Sept. 1, 1942. S. G. BRADY 2,294,733

GRINDING MACHINE

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FIG.2.

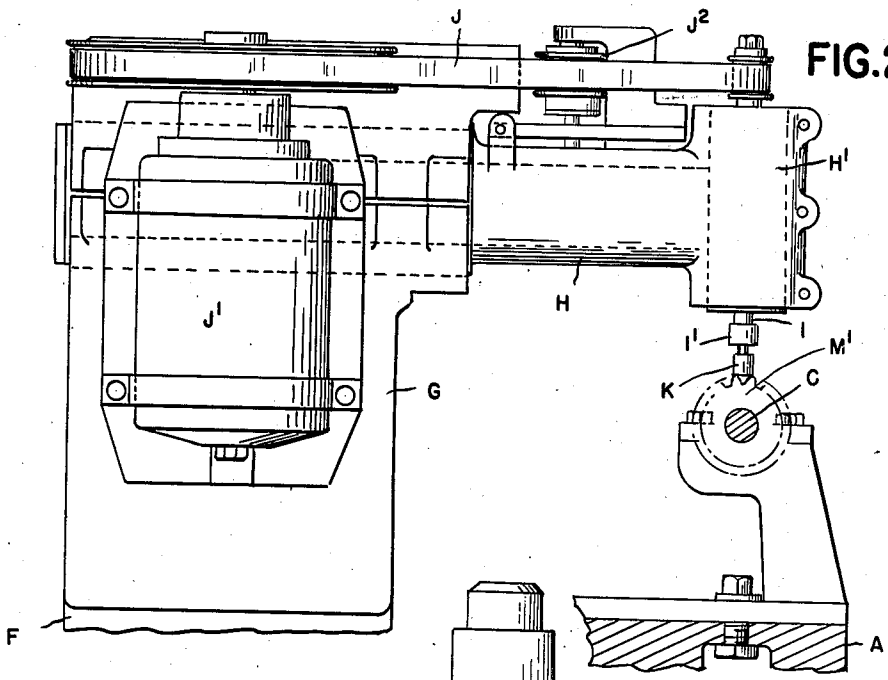
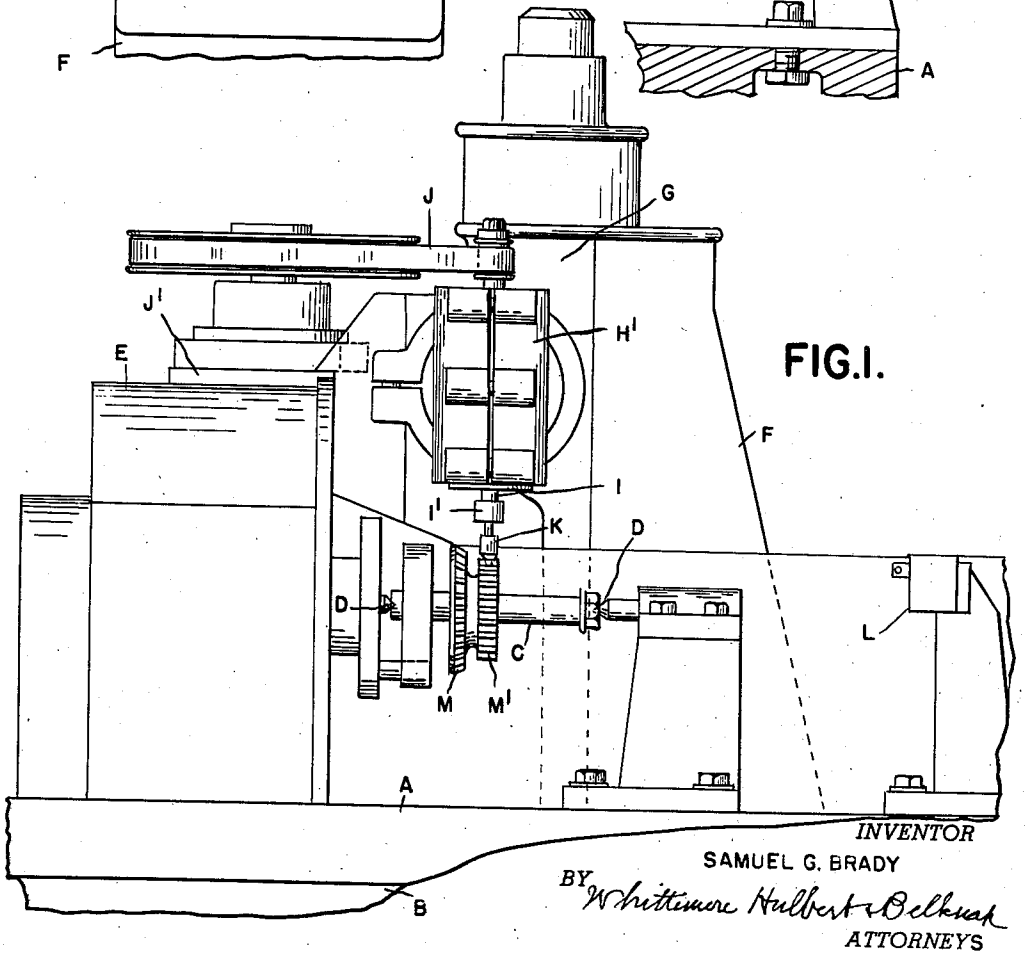


FIG.1.



