AUTOMATIC GAUGE CONTROL AND MEANS THEREFOR


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3 Claims. (Cl. 33—147)

This invention relates to automatic gauges for gauging the diameter of cylindrical work during a reduction in the diameter thereof as by a grinding machine, lathe, or other device for the purpose and so arranged as to constantly indicate the extent of reduction of the diameter and visibly indicating when the work has been reduced to the predetermined diameter.

An object of the invention is to provide a simple, compact, and comparatively inexpensive tool for this purpose counterbalanced in such manner that the tool does not rest with its full weight on the work thus reducing wear on the tool, the arrangement being such that a manual operation is required to position the device in operative relation with the work and by manual movement of the device from engagement with the work the device, upon release is automatically withdrawn from close association with the work permitting ready removal of the finished work or introduction of new work to the machine.

A further feature of the invention is in the provision of means restricting movement of the tool either in placing the same on the work or the automatic withdrawal from any determined point to inoperative position whereby breakage of the tool through carelessness of the operator is avoided in the placing of the tool on the work and further relieving the operator from attention to the tool once it is withdrawn from its operative relation with the work, it being only necessary to release the tool at such time to its automatic control.

The desired feature of the structure is to secure a thinness of parts particularly the portion engaging the work permitting the same to be introduced into a cylindrical groove on the work or where space is limited by work rests or other devices being positioned on or near the part being operated on and at the same time provide contact elements of such design as to prevent the same from engaging the key-ways or slots that may be formed in the surface being reduced in diameter.

A further object is to secure a device of such simplicity of construction and arrangement as to permit the operative parts to be practically wholly enclosed and thus shielded from the grit and waste material produced in the operation of the machine on the work.

A further object is to provide gauging elements one of which is relatively fixed and the other movable and both yieldably held in contact with the surface of the work.

The principal object and feature of the invention is to provide a tool of the character stated in which shoes or work contacting portions are provided one engaging the under side being relatively fixed and the other engaging the diametrically opposite side of the work and yieldably held in contact therewith and in conjunction with such a tool a suspension means tending to hold the relatively fixed shoe in contact with the surface being operated on under pressure sufficient to lift the tool to inoperative position when released from engagement with the work.

These and other objects and various novel features of the invention are hereinafter more fully described and claimed, and the preferred form of construction of a gauge and control element embodying my invention is shown in the accompanying drawings in which—

Fig. 1 is a side elevation of a tool showing the same in relation to a grinding wheel and the work being operated on, the tool being shown in operative position in full lines and in inoperative position in dotted lines.

Fig. 2 is a front elevation of the tool taken from the left side of Fig. 1.

Fig. 3 is a longitudinal section of the tool.

Fig. 4 is a section taken on line 4—4 of Fig. 3.

Fig. 5 is a section on an enlarged scale taken on line 5—5 of Fig. 2.

Fig. 6 is an elevation partly in section showing the mechanism for supporting or suspending the tool.

Fig. 7 is a section taken on line 7—7 of Fig. 6.

Fig. 8 is a detail partly in section showing the mounting of the tool relative to the supporting arm.

The gauging portion of the tool is shown more clearly in Fig. 3. The tool consists of the gauge proper 1 and the supporting element which consists of the oscillatable arm 2 and the automatic control indicated generally at 3 all of which is supported by means of a bracket 4 fixedly secured to a stationary portion of the machine as for instance the guard 5 of the grinding wheel 6 when the device is used in conjunction with a grinding machine.

The tool proper is shown more clearly in Fig. 3 and consists of the hollow body 7 which, as shown in Fig. 2, is comparatively thin for practically half its length and of greater width at the upper end. The body at the lower end is provided with a pair of extending ears 8 and 8' between which is positioned an arm 8 apertured to receive a tubular pin 10 which is slotted longi-
tudinally as indicated and is driven to place in securing the arm 9 to the body and this arm 9 has an extension provided with the contact points 14 and 15 which engage finished surfaces on the tool body and the arm 9 is assembled therewith. Thus, this arm by means of a single pin (which is necessarily contracted by being driven to position) is fixedly held in position. The arm 9 is arcuate in form and very thin to enable the same to pass into narrow cylindrical grooves on the shafts in such like which it may be desired to gauge. The lower end of the arcuate arm 9 is provided with a shoe 13 which engages the under side of the work indicated by dotted lines 14 in Fig. 3 and in full lines in Figs. 1 and 2. This shoe is also narrow in form but in a direction circumferentially of the work is comparatively wide which enables the shoe to ride over slots or keyways oftentimes cut into the surface at the point the work is being ground or finished. The opposite shoe 15, which when the parts are in gauging position is diametrically opposite the shoe 13, is of the same character and the shoe 9 is provided with a projection 16 in the inner side approximately equidistantly between the two shoes and provides a stop limiting the possible movement of the tool onto the work in placing the same thereon.

