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H. J. LOVENSTON

2,256,120

ELECTRIC INDICATOR FOR GRINDING MACHINES

Filed May 20, 1940.

2 Sheets-Sheet 1

FIG. 1.

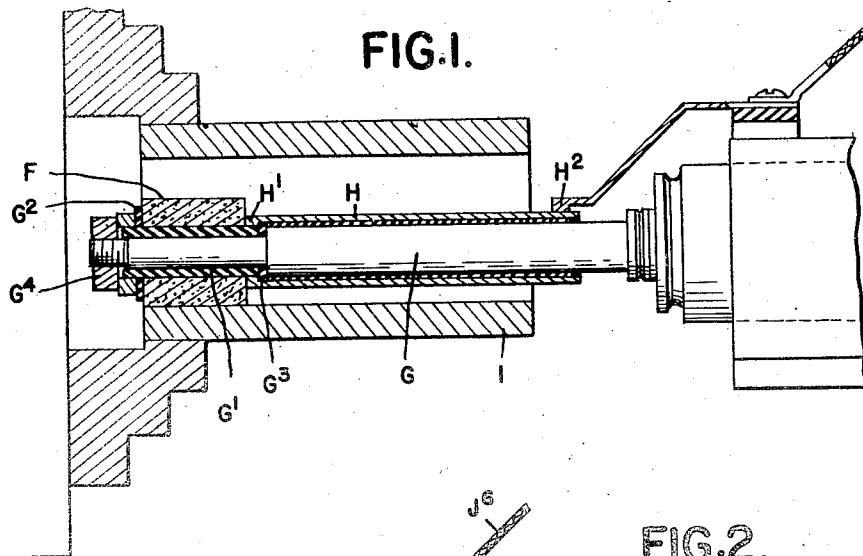


FIG. 2.

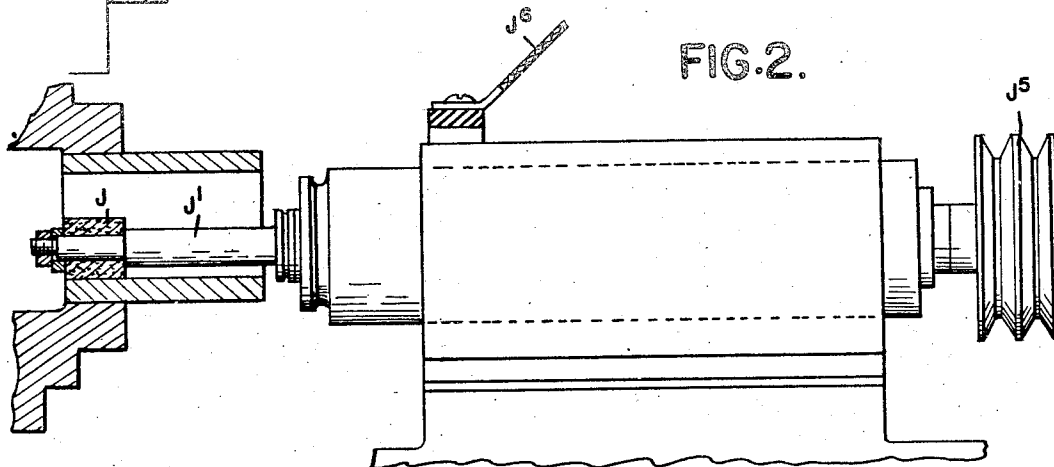
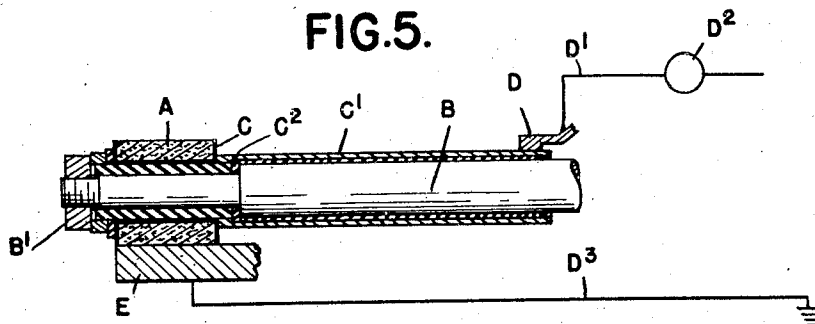


FIG. 5.



