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## EUROPEAN PATENT APPLICATION

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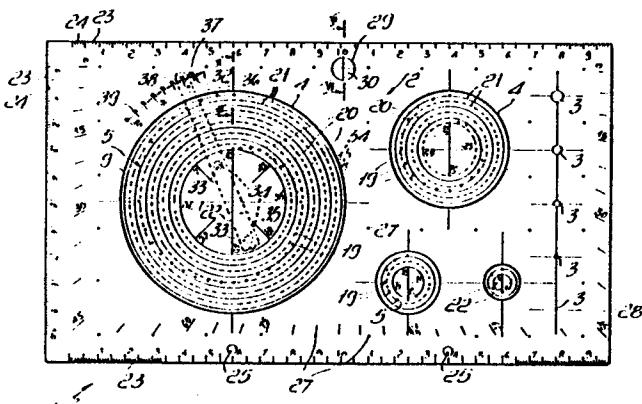
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④ A rotating guide instrument for drawing circles.

⑤ This invention relates to a rotating guide instrument for drawing circles which, in a preferred embodiment (1) thereof, comprises a transparent sheet (2) provided with rotatable disks (5) which enable circles to be drawn with a free pencil.

That instrument affords important advantages resulting, inter alia, from a much reduced overall size relatively to the largest diameters that can be drawn and a high versatility and ease of use.



## A ROTATING GUIDE INSTRUMENT FOR DRAWING CIRCLES

This invention relates to a rotating guide instrument or tool for drawing circles.

For drawing circles without a compass, circle drawing stencils have been available which comprise 5 as many different diameter circular holes as are the circles to be drawn thereby.

It may be appreciated, however, that such stencils must have an area which is at least slightly larger than the combined areas of the holes cut through 10 it. Thus, as an example, a stencil having a full set of circular holes ranging in diameter from 1 mm up to 35 mm with 1 mm increments, already covers an area of 15  $300 \text{ cm}^2$ . If the largest diameter in the stencil is to be increased further, then the overall area of the stencil is bound to increase exponentially to soon reach an unmanageable size.

Also to be considered is the fact that, even though such stencils carry reference indicia, in actual practice adjusting any in the set of holes to 20 fit true around a selected centerpoint is quite difficult, thereby if two or more homocentrical circles are to be drawn, their concentricity is often but coarsely attained.

It is the general aim of this invention to obviate 25 such prior disadvantages by providing an instrument or tool for drawing circles which, while being highly compact in overall size, allows a full range of circles to be drawn, even to a large diameter, with high

drafting and dimensional accuracy.

Within the above aim, it is a particular object of the invention to provide an instrument as indicated which, while ensuring an unobstructed view of the 5 drawing sheet, can be quickly set in position with a high degree of accuracy.

A further object is to provide an instrument as indicated, which can be manufactured of a small number of component parts, to be formed, for example, 10 from plastics, so as to be of a low cost to extend its application potential.

The above aim and objects are achieved, according to the invention, by a rotating guide instrument for drawing circles, characterized in that it comprises 15 a movable member having at least a portion thereof with a circular contour profile and being slidable, by rotation about the center thereof, along matingly shaped guide means provided on a fixed member, said movable member having guiding passages for a tracing 20 point arranged at varying distances from said center.

Further features and advantages of the invention will be more clearly understood from the following description of five preferred embodiments thereof, to be taken in conjunction with the accompanying 25 illustrative drawing, where:

Figure 1 is a top plan view of a first embodiment of this rotating guide instrument;

Figure 2 is an enlarged scale sectional view taken along the line II-II of Figure 1, showing a

first variation of the coupling of the movable member with the fixed member;

Figure 3 shows a second variation of the same coupling as in Figure 2;

5 Figure 4 shows a third variation of the coupling of Figure 2;

Figure 5 shows a fourth variation of the coupling of Figure 2;

10 Figure 6 is an enlarged scale sectional view taken along the line VI-VI of Figure 1;

Figure 7 is a top plan view of a second embodiment of this instrument;

Figure 8 is a sectional view taken along the line VIII-VIII of Figure 7; and

15 Figure 9 is a top plan view of a third embodiment of this instrument.

A first embodiment of this instrument for drawing circles, as generally designated with the reference numeral 1, comprises a fixed member advantageously composed of a preferably transparent or clear plastics sheet 2 which, in addition to having circle drawing holes 3 like ordinary stencils, has a number of circular openings 4 on the inside whereof corresponding disks, advantageously forming 20 the instrument movable members, are fitted for unrestricted rotation about their center.