The shoe 15 is carried by a rod 16 that is reciprocable in the body 7 and is preferably rectangular in form at the lower end as will be understood from Fig. 4, and it is to be noted in conjunction with Fig. 4 that preferably the lower end of the body has an opening through the side wall closed by a strap 17 held in place by rivets 18. The upper end 19 of the rod is hollow and cylindrical in form and is provided with a slot 20 on one side thereof. At the extreme upper end the rod is threaded to receive the adjusting screw 21 which is engaged by the dial actuator 22. This actuator has a projection 23 on one side to engage the end of the pointer actuating pin 24. This dial, indicated at 25, is of the common form used in structures of this character and in this case is mounted on a bracket 26 on the body of the tool and has a stem 27 extending through an aperture in the body of the tool and in which the pointer actuating pin 24 is reciprocable. The head of the pointer actuating pin 24 is beveled as shown and in the under face of the projection 23 of the pin 24 is also beveled at the same angle and engages thereon. The adjusting screw 21 limits the upward movement of the dial actuator 22 and is held in engagement therewith by means of a coined spring 28. This pin 22 is loose in the socket 29 provided therefor in the rod 16 as shown. There is also a coined spring 30 attached to the lower end to the body of the tool and at the upper end engages in a notch 31 shown in Fig. 5, formed in the end of the rod 16. Thus, this spring tends to force the shoe 15 into contact with the upper side of the work and the shoe 13 to contact with the lower side diametrically opposite.

As the work is reduced in diameter the spring 30 draws the shoes at 13 and 15 toward each other and this causes the shoe 15 which is attached to the rod to move toward the shoe 13 downward and thus depress the pointer actuator element 24 to cause an indication. The dial includes the usual pointer 32 shown in Fig. 2 and a calibrated face over which the pointer is movable and when the gauge is placed on the work the pointer will be moved to the left of the position shown in Fig. 2 due to the shoe being moved a distance apart greater than the diameter to which the shaft or other work 14 is to be reduced. Therefore, in operation, as the work is reduced in diameter the spring 30 causes the shoe 15 to approach each other and thus moves the pointer actuating pin 24. This causes the pointer 32 to move toward the right until the needle points to the proper indication at which time the work is finished as to diameter. By 100 adjusting the screw 41 the tool may be set to gauge various diameters within its capacity. Preferably the end of the body is provided with a cap 33 which has a tubular projecting portion 34 into which the screw 21 may move in forcing the shoe 13 and 15 apart in placing the same on unfinished work.

It will be noted in Fig. 5, which is an enlarged section on lines 5, 5 of Fig. 3, that the upper end of the rod 16 is cylindrical in form and the body is formed at that point to provide a guide for the rod in its reciprocation. Also that the body is provided with a slot 30 opening to the inside in which the upper end of the tool is positioned in which slot the end 23 of the pin 22 rides, and that the spring 30 is provided in a recess 30' at one side of the recess for the cylindrical end of the tool thereon.

The gauge proper therefore, as will be understood from the foregoing, is very simple and compact in form and consists of the body with which is associated the arm 9 carrying the shoe 13 and the reciprocable rod 16 carrying the shoe 15 and the indicator and actuating elements at the upper end of the body; and further that all of the control or actuating mechanism is entirely enclosed and shielded from dirt and possible ingress of abrasives from the grinding wheel or particles of the steel removed in the grinding or cutting operation being performed on the work.

It has heretofore been the practice to mount a gauge on the work in such manner that the weight of the gauge is supported by the shoes. This tends to cause an excessive wear of the shoes and to obviate this difficulty I have devised a mechanism suspending the gauge relative to the work so that practically the only pressure of the shoes on the work is the pressure of the spring 30. As hereinafter described the suspension means overbalances the weight of the gauge proper tending to lift the same. The suspension means preferably consists of a shaft 36 rotatably mounted in a tubular member 37 secured in the upper end of the tool body as shown. This shaft 36 is also provided with a groove 38 in the inner end and a screw 39 extends through the tubular member 37 into the groove 38 and thus prevents longitudinal movement on the shaft 36.

