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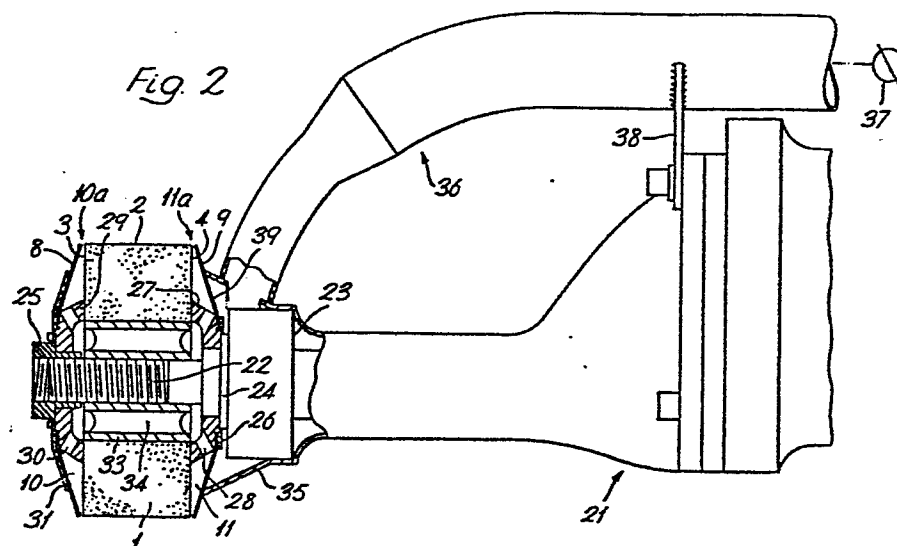
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⑥④ Improvements in or relating to radial grinding tools with means to remove grinding dust.

⑤⑦ A radial grinding tool, preferably portable and hand-held. Grinding dust generated by contact between the grinding face (2) and the work is drawn axially into the mouths (10a, 11a) of ring-shaped cavities (10, 11), one to each axial side of the wheel (1). The chambers interconnect by passages (30, 34, 28), and are connected to the suction source (35, 36, 37). The outer walls (8, 9) of the cavities are of plastics or other wear-away material and spin with the wheel, so that they wear by contact with the work as the wheel wears likewise.

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IMPROVEMENTS IN OR RELATING TO RADIAL GRINDING TOOLS WITH
MEANS TO REMOVE GRINDING DUST

This invention relates to means to remove grinding dust, during operation, from radial grinding tools. It relates especially to hand-held radial grindingwheels. The dust produced when grinding many materials, particularly metal castings, is
05 dangerous; if inhaled by operators it can damage their respiratory system. It is known good practice to conduct such grinding under well-ventilated conditions so that any dust produced is drawn away from the operator's breathing zone. Fixed position grinding machines are therefore usually covered with powerful
10 extraction hoods, and portable ventilated enclosures or "booths". may be used when a portable grinding tool has to be taken to grind a fixed object. Where the object is large, however, it may not be possible to design a booth so that it effectively encloses the area to be ground, and in such cases the usual alternative
15 has been for the operator to wear a respirator. Unfortunately respirators may be both uncomfortable and inconvenient. Moreover they protect the wearer only and do not prevent the dust that he is producing from being a nuisance or hazard to other workers nearby. Respirators can also impair the wearer's view of his work.

20 For face grinding tools, where the tool is cup-shaped and the rim of the cup performs the grinding, it is known to surround the walls of the cup by an outer wall so that a cylindrical passage

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for the extraction of dust is formed between the two walls, the annular mouth of this passage lying immediately and radially outwards of the grinding rim. With such a device, of course, whatever the suction applied to attract dust to the duct the centrifugal motion of that dust when first released also helps to carry it towards the duct.

Similar expedients have been applied to face grinders where the active surface is one of the side faces of a plain wheel. See, for instance, U.S. patent No. 2895266 where the mouth of the dust extraction duct is a circular channel within the active surface. Such an arrangement can suffer from the disadvantage that when grinding is taking place, contact between the wheel and the work may itself seriously obstruct access of the dust to the duct.

The present invention is based upon the discovery that an extraction duct, similarly close to the grinding face, can be associated with a radial grinding tool in such a way that contact between tool and work presents no serious obstruction, even where the centrifugal motion of the dust when first released does not help to carry it towards the duct mouth.

According to this invention a radial grinding tool includes means to remove grinding dust, these means comprising a dust extraction duct with its mouth displaced axially from the grinding face and means to suck the dust into the mouth.