25 According to the invention, the sliding fit or coupling between the sheet 2 and disks 5 is a single piece construction made demountable by the provision,

in a first variation shown in Figure 2, of a substantially cylindrical circular opening 4 the wall 6 of which has a projecting annular rim portion 7 fitting in a corresponding circumferential recessed portion 8 in the rim 9 of the disk 5.

That recessed portion 8 is included between a projecting head 10, abutting the top face 11 of the sheet 2, and at the opposed end, an enlarged base 12 having a rounded outer edge 13.

10 The disk 5 can thus be coupled with the sheet 2 by inserting the enlarged base 12 into the circular opening 4 and applying a slight pressure to crown the sheet 2 and enable the enlarged base to move past the projecting portion 7, the operation being made 15 easier by the rounded outer edge 13.

20 The coupling also allows the disk 5 to be pulled off by applying a slight pressure to the enlarged base 12, such as for the purpose of periodically cleaning the coupling.

25 In a second variation, shown in Figure 3, the circular opening 4a is made conical and the projecting portion is provided by its narrow region 14, located at the top face 11. The disk 5 is pressed in by forcing the head 10a through the large end of the opening 4a and crowning the sheet 2 slightly to a snap fit.

Withdrawal is accomplished from the opposed end, and is also facilitated by the taper of the circular opening 4a.

30 The recessed portion 8a is connected to the

enlarged base 12a by an intermediate portion 15 the taper whereof facilitates pulling the disk 5 out of its manufacturing mold.

In a third variation, shown in Figure 4, the 5 wall 6b of the circular opening 4b is configured as a double cone defining a projecting mid-portion 16; the disk 5 has an enlarged base 12b which can be pressed in past the mid-portion 16, utilizing either taper 17 of the opening 4b, and which can be withdrawn 10 from the same side by utilizing the other taper 18 where its conical pattern performs a lead-in action.

A fourth variation, shown in Figure 5, envisages 15 a disk 5 whose enlarged base 12c, by virtue of its conical taper, can be snapped in through the small end of an opening 4c, also conical; withdrawal is accomplished here too through the small end by applying a pressure to the enlarged base 12c and utilizing the taper of the opening 4c.

In order to impart the narrow region 14a with 20 a high deformability feature, which on deforming the sheet 2 when the enlarged base 12c is forced in, would otherwise tend to restrict the passage area, an annular groove 55 is provided in the sheet 2 which is open at the top face 11; a similar function is 25 served by the annular groove 55 provided in the enlarged base 12 as shown in Figure 2.

It may be appreciated that with couplings which 30 provide for the disk 5 to be inserted from the same side of the sheet 2, although slightly more complex construction-wise, the head 10, not being required to

go through the circular opening 4, may have any desired dimensions, thereby even large bearing surfaces may be provided between the head 10 and sheet 2.

5 In the disks 5, there are formed guiding passageways, comprising conical perforations 19, which are laid each at a different distance from the center of the respective disk and distributed along a spiralling line that ends within one turn.

10 After selecting the perforation 19 that corresponds to a desired distance from the centerpoint, one can introduce the tip of a pencil, or other writing implement, therethrough such that in turning the disk 5 around its center it will draw a circle under the 15 guide provided by the perforation itself.

To better find out the circles, the disks 5 carry a numbering indicative of the respective diameters provided by the perforations 19; expediently, such numbering would be number marks 20 which would be all 20 placed substantially at the same distance from the center of the disk 5, inwardly of the spiralling line and radially aligned to a respective perforation.

In order to favor a precise positioning of a circle to be drawn, e.g. to place it exactly tangent 25 to other lines or points on the drawing, marked out on the disks 5, at the perforations 19, are a plurality of concentrical reference circles 21 which, both to improve the clear view of the underlying drawing and mainly to be more readily recognizable, are alternately 30 shown in full lines and dash lines with gradually

length dashes toward the center.

Also for the purpose of an improved positioning, and accordingly improve the accuracy and useability of the instrument, the centerpoint of the disks 5 is brought out by the provision of two orthogonal axes 22 thereon.

Further, a sheet 2 of rectangular shape is used which has printed on at least two of its adjoining straight sides 23, orthogonal to each other, a 10 measuring scale 24 whereby the instrument 1 may be used as a set square.

