(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 405 338 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90111799.4**

(51) Int. Cl.5: **B24B 3/26**

(22) Date of filing: **21.06.90**

(30) Priority: **28.06.89 IT 2101289**

(43) Date of publication of application:
02.01.91 Bulletin 91/01

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR LI LU NL SE

(71) Applicant: **V.P.M. s.r.l.**
Via Briziano, 1
I-46018 Sabbioneta (Mantova)(IT)

(72) Inventor: **Carrera, Pietro**
Via delle Primule, 30
I-22040 Malgrate (Como)(IT)
Inventor: **Rui, Clementina**
Via delle Primule, 30
I-22040 Malgrate (Como)(IT)

(74) Representative: **Lunati, Vittoriano**
LUNATI & MAZZONI S.a.s. Via Carlo Pisacane, 36 36
I-20129 Milano(IT)

(54) Sharpening machine for twist drills, in particular for drilling machines.

(57) A sharpening machine for twist drills, in particular for drilling machines, including: a basement (2), a motor (4), an abrasive wheel (5) driven by the motor (4), a support and guide device (6) suitable for locating a twist drill (7) in sharpening position and for causing a shaping movement to the same twist drill, and handling means (42) suitable for obtaining the reciprocal approaching of the twist drill (7) and the abrasive wheel (5), the support and guide device (6) including a guide pin (10) engaged with the basement (2), an oscillating base (8) hinged to the guide pin (10) and supporting the positioning means (12) engaging the tang (7a) of the helical twist drill (7), and tightening means (19) including grip cheeks (20) located in proximity of the abrasive wheel (5) and rotating in reciprocal approaching for tightening the helical twist drill (7) in proximity of the cutting end thereof (7b).

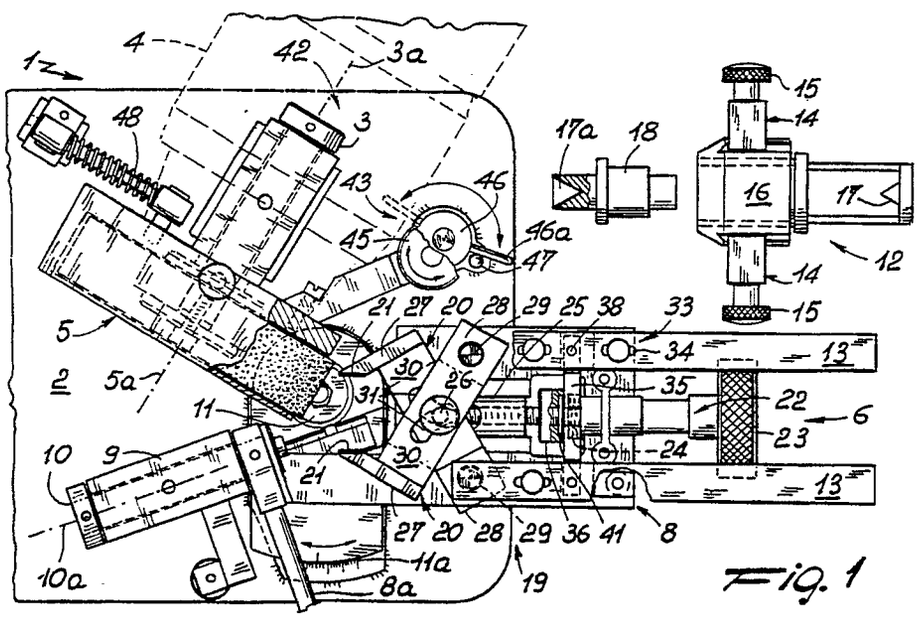

Fig. 1

EP 0 405 338 A2

SHARPENING MACHINE FOR TWIST DRILLS, IN PARTICULAR FOR DRILLING MACHINES

This invention has for its subject-matter a sharpening machine for twist drills, in particular for drilling machine tools. As it is known, various types of sharpening machines actually exist, these machines being foreseen for particular uses or also for universal use, which provide the sharpening of various tools of the operating machines, when the cutting edges thereof are worn. In particular the sharpening machines for twist drills must provide cutting edges and a nose angle exactly corresponding to the foreseen angles, if geometrically perfect drillings must be made and for avoiding to cause irregular stresses during the use of these tools. For fulfilling these exigences some sharpening machines were conceived, these machines using abrasive wheels driven by electric motors and support and guide devices suitable for causing the drills to be sharpened to be moved in an operative shaping movement corresponding to the conoid faces present at the ends thereof. Further the sharpening machines must include handling means suitable for fulfilling the reciprocal approaching of twist drills and abrasive wheels.

In detail some well-known sharpening machines show support devices for the twist drills made up by simple V-prisms, that fulfil contemporaneously the positioning and locking of the same twist drills.

Using these devices, after having made the sharpening of a cutting end or profile, generally it is necessary to turn the same support devices for making the sharpening of the second cutting edge or profile. But during this operation each inaccuracy, eccentricity or slack of these devices can cause high inaccuracies in the sharpening of the cutting profiles of the twist drills.

It was tried to overcome these drawbacks projecting support devices for the twist drills having a particularly precise and improved construction. For example some devices including spindles with six grip cheeks, among which the twist drills were tightened, were conceived.

In this manner it was obtained sharpening machines particularly costy and cumbersome that, yet, do not remove the presence of oscillations and bendings of the twist drills in the direction transversal to the development axle thereof. In fact these last twist drills are tightened in an anomalous manner onto the helical edge by means of the six grip cheeks that act onto six different points, causing deviations of the axle of the twist drill from its rectilinear configuration, that can cause inaccuracies in cutting profiles that are increased in time owing to the wear of the same grip cheeks.

Further as regards the reciprocal approaching between twist drills and abrasive wheels, it must be specified that the sharpening machines of well-known type fulfil the progress of the helical twist drills towards the abrasive wheels during the machining using slides or trolleys that hold the support device of the twist drills. Therefore at the end of the first cutting profile sharpening it is necessary to note or record mentally the position reached by the slide or trolley, reading a suitable graduated scale, for being able to repeat in the following the same progress during the sharpening of the second cutting profile.

