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54 **Floor cleaning and polishing equipment.**

57 Floor cleaning and polishing equipment has a shaft 17 pivoted to a base. In order to achieve an inclined handle position the shaft 17 possesses a retractable rod 30 the end 34 of which can be caused to lodge in perforations 9 in a arcuate strip 7 just beneath the end of the shaft 17, and thereby immobilise the shaft at the desired angle and operation height. Other embodiments cover the use of two holes only in the strip 7 and the consequent positioning of the strip either upright or in a single predetermined position. Also, the strip can be located at the underside of the base.

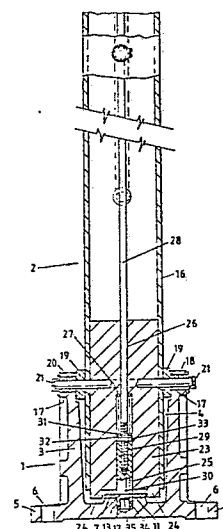


FIG. 1.

Description

FLOOR CLEANING AND POLISHING EQUIPMENT

This invention relates to floor cleaning and polishing equipment.

A floor polishing machine typically comprises a base carrying at its underside a driven rotary brush or pad journaled e.g. centrally about a vertical axis; an electric motor, for rotating the brush or pad, supported by the base; and an upwardly extending shaft, terminating in an operating handle, connected to the base. The present invention is particularly concerned with the interconnection between the base and the upwardly extending shaft.

Typically, machines are offered in a range of sizes, differing by the use of different motors, base sizes or handle types. There is thus a general need for straightforward, and compatible, interconnections. Also, the shaft should be adjustable in inclination to present the handle at a suitable and immobilised height for use.

Conventionally, to achieve this, the base/shaft interconnection has hitherto comprised a gearwheel held in fixed relationship to the base and with its axis transverse thereto. The shaft pivots about the axis, and carries an internal rod which, by manipulation of a lever on the handle, can slide within the shaft to an extent such that an end face, configured with complementary teeth to those on the fixed gear wheel, either engages with this gear (to lock the shaft in a desired position) or disengages (to allow the shaft to be inclined to a new desired position).

This arrangement however gives penalties of cost, weight and reliability.

Firstly, it is expensive to manufacture a complete accurate gear wheel for this purpose. In practice, only a few of the teeth ever become engaged in use, but a complete gear wheel has to be manufactured because of the typical method of manufacture and because it facilitates assembly. Also, it is expensive to manufacture complementary teeth in the end face of the engagement rod.

Secondly, the gearwheel is a heavy object, and needs to be housed in a suitable heavy housing. Also, for good engagement between the wheel teeth and rod teeth, the width of the wheel and rod diameter are usually for example about two centimetres, again leading to significant weight problems.

Finally, and as to reliability, the relative proportions and gear teeth shape required for safe base/shaft engagement even after a period of use have to be traded to some extent against weight and cost considerations. This is because the handle adjustment for height is essentially stepped, in proportion with the ratio of tooth pitch over the gear wheel radius multiplied by the shaft length (itself not very variable). To have enough teeth to give small adjustment steps implies that the small tooth pitch and depth must be compensated (to give an acceptable overall engagement area between the gear and the end face of the shaft) by the width of the gear and the shaft diameter. Even with this trade-off there is a tendency for the shaft and base to become disengaged, especially once the machine

is rather worn. The necessary shape of gear teeth also tends to permit complete disengagement once the disengagement starts up.

Cost and reliability problems are self-evident disadvantages for such equipment. The weight problem is not so much a problem of operator lifting or movement as a problem of balance. Since the shaft leaves the base from a generally peripheral region thereof, excess weight will tend to act at this region and thereby constrain the possible location of the motor. Typically, the shaft joins at a given region and the motor is supported at a generally diametrically opposite region, to keep the overall weight distribution generally central. We have found that reducing the weight at the shaft and its linkage allows the motor to be moved to other and more desirable locations without unduly detrimental effect.