The instrument 1 is also arranged for connection, through two connecting pins 25 projecting from the top face 11 of the sheet 2, to a holder, not shown, having two rollers which can be wheeled across an 15 underlying drawing sheet to move the sheet 2 always parallel to one side 23 thereof owing to their being mounted rigidly to a common axle.

On the bottom face 26 of the sheet 2 there are 20 evenly distributed a plurality of small rounded projections 27 which hold the sheet slightly raised off the rest surface, thus enabling its use with a tracing pen.

The sheet 2 also has a first goniometric scale 28 25 printed thereon whose vertex lies at a hole 29, e.g. a conical one, wherewith a movable pushbutton 30, better shown in Figure 6, is associated which can be depressed to bring the base 31 to engage with the rest surface ; thus, it becomes possible to rotate the 30 sheet 2 around the pushbutton 30, i.e. about the

vertex of the first goniometric scale 28, e.g. to rotate through a preset angle one side 23 thereof relatively to a first line being the side of an angle and draw the other side of the angle, at an 5 inclination with respect to the former by a selected amount.

Also printed on the sheet 2 is a second goniometric scale 32, having its vertex coincident with the center of one of the disks 5; in this 10 respect, that disk 5 has two diametrically opposed eyes 33 about its center through which a pair of connecting pins 34 may be passed which are pressure lockable to the rest surface of a removable rod 35 indicated by a dash line in Figure 1.

15 By pushing the rod 35 against the rest surface, its pins 34 will stick to it and block the movement of the disk 5 while on the end 36 of the rod 35 which overlie the second goniometric scale 32 and carry each a reference index 37 marked thereon, it is possible 20 to measure the angle through which the sheet 2 is rotated and hence its sides 23.

Expediently, at least one of the ends 36 of the rod 35 has, at the index 37, an elevation 38 which snap engages into notches 39 provided in the sheet 2 and evenly distributed along the second goniometric 25 scale 32.

Quite apparently, the principle of operation of the instrument 1 herein consists of providing for the tracer point a guide on a movable member which 30 is secured at at least two points of its circular

contour, and based on this same principle other embodiment forms may be provided wherein both the movable and fixed members may have different shapes.

5 A second embodiment, shown in Figures 7 and 8, comprises a fixed member, comprising essentially a side guide 40 having, on a peripheral substantially circular portion 41 thereof, a recess with undercut portions 42 which fit slidably on the matingly shaped rim 9a of a rotating disk 5a.

10 This second embodiment illustrates one possible variation of the guide passageways for the tracer point, which comprise in this case a perforation 43 formed through the free end 44 of a flat bar 45 the opposed end 46 whereof is journalled to the disk 5a; thus, the bar 45 can swing relatively to the disk 5a to move the perforation 43 to overlie a passageway 47, and can be locked temporarily in the set position, e.g. by means of a nut on the end 46.

20 Figure 9 shows a third embodiment wherein the fixed member comprises a bracket 48 of substantially L-like shape which carries two separate pairs of side-by-side rotating rollers 49 between which a peripheral circumferential elevation 50 runs of a disk 5b which is thus guided in its rotation about its center.

25 The third embodiment also illustrates a possible variation of the guide passageways for the tracer point, which comprise here a pair of perforations 51 formed in a slider 52 arranged to slide in a radial slot 53 of the disk 5b and to be locked in a desired position.

Thus, the special functionality and versatility of this instrument has been ascertained in practice, which is specially designed for drawing circles and enables a whole set of operations which normally 5 require the availability of a number of different instruments or tools to be performed quickly and in a highly accurate way.

Drawing circles is extremely accurately effected, both by virtue of the principle adopted and of the 10 specific design of the coupling between the rotating disk 5 and sheet 2 which, while being of unitary construction, provides a sliding movement with the least of play and friction and at the same time the faculty to manually disassemble and assemble the 15 component parts together in a very simple manner.

Also to be held in mind is the peculiar lay of the reference marks printed on the disks 5 which enable prompt and natural recognition of that 20 perforation 19 which corresponds to a desired diameter and exact positioning of the circumference relatively to the other parts of a drawing, without impairing a clear view of the drawing.

The invention herein is susceptible to many modifications and variations without departing from 25 the scope of the inventive concept.

Thus, as an example, to reduce the frictional coefficient between the movable and fixed members, small balls or bearing needles may be interposed thereto as shown by way of example in Figure 1 at 54.

