

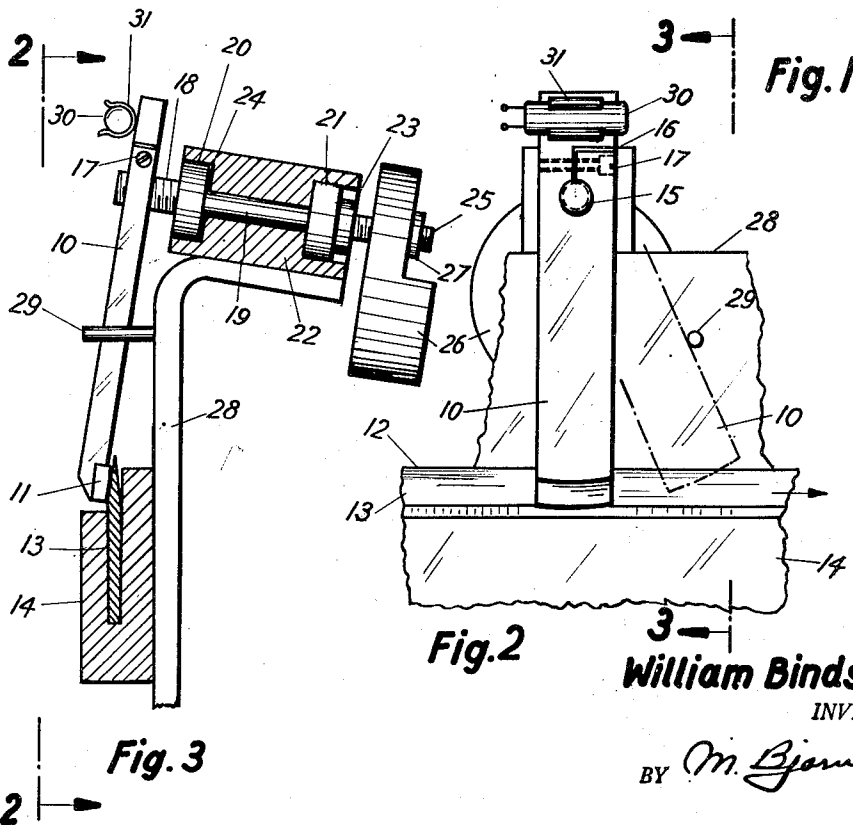
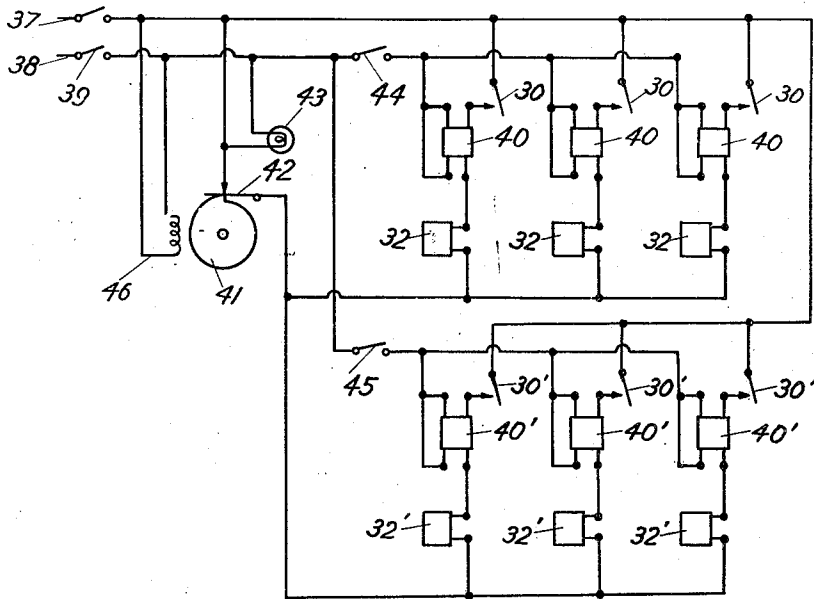
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AUTOMATIC GRINDING SYSTEM

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AUTOMATIC GRINDING SYSTEM

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This invention relates to improvements in means for automatic control of the grinding of fine cutting edges and specifically it refers to an automatic grinding system for cutting edges on razor blades such as described in my Patent No. 2,692,457, dated October 26, 1954.

The present invention represents an improvement over the automatic control device illustrated in Figures 5 and 11 in the above patent, as will be here-in-after explained. It was found after the first machine was built that the original design was giving difficulties in operation due to the fact that little particles of dust or dirt would throw the setting off and would cause damage. In the present improvement these difficulties have been eliminated as here-in-after described.

The main object of my invention is to provide an automatic grinding system which will automatically adjust the grinding wheels, in the production of a fine cutting edge on a strip of steel.

Another object of my invention is to provide an automatic grinding system which has a time delay whereby any temporary change such as due to impurities or fine metal particles will not be adjusted for, thereby preventing the jamming of the machine.

