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(54) **Device for cutting oil filters.**

(57) Cutting device (1) for cutting in peripheral direction through the jacket (25) of a cylindrical holder, comprising three blades (3) connected to a base element (2) and rotatable in the same cutting plane for cutting at three locations through the cylindrical jacket to be arranged rotatably relative to these blades, positioning means (8,9,10) for carrying the blades from a free position into an active position wherein the blades cut through the jacket, in addition to control means (11) for rotating the jacket and the blades relative to each other through an angle such that the jacket is cut through completely, wherein the base element is provided with blade guides (4) for displacing the blades therealong, and the positioning means comprise a system of mutually coupled connecting arms (8) connected to these blades.

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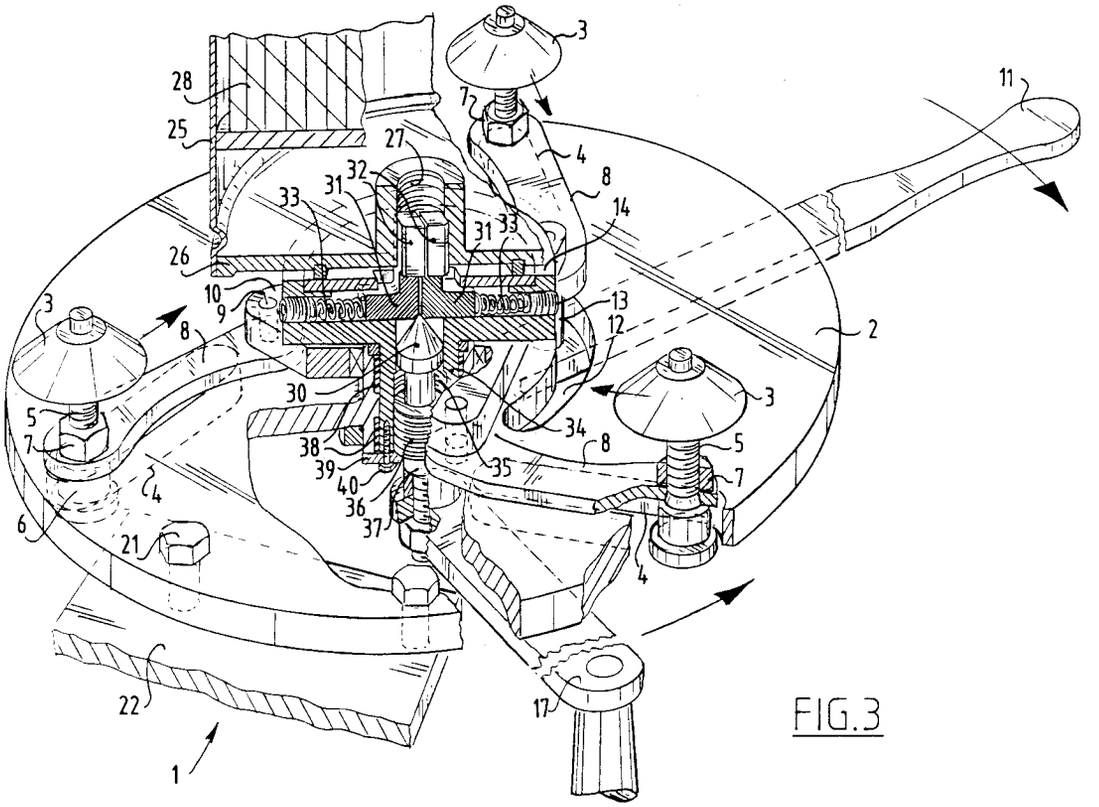
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FIG.3

The invention relates to a cutting device for cutting in peripheral direction through the jacket of a cylindrical holder, comprising three blades connected to a base element and rotatable in the same cutting plane for cutting at three locations through the cylindrical jacket to be arranged rotatably relative to these blades, positioning means for carrying the blades from a free position into an active position wherein the blades cut through the jacket, in addition to control means for rotating the jacket and the blades relative to each other through an angle such that the jacket is cut through completely.