This procedure can cause reading and/or storing errors of the progress values for the twist drills that are really achieved and these errors are added to the above mentioned machining inaccuracies.

In this situation the technical scope of the present invention is to supply a sharpening machine that is suitable for avoiding substantially the above mentioned drawbacks.

The specified technical scope is substantially achieved by a sharpening machine for helical twist drills, in particular for drilling machines, including: a basement, a motor supported by said basement, an abrasive wheel showing a central rotation axle and supported and driven in rotation by said motor, a support and guide device suitable for causing the location in the sharpening position of a helical twist drill and for causing the shaping movement of the same twist drill, said helical twist drill having, in opposite parts thereof, a tang and a cutting end directed towards said abrasive wheel, in sharpening position, and handling means suitable for causing a traverse movement for reciprocally approaching said cutting end and said abrasive wheel, characterized in that said support and guide device includes:a guide pin engaged with said basement, an oscillating base rotatably supported by said guide pin, positioning means that can be fixed in a plurality of positions onto said oscillating base and suitable for engaging said tang, and thightening means including grip cheeks rotatably engaged with said oscillating base in proximity of said abrasive wheel and mobile in reciprocal approaching in a manner suitable for tightening diametrally opposed parts of said helical twist drill near to said cutting end.

Further characteristics and advantages of the invention shall appear better in the following description of a preferred fulfilment form of a sharpening machine for twist drills, shown in the annexed drawings, in which:

Figure 1 shows a plan view, in partial section and partially exploded view of the sharpening machine according to the invention;

Figures 2 and 3 show partial views respectively in lateral view and plan view of the machine of Figure 1;

Figures 4 and 5 show section views according to the planes IV-IV and V-V of Figure 3;

Figure 6 is a perspective view of a part of helical twist drill to be sharpened;

Figure 7 shows how the helical twist drill of Figure 6 is thightened in the machine, seen from the front side; and

Figures 8 and 9 show the movements made by the parts of the machine during the sharpening of a twist drill.

Making reference to the shown Figures, the sharpening machine is indicated by **1**.

It includes a support basement **2**, that is associated; by means of a handling pin **3**, to an electric motor **4** supporting and driving an abrasive wheel **5**, and a support and guide device **6** for a helical twist drill **7**, suitable for driving the same twist drill in an shaping movement in conjuction with the abrasive wheel 5.

The motor 4 and the abrasive wheel 5 are coaxial and the abrasive wheel 5 shows a central rotation axle **5a** substantially parallel to the support plane of the basement 2.

The helical twist drill 7 has a main development direction corresponding to a longitudinal axle **7d** and shows in opposite parts a tang **7a** (Figure 3), substantially cylindrical in form and smooth, and a cutting end **7b** suitably shaped (Figures 3 and 6). When the helical twist drill 7 is worn and it is sharpened, the cutting end 7b approaches to the tang 7a.

The support and guide device 6 includes on its turn an oscillating base **8** rotatably engaged to the basement 2 by means of a guide pin **10** establishing a guide axle **10a** in conjuction to a support square **9** protruding from the same basement 2.

The support square 9 is fixed to the basement 2 in a position with respect to the vertical pin **11**, depending on the shape of the cuting edges 7b of the helical twist drill 7 to be sharpened. A graduated scale **11a** shows the prefixed fastening position.

The guide axle 10a is substantially horizontal and located at an height near to the position of the central rotation axle 5a. Further the guide axle 10a is oblique both with respect to the central rotation axle 5a and with respect to the longitudinal axle 7d of the helical twist drill 7 in sharpening position.

The oscillating base 8 is driven around the guide axle 10a by means of a first move rod **8a**.

The oscillating base 8, in position spaced from the abrasive wheel 5, holds positioning means **12** for the tang of the twist drill 7, sliding linearly onto the oscillating base 8 for inserting a couple of sliding guides **13**.

These last guides are parallel with one another and with the longitudinal axle 7d and substantially at the height of the guide axle 10a and have development directions directed towards the abrasive wheel 5.

The positioning means 12 are engageable in a plurality of positions onto the sliding guides 13 by means of locking elements **14** including screws **15a** driven by grips **15**.

The positioning means 12 include a main body **16** and a punctiform seat **17** suitable to be inserted into the truing hole of the various Morse-type tangs of the twist drills 7 having a greather diameter. The cylindrical tangs of the twist drills having a lesser diameter are, on the contrary, housed into the conical seat **17a** of a tangholder **18**, that is suitably inserted into the main body 16.

Then the oscillating base 8 supports between the sliding guides 13 and the abrasive wheel 5 and in proximity of this last abrasive wheel, some thightening means **19**, that, with the positioning means 12, establish the sharpening position of the helical twist drill 7. The thightening means 19 include a couple of grip cheeks **20**, supplied with hollow seats **21** (Fig. 7) partially countershaped to the sides of the twist drill 7 and at the height of the sliding guide 13.

The hollow seats 21 are suitable for tightening the opposite parts **7c** (Figures 6 and 7) of the helical twist drill 7, located in proximity of the cutting end 7b.

Further the thightening means 19 include a screw member **22** that can be driven manually by means of a knob **23**, rotatably engaged onto the oscillating base 8, in parallel direction with respect to the sliding guides 13.

The screw member 22 is further engaged onto the oscillating base 8 oscillating with respect to the translation, in the direction of its main development.

The translation of the screw member 22 is opposed to elastic means **24** formed, for example, by a plurality of cup springs.

Between the grip cheeks 20 and the screw member 22 it is foreseen a sleeve **25**, that can be slided longitudinally and fixed with respect to rotation, screwed to the screw member 22, with coupling of the screw-nut type and having in transversal direction a pushing pin **26** extending vertically, in a direction transversal to the screw member 22.

Each grip cheek 20 shows an active part **27** engaged into the hollow seat 21, a hinge part **28** hinged to a respective axle **29** onto the base 8, and a central part **30** developing between the active part 27 and the hinged part 28.