Still another object of my invention is to provide a simple and reliable automatic grinding control system which may be manufactured and maintained at low cost.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the accompanying drawing forming a part of the specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 represents a schematic wiring diagram of an automatic grinding control system embodying my invention,

Figure 2 represents a front elevation of the control lever taken along line 2-2 in Figure 3, and

Figure 3 represents a side elevation of the control lever taken along line 3-3 in Figure 2.

In the drawings wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 10 designates the control lever, the end 11 of which rests upon the one face of the edge 12 of the steel strip 13 which is being moved through the support and holding member 14. The control lever 10, commonly called a feeler gage, is supplied with a tungsten-carbide, insert 11. The insert 11 is ground accurately to be in intimate touch with the face of the edge to be ground. The edge of the piece 11 which is nearest to the sharp point of the cutting edge is ground off slightly to avoid damaging the cutting edge. The feeler gage 10 has a threaded hole 15, see Figure 2, a slot 16 and a screw, 17. The feeler gage 10 is mounted on a finely threaded portion 18 of the shaft 19, which is journaled in the ball bearings 20 and 21, see Figure 3. The bearing 21 is placed tightly against the block 22 on one side and a collar 23 is fastened on the shaft 19 tightly against said bearing 21. The bearing 20 rests against a spring washer 24 on one side, and the larger diameter of the portion 18 of the shaft 19 holds the bearing 20 against said spring

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24. The spring 24 acting through the shaft 19 holds the collar 23 tightly against bearing 21 whereby the feeler gage 10 is held in a fixed angular relation to the mounting bracket 28 and the work strip 13.

5 On the rear end 25 of shaft 19 is mounted counterweight 26 by means of nut 27. The weight 26 is in the form of a cylindrical body mounted eccentrically, thus acting as a counterweight to the feeler gage 10.

10 The bearing block 22 is mounted upon a bracket 28 which is fastened to the guide block 14. The feeler gage 10 is rotatable with shaft 19 in bearings 20 and 21 through a small angle as indicated in Figure 2. A stop pin 29, fastened in bracket 28 limits the extent of the travel of the feeler gage 10.

15 A mercury switch 30 is mounted in a clip 31 on the upper end of the feeler gage 10 at a slight angle. The switch 30 is connected into a circuit as illustrated in Figure 1 which will be here-in-after described. In further reference to my patent mentioned supra, it is pointed out that one of these feeler gages as here described, is mounted following each grinding wheel. In the case where a single edge strip is being ground, there may be 2 or 3 grinding heads as desired, but where a double edge is being ground at one time, there may be 4 or 6 grinding heads.

25 In Figure 1 is illustrated the circuit showing the connections between the mercury switches 30 and the other elements required. As shown in my patent mentioned supra, a solenoid is utilized for the adjustment of the grinding wheels. This is the solenoid designated with the numeral 32 in Figure 1. It has been found, however, that with my present arrangement, it is not necessary to have a two-way solenoid as illustrated in Figure 5 of my patent mentioned supra. The one solenoid 33, 36 is now eliminated and there only remains the solenoid 34, 35 which operates in one direction. The incoming leads 37 and 38, lead to a switch 39 which is the on-off switch for the entire system. The mercury switches 30 are connected to one of the leads coming from switch 39. The circuit shown in Figure 1 covers both single edge and double edge grinding. Therefore, three mercury switches 30 in a group control the grinding wheels for the upper edge, and three mercury switches 30' in another group control the grinding wheels for the lower edge. Following the mercury switches 30 and 30', there are connected time delay relays 40 and 40', one for each mercury switch. The output of the time delay relays 40 is connected to the solenoids 32 for the upper group, and the output of the time delay relays 40' is connected to the solenoids 32' for the lower group. The other leads of the solenoids 32 and 32' are connected to a lead going to the motor driven interrupter 41 with a switch 42 which is connected across the line and which runs with a constant speed preferably about 24 R. P. M. A pilot lamp 43 indicates when the circuit is on. A switch 44 provides connection to one side of the time delay relays 40 in the upper group while a switch 45 similarly connects to the time delay relays 40' in the lower group. The switches 44 and 45 are used for double strip, single edge grinding only.

The operation of my device is as follows:

30 The feeler gage 10 is adjusted by turning the shaft 19 with the fine thread 18 in hole 15 until the tungsten-carbide tip 11 touches the ground face of the cutting edge. The screw 17 is then tightened up thereby clamping the feeler gage 10 securely to the threaded portion 18 of the shaft 19. When the steel strip 13, which is to be ground, starts moving, any change in the face of the cutting edge will be detected by the tip 11 of the feeler gage 10. When the machine is started up, the grinding wheels are at first adjusted by hand to a position where automatic operation can start. When any one wheel does not remove a sufficient amount of material, the excess material will cause a pressure against the tip 11 of