We have now discovered a new form of linkage, of lower weight and which facilitates use of a lighter shaft construction. It has increased reliability in use is and cheaper to manufacture and easier to assemble or repair than current designs.

The invention consists in floor cleaning or polishing equipment of the type in which a handle is connected to a cleaning or polishing base by an elongate shaft capable of pivoting to give a predetermined angular adjustment at the base to or from the vertical position from or to an inclined position presenting the handle at an operator-suitable height, and comprising an outwardly biased but retractable pin at the lower end of the shaft and an arcuate surface presenting perforations adjacent which surface the said lower end of the shaft passes as the shaft pivots, whereby selective retraction and releasing of the pin from or into one or other of the said perforations allows the shaft to be pivoted to and immobilised either in a vertical position or in a predetermined angled position, or in one of a choice of such positions.

Preferably, the retractable pin is the end of a rod slidably housed in a bore at the end of the shaft, said bore containing an outwardly biasing spring for said rod and said rod being connected along the shaft to a handle-mounted retraction and release member.

The arcuate surface can present only two perforations, one of which accommodates the pin when the handle is vertical and the other of which accommodates the pin when the handle is at a predetermined angle for use. Alternatively it can present three or more perforations, to give more than one immobilised angle of use for the handle.

The arcuate surface may be embodied as a suitable perforate and arcuate metal strip. In one embodiment, this strip can itself be supported between opposed parallel walls extending upwardly from the base, between which walls the lower end of the shaft may be pivoted for movement of the retracted pin over the surface. In another embodiment, the shaft can pivot between opposed walls of an opening in the base of the equipment and the arcuate surface can be a metal strip fixed beneath

the base, this being a particularly light and compact arrangement.

While the invention is defined above in terms of the whole machine, it will be appreciated that, since shafts and handles can be combined with different bases, the interconnection per se is also a feature of the present invention.

The invention will be further described with reference to the accompanying drawings in which:-

Figure 1 is a section through one embodiment of the shaft/base interconnection in a direction transverse to that of forward movement of a polisher or like machine,

Figure 2 is a longitudinal section through the interconnection of Figure 1,

Figure 3 shows a further type of interconnection partly in section, and

Figure 4 shows part of equipment using such an interconnection.

The interconnection shown in Figures 1 and 2 comprises a stationary portion generally indicated at 1 and a movable portion generally indicated at 2.

Stationary portion 1 is predominantly a lightweight casting e.g. of aluminium alloy, with spaced parallel side walls 3 (spaced by an amount slightly greater than the width of the shaft, as described below) and an arcuate central portion 4. At its base the stationary portion possesses two lugs 5 each provided with a through orifice 6 for attachment to the top of the base of a floor polisher.

Within the walls 3, and lying along the arcuate central portion 4 is a similarly arcuate steel strip 7, bolted by a single bolt at 8 and drilled at 9 with a uniformly spaced succession of small holes. Towards the other end of strip 7 from bolt 8 is a single, larger diameter, bore 11.

A steel bush 12 is located with this larger bore 11. At its lower region it also locates in a recess 13 in the lowermost part 4a of central portion 4. The inner diameter of bush 12 is generally equivalent to the inner diameter of each hole 9.

Over the top and rear portions of the interconnection 1 are located flexible cover members 14 and 15 as shown.

Movable portion 2 comprises an aluminium alloy shaft 16 of closed rectangular section, pivoted in the walls 3 at aligned locations 17 using steel pivot pin 18, spacing washers 19, bearing bushes 20 and end caps 21. The shaft is thus capable of moving between side walls 3.

Within the lower end of the shaft 16 is fitted by bolt 22 an aluminium guide block 23 also of rectangular cross-section projecting downwardly at lugs 24 which run one to either side of the steel strip 7 as the shaft pivots. The pivot 18 passes through this guide block where shown, i.e. just off the centre line of the shaft.