The axles 29 are located spaced and symmetrical with respect to the screw member 22 and allow the movement in reciprocal approaching and moving away of the grip cheeks 20.

The central part 30 of each grip cheek 20 is machined for forming a slot **31** suitable for housing a pushing pin 26 in conjuction with which the central parts 30 and the slots 31 are at least partially overlapped. The slot 31 is extended in a development direction mainly parallel to the development direction of grip cheeks 20 between the hinge element 28 and the active part 27, and an end **32**, near to the joint part 28, is bent for being approched to the main axial development direction of the screw member 22 when the grip cheeks 20 are located in a position of maximum spreading (Figure 1).

Further the forcing means **33** are foreseen for locking the twist drill 7, in sharpening position and tightened, pressing and forcing the twist drill against the grip cheeks 20, in the direction of the abrasive wheel 5, for avoiding the unallowable tightening slacks of the helical twist drill 7.

Also the forcing members 33, so as the grip cheeks 20, are controlled by the screw element 22.

For fulfilling the above mentioned forcing of the locking action, the sliding guides 13 are mobile in the direction of its development at leat by a part of the play allowed by elongated connecting holes **34** of the sliding guides 13 onto the base 8.

The sliding guides 13 are moved by the forcing members 33 by means of a rocker arm **35** and a presser element **36** joined to the screw element 22.

The rocker arm 35 shows a first fork end **37**, engaged by means of pins **38** onto the sliding guides 13, a central part **39**, substantially hinged to the base 8, and a second driving end **40** by a part stricking the elastic means 24 and in opposite side in contact, interposing an axial bearing **41**, e.g. of roller type, with the presser element 36. Further the sharpening machine includes some handling means **42**, suitable for fulfilling the reciprocal approaching of the twist drill 7 and abrasive wheel 5 and, more precisely, the approaching or moving away of the abrasive wheel with respect to the twist drill 7.

The handling means 42 include the above mentioned handling pin 3, developping in a direction parallel and spaced with respect to the central rotation axle 5a of abrasive wheel 5, and establishing an handling axle **3a** of the electric motor 4 with respect to the basement 2, and control means **43** for the movements of the abrasive wheel 5.

The control means 43 include a screw element **44** threadably associated to an appendix **4a** of the motor 4 and that can be moved manually by means of a handle **45**. The screw element 44 is spaced by the handling pin 3, and shows a development direction transversal to the handling axle 3a, and is engaged with an end onto a cam body **46**.

This last cam body shows a second move rod **46a** and is rotatably associated with the basement 2 along a substantially vertical axle for supporting the screw element 44 that establishes a bearing strut of the motor 4. It is also present a reference ledge **47** for the cam body 46, limiting the rotation of the cam body and formed by a pin.

Finally an elastic presser **48** keeps the motor 4 pressed against the cam body 46 by means of the screw element or strut 44.

The running of the sharpening machine, occurs as follows.

After having adjusted in 11b the oscillating base 8 turned in the angular position foreseen for the cutting end 7b that must be sharpened, it is positioned the tang 7a of the twist drill 7 onto the punctiform seat 17, in the case of Morse-type tangs 7a or into the tang-holder 18 inserted into the main body 16, in the case of twist drills having cylindrical tangs.

In the following the main body 16 is locked onto the sliding guides 13 by the grips 15 in a suitable position according to the length of the twist drill 7, so that the conoid surfaces of the cutting end 7b can protrude slightly from the grip cheeks 20.

The screw element 22 is turned using the knob 23, causing the progress of the sleeve 25. This last sleeve moves, by the pushing pin 26 inserted into the slots 31 of grip cheeks 20, the grip cheeks approaching them with one onother until the insertion of the opposite parts 7c of the twist drill 7 into the hollow seats 21.

The particular configuration of the slots 31 is conceived so that, when the grip cheeks are brought in a wide spreading with one another, this position being used for tightening the twist drills of great diameters, the approching of the grip cheeks is slow and then the tightening force is greather; on the contrary, when the grip cheeks are brought in a reduced spreading position, its approching is faster and therefore also the tightening force is more limited, as it is required by the twist drills having a smaller diameter.

So the tightening of the twist drill 7 is over and it can be made immediately, using the same knob 23, the forcing of the twist drill 7 for stabilizing the same twist drill.

In fact as soon as the grip cheeks 20 are brought in contact with the twist drill 7, being prevented any further progress of the sleeve 25, the continuation in the same direction of the rotation of the screw member 22 causes the axial traverse of this screw member, moving it away from the said sleeve 25.

This axial traverse, made possible by the package compression of the elastic elements 24, causes also the translation of the presser element 36 that, the axial bearing 41 being interposed,

moves the second driving end 40 of the rocker arm 35 into the same direction. Therefore this last rocker arm oscillates around its central part 39 and causes the traverse, during approaching to the grip cheeks 20, of the sliding guides 13. The sliding guides 13 on its turn drag therewith the positioning means 12, that in this manner press the tang 7a of the twist drill 7 towards the grip cheeks 20 with great force.

In this manner it is established the forcing of the twist drill 7 with following elimination of any tightening slack and the real sharpening work can be started.

The cam body 46 is located, by the second move rod 46a, in such a manner that this last rod is brought in contact with the stricker ledge 47. Operating the screw element 44, it is caused the rotation of the abrasive wheel 5 approaching to the twist drill 7 until the wished distance, while, tightening the first move rod 8a, it is carried out the shaping movement corresponding to the conoid surface of the cutting end 7b.

After having made the sharpening of the first cutting edge (Figure 8), the abrasive wheel 5 is moved away from the twist drill 7 turning the cam body 46 that lifts the screw element 44 by an angle proportional to the rotation that was made, acting onto the second move rod 46a (Figure 9). Then it is released the locking of the twist drill 7 causing the knob 23 to turn in a direction opposite to the rotation made during the tightening and forcing phase.

The twist drill 7 is turned by 180° and then it is tightened and forced again.