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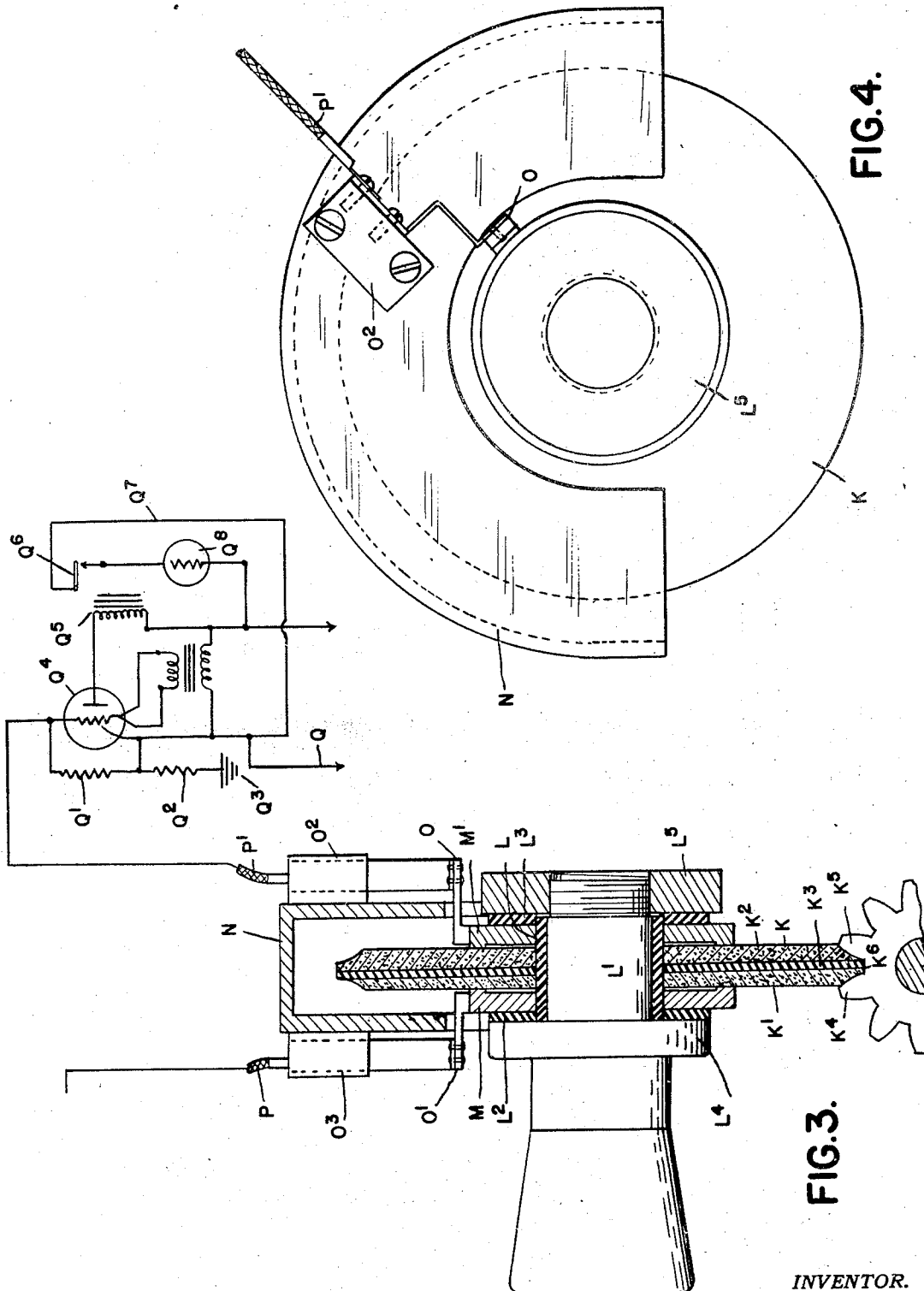


FIG. 3.

FIG. 4.