Furthermore all of the details may be replaced 30

with other technically equivalent elements, and in  
practicing the invention, the materials used, as  
well as the dimensions, may be any selected ones  
contingent on individual requirements and the state  
5 of the art.

CLAIMS

1. A rotating guide instrument for drawing circles, characterized in that it comprises a movable member having at least a portion thereof with a circular contour profile and being slidably, by rotation about 5 the center thereof, along matingly shaped guide means provided on a fixed member, said movable member having guiding passages for a tracing point arranged at varying distances from said center.
- 10 2. An instrument according to Claim 1, characterized in that said movable member comprises a rotating disk (5,5a,5b) about its center, the rim (9,9a,9b) of said disk (5,5a,5b) being coupled slidably with guide means provided on said fixed member.
- 15 3. An instrument according to Claim 2, characterized in that said fixed member comprises a sheet (2) having at least one circular opening (4,4a,4b,4c) on the inside whereof said disk (5) can rotate with a minimal radial play and a sufficient transverse play to ensure rotation without jamming.
- 20 4. An instrument according to Claim 3, characterized in that the wall (6,6a,6b,6c) of said at least one circular opening (4,4a,4b,4c) in said sheet (2) has a circumferentially projecting portion (7,14,14a, 16) slidably received in a recessed circumferential portion (8,8a,8b,8c) of the rim of said disk (5), said projecting portion (7,14,14a, 16) and said recessed portion (8,8a,8b,8c) being fitting together with a minimum of interference to disengage from each other on slightly crowning said sheet (2) and disk (5,5a,5b)

to allow said disk (5,5a,5b) to be manually inserted into and pulled out of said circular opening (4,4a,4b,4c).

5. An instrument according to Claim 4, characterized in that said recessed circumferential portion (8,8a,8b,8c) is included between a projecting head (10,10a,10b,10c) engaging with the top face (11) of said sheet (2) and an enlarged base (12,12a,12b,12c).

10. An instrument according to Claim 2, characterized in that through said disk (5,5a,5b) there are formed guiding passages in the form of conical perforations (19) distributed along a one-turn spiral line.

15. An instrument according to Claim 6, characterized in that on said disk (5,5a,5b) there is applied a numbering indicative of the diameters related to each of said perforations (19), said numbering being essentially number indicia (20) placed substantially at the same distance from the center of said disk (5,5a,5b) and being aligned radially to respective ones of said perforations.

20. An instrument according to Claim 6, characterized in that, on said disk (5,5a,5b) at said perforations (19), there are brought out a plurality of concentrical reference circles (21).

25. An instrument according to Claim 8, characterized in that said concentrical reference circles (21) are drawn alternately in full and dash lines.

30. An instrument according to Claim 6, characterized in that on said disk (5,5a,5b) there are provided

reference indicia bringing out the center thereof and comprising essentially a pair of orthogonal axes (22).

11. An instrument according to Claim 3, characterized in that said sheet (2) has at least 5 two straight adjoining sides (23) orthogonal to each other and carrying measuring scales (24) printed thereon.

12. An instrument according to Claim 11, characterized in that from the top face (11) of said 10 sheet (2) there project two connecting pins (25) for a holder comprising two rubber-coated rollers rotating rigidly with a common shaft to enable said sheet (2) to move parallel to said sides.

13. An instrument according to Claim 3, 15 characterized in that the bottom face (26) of said sheet (2) has a plurality of projections (27) adapted to hold said bottom face (26) off the rest surface and allow for the use of an ink tracing pen.

14. An instrument according to Claim 3, 20 characterized in that said sheet (2) has, at the vertex of a first goniometric scale (28) printed thereon, a hole (29) accommodating a movable push-button (30) the base (31) whereof can be pressed against the rest surface to set said sheet (2) angularly 25 relatively to said vertex.

15. An instrument according to Claim 3, characterized in that on said sheet (2) there is 30 printed a second goniometric scale (32) having its vertex coincident with the center of said disk (5), said disk (5) having, laid diametrically about its

center, two eyes (33) for letting through a pair of connecting pins (34) pressure lockable against the rest surface from a rod (35) on the ends (36) whereof overlying said second goniometric scale (32) 5 there is printed a reference index (37) adapted to be aligned to said second goniometric scale (32) to set said sheet (2) at an angle.

16. An instrument according to Claim 15, characterized in that from at least one of said ends 10 (36), at said index (37), there projects an elevation (38) engaging with a snap action into notches (39) provided in said sheet (2) and being evenly distributed along said second goniometric scale (32).