Guide block 23 possesses a central bore 25 from below, over about half of its length and a smaller diameter central bore 26 from above, communicating with the first bore 25 to define shoulder 27. Smaller diameter operating rod 28 passes from above slidingly through the bore 26 to project into the bore 25. At its lower end it possesses a screw-threaded region 29. A short, and larger

diameter rod 30 fits slidingly within bore 25 and has an internal screw thread for attachment at 29. Around the rod 28 is located a biasing spring 31, bearing at its inner end on shoulder 27 and at its outer end on washer 32 located by nut 33. The threaded interconnected rods 28 and 30 are thus urged downwards in relation to block 23 by the spring 31 and block 30 is guided in its travel by bore 25.

Rod 30 projects beyond the end of a block 23 and has an end region 34 of diameter to fit holes 9 or the inner diameter of bush 12. The length of this portion as shown is generally the same as that required to enter the full depth of the holes 9, but if necessary could be somewhat longer to give especially secure seating at bush 12.

The end periphery 35 of region 34 is slightly chamfered as shown.

Figure 2 shows how rod 28 passes upwardly towards the handle (not shown) and how a typical attachment socket 36 for the motor (also not shown) can be located in relation to the shaft with its leads 37 passing upwards towards the handle. The handle is conventional, being provided with switches for controlling the motor operations and a hand lever for pulling rod 28 upwards against the bias of spring 31, to disengage end region 34 of rod 30 from bush 12 (or from whatever hole 9 is in use) and allow angular adjustment of the shaft to a new position.

The embodiment exemplified shows a number of advantages of the invention. Thus,

(a) The drilled arcuate strip 7 is far cheaper to manufacture than a gearwheel, and the simple projecting end region 34 is cheaper to manufacture than a rod with teeth across its end face. They are also easier to assemble.

(b) The arcuate strip need not be of high precision manufacture since the spring bias will compensate for any differences from exact circularity.

(c) Instead of using a wide gear and wide operating rod, a thinner rod and simple metal strip are used, with useful weight savings and improvement in balance of the equipment. Also, the smaller operating rod means that a light shaft construction can be envisaged.

(d) The end region of rod 30 has a more positive engagement with the walls of holes 9 than is encountered with the interengaging teeth of the prior art assemblies. Partly, this is due to the shape of the teeth, and partly due to size constraints on the teeth because of the gear wheel radius from the common pivot. With the present invention there is a cylinder wall contact of the end 34 and hole walls 9 (not an involute contact). Moreover, the lever arm is the distance from pivot 18 to holes 9 which is about twice the effective lever arm of the prior art gear wheel. This allows for a deeper interconnecting surface as between the end 34 and holes 9 and also for less force to be exerted on the walls of the holes 9 in use.

(e) We have discovered moreover, rather contrary to expectation, that maximum wear problems arise at the shaft-upright position. Other portions tend to be varied i.e. with the

stature of different operators) and tend in use not to lead to major stresses since the machine tends to "float" and does not need to be pushed hard. Impact stresses however tend to arise in transit, over ledges, stairs or rougher surfaces, and in this mode the handle is usually upright. The present invention allows a stronger construction, e.g. bush 12, and if desired, a longer interconnection of end 34 at this upright location.

We have moreover established that the interconnection can be of a particular lightweight and simple construction and that if desired only two locking perforations need be provided, one for the upright position and one for a predetermined inclined position.

The interconnection shown in Figures 3 and 4 utilises a shaft 17 essentially identical with that shown in Figures 1 and 2. The transverse pivot pin or pins 18, is, however, located to fulfil its pivoting function at a somewhat lower region and possesses grooves 35 extending around the free ends of the pins 18.

The base 36 is provided at its rear portion 37 with a pair of ground-support wheels 38 and with a through hole 39 having in its opposed parallel side walls 40, two recesses 41 each configured with a locating rib 42 to accommodate the groove 35 in each pivot pin 18. Discs 43 are fixed by central bolts 44 to overlie the recesses 41, so that when the pins 18 are located in the recesses 41 they may be held firmly and pivotally in place.

At the underside of the base 36 is an integral mounting block 45. An arcuate strip 46 of metal extends from this block to the region forward of the front edge of hole 47, being fastened at the front and back ends with bolts 48, 49 respectively. It presents an arcuate surface 50 to retractable pin, as before, in this embodiment comprising only two through holes 51, 52, one 51) corresponding to a vertical position and one (52) to a single inclined position of the shaft 17.