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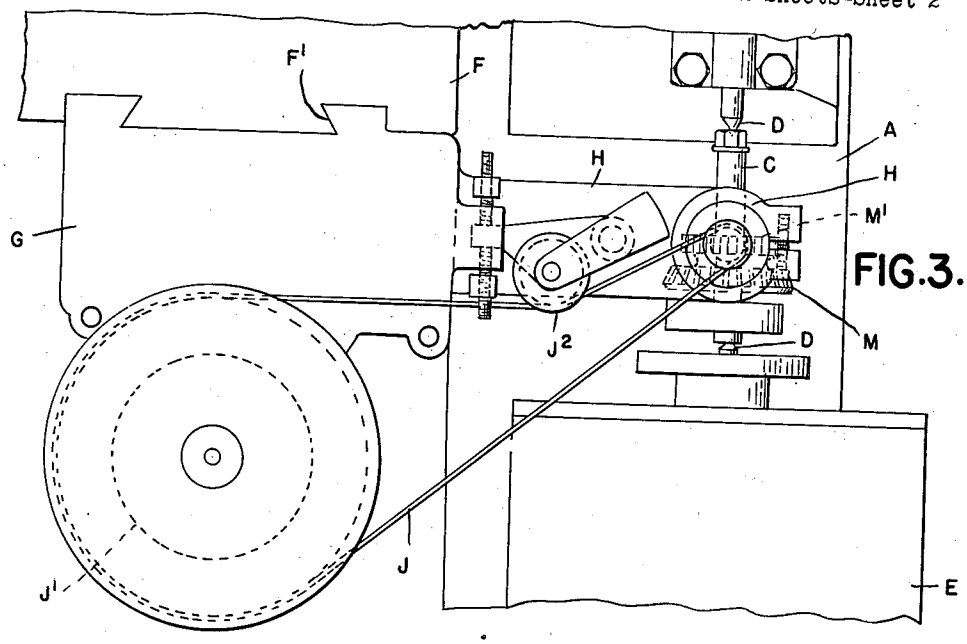


FIG.3.

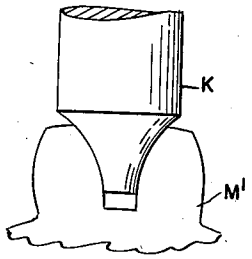


FIG.5.

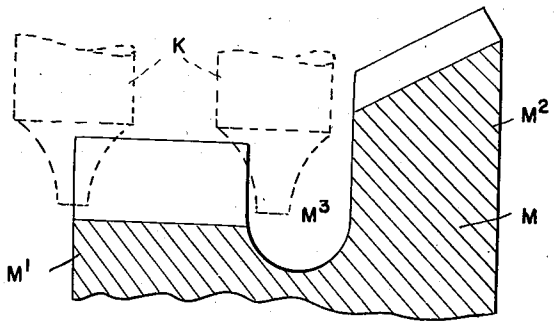


FIG.4.

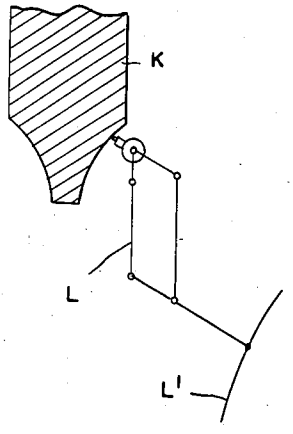


FIG.6.

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Patented Sept. 1, 1942 2,294,733

UNITED STATES PATENT OFFICE

2,294,733

GRINDING MACHINE

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Application March 3, 1941, Serial No. 381,583

3 Claims. (Cl. 51—92)

The invention relates to grinding machines and more particularly to that type in which a formed grinder wheel is used for imparting a similar cross sectional contour to the work such, for instance, as the teeth of gear wheels.

With such machines it is usual to trim the rotary grinder wheel in a radial plane so as to produce a predetermined cross sectional contour. The work is then ground by a relative reciprocation of the same with respect to the grinder wheel, in the plane of rotation of the latter. However, such a machine is not adapted for the grinding of certain types of work as, for instance, cluster gears, which do not provide the required clearance. This is for the reason that the grinding portion of the grinder wheel is only that which is immediately adjacent an axial plane thereof, while on account of its radial dimension, the wheel will project a considerable distance in advance of this grinding portion. Thus, in a cluster gear where one of the gear portions is of greater diameter than another portion and in fairly close proximity thereto, there will not be clearance for the grinding of the teeth of the latter.