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UNITED STATES PATENT OFFICE

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ELECTRIC INDICATOR FOR GRINDING MACHINES

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Mich., a corporation of Michigan

Application May 20, 1940, Serial No. 336,315

4 Claims. (Cl. 177-311)

It is the object of the invention to obtain indicating means for grinding machines which will enable the operator to determine whether the grinder is in contact with the work, this being particularly useful where such contact is concealed from direct observation. To this end the invention consists: first in an electrical signal circuit operated by contact of a portion of the grinding surface with the work; and second in the peculiar construction of the grinder wheel which adapts it for this purpose.

In the drawings:

Figure 1 is a sectional elevation showing one form of my improved indicating mechanism;

Figure 2 is a similar view illustrating a modified construction;

Figure 3 is a similar view showing another modification;

Figure 4 is a side elevation of Figure 3;

Figure 5 is a diagrammatic view showing another modification.

In the grinding of certain classes of work the grinder wheel may be completely concealed from view, so that the operator cannot know by observation whether or not the grinding surface is in contact with the surface to be ground. With other grinding operations, such for instance as in the form grinding of gear teeth the opposite sides of the grinding wheel fashion adjacent teeth, and it may be difficult for the operator to determine which side is in contact or whether both are simultaneously in contact. I have, therefore, devised a construction of signal mechanism in which an electrical circuit is closed by contact of the grinding surface or a portion thereof with the surface to be ground so as to operate a visual or audible signal. There is, however, one difficulty in the way of accomplishing this purpose due to the fact that many grinder wheels are formed of abrasive material of a dielectrical character. Where such wheels are used for grinding metal or other electrically conductive material the portion of the surface in contact with the work may become loaded with the grindings so as to be rendered conductive, but the difficulty remains of completing the electrical connection between this portion of the surface and the external circuit. One method of accomplishing the purpose is to use grinder wheels of a dielectrical character and to provide an electrically conductive surface coating extending from the portion actually in contact with the work to a point radially inward therefrom where it may be connected with an external conductor. Such construction is illustrated in Figure 5. Another

method is to incorporate a certain amount of electrically conductive material with the dielectric abrasive material during the manufacture of the grinder wheel, so that the latter will be rendered sufficiently conductive for the purpose. Still another method is to render the grinder wheel conductive as just described, but to insulate one portion thereof from another portion so that separate signals may be used to indicate which portion is in contact with the work.

More in detail and as shown diagrammatically in Figure 5, A is an ordinary grinder wheel which is formed of dielectrical abrasive material, and B is the arbor on which this wheel is mounted by means of a clamping nut B'. C is a facing of conductive material extending radially on one or both sides of the wheel and contacting with a conductive ring C' mounted on an insulator sleeve C² on the spindle. A brush D bearing against the ring C' will serve to conduct the current to an external circuit D' including a signal light D² and the portion D³ grounded on the frame of the machine. With this construction after the peripheral surface of the grinder wheel becomes loaded with metal a circuit will be formed whenever this surface contacts with the work E and will be broken by separation of the grinder from the work.

With the construction shown in Figure 1 the grinder wheel F is electrically conductive, but is separated from the arbor G by an insulator sleeve or bushing G' and insulator disks G² and G³ at opposite ends thereof. H is an electrically conductive tube having an inwardly extending shoulder H' engaging the disk G², so that when the wheel is clamped by the nut G⁴ it will be thoroughly insulated from the arbor by an electrical connection with the sleeve H. A brush H² contacting with this sleeve will carry the current to the external circuit (not shown). Such construction permits of grinding inside of a tubular member, such as indicated at I, and which would conceal the grinder wheel during the performance of its work. The signal will indicate whenever the grinder wheel makes or loses contact with the work.

In the construction shown in Figure 2 the grinder wheel J formed of conductive material is clamped on its arbor J' in the ordinary way and without being insulated therefrom. The arbor is revolved by pulleys J⁵ which may be driven through belts of dielectrical material, so that the whole structure is insulated. The external circuit (not shown) is connected to the grinder wheel through a conductor J⁶, so that a circuit

will be established through the grinder wheel whenever it contacts with the work.