The following approching of the abrasive wheel 5 onto the twist drill 7 for sharpening the second cutting edge is made bringing again the cam body 46 into the start-up position established by the stricker edge 47 (see Figure 8). In this manner it is made-up, both during the first approaching stroke of the abrasive wheel and during its second stroke, exactly the same approching of the abrasive wheel to the twist drill without being complelled to make any measure onto the graduated scale or other similar instruments.

The invention achieves important advantages.

In fact it is possible to make sharpenings of great quality level, as there are no turnover movements for the following sharpenings of the two cutting edges of the support and guide device: the turning is made directly onto the twist drill.

Further the twist drill is locked both on the tang and an area near the cutting end: so the bendings and oscillations of the twist drill are avoided.

It must be also underlined the use simplicity of the sharpening machine both during the positioning, locking and forcing phases of the twist drills and during the sharpening work: in fact all moves are made by simple traverses of knobs and rods, without making controls on graduated scales and further the forcing is made spontaneusly as a continuation of the locking.

Claims

1) A sharpening machine for twist drills, in particular for drilling machines, including: a basement (2), a motor (4) supported by said basement (2), an abrasive wheel (5) showing a central rotation axle (5a) and supported and driven in rotation by said motor (4), a support and guide device (6) suitable for locating a helical twist drill (7) in sharpening position and for causing the shaping movement of the same twist drill, said helical twist drill (7) having in its opposite parts a tang (7a) and a cutting end (7b) directed towards said abrasive wheel (5), in said sharpening position, and handling means (42) suitable for causing a traverse movement for reciprocally approaching said cutting end (7b) and said abrasive wheel (5),
-characterized in that
said support and guide device (6) includes: a guide pin (10) engaged with said basement (2), an oscillating base (8) rotatably supported by said guide pin (10), positioning means (12) that can be fixed in a plurality of positions onto said oscillating base (8) and suitable for engaging said tang (7a), and thightening means (19) including grip cheeks (20) rotatably engaged with said oscillating base (8) in proximity of said abrasive wheel (5) and mobile in reciprocal approaching in a manner suitable for tightening diametrally opposed parts (7c) of said helical twist drill (7) near to said cutting end (7b).

2) A sharpening machine according to Claim 1, in which, for preventing locking slack, said support and guide device (6) includes forcing members (33) suitable for pressing said helical twist drill (7) in the direction of said abrasive wheel (5) when the same helical twist drill (7) is locked between said tightening means (19) and said positioning means (12), said forcing members pressing said positioning means (12) and said tang (7a) in the direction of said tightening means (19) and said cutting end (7b).

3) A sharpening machine according to Claim 1, in which said oscillating base (8) includes sliding guides (13) substantially following said thightening means (19), moving away from said abrasive wheel (5), showing development directions parallel to said helical twist drill (7) in sharpening position, and in which said positioning means (12) include tightening members (14) for the engagement of said sliding guides (13) in a plurality of positions.

4) A sharpening machine according to Claim 3, in which said sliding guides (13) are oscillating paral-

lelly to said development directions, onto said oscillating base (8) and in which there aew forcing members (33) suitable for translating said sliding guides (13) in direction of said thightening means (19).

5) A sharpening machine according to Claim 1, in which said thightening means (19) include a couple of said grip cheeks (20) having hollow seats (21) suitable for tightening said parts diametrally opposed (7c) of said helical twist drill (7) and a screw element (22) that can be moved manually, suitable for controlling the movements of said grip cheeks (20) and rotatably engaged with said oscillating base (8).

6) A sharpening machine according to Claim 5, in which said thightening means (19) include further: a sleeve (25) that can be moved in translation along said oscillating base (8) and fixed in rotation, said sleeve (25) being associated to said screw element (22) by screw-nut coupling and said screw element (22) being substantially parallel to said helical twist drill (7) in sharpening position, and a push pin (26) joined to said sleeve (25) and developing transversally to said screw element (22), and in which said grip cheeks (20) show each an active part (27) engaging said twist drill (7), a hinge part (28) hinged to said oscillating base (8), a central part (30) developing between said active part (27) and said hinge element (28) and a slot (31) machined onto said central part (30) suitable for housing said push pin (26), said slots (31) being at least partially overlapped with one another in conjuction with said push pin (26).

7) A sharpening machine according to Claim 6, in which said grip cheek (20) shows said slot (31) having a main development direction that is parallel to said central part (30) and further shows an end near to said hinge element (28) bent approaching to said screw element (22) in a position of maximum spreading of said grip cheeks (20).

8) A sharpening machine according to Claim 5, in which said screw element (22) is mounted oscillating in axial direction, onto said oscillating base (8) and in which said oscillating base (8) includes: elastic means (24) suitable for preventing eventual axial movements of said screw element (22), a sleeve (25) fixed in rotation and sliding parallelly to said screw element (22), said sleeve being engaged to said screw element (22) and to said grip cheeks (20), and forcing members (33) including a rocker arm (35) centrally hinged onto said oscillating base (8) and at the ends thereof being engaged in translation by a part of said positioning means (12) and on the other side to said screw element (22), said screw element (22) being driven manually and being arranged for controlling both said tightening members (33) and said grip cheeks (20).

9) A sharpening machine according to Claim 8, in which sliding guides (13) oscillating parallelly to said screw element (22) and engageable in a plurality of positions by said positioning means (12) are arranged between the positioning means (12) and said rocker arm (35), and in which said rocker arm (35) has a fork end (37) engaged in translation to said sliding guides (13), a central zone (39) hinged to said oscillating base (8) and a driving end (40) engaged in translation to said screw element (22), said screw element (22) engaging rigidly a presser element (36) and said driving end (40) being connected between said presser element (36) and said elastic means (24).

10) A sharpening machine according to Claim 1, in which said handling means (42) suitable for moving in reciprocal approaching said cutting end (7b) and said abrasive wheel (5) include a handling pin (3) inserted between said basement (2) and said motor (4) supporting said abrasive wheel (5), said handling pin (3) establishing a handling axle (3a) substantially parallel and spaced with respect to said central rotation axle (5a) of said abrasive wheel (5) and control members (43) of the movements of said motor (4) around said handling axle (3a).

