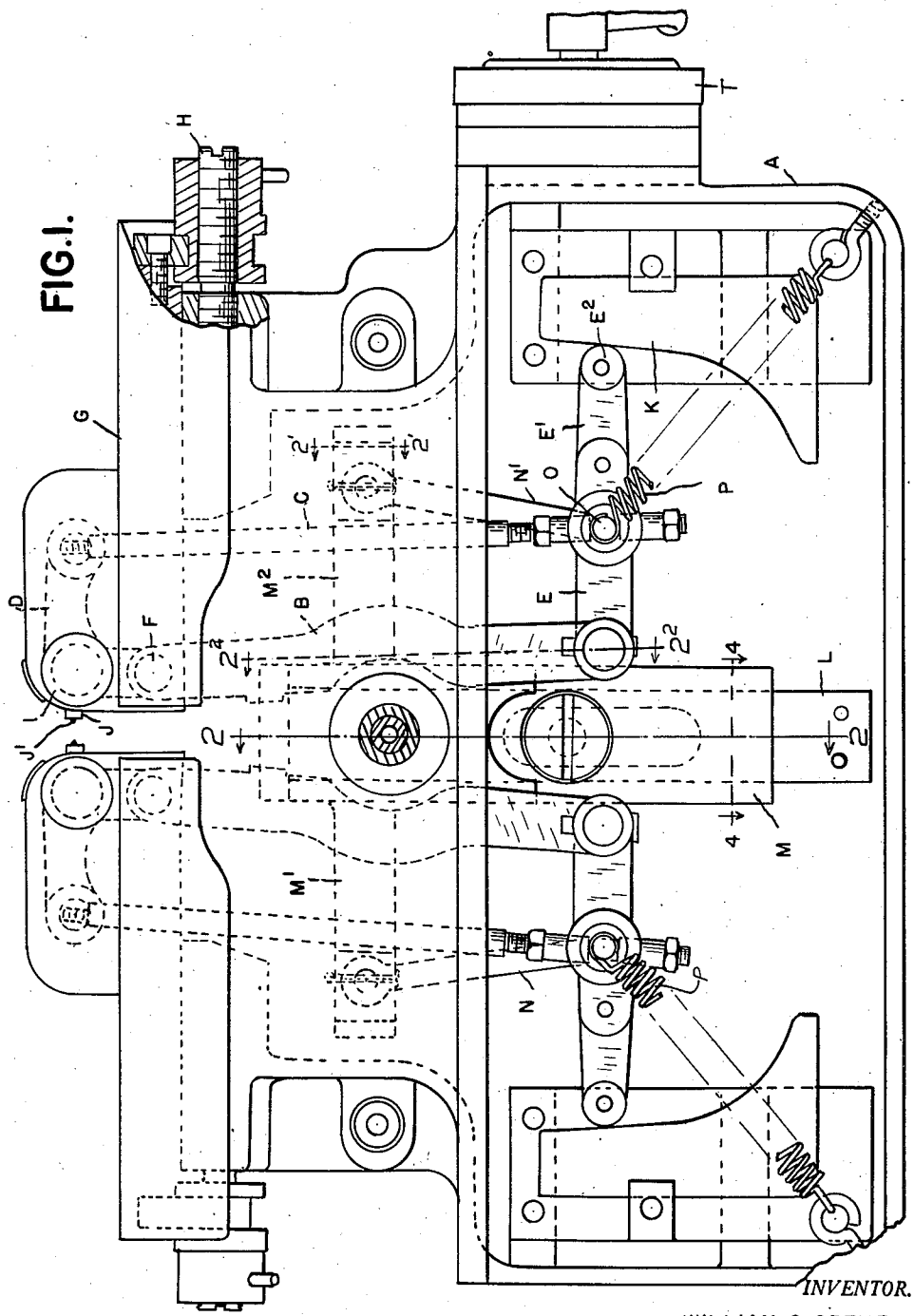
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METHOD AND APPARATUS FOR TRIMMING FORM GRINDER WHEELS

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FIG. 1.