Such a cutting device is known in the form of a can opener from the American patent no. 2 515 362.

The known can opener consists of a substantially triangular base plate to which two rotatable blades are fixedly attached and a third blade is connected to a gear rack for movement in a direction transversely of the connecting line between the two first blades. The rack in the known can opener co-acts with a toothed wheel, the shaft of which protrudes through the base plate and is connected to a transverse arm. In order to open a can with the known cutting device the movable cutting wheel is placed using the transverse arm at a distance from the two other cutting wheels such that a can for opening can be placed between the three cutting wheels. In practice the can for opening is placed upright and the cutting device is placed thereon such that the cutting wheels are situated below and the shaft with the transverse arm above the base plate. By rotating the shaft the movable cutting wheel is pulled onto the jacket of the can for opening, with further rotation the movable cutting wheel is pressed into the jacket of the can and the two fixed cutting wheels are also pressed into the can. The displacement of the movable cutting wheel caused by the movement of the rack is in radial direction relative to the axis of the can for opening. When this displacement in radial direction undergoes sufficient resistance the cutting device will, when the transverse arm is further displaced, begin to turn relative to the can for opening, wherein the cutting wheels cut through the can in peripheral direction.

A number of drawbacks are associated with the known cutting device. Due to the fixed position of two cutting wheels the known can opener is only suitable for opening cans of one particular diameter. When a can is clamped by the three wheels of the can opener the mutual distances in peripheral direction between these wheels is not equal, as a result of which a cutting wheel sometimes runs through an already made cut during the cutting operation, while other cutting wheels are still gripping in the can wall. This and the fact that two cutting wheels are attached fixedly to the base plate and one cutting wheel to a displaceable gear rack cause an unequal distribution of the occurring forces, whereby the can opener is difficult to manipulate, is subject to more rapid wear and opened cans have an irregular cut edge. The known can opener is moreover unsuitable for opening holders which do not have a flat top.

The object of the invention is to provide a cutting device which does not have these drawbacks. This objective is achieved according to the invention with a cutting device whereof the base element is provided with blade guides for displacing the blades therealong, and the positioning means comprise a system of mutually coupled connecting arms connected to these blades.

Because in a cutting device according to the invention the blades can be displaced in a mutually coupled movement along the blade guides the forces exerted on the wall for cutting by the blades are distributed uniformly, as a consequence of which during cutting of the wall a very regular cut edge results which is free of roughness and burrs. It is moreover possible to cut jackets of different diameters without problem with such a cutting device.

In preference the blade guides extend relative to the axis of the cylindrical jacket in a direction containing both a radial and a tangential component.

Such a configuration of the blade guides offers the advantage that during displacement of the blades from the free position to the active position the blades make contact with the cylinder wall for cutting in peripheral direction at an acute angle and in any case not a right angle. As a result the blades are not pressed automatically into the cylinder wall, which would be the case with a blade guide having only a radial orientation as known from the above discussed US-2 515 362, but the blades are pressed into the cylinder jacket in a movement also containing a component in tangential direction, which very considerably furthers the cutting action of the blades.

In an embodiment of a cutting device according to the invention the base element comprises a flat base plate and the blade guides comprise slots in this base plate, wherein in each slot is fixed the shaft of a blade displaceable along this slot.

Such an embodiment results in a particularly economic, robust and wear-resistant construction.

The ease of operation of a cutting device is increased according to the invention when the system of coupled connecting arms is provided with a control arm extending outside the contours of the base element.

The blade guides preferably have an identical shape and are distributed regularly over the base element in a ternary axis of symmetry. The con-

struction of such a cutting device is exceptionally durable, while the cutting edges of holders cut through with this device are regular in shape and free of burrs and sharp ridges.

In yet another embodiment a cutting device according to the invention is provided with fixing means rotatable relative to the base element for fixing a cylindrical holder rotatably on its cylinder axis.

