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2,431,099

GAUGING DEVICE

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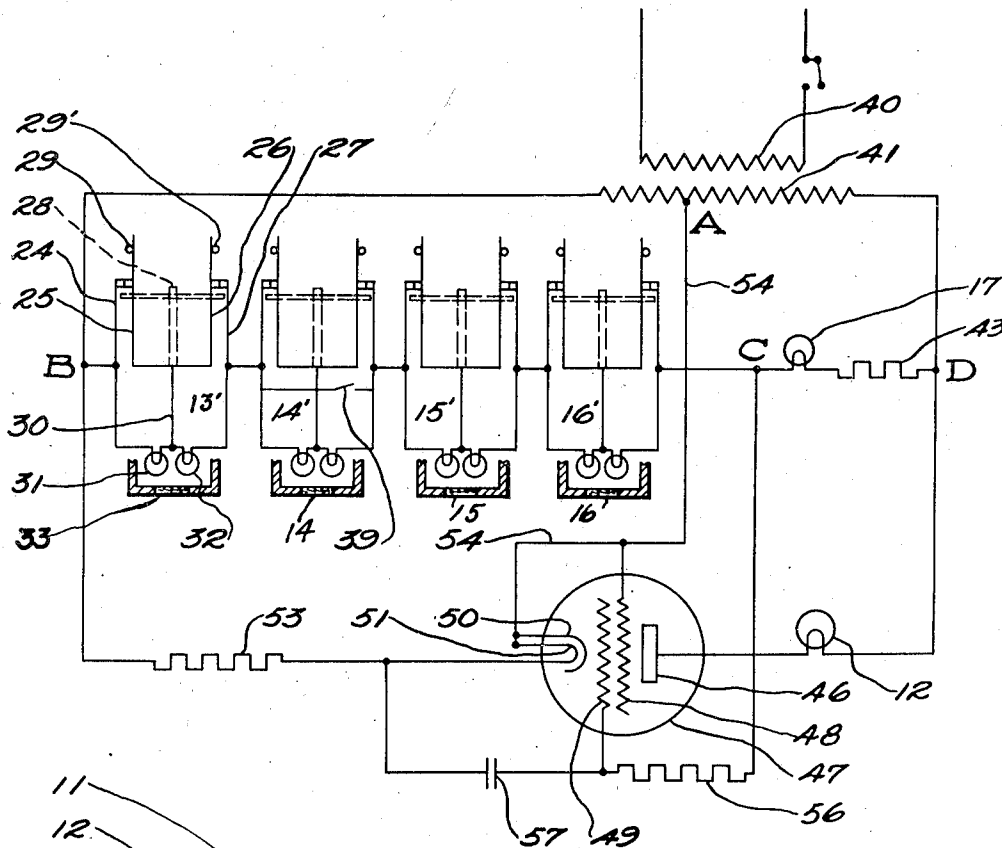


Fig 2

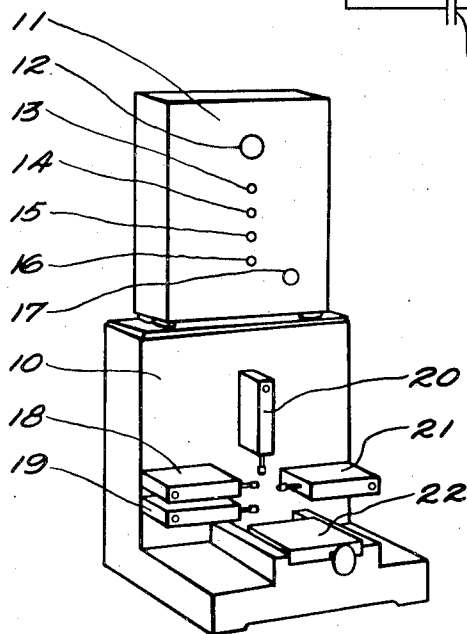


Fig 1

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GAUGING DEVICE

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5 Claims. (Cl. 177—311)

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This invention relates to gauging devices and more particularly to gauging devices adapted to check or compare dimensions of objects and provide an indication as to whether or not the dimensions checked are oversize or undersize.