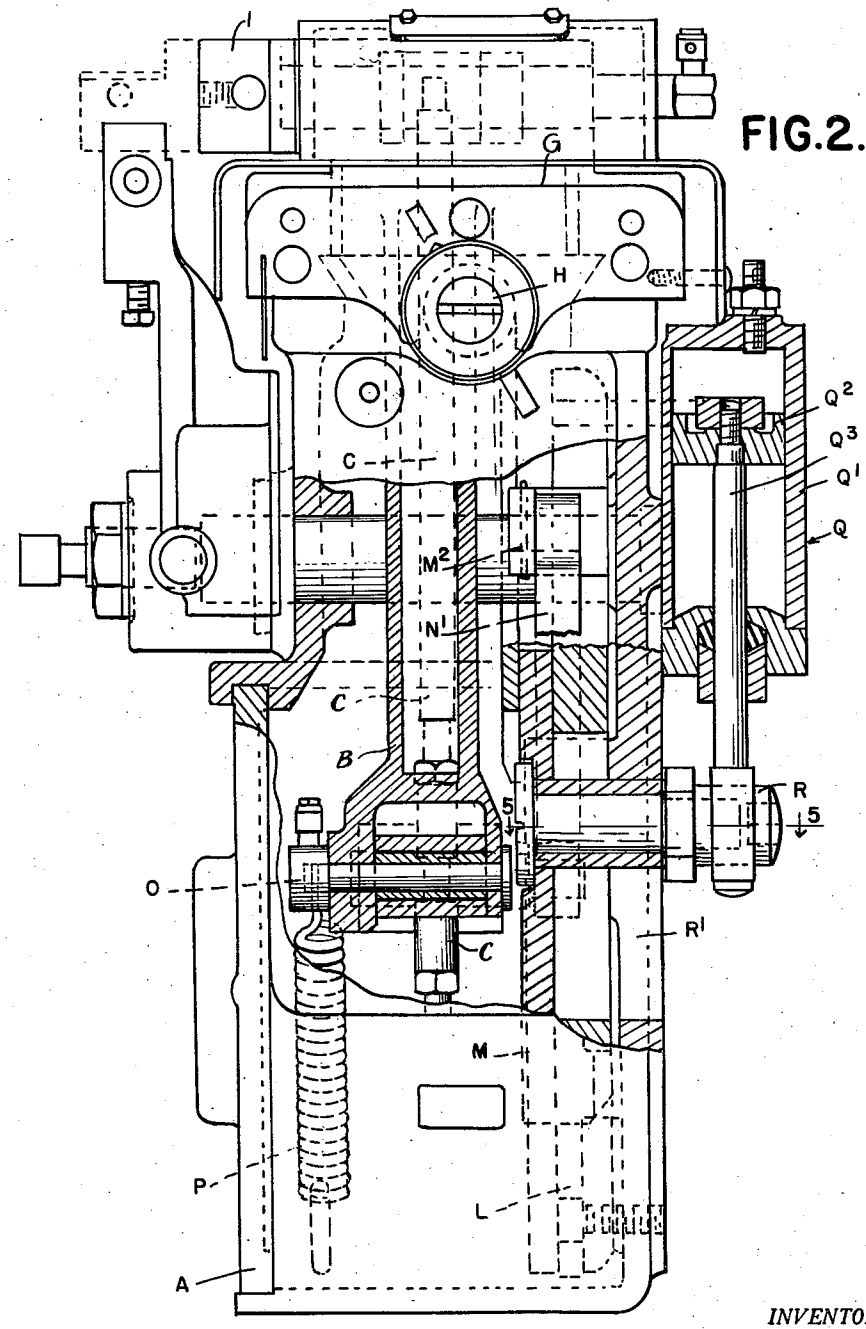
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FIG.2.



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FIG.4.

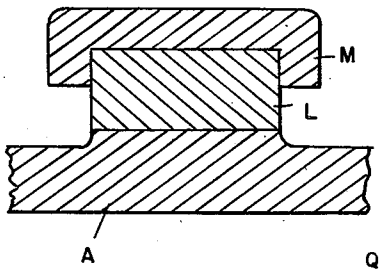


FIG.3.

FIG.5.

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METHOD AND APPARATUS FOR TRIMMING FORM GRINDER WHEELS

William G. Greve, Detroit, Mich., assignor to The Gear Grinding Machine Company, Hamtramck, Mich., a corporation of Michigan

Application June 29, 1942, Serial No. 448,978

1 Claim. (Cl. 125—11)

The invention relates to the art of form grinding and has for its object an improvement in the method of trimming the grinding surface so as to avoid certain defects therein.

In the present state of the art it is usual to provide grinding machines with trimming mechanisms which impart to the grinder wheel the desired surface contour and which restore this contour as frequently as necessary. The trimming mechanisms consist essentially of a trimming point such as a diamond and means for moving this point through an exactly predetermined path. In case the contour is an involute or other non-arcuate curve, the direction of movement of the diamond is controlled by a templet and suitable intermediate mechanism, such as a pantograph. It is, however, usual to actuate the trimmer manually so that the velocity of advancement of the trimming point corresponds to the movement of the hand of the operator. While such operation will trim the grinder to the desired contour, it has been found that the grinding surface is not always of a uniform character and this results in a corresponding lack of uniformity in the ground surface of the work. Thus there may be microscopic lines or scratches in portions of the ground surface which are objectionable.

It is the object of the invention to avoid such defect, and to this end the invention consists, first, in an improved method of controlling the advancement of the trimming point along its path of movement. Second, in the mechanism employed for this purpose and, further, in certain features of construction as hereinafter set forth.

While my invention is applicable to various types of trimming mechanisms, I have illustrated in the accompanying drawings its application to a templet controlled pantograph mechanism.

In the drawings:

Fig. 1 is a front elevation of a pantograph trimming mechanism;

Fig. 2 is a sectional elevation illustrating the actuating means for advancing the trimming point and controlling the velocity of movement thereof, the section being partly on line 2—2, partly on line 2'—2' and partly on line 2^2—2^2, Fig. 1.