Otherwise than with the known can opener a cylindrical holder for cutting does not have to be held with the hand until it is clamped between the blades, but the holder can be attached to the cutting device according to this latter embodiment independently of the movement of the blades.

The ease of operation of such a cutting device is increased still further when the control means are connected to the fixing means in order to rotate the jacket and the blades relative to each other.

The fixing means for the holder can be connected to a drive motor in per se known manner.

It has been found that the forces exerted by the cutting device according to the invention are distributed uniformly over the three cutting blades such that a hand-operated handle can suffice for the driving of a rotatably fixed cylindrical holder. When the blades are arranged symmetrically relative to the cylinder jacket a rotation of the handle through an angle of 120° is sufficient to cut completely through the cylinder jacket.

The fixing means advantageously comprise a threaded piece. A cutting device provided with a rotatable threaded piece is particularly suitable for cutting through the cylindrical housing of an oil filter that is for instance used for filtering oil in an automobile. Such an oil filter usually comprises a cylindrical housing which is fixedly connected to a cover and in which the actual paper or cardboard oil filter is enclosed. The cover is provided standard with a feed and drain for respectively oil for filtering and filtered oil and with a threaded piece of standard dimensions to screw the complete filter onto a co-acting threaded piece. Used car oil filters are normally collected and treated as chemical waste. To reduce the amount of chemical waste and therefore the cost of processing used oil filters it is recommended to cut open the filters, to capture the oil collected therein and subsequently dispose of the metal filter housings and the actual filters separately as respectively metal waste and chemical waste.

Such an oil filter can be screwed in simple manner on the threaded piece of a cutting device according to the invention and opened using the cutting device.

The specifications of the threaded piece are of course determined by the specifications of the holder for screwing thereon. To make the cutting device suitable for the types of oil filters mostly used in automobiles the threaded piece is preferably an interchangeable threaded piece having at choice one of the screw threads M15, M16, M18, M20, M30 or 3/4".

The fixing means of a cutting device according to the invention preferably comprise a tensioning device.

With a tensioning device the cutting device is suitable for the types of oil filters most used in automobiles without the use of an interchangeable threaded piece, which considerably increases the ease of operation of the cutting device.

A tensioning device comprises according to the invention for instance a conical element coaxially displaceable relative to the cylindrical holder for driving outward in radial direction at least two tensioning elements enclosed under bias.

The tensioning device comprises for instance a tubular part, the inside of which comprises a screw thread which co-acts with a screw thread on a shaft connected to the conical element and the outside of which is attached rotatably relative to the base element via a slip coupling.

The top angle of the conical element has a value for instance between 70° and 75°.

The blades in a cutting device are according to the invention preferably frusto-conical.

Rotating frusto-conical blades offer the advantage that the part of a cylindrical holder separated after cutting through, the cut edge of which adjoins the conical surfaces of the blades are pressed away in axial direction relative to the other separated part. When the frusto-conical blades are placed such that the base surfaces thereof face toward the base element of the cutting device, with this effect is achieved that when a holder is cut through one portion of this holder is pressed away relative to the base element while the distance of the other portion to this base element does not become smaller, as a result of which the danger of jamming or damage to the blades is reduced to a minimum.

The invention will be further elucidated hereinbelow on the basis of an embodiment and with reference to the drawing.

In the drawing:

figure 1 shows an oil filter cutter according to the invention,

figure 2 shows the vertically disposed oil filter cutter of figure 1 in the active situation provided with an oil filter, and

figure 3 shows another embodiment of an oil filter cutter according to the invention.