The construction shown in Figure 3 is designed for the form grinding of gear wheel teeth. The grinder wheel K has its peripheral portion fashioned for insertion between adjacent teeth of the gear wheel to grind the faces thereof to correct form. It is essential that both gear teeth should be ground to correctly form the contours thereof, and therefore the operator should be warned if either side of the grinder wheel fails to contact with its respective tooth. To accomplish this result the grinder wheel is formed in two electrically conductive portions K' and K², which are separated from each other by a dielectrical partition K³. This partition is preferably molded into the wheel during the formation thereof, and may be made of suitable dielectrical material, such as melted sulphur, which will have the requisite mechanical strength and will firmly bond to the abrasive material. The formed portions of the wheel K⁴ and K⁵ are trimmed to the exact cross sectional contour desired, but the peripheral portion K⁶ also functions to grind the bottoms of the interdental spaces. Consequently, if the partition K³ were arranged parallel to the plane of rotation there would be a portion of the peripheral surface K⁶ without abrasive material so that it would fail to properly function. This difficulty I have avoided by arranging the peripheral portions of the partition K³, which are on opposite sides of the axis of the wheel, slightly offset from each other so as to obtain a trace of abrasive material throughout the entire width of the peripheral portion K⁶. This is preferably accomplished by placing the partition K³ in a plane slightly inclined to the axis and fashioning the abrasive portions of the wheel which are on opposite sides thereof to compensate for this inclination. The wheel K is mounted on an insulator sleeve L surrounding the arbor L' with conductor disks M and M' contacting the portions K' and K². Insulator disks L² and L³ separate the disks M and M' respectively from the shoulder L⁴ on the arbor and the clamping nut L⁵. A wheel guard N covers the upper portion of the wheel K and brushes O and O' secured on insulator blocks O² and O³ mounted on the guard respectively contact with the peripheries of the disks M and M'. Insulated conductors P and P' lead from the respective brushes to separate external circuits, such for instance as diagrammatically represented at the right, Figure 3, including a service conductor Q, resistors Q' and Q² respectively connecting said service with the conductor P' and a ground Q³. A tube Q⁴ is connected in shunt with the resistance Q' and operates a suitable relay Q⁵ controlling a switch Q⁶ in a circuit Q⁷ including the signal light Q⁸. The arrangement is such that whenever the circuit is closed by contact of the portion K² of the grinder wheel with the work, the signal light Q⁸ will be displaced. A

similar construction is used for the circuit connected to the conductor P.

In the operation of the construction last described, the signal circuits connected respectively to the portions K² and K³ of the grinder wheel are separate and distinct from each other so that if only one of these circuits is energized the operator will at once be made aware of the fact that both of the fashioned sides of the grinder wheel are not in contact with the work, as well as indicating the particular side which is. This insures that before the work is finished proper adjustments will be made to correctly form all of the working surfaces of all of the teeth.

What I claim as my invention is:

1. An electrically conductive grinder wheel having a plurality of portions insulated from each other, an insulator mounting for said wheel on its driving spindle, and a separate external electrical signal circuit connected with each portion of said wheel and including the work to be ground, whereby the contact of the grinding surface of each of said portions with the work will be indicated by its corresponding signal circuit.
2. A disk-shaped grinder wheel having opposite electrically conductive abrasive side portions and an intermediate dielectrical portion, an insulator mounting for said wheel on its driving spindle, and a separate external electrical signal circuit connected with each portion of said wheel and including the work to be ground whereby the contact of the grinding surface of either of said portions will be indicated by its corresponding signal circuit.
3. A disk-shaped grinder wheel having opposite electrically conductive abrasive side portions and an intermediate dielectrical portion, said dielectrical portion extending to the periphery of the disk but being offset in different portions of said periphery to form abrasive grinding portions the full width thereof, an insulator mounting for said wheel, and a separate external signal circuit connected with each portion of said wheel and including the work to be ground whereby the contact of the grinding surface of each of said portions with the work will be indicated by its corresponding signal circuit.
4. A disk-shaped grinder wheel having opposite electrically conductive abrasive side portions and an intermediate dielectrical portion the latter extending to the periphery of the wheel and being arranged in a plane slightly oblique to the plane of rotation of the wheel so as to offset the peripheral portions on diametrically opposite sides thereof, and to form grinding portions the full width of the periphery of said wheel, an insulator mounting for said wheel and a separate external signal circuit connected with each portion of said wheel and including the work to be ground, whereby the contact of the grinding surface of each of said portions with the work will be indicated by its corresponding signal circuit.

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