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The tool may be a wheel and the duct may be ring-shaped, co-axial with the wheel and substantially equal to the wheel in outer radius; a side wall of the wheel may form one side wall of the duct and the opposed duct side wall may be mounted to spin with
05 the wheel. This opposed side wall may be of wear-away character, for instance a flexible plastics disc, so that as the wheel wears the disc may wear to match. There may be two ducts, one to each axial side of the wheel.

The inner radial end of the duct may be connected to the suction means, preferably by way of at least one bore within the
10 shaft means by which the grinding wheel is rotated.

The invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which:-

Figure 1 is a diagrammatic view, partly in axial section of a portable radial grinding wheel, and

Figure 2 is a similar view of another such wheel.

15 Figure 1 shows a tool comprising a radial grinding wheel 1. presenting a cylindrical grinding face 2 and flat side faces 3 and 4. The wheel is mounted on a hollow shaft 5 driven through reduction gearing 6 by an electric motor 7 the casing of which may be shaped to provide a grip whereby the instrument may be hand-held. The
20 shaft also carries two flexible plastics discs 8, 9, each having an outer radius equal to that of the wheel 1. A ring-shaped cavity 10, having an axial dimension that decreases with increasing radius, is thus formed between disc 8 and face 3; a similar cavity 11 is formed between disc 9 and face 4. Cavities 10 and 11 are connected

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to an exhaust pump (shown diagrammatically at 12) via holes 13 in the wall of shaft 5, then via the bore 14 of the shaft and then via a flexible hose 15 connected to shaft 5 by a rotatable coupling 16. When motor 7 and pump 12 are operating and work is presented to face 2, it has been found that the suction exerted from channels 10 and 11 may be strong enough to draw into the mouths 10a, 11a of those channels the dust that is released from either the workpiece or the wheel by the grinding process. As will readily be seen, mouths 10a and 11a are displaced axially from face 2 but substantially coincident with it radially.

In a typical hand-held grinder according to the invention, wheel 1 may be of carborundum and of 150 mm outer diameter, mounted on a shaft 5 of inner and outer diameters 25mm and 35mm respectively, driven by motor 7 at 4200 rpm, and pump 12 may exhaust air at $3\text{m}^3/\text{min}$. Tests on such equipment indicated that such an exhaust rate can substantially reduce the emission of respirable dust particles when grinding steel or iron castings; the concentration of particles breathed by the operator is then likely to be below the accepted threshold limit in many cases, allowing the operator to work without additional exhaust ventilation or respiratory protection.

In such apparatus, discs 8 and 9 have been of polythene, of about 1mm thickness and vacuum-formed to the illustrated shallow dished shape, so that the discs have readily worn down by abrasion against the work as grinding has progressively eroded the wheel, discs and wheel thus remaining of equal outer radius despite wear.

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Discs 8 and 9 have been secured to collars on shaft 5 by means of small screws.

In the apparatus shown in Figure 2, parts corresponding exactly with any shown in Figure 1 are denoted by the same reference numerals. In Figure 2 the motor (not shown) may be contained within handle 21, and drives shaft 22 by way of reduction gearing contained within a cylindrical housing 23. A flange 24 is mounted on shaft 22, and one feature of this version of the invention is that all the active, spinning components of the apparatus to the left-hand side of flange 24 (as shown in Figure 2) are assembled by simply slipping them over shaft 22 and finally securing the whole assembly by a nut 25. Plastics disc 9 is clamped between a plain metal ring 26 and a dished annular plate 27, formed at intervals with oblique passages 28; ring 26 and plate 27 are held together by bolts (not shown). In similar manner plastics disc 8 is sandwiched between a dished plate 29, formed with passages 30, and a ring 31; for safety, ring 31 is of greater radius than ring 26 and is saucer-shaped. When the apparatus is assembled, one face of plate 27 bears against flange 24 and the nut 25 bears against the corresponding face of plate 29. The annular grinding wheel 1 is clamped between the rims of plates 27 and 29, and the space between wheel 32 and shaft 22 is taken up by a sleeve 33 formed with axial passages 34.

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A conical shroud 35 surrounds housing 23 and is connected by way of a pipe 36 to a vacuum source 37. Pipe 36 is supported from handle 21 by a bracket 38. When source 37 is running to create a vacuum, dust generated by the grinding action of face 2 of wheel 1 is sucked into the ducts 10, 11 between the wheel and the plastics discs 8 and 9. From duct 11 the dust passes directly by way of holes 39 formed at intervals in disc 9 into the space enclosed by shroud 35, and so into pipe 36. From duct 10 the dust reaches pipe 36 by first transferring to duct 11 through the hollow centre of annular wheel 1 by way of passages 30, 34 and 28.

While two ducts 10 and 11, one to each axial side of wheel 1, appear both in Figure 1 and in Figure 2, a single such duct might be enough for some applications provided the suction from source 12 or 37 was strong enough.