11) A sharpening machine according to Claim 10, in which said control members (43) include a cam body (46) rotatably engaged with said basement (2), and a screw element (44) adjusted manually, spaced from said handling axle (3a) and having a development direction transversal to said handling axle (3a), said screw element (44) rotatably engaging said cam body (46) and threadably engaging an appendix (4a) of said electric motor (4), said cam body (46) being suitable for moving said screw element (44) along said development direction transversal to said handling axle (3a).

12) A sharpening machine according to Claim 11, in which said screw element (44) is engaged as a strut onto said cam body (46), said control members (43) including further an elastic presser (48) suitable for keeping said motor (4) bearing onto said cam body (46) by means of said screw element (44).

13) A sharpening machine according to Claim 12, in which said cam body (46) can be driven manually and shows a stricker ledge (47) limiting the rotation thereof, said cam body (46) establishing in conjuction with said striker ledge (47) a fixed and minimum support height of said screw element (44).

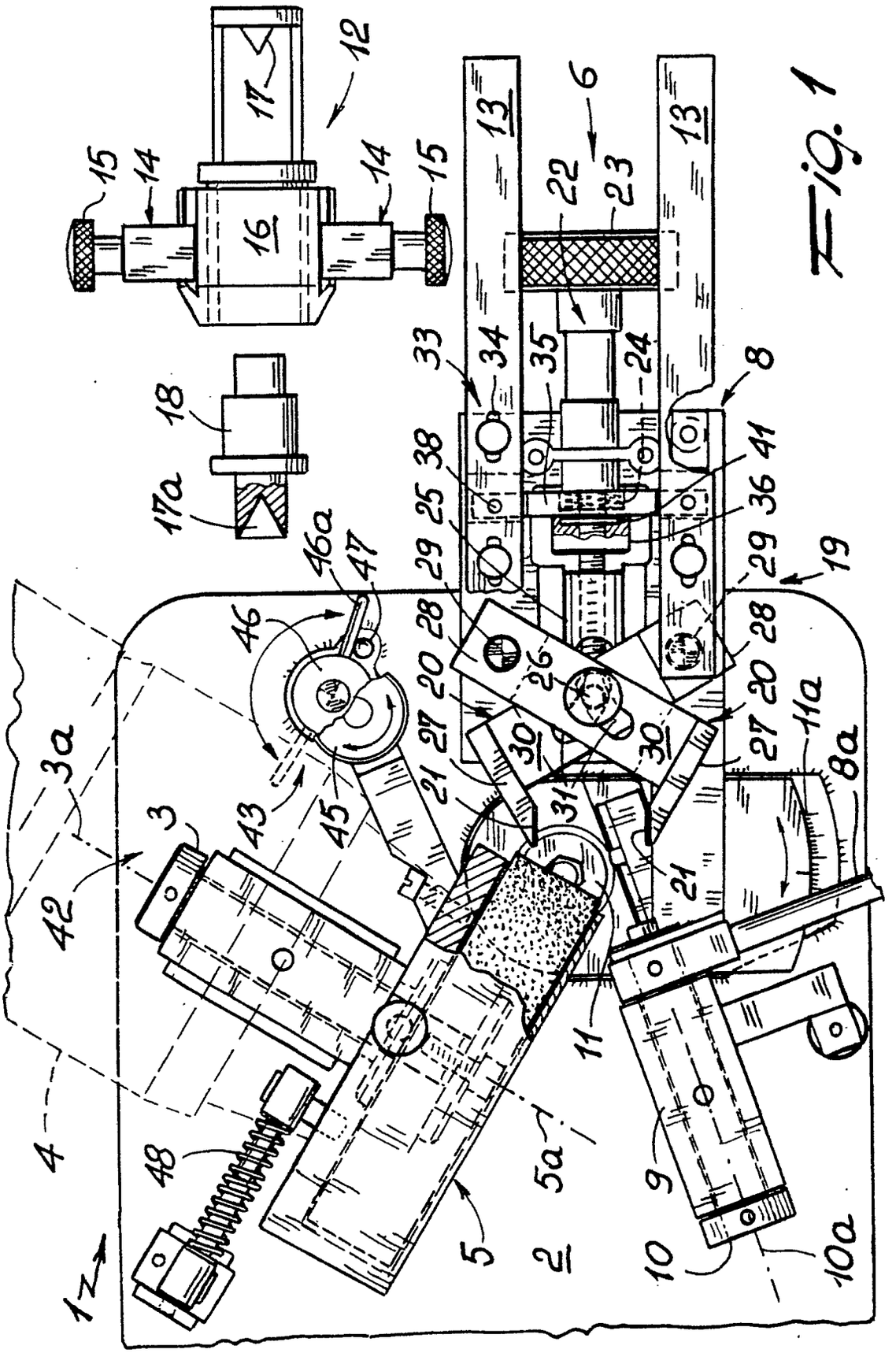
12
17
15
14
16
13
6
22
23
18
17a
33
34
35
24
8
38
41
25
36
29
19
46a
47
46
28
20
26
27
30
21
11a
8a
31
3a
3
43
45
42
4
48
1z
5
2
5a
9
11
10
10a