17. An instrument according to Claim 2, 15 characterized in that said fixed member comprises a side guide (40) having, on a substantially circular peripheral portion (41) thereof, a recess with undercut portions (42) fitting slidably on the matingly shaped rim (9a) of said disk (5a).

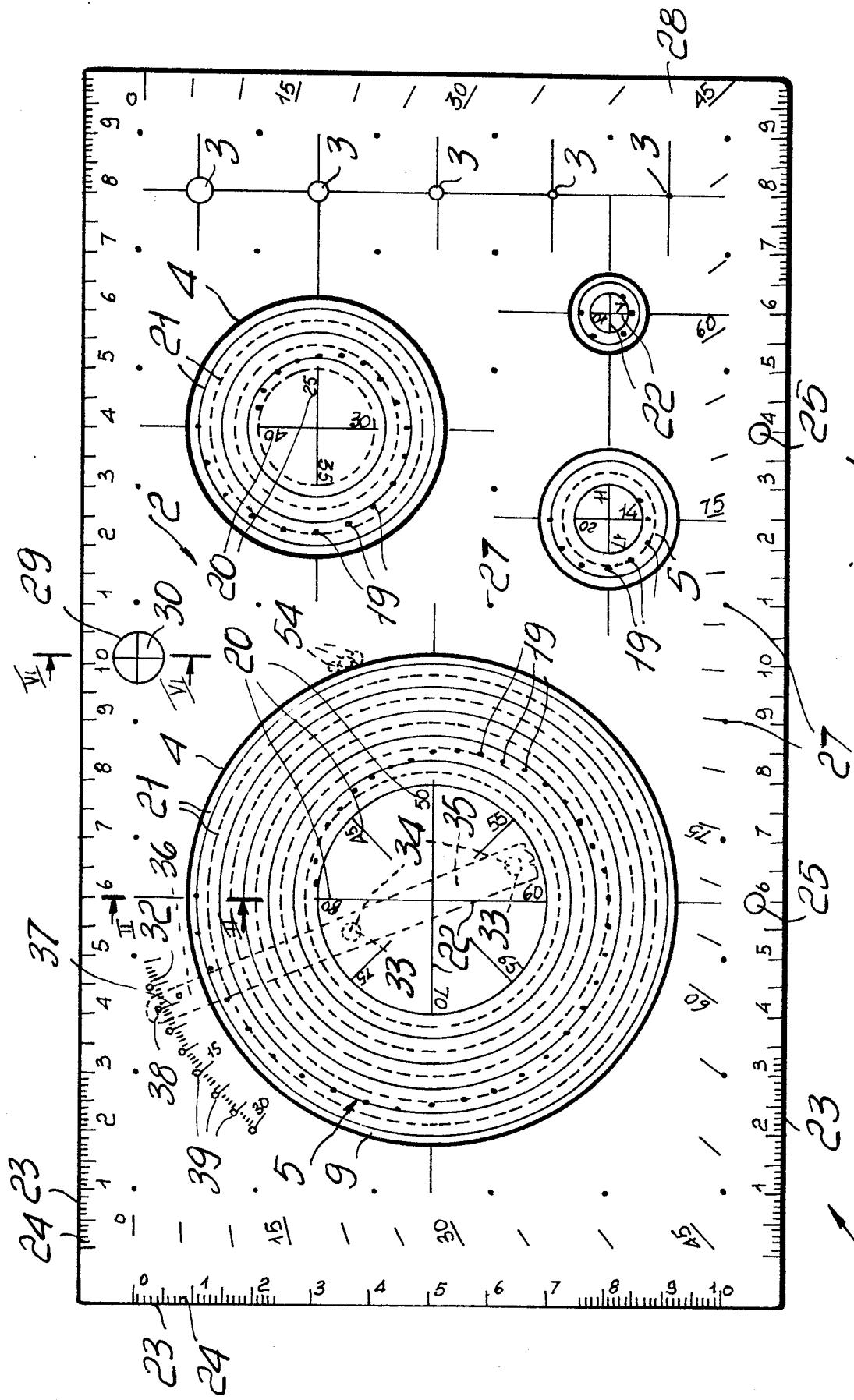
20 18. An instrument according to Claim 2, characterized in that said fixed member comprises a bracket (48) having two separate pairs of side-by-side rollers (49) wherebetween a circumferential elevation (50) on said disk (5b) is adapted to run.