Figure 1 shows an oil filter cutter 1 which comprises a base plate 2 on which three rotatable blades 3 are attached for displacement along three slots 4. Blades 3 are fastened onto blade shafts 5

which are partly provided with screw thread and which protrude through bores in connecting arms 8, wherein the connecting arms 8 are clamped between a widened shaft portion 6 and a nut 7. The diameter of the widened shaft portion 6 fits precisely into the width of a slot 4. The three connecting arms 8 are connected using coupling pins 9 to a triangular coupling plate 10 from which a pawl 13 extends into an arcuate slot 12 in base plate 2. The coupling plate 10 is fixed rotatably about the centre of the round base plate and can be rotated using a handle 11 connected to this coupling plate 10, wherein the movement is bounded by the pawl 13 coming up against the outer ends of the arcuate slot 12. On the side of base plate 2 above which the blades 3 are also situated the figure further shows a rotatable turntable 14 fixed onto a shaft 15. Shaft 15 protrudes through a bearing 16 in the centre of base plate 2 and is connected on the underside to a crank handle 17. Placed over the outer end 18 of central shaft 15, which end is provided with a screw thread, is an interchangeable threaded piece 19 which is fixed onto the turntable using a nut 20. The base plate 2 is fastened with bolts 21 to a foot piece 22. Figure 1 shows the oil filter cutter in a free position, in which the blades 3 are situated at maximum distance from the central shaft 15. When the handle 11 is moved in clockwise direction as according to the drawn arrow the triangular coupling plate 10 is turned, as a result of which the blades 3 are pulled inward along the slots 4 by the connecting arms 8 in the direction indicated by the arrows. When an oil filter is screwed onto threaded piece 19 the blades 3 are come up against the jacket of this oil filter and the blades make a small cut therein, whereafter by turning the handle 17 in the direction indicated by the arrow the oil filter clamped round by blades 3 can be rotated and further cut open.

Figure 2 shows once again the oil filter cutter 1 of figure 1, provided with a foot piece 22 with which the cutting device is fastened with bolts 23 onto a platform 24. The figure further shows in cut away perspective view an oil filter with a housing 25, a bottom 26 provided with a screw thread 27 and the actual filter 28 which supports the upper part of housing 25 against the bottom 26 using a spring 29. The figure shows the oil filter cutter in an active position in which the blades 3 have been placed by handle 11 in the direction indicated by the arrow into a position in which they cut through the jacket 25 of the oil filter. By turning handle 17 in arrow direction the filter housing 25 clamped in by the blades is rotated and cut open in peripheral direction, wherein the frusto-conical form of blades 3 results in the portion of housing 25 separated from the bottom 26 being pressed away from the base plate 2 (to the right in the figure), whereby the chance of jamming or damage to the cutting device is practically zero. After the oil filter has been turned through an angle of 120° the cuts made by blades 3 are joined and housing 25, the actual filter 28 and the bottom 26 can be successively removed and disposed of as metal waste or chemical waste. The oil coming from the filter is collected in simple manner by placing the cutting device above a collecting basin for used oil.

Figure 3 shows a variant of the cutting device shown in figures 1 and 2. Identical reference numerals in the figures 1-3 have the same designation.

The cutting device according to figure 3 comprises a tensioning device for clamping an oil filter 25-28 whereby a threaded piece connected to the shaft of handle 17 and co-acting with the screw thread 27 of the oil filter becomes unnecessary. The shown tensioning device comprises a conical element 30 connected via a shaft 37 to the handle 17. Shaft 37 is provided with a screw thread 36 which co-acts with screw thread 35 of a tubular portion 34 of the turntable 14. By turning the handle 17 the conical element 30 can be displaced in the tube 34 in the direction of the tensioning elements, wherein the tensioning elements 31 are forced outward in radial direction. The heads 32 of the tensioning elements 31 are herein pressed against the screw thread 27 in the bottom 26 of the oil filter. During turning of the handle 17 the turntable 14 is locked against rotation by slip couplings 38. When the heads 32 of tensioning elements 31 press sufficiently firmly against screw thread 27 the couple applied by the slip couplings 38 when handle 17 continues to be turned is overcome and the turntable 14 and the oil filter connected thereto will perform a rotation, whereafter the blades 3 can be placed using handle 11 against the housing 25 of the oil filter and housing 25 can be cut open. After cutting open has been completed, the bottom 26 with the still remaining portion of the housing 25 connected thereto can be easily removed by turning the handle 17 in a direction opposed to the first, as a result of which the conical element 30 is retracted from the tensioning elements 31, whereupon the tensioning elements are pressed inward by the springs 33 and the heads 32 of tensioning elements 31 are released from the screw thread 27. The couple to be overcome that is exerted by the slip couplings 38 can be adjusted using set screws 40 which press on an adjusting disc 39. The heads 32 are preferably manufactured from a hard steel type, for instance a tool steel with a chrome content of 12%. The separation of the bottom of the oil filter proceeds in exceptionally simple manner when the conical element has a top angle with a value of between 70° and 75°.