Fig. 1

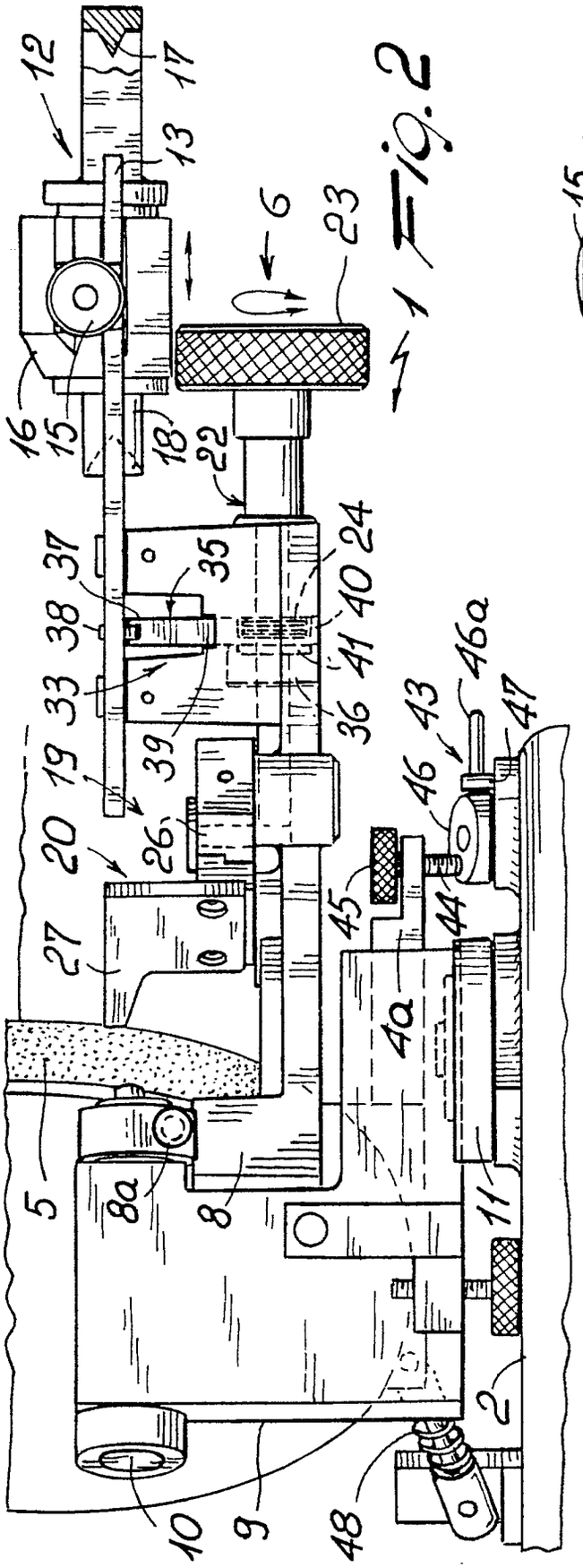

Fig. 2

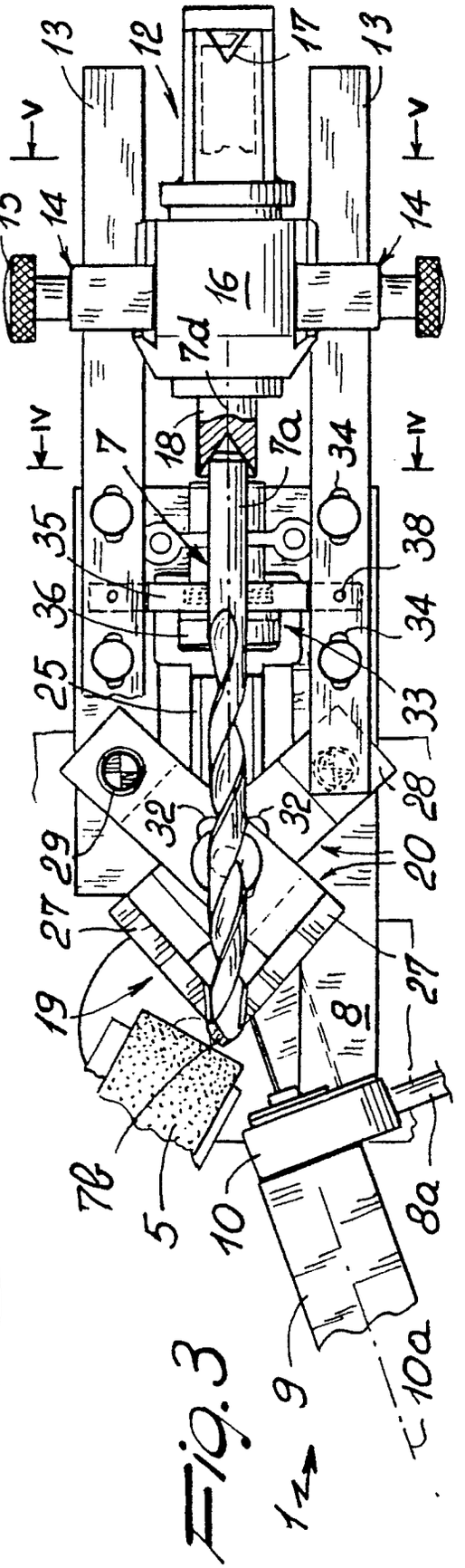

Fig. 3

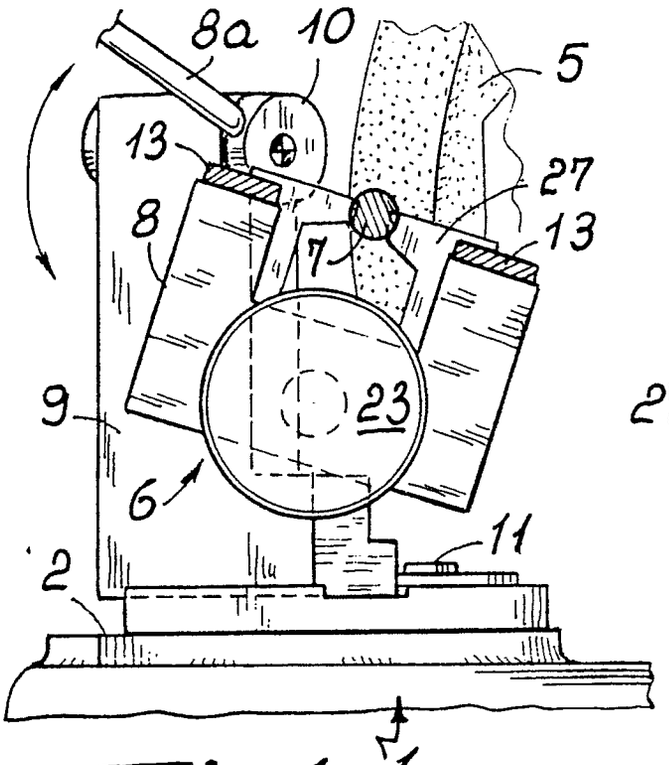

Fig. 4