Fig. 3 is an elevation viewed at right angles to Fig. 1;

Fig. 4 is a horizontal section on line 4—4, Fig. 1; and

Fig. 5 is a horizontal section on line 5—5, Fig. 2.

The pantograph mechanism is not a part of the instant invention and therefore a description of the general features thereof will be sufficient. As illustrated, A is a suitable housing or standard on which is mounted a pair of similar templet controlled pantograph mechanisms for trimming the opposite sides of a grinder wheel. Each of these mechanisms comprises a pivotally connected parallelogram frame including a main bar B, a parallel bar C, and connecting cross bars D and E. The frame is anchored on a pivot F engaging a bearing in the bar B which is mounted upon a carriage G horizontally adjustable on the frame A. Such adjustment may be effected by a screw H, or other suitable means. The bars B, C, D and E are pivotally connected to each other, and the pivotal connection between the bars B and D includes a head I having a diamond carrier J radially adjustably secured thereto. The bar E has an extension arm E' carrying at its outer end a roller E^2 which is adapted to engage a templet K mounted on the frame. The arrangement is such that the path of movement of the roller E on the templet K will be reproduced on a smaller scale by the path of movement of the diamond point J' on the carrier J.

The pantograph trimming mechanism just described has been heretofore used but has been manually actuated with the resulting defects in the work as above referred to. To avoid such defects I have provided an operating mechanism of the following construction: L is a vertically extending guideway mounted on the rear of the frame A and M is a carriage engaging said guideway to travel along the same. The carriage near its upper end is provided with laterally extending cross arms M' and M^2 which are connected by pivotal link bars N and N' to the parallelogram frames of the two pantograph mechanisms. The lower end of the link bar N' preferably pivotally engages the pivot O which connects the bars C and E, and this pivot is also connected to a spring P having its opposite end anchored to the frame and adapted to hold the roller E^2 in contact with the templet K. Thus a vertical movement of the carriage M on the guideway L will simultaneously impart similar movements to the two panotgraph mechanisms causing the rollers E^2 thereof to travel along the templet K. For actuating the carriage M and controlling the velocity of movement thereof, I preferably employ a hydraulic motor Q mounted

on the rear wall of the housing A and including the cylinder Q' and piston Q^2. The piston rod Q^3 after passing through a packing gland in the lower head of the cylinder is pivotally engaged with a pin R extending rearwardly from the carriage M through a vertical slot R' in the rear wall of the housing A. Movement of the piston in the cylinder Q' is effected by hydraulic fluid alternatively admitted to opposite ends of the cylinder. As shown, a conduit S furnishes the hydraulic fluid under pressure from any suitable source and a conduit S' returns the fluid to its source.

T is a valve manually operable by the handle T' and adapted in one position to connect the pressure fluid to a conduit U leading to the lower end of the cylinder Q'. In the same position this valve connects the conduit U' leading from the upper end of the cylinder Q' to the conduit S' for return of fluid. In another position on the valve the ports are reversed so that the pressure fluid is admitted to the conduit U' and the conduit U connected with the exhaust conduit S'. At some point in this hydraulic system and as shown located in the conduit U', is a means for restricting the rate of flow, such for instance as a needle valve V. This may be adjusted to accurately control the velocity of movement imparted to the piston Q^2 and through the latter, and the rod Q^3, transmitted to the carriage M.

With the construction as described, it will be understood that the velocity of movement of the diamond trimming points is very accurately controlled. During the trimming operation the controlling handle T' of the valve T is first moved from one of its two extreme positions to the other, which causes the travel of the piston and the simultaneous movements of the diamond points along the cross sectional contour of the grinding wheel. The velocity of advancement of the diamond points may be varied by adjustment of the valve V, but after such adjustment will remain uniform throughout its entire movement. This precludes the leaving of any ridges or high points in the trimmed wheel, such as frequently happens when the trimming mechanism is manually actuated. As a result, the ground surface of the work is of a uniform character in all portions thereof.

What I claim as my invention is:

A trimming mechanism for fashioning the contour of a grinder wheel comprising a pair of similar pantograph mechanisms arranged in parallel planes and upon opposite sides of the grinder wheel to be trimmed, each pantograph mechanism including an actuated arm carrying the trimming point, an actuating arm carrying the tracing point, a templet and resilient means for holding said tracing point in contact with said templet; a casing enclosing said pantograph mechanisms, a hydraulic cylinder motor mounted on the rear of said casing in a transverse plane intermediate said pantograph mechanisms and having a vertically movable downwardly extending piston rod, a vertical guideway within said casing, a slide engaging said guideway, a pin connected to said slide and passing outward through a slot in said casing and being connected at its outer end with said piston rod, a cross head mounted on said slide, links pivotally connected to said slide and respectively to said actuating arms, and adjustable means for controlling the flow of fluid to said motor to determine the velocity of movement thereof and to maintain a constant velocity of movement of said cross head and pantograph mechanisms operated thereby.

WILLIAM G. GREVE.