To this rod 36 is attached the arm 2 it having a split end 2' by means of which it may be clamped to the rod 36 and is split at the opposite end as indicated at 38' in Fig. 6 to bindingly engage a shaft 39 rotatable in a bracket 40 in the end 40 of the bracket 4 by means of which the tool is suspended relative to the wheel guard 5. The control device indicated generally by the numeral 3 consists of a receptacle 41 for oil and is provided with a removable cap 42. By removal of the cap the receptacle 41 may be supplied with oil or other desired fluid. This receptacle is secured at one side to the end 40 of the bracket and is apertured to permit the shaft 39 to extend therethrough and through a chamber 42.
provided at the bottom of the receptacle casting. A closure 43 is provided for the said chamber and is secured by means of screws shown in Fig. 1, to the receptacle 41. This closure member provides a bearing for the inner end of the shaft 33 and terminates in a chamber 44 provided in an extending portion of the member 43 in which is positioned a torsion spring 45. One end of this torsion spring is secured to a rod end 46 of the shaft 33 and the opposite end is secured to the slotted end of an adjusting screw 47 which extends through an unthreaded aperture in the cap 48 which provides a closure for the end of the chamber 44. The screw is provided with a lock nut 49 and by turning this screw one way or the other upon release of the lock nut the tension of the spring 45 may be increased or decreased and thus actually counterbalance the weight of the tool or overbalance the same and thus automatically lift the tool when freed from the work as may be desired. Upon adjustment to the desired tension, the nut is turned up to bring the shoulder of the part 47 into tight engagement with the cap 48.

The bracket 4 is shown as secured to the wheel guard but it may be positioned on any convenient part of the machine which would permit the positioning of the gauge at the proper place forward of the grinding wheel or cutting instrument used to reduce the diameter of the work. This bracket is supported principally by the stud bolt 50 there being at least three other adjusting screws 51, 52 and 53 permitting the bracket to be adjusted to position the shaft 33 on the horizontal plane to maintain the tool strictly in a vertical plane and thus in proper gauging relation with the work when positioned thereon. There is also a further problem solved by the structure herein shown. This tool is intended to be raised from its operative to inoperative position as shown by full and dotted lines in Fig. 1 so that when the tool is removed from the work it occupies the dotted position and therefore out of the way permitting the removal of the work from the position of the receptacle in the machine. In moving the tool manually from and to the operating position the workman may carelessly injure the tool by too rapid movement and further to move the tool from the work consumes the time of the operator. To avoid these difficulties I have provided the oil receptacle 41 herebefore mentioned and in the chamber 42 and attached to the shaft 33 by means of a pin 54 is a pump element 55 which is simply a cylindrical piece of metal practically fitting the chamber 42 at the bottom of the oil receptacle in which it is positioned.

This element 55 is provided with a cutout portion 56 on the side in which is positioned a stop 57 fastened in the bottom of the chamber 42 by the screw 58. This extends across the element 55 from one end of the chamber 42 to the other and is practically engaged by the shoulder 59 of the pump element when the tool is in gauging position on the work and by the shoulder 60 when the tool is in this operative position.

As will be seen in Fig. 7 the lower end of the receptacle 41 is semi-circular in cross section and practically of the same radius as the element 55 rotate therein and this pump element 55 extends upwardly into the receptacle to such extent that when the tool is in its operative position on the work the recess formed by the cutaway portion 56 is open at the point 61 to the receptacle 41 and thus fills with the oil.

Bearing in mind that there is a tendency of the tool to move upward to inoperative position by reason of the torsion of the spring 45, which is not only of sufficient tension to balance the weight of the tool but to actually lift the same, it will be seen that, by withdrawing the tool manually by movement to the left from the position shown in full lines in Fig. 1 and releasing the tool, the spring will move the tool upward to the d 73 owd inoperative position but that this movement will be accomplished slowly and without jar because the oil in the pocket formed in the cutout portion 56 in the pump element 55 and wall of the chamber 42 will be pocketed therein and cannot escape except by reason of the intentional looseness of the parts which permits a comparatively slow leakage and thus permits a comparatively slow movement of the tool.

When the tool has reached the inoperative position the shoulder 59 comes to the same relation with the oil of the receptacle as is described relative to the shoulder 60 on the opposite side of the oil receptacle. Thus, when the operator is ready to move the tool to gauging position he is restrained from jamming the tool on the work because he cannot bring the tool to operative position except in the predetermined careful manner by reason of the oil in the cutout portion 56 requiring to be discharged from the pocket between the shoulder 59 and the stop member 57 in the same manner as described relative to the upward movement of the tool.