One object of the invention is the provision of a gauging device for checking or comparing dimensions, and incorporating a number of lamps providing for dimensional indications of different dimensions and a cooperating master light under the control of an electronic relay which is so connected to the dimensional indicating lamps as to change the state of energization of the master light when any one or more of the dimensional indicating lamps are in circuit.

Another object is the provision of a gauging device having a series of dimensional indicating lamps each provided with a short circuiting switch under the control of the workpiece, a master light being so connected with an electronic relay as to provide flow of current through the master light if any one or more of the dimensional control lamps is energized. The electronic relay employed in conjunction with the master light for this purpose is such that a flow of current takes place from the plate or anode only if the control grid of the relay is not definitely negative with respect to the cathode, the control grid and cathode being connected to the source and to the series of dimensional indicating lamps so that the voltage applied to the control grid is effected by the voltage drop across the lamps.

Another object is the provision of a gauging device of the character mentioned adapted to check both oversize and undersize conditions of a series of different measurements on a workpiece, with a series of indicating lamps to indicate whether any dimension is oversize or undersize, and incorporating a master light under the control of an electronic relay and so connected to the plate or anode of the relay that the master light is energized if any one of the dimensional control lamps is energized.

Other objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawing, in which,

Fig. 1 is a perspective view of a gauging device embodying the present invention, and

Fig. 2 is a diagram showing the electrical connections and illustrating how the electronic relay is incorporated in the circuit.

Referring more particularly to the drawing, in which the same reference numerals have been

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applied to like parts in the several views, 10 generally designates the frame structure of a gauging device, having a lamp panel 11 on which is a master light 12 and a series of dimensional indicating lights 13 to 16 inclusive. The lamp panel also incorporates a pilot lamp 17. The dimensional indicating lamps are controlled by electric switches provided in the several controllers 18, 19, 20 and 21 having work operated gauging fingers or plungers which are positioned by different portions of a workpiece applied to the work holding slide 22 and moved back into gauging position in a manner that has been more fully described, for example, in the prior patent of W. F. Aller No. 2,254,812.

The controllers 18 to 21 inclusive are similar in construction, the controller 18, for example, having switch blades 24, 25, 26 and 27 (see Fig. 2) under the control of a movable arm 28 which is moved by the work operated plunger of the controller. In its normal centered position, corresponding to a normal or desired size of the workpiece dimension, the parts are positioned as shown in Fig. 2, permitting the switch blades 24 and 25 and the switch blades 26 and 27 to be in contact. Movement of the arm 28 to one side or the other from its central normal position will open one or the other of the circuits by pushing outwardly on the blade 24 or the blade 27, since the blades 25 and 26 are yieldingly held against adjustable stops 29 and 29' arranged preferably as described in the prior patent above referred to. The positions of the stops determine the amount of tolerance.

The switch blades 25 and 26 are connected together and to a lead wire 30 which extends to two lamp bulbs 31 and 32 which are preferably of different colors, one red and one green. These lamp bulbs are arranged adjacent one another and back of a suitable glass 33 through which red rays or the green rays can be viewed. Both of the lamp bulbs 31 and 32 will be short circuited when the dimension checked by the particular controller in which their switches are incorporated is within the required tolerance. If the particular dimension checked by this controller is oversize, the green lamp will be energized, and if the dimension is undersize the red lamp will be energized. The two dimensional indicating lamps 31 and 32 and the glass 33 provide the light circuit 13' for light 13 previously referred to. In a similar manner, the light circuits designated generally 14', 15' and 16', and as many additional indicating lights as may be required, are connected to one another, as indicated in Fig. 2

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so that all the lamps are in series with one another and so that each of the lamps is provided with a short circuiting switch. Thus if two of the dimensions simultaneously checked by the several controllers happen to be oversize, two of the green lamps corresponding to those two dimensions will be connected in circuit, one in series with the other and will be energized, showing the operator that those dimensions are oversize. A manually operable switch 39 may be closed to entirely cut a pair of the dimensional indicating lamps out of circuit if it is unnecessary to employ a controller and its associated lamp circuit.