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CLAIMS

1. A radial grinding tool including a grinding wheel (1) and means to remove grinding dust, these means comprising a dust extraction duct (10, 11; 15, 36) and means (12, 37) to suck the dust into the mouth of that duct, characterised in that the mouth (10a, 11a) of the duct is displaced axially from the circumferential grinding face (2) of the wheel.
05
2. A radial grinding tool according to Claim 1, characterised in that the duct includes a ring-shaped portion (10, 11), coaxial with the wheel and substantially equal to it in outer radius.
- 10 3. A radial grinding tool according to Claim 2, characterised in that a side wall (3, 4) of the wheel forms one side wall of the ring-shaped duct, and the opposed side wall (8, 9) is mounted to spin with the wheel.
4. A radial grinding tool according to Claim 3, characterised in
15 that the said opposed side wall of the duct is of wear-away character, for instance a flexible plastics disc, so that as the wheel wears the opposed side wall may wear to match.
5. A radial grinding tool according to any of Claims 2 to 4, characterised in that there are two ring-shaped duct portions
20 (10, 11), one to each axial side of the wheel.
6. A radial grinding tool according to any of Claims 2 to 5, in which the wheel is carried by a rotatable shaft (5), and characterised in that the inner radial end of the or each ring-shaped duct is connected to the suction means by way of a bore (14)
25 within the shaft.

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7. A radial grinding tool according to Claim 5 in which the wheel is annular, characterised in that the two ducts communicate through the hollow centre of the annulus (30, 34, 28).

8. A radial grinding tool according to Claim 1, substantially
05 as described with reference to Figure 1 or Figure 2 of the accompanying drawings.

