Figures 6 and 6a, the longitudinal section 5b may also be equipped at the proximal terminal extremity with an annular cylindrical projection 11, which may however be omitted if desired. Starting from the proximal terminal surface 13, the spindle section 5b is then provided with two or four mutually opposed longitudinally directed groove-like excisions 14, the lateral surfaces 14a delimiting the recesses or excisions 14 extending mutually parallel or being arranged to subtend a particular angle with each other, whereas the confronting extremity of the other longitudinal section 5a is provided with projections corresponding to the grooves or slots which engage in the slots 14 so that the parts may be coupled together. In a similar manner, the terminal wall surface 13 of the longitudinal section 5b may be provided with a denticulation 15 corresponding to Figures 5 and 5a, and this denticulation has a corresponding denticulation of the confronting terminal wall surface of the longitudinal section 5a placed in engagement with it.

According to another possibility as shown in Figures 7 and 7a corresponding to Figures 4 and 4a in principle, pairs of excisions 16 opposed to each other with respect to the axis and divergently tapering and in which corresponding complementary projections on the confronting extremity of the longitudinal section 5a are placed in engagement, start from the proximal end surface 13, this engagement occurring laterally. In this case, when the cutting spindle 5a, 5b is withdrawn with the drive coupling 4 from the tubular shaft 1, the distal longitudinal section 5b is also entrained in any case, whereas this section 5b has to be caused to slide out of the tubular shaft 1 separately in the embodiments previously described.

CLAIMS

1. A cartilage or bone cutter of the kind described, wherein the hollow spindle whose distal

end is under spring loading against the distal base of the tubular shaft, is subdivided at an optional point along its length by a coupling which comprises peripherally distributed or end incisions or excisions of the wall of the one longitudinal section and complementary projections or the like of the wall of the other longitudinal section, which may be brought into engagement therewith.

2. A cutter as claimed in claim 1, wherein the proximal end of the wall of the one longitudinal section of the hollow spindle is provided with at least two flat portions oppositely situated with respect to the longitudinal axis and formed by wall excisions, and the oppositely situated engageable end of the other longitudinal section of the hollow spindle is provided with wall projections which are longitudinally directed and complementary to the flat portions.

3. A cutter as claimed in claim 1, wherein the wall of the one longitudinal spindle section is provided with at least one axially parallel excision starting from the proximal end and corresponding to the whole thickness or part thickness of the spindle wall and at least one corresponding complementary engageable projection departs from the oppositely situated end side of the other longitudinal spindle section, so as to form a coupling means.

4. A cutter as claimed in claim 3, wherein said excisions and complementary projections corresponding to the whole wall thickness of the hollow spindle taper divergently starting from the ends of the two longitudinal sections.

5. A cutter as claimed in claim 1, wherein the confronting ends of the two longitudinal sections of the hollow spindles are each provided with an intermeshing denticulation or partial denticulation.

6. A cutter as claimed in any of the preceding claims, wherein the wall of the hollow spindle is enlarged in the area of the two intermeshing coupling halves.

7. Bone or cartilage cutters, substantially as hereinbefore described with reference to the accompanying drawings.

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