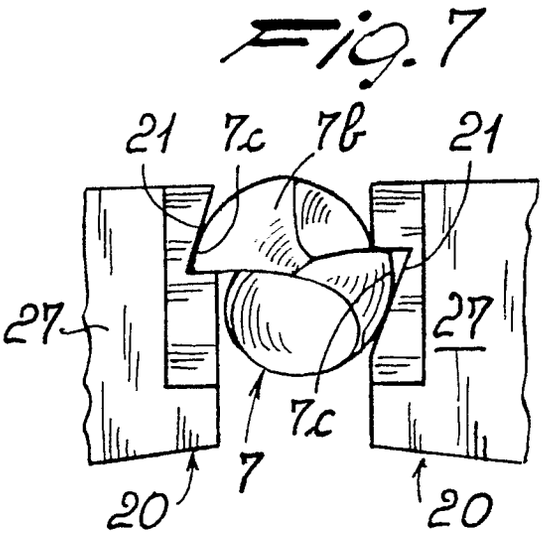

Fig. 7

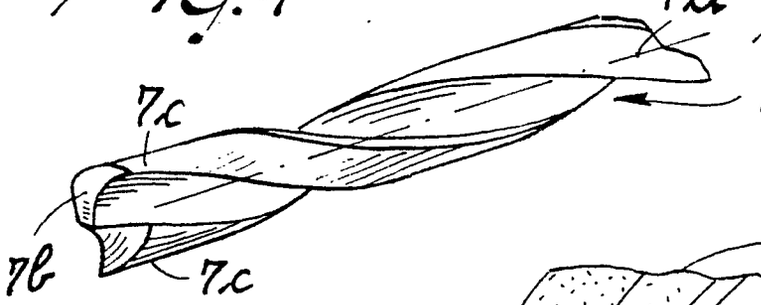

Fig. 6

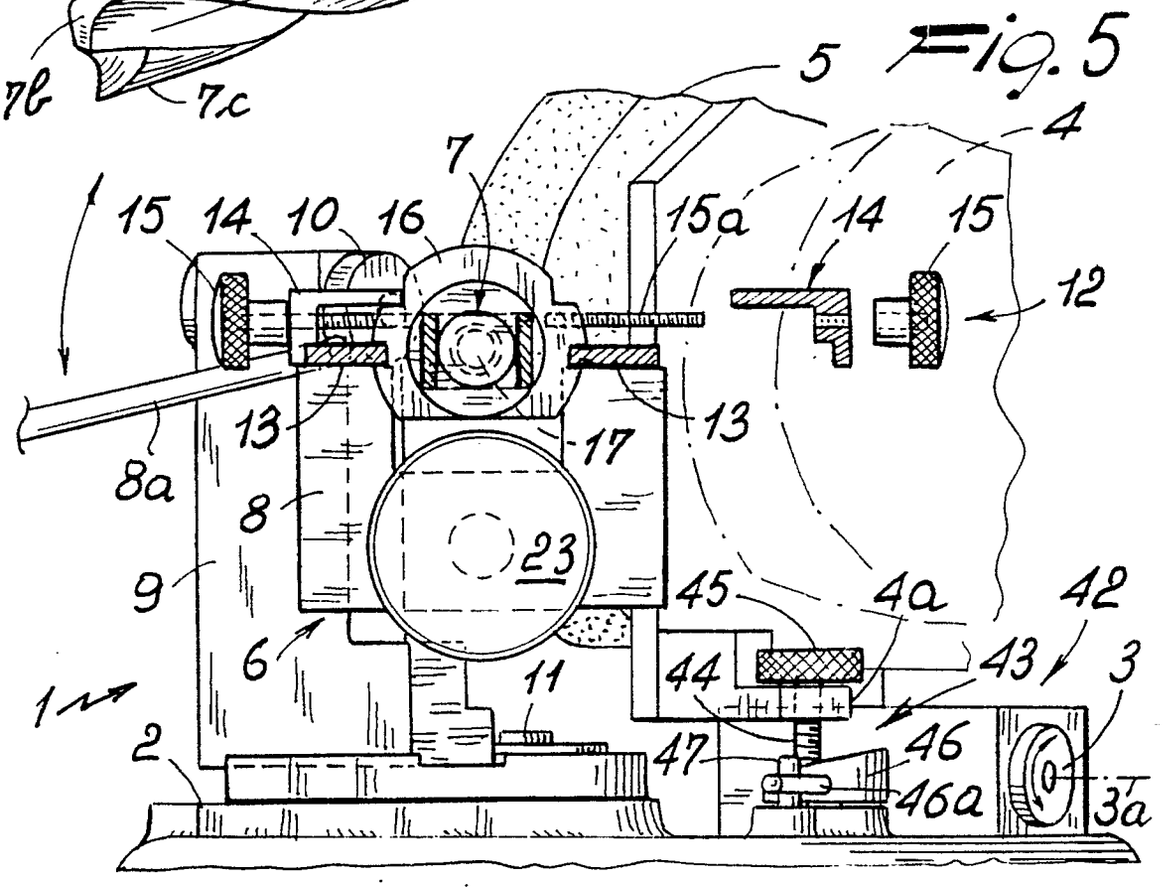

Fig. 5

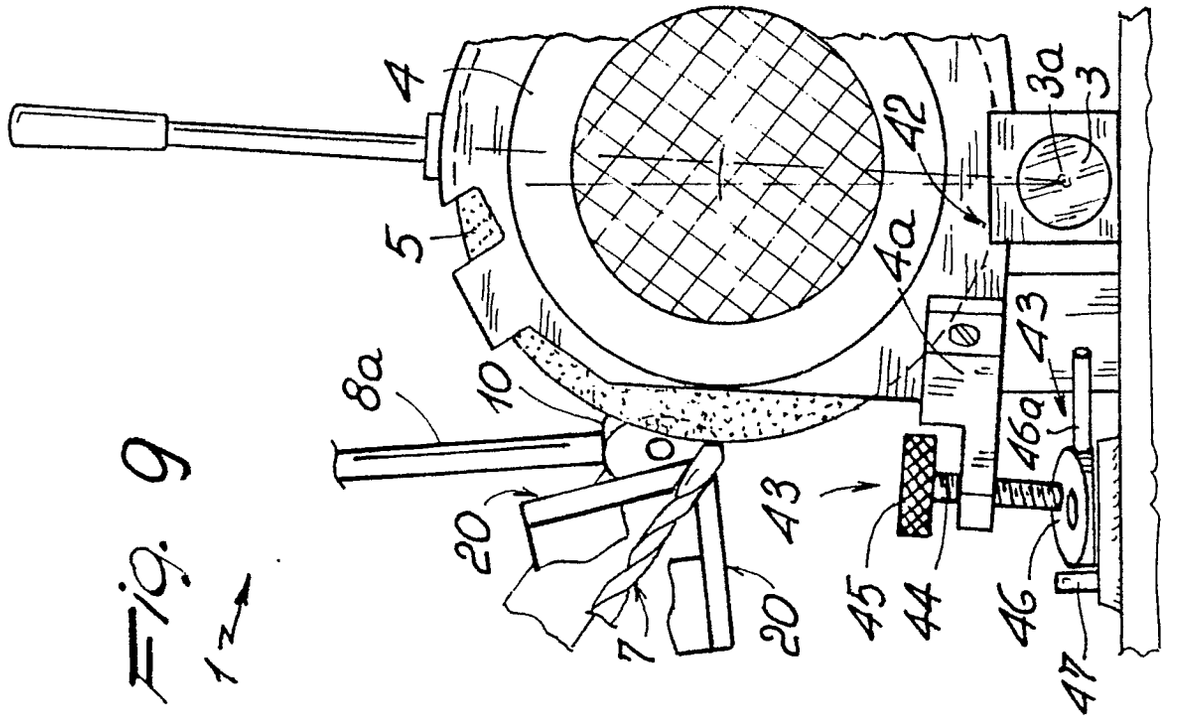