Operation of the handle will be self evident from the drawing and a consideration of the earlier embodiment. Of course, if desired, the arcuate strips 7 in Figure 2 could also be present, i.e. with three or more holes and conversely a two-hole strip 46 as in Figure 3 could be used in the embodiment of Figure 2.

Claims

1. Floor cleaning or polishing equipment of the type in which a handle is connected to a cleaning or polishing base by an elongate shaft capable of pivoting to give a predetermined angular adjustment at the base to or from the vertical position from or to an inclined position presenting the handle at an operator-suitable height, and comprising an outwardly biased but retractable pin at the lower end of the shaft and an arcuate surface presenting perforations

adjacent which surface the said lower end of the shaft passes as the shaft pivots, whereby selective retraction and releasing of the pin from or into one or other of the said perforations allows the shaft to be pivoted to and immobilised either in a vertical position or in a predetermined angled position, or in one of a choice of such positions.

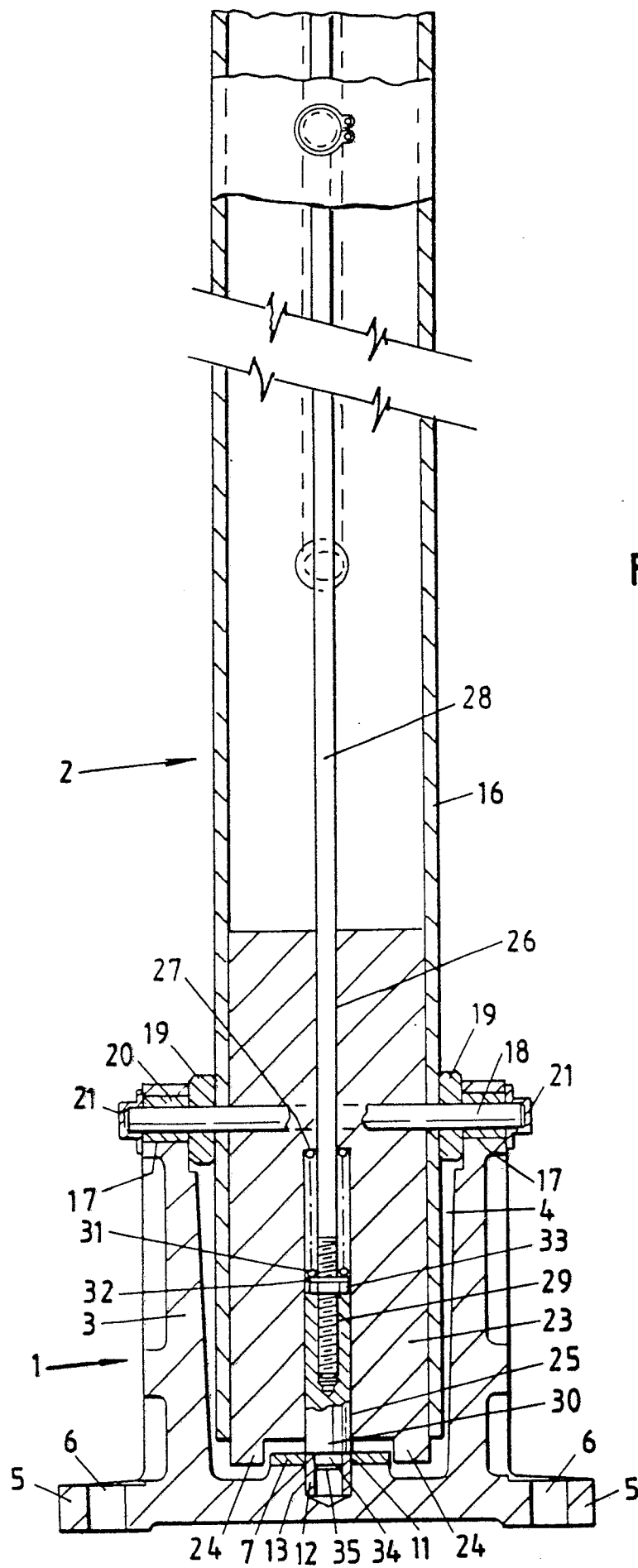
2. Floor cleaning and polishing equipment as claimed in claim 1 characterised in that the retractable pin is the end of a rod slidably housed in a bore at the end of the shaft, said bore containing an outwardly biasing spring for said rod and said rod being connected along the shaft to a handle-mounted retraction and release member.