It is the primary object of the invention to obtain a construction of formed grinder wheel which requires relatively small clearance and which thus would be adapted for the grinding of cluster gears and similar work. To this end, the invention consists, first, in the employment in a grinding machine of a grinder wheel having the desired grinding contour in an axial plane thereof. The invention further consists in various features of construction as hereinafter set forth.

In the drawings:

Fig. 1 is a side elevation of a grinding machine of my improved construction;

Fig. 2 is an end elevation thereof;

Fig. 3 is a plan view;

Fig. 4 is an enlarged view similar to Fig. 1 and partly in section, showing the grinder wheel in operative relation to the teeth of a smaller member of a cluster gear;

Fig. 5 is an elevation at right angles to Fig. 4; and

Fig. 6 is an axial section of the grinder wheel, illustrating diagrammatically the trimming mechanism therefor.

As illustrated, A is the traveling carriage or table of a grinding machine, and B the supporting bed or frame therefor. C is a mandrel on which the work such as a cluster gear is mounted. D are centers for supporting the mandrel, and E is a housing mounted on the table A within which is the indexing mechanism (not shown). Mounted on the bed at one side of the table is a column F provided with a guideway F′ for a vertically adjustable head G. This head supports an arm H which extends laterally above the table and over the work. At the outer end of this arm is a bearing H′ for a vertically extending grinder spindle I. This spindle is driven through the medium of a belt J from a motor J′ mounted on the head G, and a tightener pulley J^2 is arranged to hold this belt taut.

The lower end of the spindle I is provided with a suitable chuck I′ for holding a grinder member K. This is of cylindrical form and of relatively small diameter, being only sufficient to provide an axial section corresponding to the interdental space between adjacent gear teeth. The lower portion of this grinder is trimmed to a predetermined contour in an axial plane, by a suitable trimming mechanism diagrammatically represented at L (Fig. 6). The contour imparted to the grinder corresponds to that of a template L′, which is the same on a large scale as the contour of one side of the gear tooth. As the trimming is in an axial plane, it is only necessary to have a single trimmer which will impart the same contour to all sides of the grinder.

As illustrated in Fig. 4, a cluster gear M has a pinion portion M′ which is of smaller diameter than an adjacent gear portion M^2, but with a limited clearance space M^3 therebetween. The width of this space is slightly greater than the radius of the grinder K, and consequently the trimmed axial contour of the grinder can pass completely through the teeth of the pinion M′ without interference with the portion M^2. This would not be possible by the use of a grinder wheel trimmed in the usual way.

The grinder can be trimmed from time to time to restore its contour, the spindle I being adjusted vertically downward to provide the necessary stock. Also, the length of the cylindrical portion may be sufficient for a relatively long life. To grind the teeth of cluster gears of different diameters, the head G is vertically adjusted upon the column F so as to provide the proper clearance for the gear. The motor J′, the spindle I and the transmission belt J, being all mounted on the head G, will be adjusted with it.

What I claim as my invention is:

1. In a method of grinding a smaller diameter gear of a cluster, the steps of mounting the gears to be ground and a cylindrical grinder therefor with their axes perpendicular to each

other and intersecting, said grinder being of a maximum radius less than the clearance space between adjacent gears of the cluster, trimming the outer end portion of the grinder to a contour in its axial plane corresponding to the interdental contour of the gear to be ground, and relatively moving said grinder and cluster gear to grind the full length of the teeth of the smaller diameter gear without interference from the adjacent larger diameter gear.

2. A machine for grinding cluster gears comprising a bed, a table mounted for reciprocation thereon, a work holder mounted on said table, a column rising from said bed at one side of said table, a head vertically adjustably secured to said column, an arm projecting laterally from said head to extend above said work holder, and a rotary grinder mounted on said arm having its axis perpendicular and intersecting the axis of said work holder, said grinder having a radius less than the clearance space between adjacent gears of the cluster and being trimmed to a contour in its axial plane corresponding to the contour of the interdental space of a smaller diameter gear in said cluster, whereby in the reciprocation of said table said grinder will grind the full length of the teeth in said smaller diameter gear without interference with an adjacent larger diameter gear.

3. A machine for grinding cluster gears comprising a bed, a table mounted for reciprocation on said bed, a rotary work holder mounted on said table, indexing means controlling the rotative adjustment of said work holder, a column rising from said bed at one side of said table, a head vertically adjustably secured to said column, an arm projecting laterally from said head to extend over said work holder, a motor mounted on said head, a vertically extending rotary spindle mounted on the outer end of said arm and having its axis perpendicular to and intersecting the axis of said work holder, transmission means between said motor and spindle, a cylindrical grinder mounted at the lower end of and coaxial with said spindle being of a radius less than the clearance space between adjacent gears of the cluster, the free end of said grinder being trimmed to a contour in an axial plane thereof corresponding to the contour of the interdental space of a smaller diameter gear in said cluster, whereby in the reciprocation of said table said grinder will grind the full length of teeth in said smaller diameter gear without interference with an adjacent larger diameter gear.

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