The lamps are energized from a suitable electric current source, preferably including a transformer having a primary winding 40 and a secondary winding 41. One end of the secondary winding is connected to the point B at one end of the series of dimensional indicating lamps and the other end of the secondary is connected to a point D which is connected to the other end of the series of dimensional indicating lamps through pilot lamp 17 and a voltage dropping resistor 43. The resistance of the resistor 43 is quite large compared with the resistance of the lamps, the resistor, in one embodiment of the invention that has been satisfactorily used having a resistance of 500 ohms in a secondary circuit of 125 volts, while the individual lamps 31, 32, etc., are of low resistance and each is adapted to be energized by 6 volts.

The master light 12, which is preferably a 110 volt, 6 watt lamp, is connected to the point D leading to one side of the transformer secondary, and is connected, as shown, to the plate or anode 46 of an electronic relay 47. This relay may be a gas tetrode tube. A number 2050 gas tetrode tube has been satisfactorily employed for this purpose. It comprises a grid 48, a control grid 49, cathode 50 and heating element 51, together with the anode, the character of the tube being such that no substantial current flow takes place to the anode if the control grid is definitely negative. However, if the control grid is positive or is only slightly negative, that is only about two volts or so negative, then there is a current flow to the anode and the master light will be energized.

The heating element 51 is connected to the point B and one side of the transformer secondary, preferably through a low resistance 53, and is connected through a lead wire 54 to a point A between the opposite ends of the transformer. There is a differential of about 6 volts between the points A and B. The cathode 50 is also connected to the lead wire 54, and the grid 48 likewise has a connection to the lead 54. The control grid 49 is connected through a resistance 56, preferably of about 50,000 ohms, to the point C which leads to the pilot light 17 and to the series of dimensional indicating lamps. A condenser 57 is preferably connected between the control grid 49 and the heating element 51.

The control grid 49 has a voltage applied to it in accordance with the voltage drop across the several dimensional indicating lamps that are energized or across any one of those lamps if only one is energized. The point C is definitely positive with respect to point B if two or three or more of the dimensional indicating lamps in the series are in circuit, and under these conditions there will be a current flow from the cathode to the anode, sufficient to energize and illuminate the master light 12. Even if only

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one of the dimensional indicating lamps is in the circuit, the master light 12 will be energized, since the control grid will be only slightly negative, that is only a couple of volts negative with respect to the point A. If all of the dimensional indicating lamps are short circuited, the point C will be connected directly to the point B by the short circuiting switches of the indicating lamps, and this makes the point C, and thus the control grid, definitely negative with respect to the cathode, and under these conditions there will be no current flow through the master light 12. The pilot light 17 however will remain energized as long as current is supplied by the primary 40 of the transformer to show that the device is in operation.

It will be apparent that with point B negative with respect to the point A, a definitely negative voltage will be applied to the control grid of the gas tetrode tube, preventing the tube from conducting current between the cathode and the anode, if all of the dimensions gauged are within tolerance, and all the lamps are short circuited. If any one or more of the dimensional indicating lamps is energized, the voltage drop across that dimensional indicating lamp, and thus between the points B and C causes the point C to become positive with respect to the point B and positive with respect to the point A or even slightly negative with respect to the point A. This reduction in the negative bias of the control grid of the electronic relay tube allows the tube to pass current to the anode and illuminate the master light 12.

When no object is in the gauge, the work gauging plungers are projected, the switch arms 28 being normally biased so that the switches across the red lamps are all opened, and the red lamps are all energized. The pilot lamp 17 is energized showing that the device is operating. The master light 12 is energized since the control grid is definitely positive with respect to the point B. The object is then applied to the gauge and the several plungers are positioned by the object. If these plungers are so positioned that all of the movable arms 28 are centrally positioned, corresponding to the desired or normal workpiece dimensions, all of the dimensional indicating lamps are deenergized, the pilot lamp 17 is energized showing that current is being supplied to the gauge, and the master light 12 is deenergized showing that all of the dimensions checked meet the required standard. If any lamp in the series of dimensional indicating lamps is energized it shows that that dimension does not meet the required standard, and at this time the master light 12 is energized, also showing that at least one of the dimensions being checked is not satisfactory.