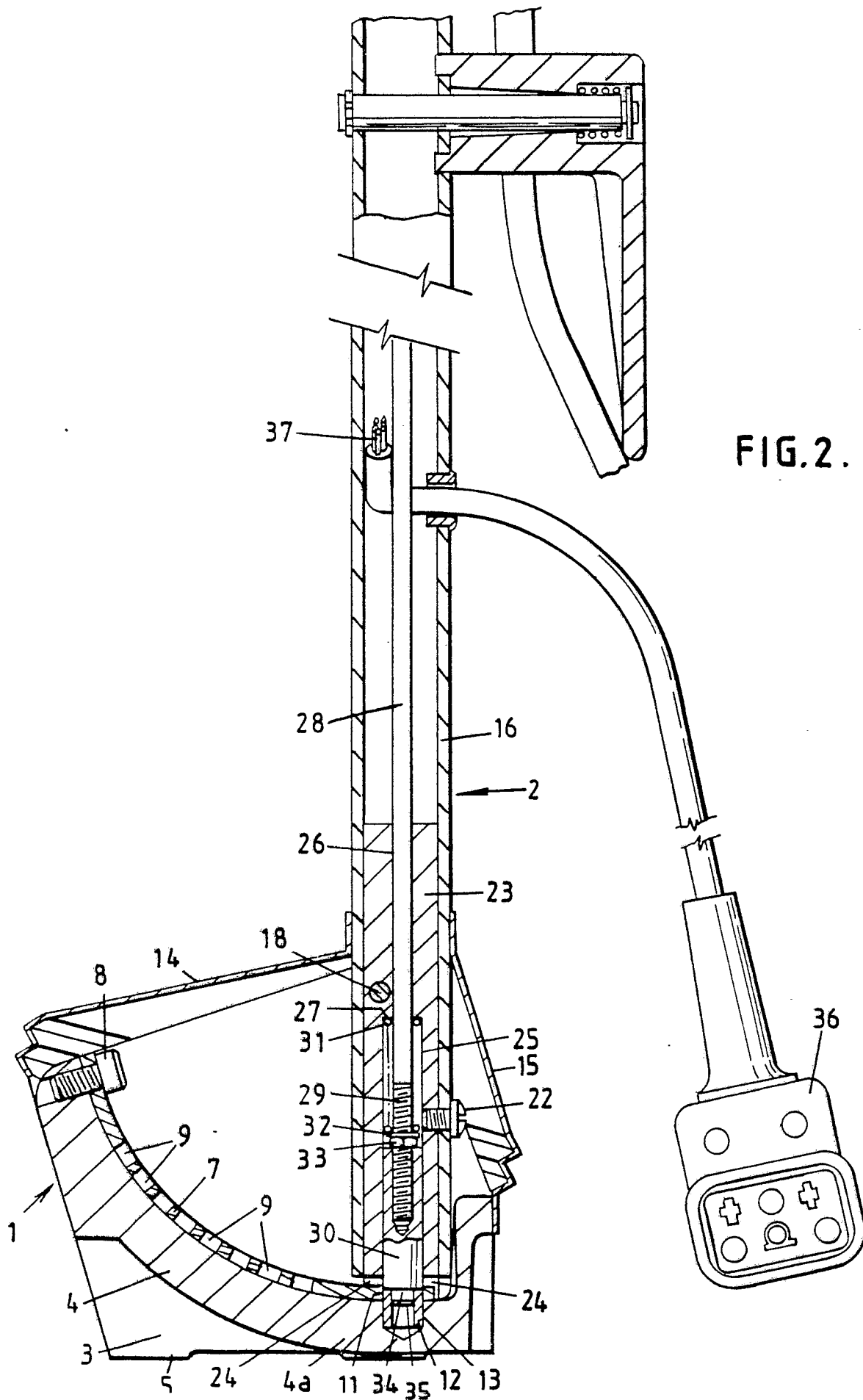
3. Floor cleaning and polishing equipment as claimed in claim 1 or 2 characterised in that the arcuate surface present only two perforations, one of which accommodates the pin when the handle is vertical and the other of which accommodates the pin when the handle is at a predetermined angle for use.