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the feeler gage 10 which will cause an increased friction between the strip 13 moving in the direction shown by arrow in Figure 2 and the feeler gage 10. This friction will swing the feeler gage 10 to one side as indicated in broken lines in Figure 2. When the feeler gage 10 is moved to one side by friction between the point 11 of the feeler gage 10 and the ground edge of the single edge strip 13 shown in Figure 3, the mercury switch 30 which is normally almost horizontal, will be tilted to one side and will make contact between its two poles. When thus the strip 13 comes through with an edge which is not sufficiently ground down the increased thickness of material on the edge will increase the friction between same and the point 11 of the feeler gage 10, the increased friction will then move the feeler gage along with the motion of the strip as indicated in dotted lines in Figure 2. This will energize the relays which will change the setting of the grinding as described in my patent mentioned supra and more material will be ground off the edge of the strip 13. This again will result in less friction between the point 11 and the moving strip 13. After this has been reduced to a certain point, gravity will return feeler gage 10 to its original perpendicular position as indicated in Figure 2, at the same time opening the switch 30. The switch 30, therefore, becomes gravity operated or gravity sensitive. As indicated in the circuit diagram in Figure 1, the mercury switches 30 will energize the time delay relays 40. In normal operation these time delay relays 40 are set to give a delay of 4 seconds. If, therefore, a speck of dust or other impurity should get onto the cutting edge and should move the feeler gage 10 over temporarily, the 4 seconds' delay will give it a chance to fall back in its normal position thereby opening the switch 30 and nothing will happen. If, however, the change detected by the feeler gage is of a duration of more than 4 seconds, the time delay relays 40 will give an impulse which will energize the solenoids 32. As shown in my patent mentioned above, the solenoids 32 will advance the grinding wheel one notch which may be less than .0001 inch, all according to how the mechanism is arranged. If the deflection of the feeler gage 10 continues, then after another 4 seconds the solenoids 32 would get a second impulse from the time delay relays 40. However, the solenoids had not been reset and would not be operable at this time. I have, therefore, arranged a motor-driven switch 41, 42 which has a speed of 24 R. P. M. and which thus resets the solenoids every 2½ seconds by furnishing an operating impulse for each revolution. When, therefore, the second impulse comes from the time delay relays 40, the solenoid will move the grinding wheels forward another notch. This operation will continue until sufficient metal has been removed by the grinding wheels so that the feeler gage 10 will return to its original position and will thus open switch 30. It is obvious that any one of the switches 30 with its connected time delay relay 40 is operating individually and is adjusting the grinding wheel which is preceding it.

If a double edge strip is ground such as used for ordinary safety razors of the "Gillette" type, then the same operation will occur on the lower edge where the three grinding wheels will be adjusted automatically by means of three mercury switches 30' and the connecting time delay relays 40' working into the solenoids 32'. In this manner it is possible to set up a machine for grinding both single and double edge blades just by changing the guide blocks 14.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted

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to, without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention I claim:

1. An automatic control system of the character described comprising a feeler gage mounted adjacent to a moving strip to be ground, said feeler gage having a free swinging lever, one face of the end of said lever swinging parallel to and in sliding contact with the surface being ground, the other end of said lever being mounted upon a shaft journaled in bearings upon a fixed support; a gravity sensitive switch mounted upon the journaled end of said lever; electrical control means operable by said switch, and an electrical delay circuit interposed between said switch and said electrical control means.

2. An automatic control system of the character described comprising a feeler gage adapted to gaging a moving strip, said feeler gage having a lever mounted in parallel and right angle relation to said strip, said lever being mounted upon a rotatable shaft near one end and having its other end in frictional contact with said strip and free to swing along the path of said moving strip; a gravity sensitive switch mounted near the journaled end of said lever; electrical control means operable by said switch, and an electrical delay circuit interposed between said switch and said electrical control means.

3. An automatic control system of the character described comprising a feeler gage adapted to gaging the thickness of a moving strip, said feeler gage having a lever mounted in parallel and right angle relation to the surface to be gaged, said lever being mounted upon a rotatable shaft near one end, said shaft being adjustable axially in anti-friction bearings and having a spring holding said shaft in a fixed axial relation to said bearings, the other end of said lever being in frictional contact with the surface to be gaged and free to swing parallel to and in the same direction as said moving strip; a gravity sensitive switch mounted upon said lever; electrical control means operable by said switch, and an adjustable electrical delay circuit interposed between said switch and said electrical control means whereby the action of said control means may be delayed as desired.

4. An automatic control system of the character described comprising a feeler gage adapted to gaging the changes produced by the grinding of a moving strip; said feeler gage having a lever mounted with one end on a freely rotatable shaft, said shaft being journaled in precision type ball bearings; a ball bearing housing holding said bearings; a spring interposed between one of said ball bearings and said housing; the other end of said lever being in frictional contact with the edge to be ground on said moving strip and being free to swing through an angle along and parallel to said edge; a counterweight balancing said lever; electrical control means operable by the angular displacement of said lever, and an adjustable electrical delay circuit interposed between said switch and said electrical control means whereby the action of said control means may be delayed as desired.

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