Claims

1. Cutting device for cutting in peripheral direction through the jacket of a cylindrical holder, comprising three blades connected to a base element and rotatable in the same cutting plane for cutting at three locations through the cylindrical jacket to be arranged rotatably relative to these blades, positioning means for carrying the blades from a free position into an active position wherein the blades cut through the jacket, in addition to control means for rotating the jacket and the blades relative to each other through an angle such that the jacket is cut through completely,

   characterized in that the base element is provided with blade guides for displacing the blades therealong, and the positioning means comprise a system of mutually coupled connecting arms connected to these blades.

2. Cutting device as claimed in claim 1, **characterized in that** the blade guides extend relative to the axis of the cylindrical jacket in a direction containing both a radial and a tangential component.

3. Cutting device as claimed in claim 1, **characterized in that** the base element comprises a flat base plate and the blade guides comprise slots in this base plate, wherein in each slot is fixed the shaft of a blade displaceable along this slot.

4. Cutting device as claimed in claim 1, **characterized in that** the system of coupled connecting arms is provided with a control arm extending outside the contours of the base element.

5. Cutting device as claimed in claim 1, **characterized in that** the blade guides have an identical shape and are distributed regularly over the base element in a ternary axis of symmetry.

6. Cutting device as claimed in claim 1, **characterized in that** this is provided with fixing means rotatable relative to the base element for rotatably fixing a cylindrical holder on its cylinder axis.

7. Cutting device as claimed in claim 6, **characterized in that** the fixing means are connected to the control means.

8. Cutting device as claimed in claim 7, **characterized in that** the fixing means are connected to a handle.

9. Cutting device as claimed in any of the claims 6-8, **characterized in that** the fixing means comprise a threaded piece.

10. Cutting device as claimed in claim 9, **characterized in that** the threaded piece is an interchangeable threaded piece having at choice one of the screw threads M15, M16, M18, M20, M30 or 3/4".

11. Cutting device as claimed in any of the claims 6-8, **characterized in that** the fixing means comprise a tensioning device.

12. Cutting device as claimed in claim 11, **characterized in that** the tensioning device comprises a conical element coaxially displaceable relative to the cylindrical holder for driving outward in radial direction at least two tensioning elements enclosed under bias.

13. Cutting device as claimed in claim 12, **characterized in that** the tensioning device comprises a tubular part, the inside of which comprises a screw thread which co-acts with a screw thread on a shaft connected to the conical element and the outside of which is fastened rotatably relative to the base element via a slip coupling.

14. Cutting device as claimed in claim 13, **characterized in that** the top angle of the conical element has a value between 70° and 75°.