By this arrangement providing the pocket for oil and the pump element 55 and a restricted discharge of oil from the pocket, the tool at no time can be injured by carelessness of the workman by sudden jamming of the tool onto the work or in disarrangement of the parts by the sudden shock of the tool in its upward movement or inoperative position and the workman is freed from attention to the tool immediately upon its withdrawal from the work for which purpose it is only necessary to grasp the tool adjacent the gauging end and move it slightly to the left of the full line position shown in Fig. 1.

The tool as has been stated heretofore, has the arm 9 and a lug 16 positioned approximately on a line passing through the center of the work at a right angle to the line passing between the centers of the shoes and limits the extent to which the tool may be positioned on the work 55 but as the shoes are of accurate form practically or closely approaching the arc of the finished work the shoe will stand centrally on the work due not only to tension of the torsion spring 45 but also due to the spring 30 drawing the shoes together to engagement with the work.

Rotation of the work is in the direction of the arrow shown in Fig. 3 and there is therefore no tendency for the tool to move off from the work during the gauging operation but requires the manual act of the operator to release the same and as soon as released from this position the tension of the spring 45 raises the tool to operative position.

The drawings and description refer more particularly to cylindrical work being finished but the invention is not confined to the use of the gauge on cylindrical work as it may be employed for instance in gauging work formed with a taper. Therefore, the claims principally involve...
the use of the tool in the gauging of work being reduced in size as the functions of the device, particularly the automatic control for lifting the gauge from position upon release from the work or in preventing jamming of the tool onto the work by the operator in positioning the same is not affected by the specific character or form of the work being gauged.

From the foregoing description it will be observed that the gauge proper is of very simple and compact construction, is suspended to relieve the shoes of the weight of the tool, and that the tool upon manual withdrawal from the work is automatically moved to inoperative position without attention or act of the operator and the operator is restrained by the control device from jamming the tool in the positioning of the same on the work.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is:

1. In a device for gauging work during its reduction in size, a gauge including work contacting elements engaging opposite sides of the work and including an indicator visibly indicating the extent of reduction in size, a supporting element for the gauge including an arm to which the gauge is pivotally connected, a hydraulic control device including a stationarily supported bracket and a container for fluid, a shaft connected with the arm and rotatably supported in the container, an element secured to the shaft to turn therewith and fitting the lower part of the fluid container, said rotatable element being in the form of a disk having a portion thereof cut from its periphery providing a chamber when mounted in the container, a stop device extending across the bottom of the container in fixed relation therewith and extending into the said chamber providing a means limiting the extent of rotation of the arm in either direction, the bottom of the chamber and the rotatable element being so relatively constructed and arranged that upon the limit of movement thereof in either direction the chamber provided by the cutaway portion of the rotatable element is open to ingress of fluid from the container and upon movement of the element from either limit of movement the fluid is trapped between the said stop and the end of the chamber wall, the parts being arranged to provide for slow leakage of the fluid from the filled chamber thereby restricting rapidity of movement of the rotatable element in either direction.

2. In a device for gauging a piece of work during the finishing operation by a machine, a torsion spring tending to raise the gauge away from the work upon its release therefrom, a shaft rotatable by the spring and to which the gauge is connected, a liquid chamber, a pump element secured to the shaft and positioned in the liquid chamber operable by the said spring upon release of the tool from the work to pass a body of liquid through a restricted opening provided therefor and thereby limit the rapidity of movement of the tool away from the work by the spring.

3. In a device for gauging a piece of work during the finishing operation by a machine, a bracket fixed to the machine, a shaft having one end thereof pivotally mounted in the bracket, a liquid receptacle secured to the bracket, the shaft extending into the receptacle, an arm having one end thereof secured to the shaft externally of the receptacle, a pump element in the receptacle attached to the shaft and by rotation tending to pass fluid through a restricted opening to thereby retard the speed of rotation thereof, an adjustable spring means tending to turn the shaft in one direction to raise the arm, a gauge element pivotally supported at the opposite end of the arm, said element including an upper and a lower shoe for engaging opposite sides of the work piece being finished, the parts being so positioned that the lower shoe is held in contact with the surface of the work being finished by means of the spring, the upper shoe being movable relative to the lower shoe, a spring tending to move the upper shoe to contact with the work, an indicator member actuated by movement of the upper shoe toward the work to indicate the extent of reduction in diameter thereof, said first named spring and arm being so arranged that, upon manual removal of the shoes from the work piece, the arm and the gauge are automatically raised to position the shoes above the work piece.

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