4. Floor cleaning and polishing equipment as claimed in claim 1 or 2 characterised in that the arcuate member presents three or more perforations, to give more than one immobilised angle of use for the handle.

5. Floor cleaning and polishing equipment as claimed in any of claims 3 or 4 wherein the arcuate surface is embodied as a perforate and arcuate metal strip supported between opposed parallel walls extending upwardly from the base, between which walls the lower end of the shaft may be pivoted for movement of the retracted pin over the surface.

6. Floor cleaning and polishing equipment as claimed in any of claims 3 or 4 wherein the shaft is pivoted between opposed walls of an opening in the base of the equipment and the arcuate surface is a metal strip fixed to the base, beneath the said opening.





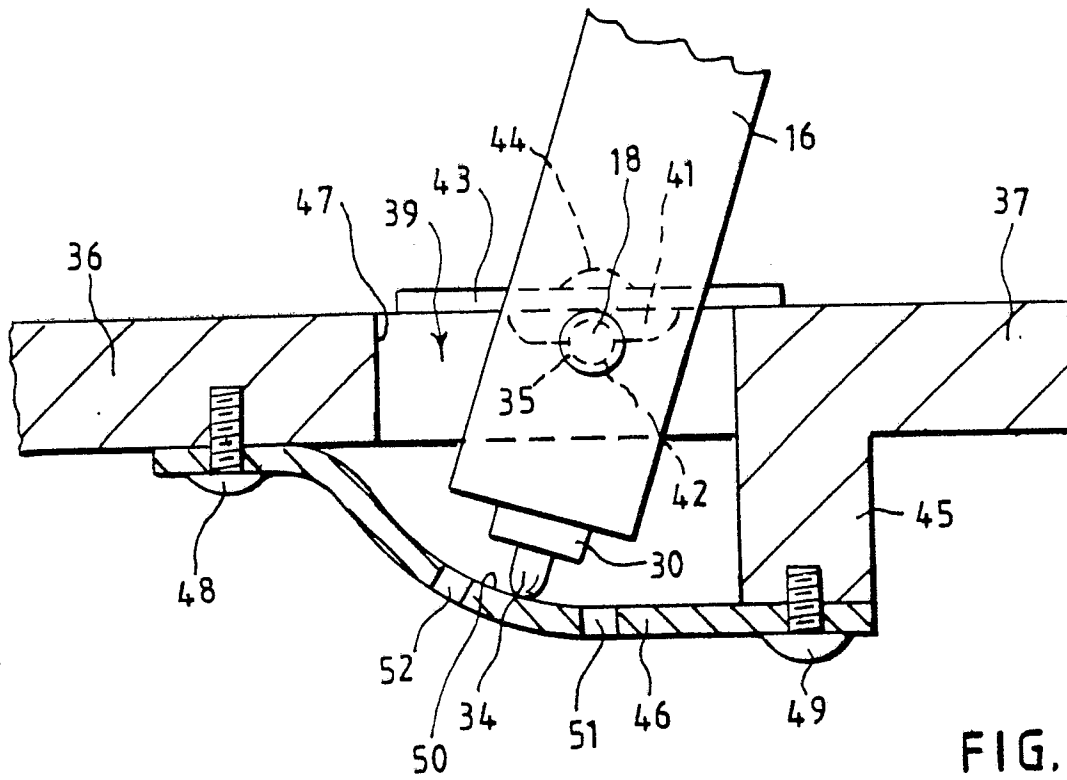


FIG.3.