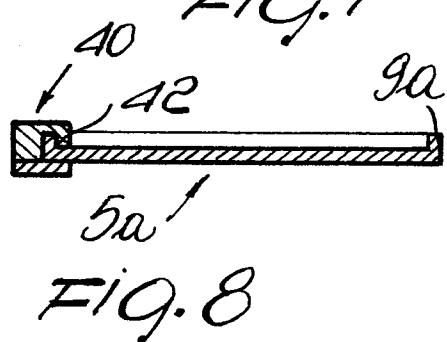
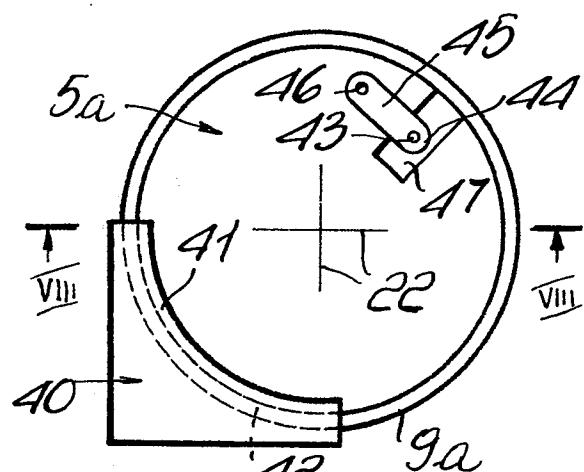
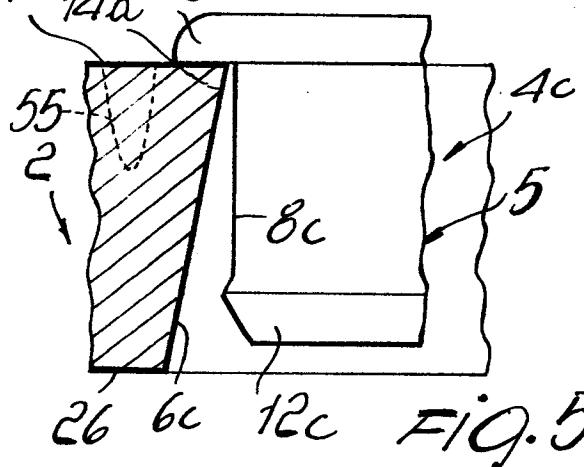
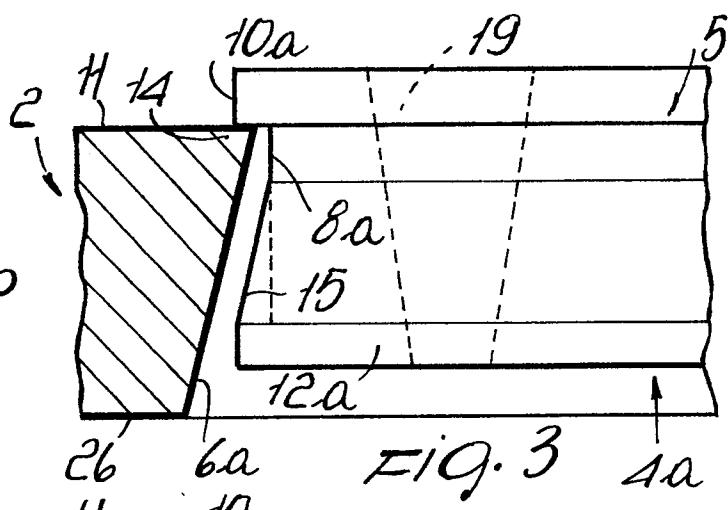
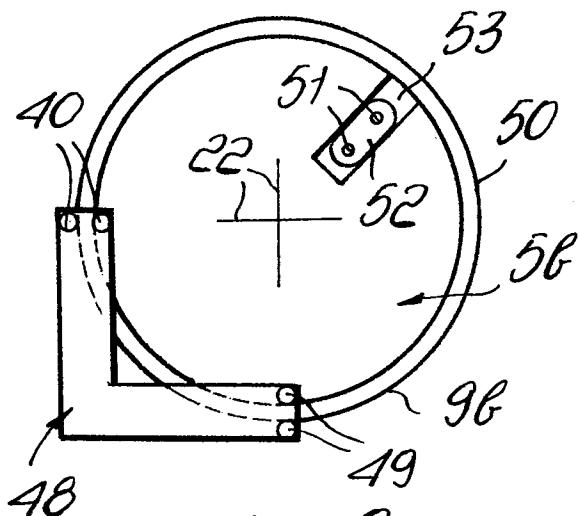
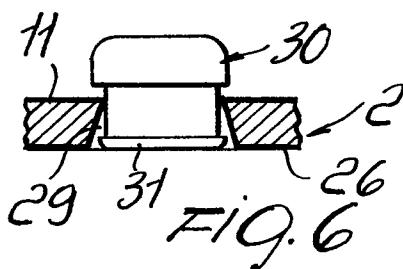
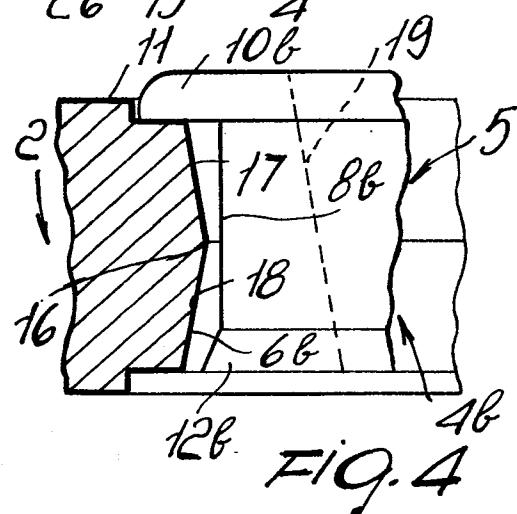
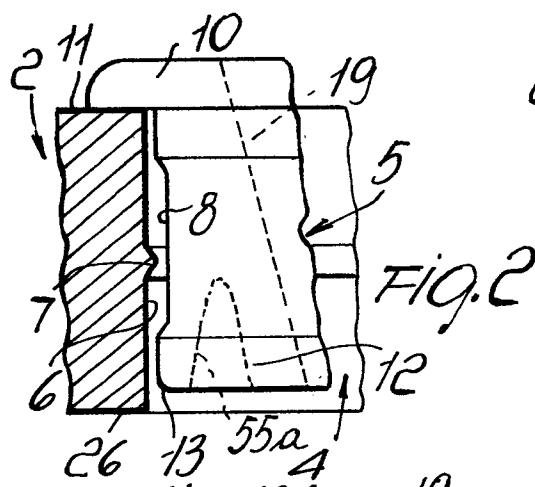
25 19. An instrument according to Claim 1, characterized in that said guiding passages comprise at least one perforation (43) formed through the free end (44) of a bar (45) the opposed end whereof (46) is connected to said movable member in an adjustably 30 swinging fashion.