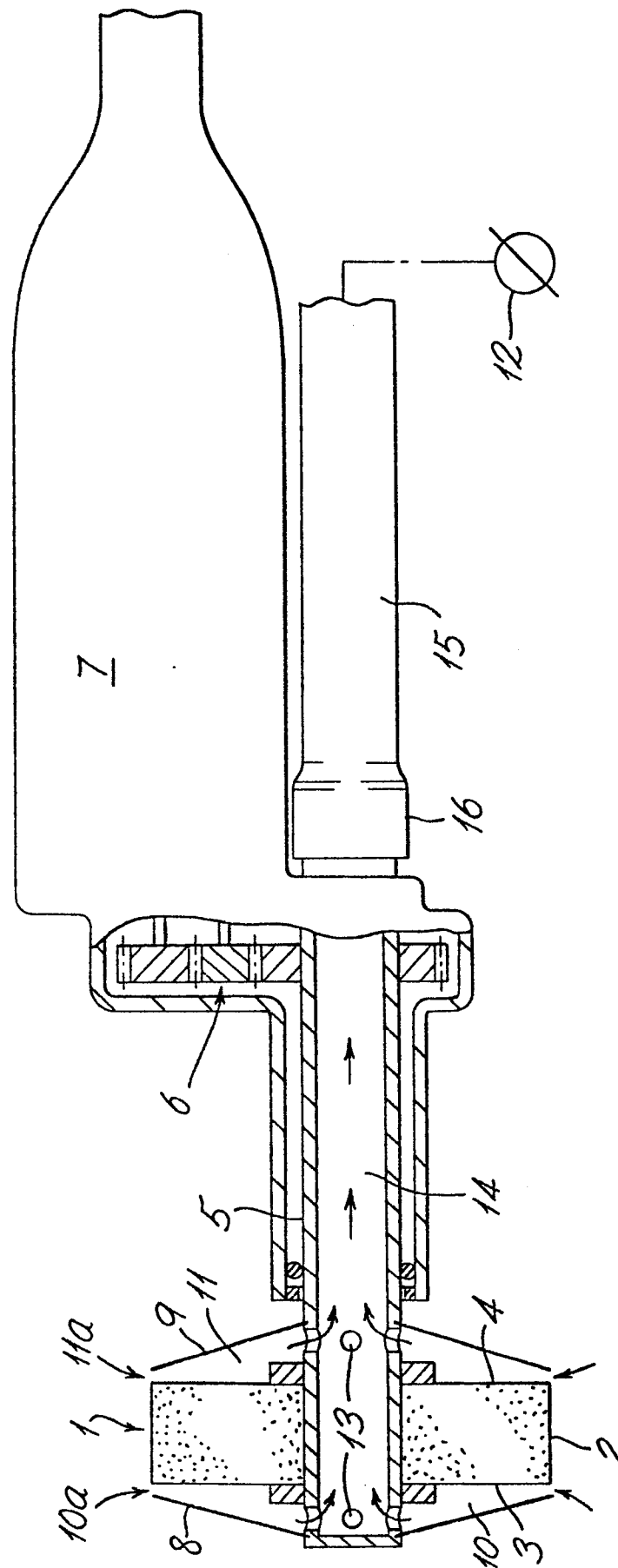
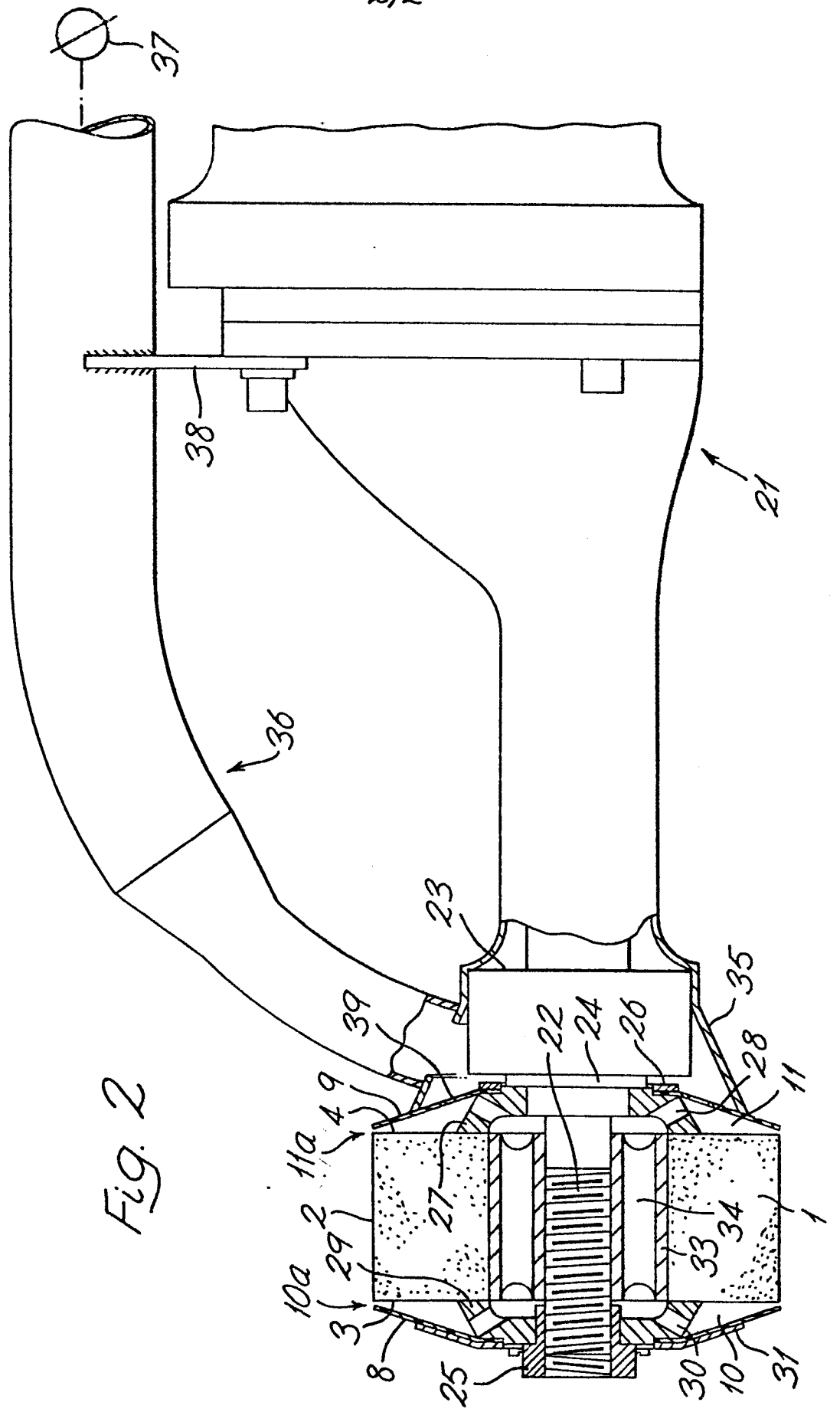


Fig. 1

Fig. 2





European Patent
Office

EUROPEAN SEARCH REPORT

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Application number

EP 79 30 0936

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ²)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 3 862 521 (ISAKSSON)</u> * column 2, lines 19-44; figures 3,4 *	1-8	B 24 B 23/02

A	<u>US - A - 3 585 980 (MELLOR)</u>		
A	<u>US - A - 2 954 653 (HARVEY)</u>		
A	<u>DE - B - 1 121 968 (ACKERMANN)</u>		

			TECHNICAL FIELDS SEARCHED (Int. Cl. ²)
			B 24 B
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
☒ The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16-08-1979	Examiner PEETERS