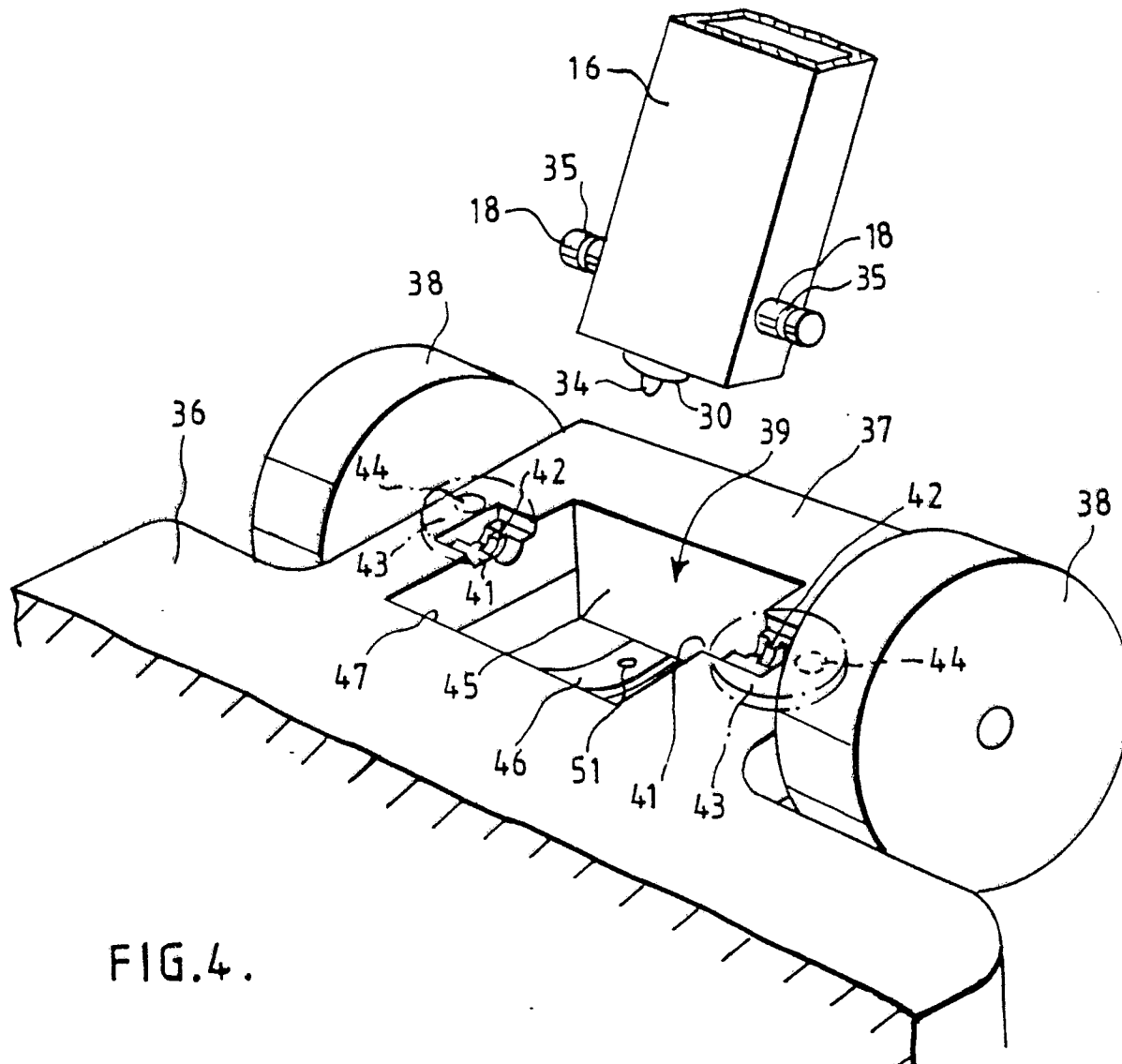


FIG.4.