As the dimensional indicating lamps are not energized when all the dimensions checked at the same time are within tolerance it is very easy for the operator to note just which dimensions are out of tolerance and whether or not those dimensions out of tolerance are oversize or undersize, and just by looking at the master light 12 and noting whether or not it is energized it will be instantly apparent whether or not all dimensions checked are of the desired size or whether some one or more dimensions do not conform to the desired size standard.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to the precise form herein chosen

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for purposes of illustration, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In combination, a source of alternating current, a plurality of indicating lamps connected in series and a resistance connected in series with the lamps and across said source, a short circuiting switch for each of said lamps, means for operating said switches, an electronic relay having a plate, a grid, a control grid and a cathode and arranged to prevent current flow to the plate only when the control grid is definitely negative with respect to the cathode, a master indicating lamp connected to the plate and to one side of the current source, a connection from the cathode to the current source at a point having a potential between the potentials at the ends of the current source and a connection from the control grid to a point between the indicating lamps and said resistance whereby the control grid is not definitely negative only when current is flowing through one or more of the indicating lamps.

2. In combination, a source of alternating current, a plurality of indicating lamps connected in series and a resistance connected in series with the lamps and across said source, a short circuiting switch for each of said lamps, means for operating said switches, an electronic relay having a plate, a grid, a control grid and a cathode and arranged to prevent current flow to the plate only when the control grid is definitely negative with respect to the cathode, a master indicating lamp connected to the plate and to one side of the current source, a connection from the cathode to the current source at a point having a potential between the potentials at the ends of the current source and a connection from the control grid to a point between the indicating lamps and said resistance whereby the control grid is not definitely negative only when current is flowing through one or more of the indicating lamps, and a pilot lamp in series with resistance and connected through said indicating lamps or through said short circuiting switches so as to be energized to show energization of the current source regardless of the energization of the master lamp.

3. In combination, a source of electric current, a series of indicating lamps connected in series with one another and with a resistance and connected across said source, short circuiting switches for the lamps of said series, means for operating said switches, an electronic relay of the gas tetrode type and having a plate, a grid, a control grid and a cathode and arranged to prevent current flow to the plate when the control grid is definitely negative, a master lamp connected with the plate and one side of said current source, a connection from the cathode to the other side of the current source at a point having a potential between the potentials at the

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ends of the current source so the control grid is not definitely negative when one or more of the lamps of the said series is not short circuited, and a connection from the control grid to the series of lamps such that the voltage differential between the control grid and the cathode is dependent upon the voltage drop across the energized lamps of said series and the control grid is definitely negative when all of the lamps of the series are short circuited.

4. In combination, a source of alternating current, a series of indicating lamps connected in series with one another and with a resistance and connected across said source, a short circuiting switch for each lamp, means for operating said switches in pairs to open one or the other of a pair of switches or to close both switches of the pair, an electronic relay having a plate, a control grid and a cathode and arranged to prevent current flow to the plate when the control grid is definitely negative with respect to the cathode, an indicating master lamp connected to the plate and to one side of the current source, a connection from the cathode to the source at a point having a potential between the potentials at the ends of the current source and a connection from the control grid to a point between the indicating lamps and said resistance whereby the control grid is not definitely negative only when current is flowing through one or more of the indicating lamps and current then flows through the indicating master lamp.

5. In combination, a source of electric current, a series of indicating lamps connected in series with one another and with a resistance and connected across said source, a short circuiting switch for each of said lamps, means for operating said switches, an electronic relay connected across the series of lamps and adapted to be energized by the voltage drop across one or more of said lamps when one or more of said switches is open, a master indicating lamp connected to one side of the current source and the said relay for energization when the relay is energized, and a pilot lamp in series with the said resistance and connected through said indicating lamps or through said short circuiting switches so as to be energized to show energization of the current source regardless of the energization of the master lamp.

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