15. Cutting device as claimed in any of the foregoing claims, **characterized in that** the blades are frusto-conical.

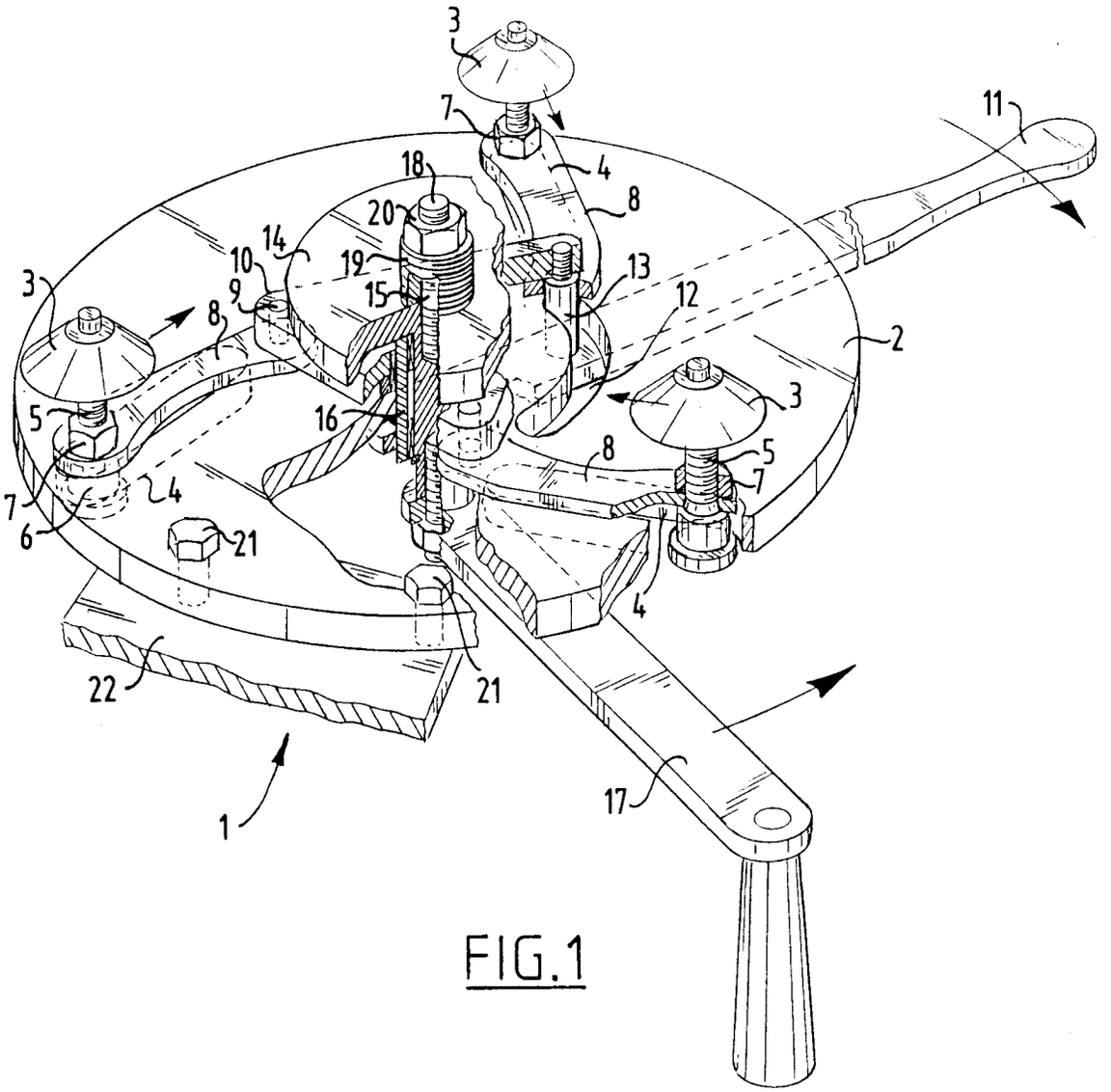

FIG.1

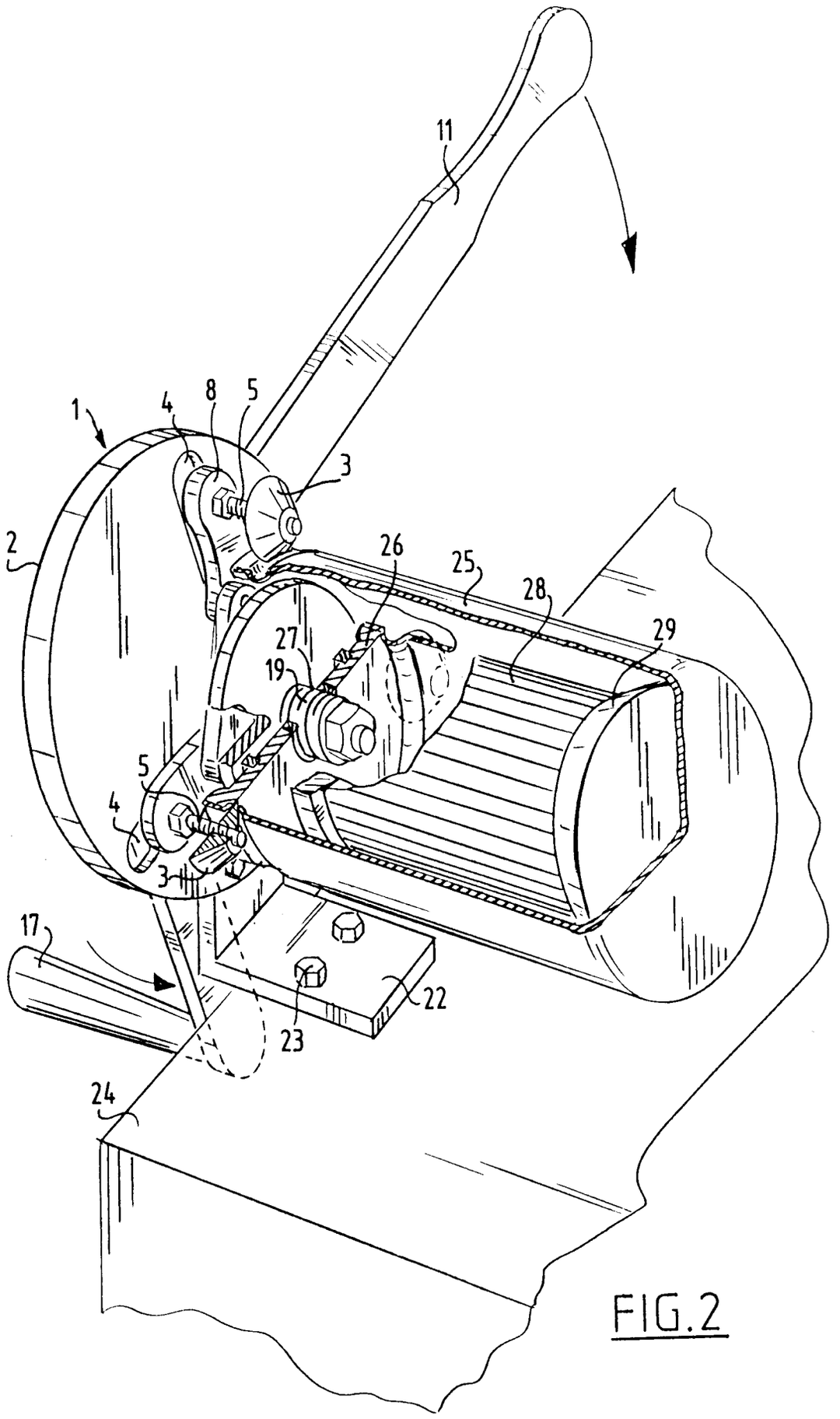

FIG.2

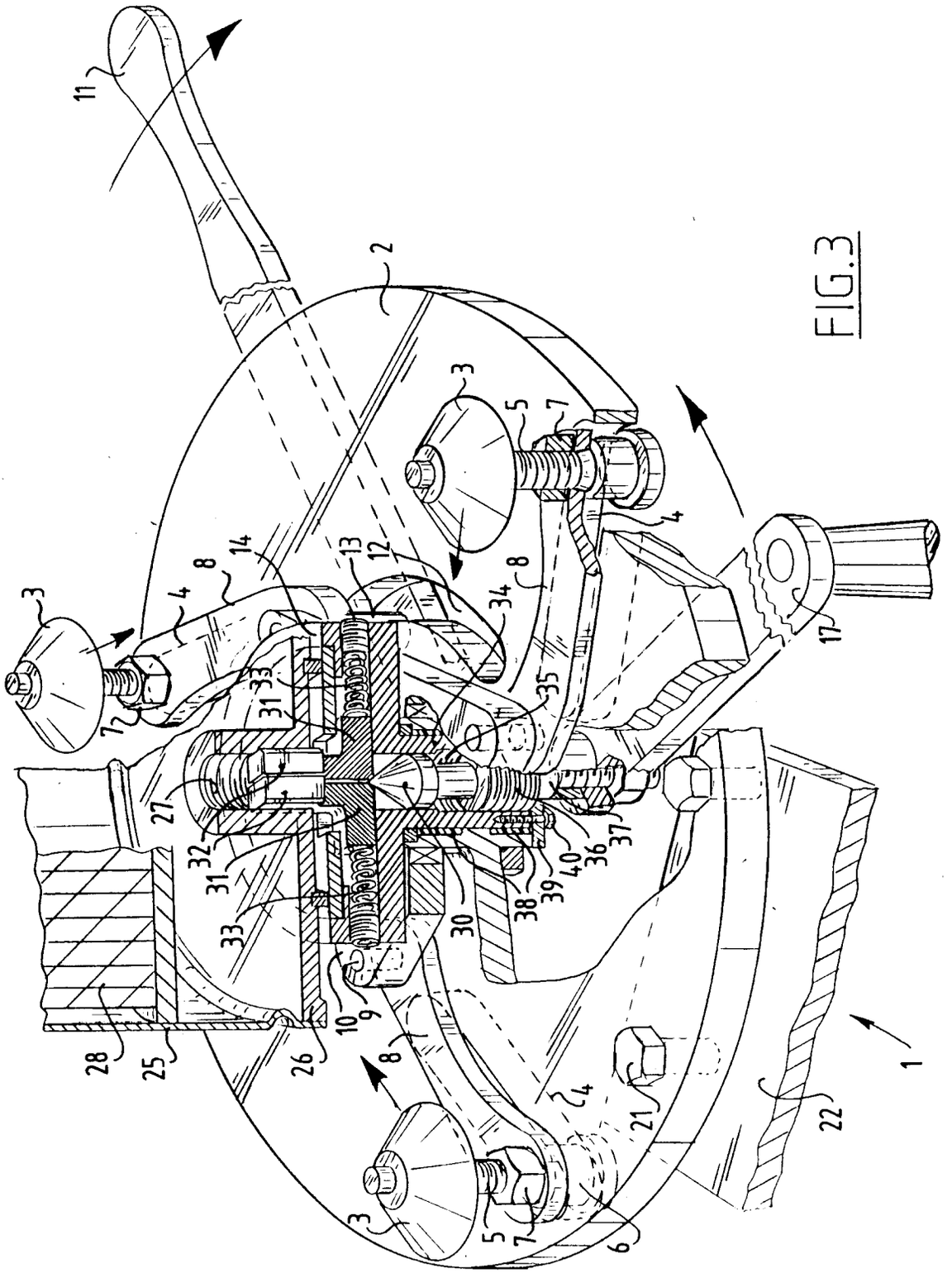
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FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2030

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-C-185 167 (H. KLEPPER) * the whole document *	1,5	B67B7/52
Y	US-A-1 370 943 (W. BOYD ET AL.) * page 2, line 42 - page 3, line 60 * * figures 1,3,6 *	1-7,11	
Y	FR-A-1 251 130 (A-M. ETESSE) * page 6, left column, line 18 - line 54 * * figures 1,2 *	1-7,11	
D,A	US-A-2 515 362 (H. VON DER LIETH) * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B67B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 December 1993	Smolders, R

CATEGORY OF CITED DOCUMENTS

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