4
5
42
3a
3
4a
43
8a
10
46a
20
43
45
44
46
7
20
47

Fig. 9

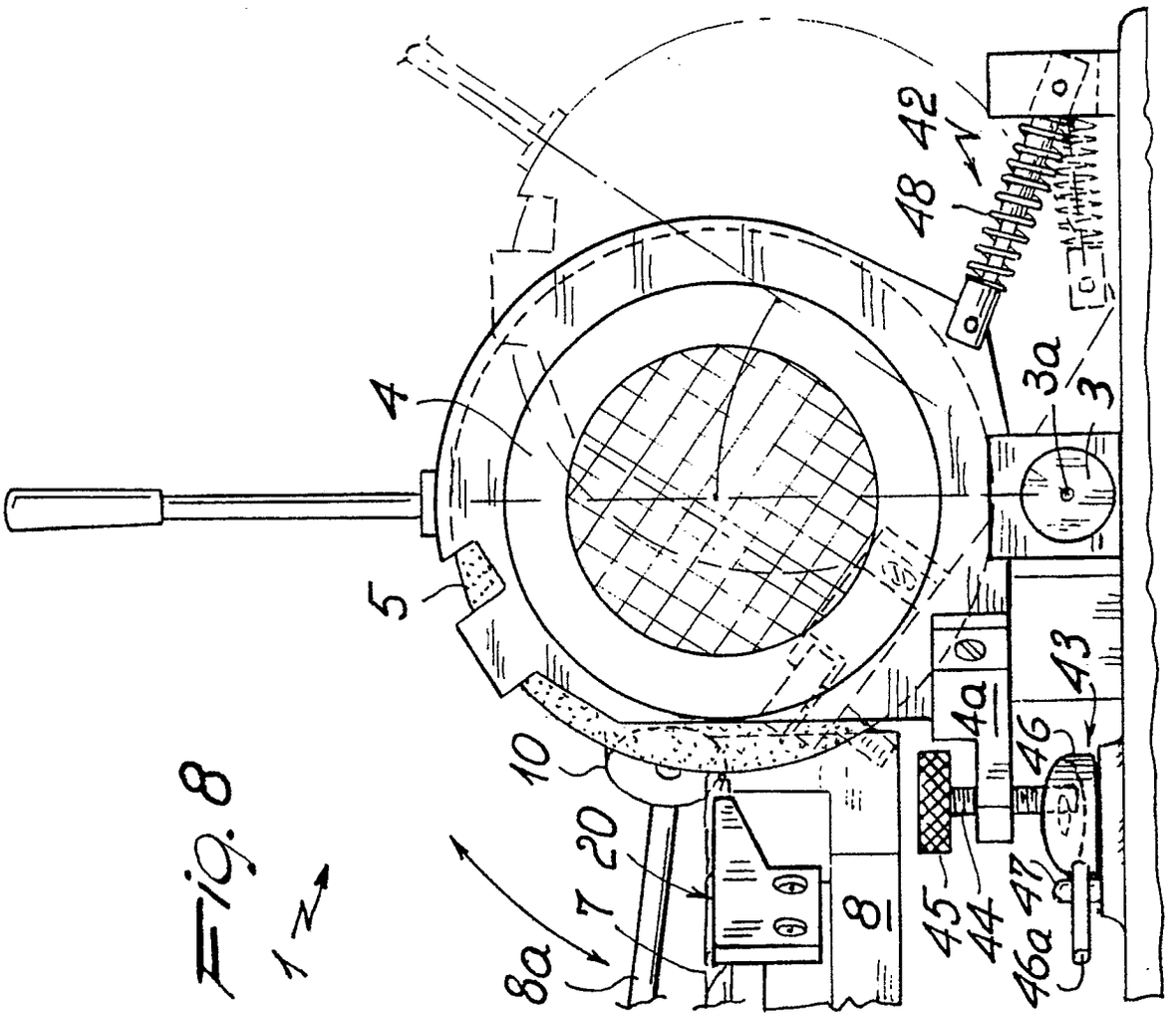
48
42
4
3a
3
5
43
10
4a
46
20
45
44
8a
7
8
46a
47

Fig. 8