20. An instrument according to Claim 1,  
characterized in that said guiding passages comprise  
at least one perforation (51) formed through a  
sliding slider (52), in an adjustable fashion,  
5 within a slot (53) provided in said movable element.

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	DE-A-1 900 278 (FREY) * Page 4, line 15 - page 11 * ---	1-5,11	B 43 L 9/00 B 43 L 13/20
X	DE-U-85 03 290 (LINDEN) * Page 8, line 11 - page 10 *	1-3,13	
A	---	5	
X	US-A-4 222 171 (MALACHESKI) * Column 2, line 9 - column 6, line 3 *	1-3,11	
A	---	4,5	
X	DE-A-2 431 466 (STEINHAUSER) * Page 2, line 14 - page 4 *	1-3,11	
X	DE-A-2 120 783 (ARKENBERG) * Page 6, line 16 - page 14 *	1-3,11 ,13	B 43 L TECHNICAL FIELDS SEARCHED (Int. Cl.4)
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The present search has not been carried out for the following			
Place of search	Date of completion of the search	Examiner	
The Hague	03-06-1986	VAN OORSCHOT	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone	T : theory or principle underlying the invention		
Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date		
A : technological background	D : document cited in the application		
O : non-written disclosure	L : document cited for other reasons		
P : intermediate document	& : member of the same patent family, corresponding document		



### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

### X LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

- 1) Claims 1-5, 11, 13: Rotating guide instrument/sheet with rotating disk
- 2) Claims 6-10, 19, 20: Arrangement of guiding passages
- 3) Claims 12, 14-16: Means for positioning sheet on drawing surface
- 4) Claims 17, 18: Means for mounting disk on fixed member

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.

namely claims: 1-5, 11, 13