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CONTACT PRESSURE INDICATOR

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Fig. 1

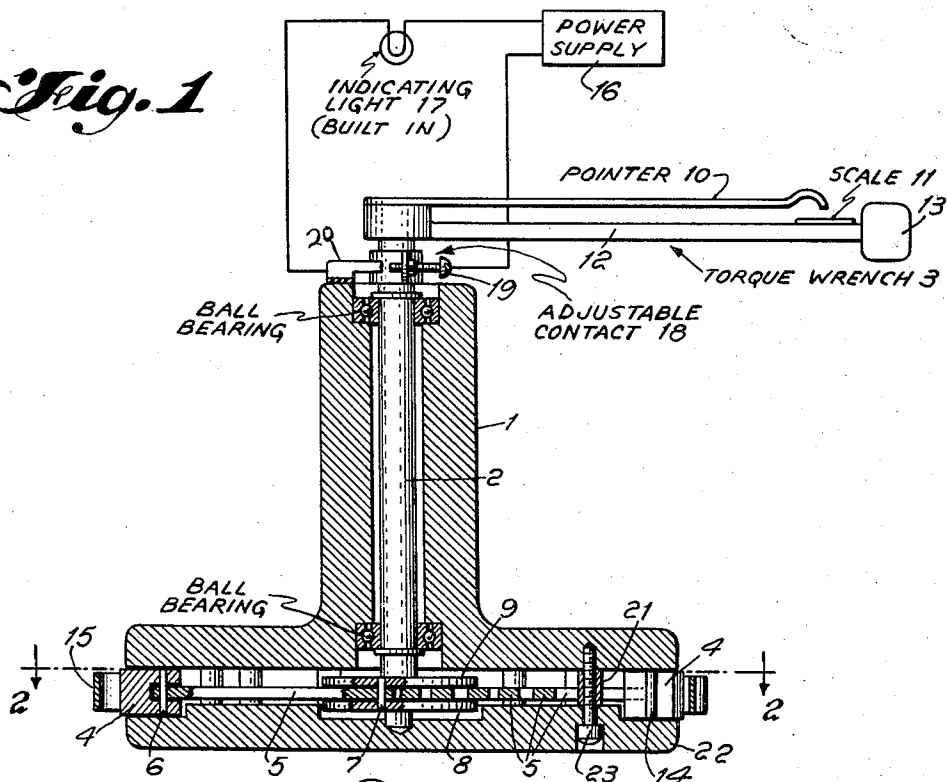
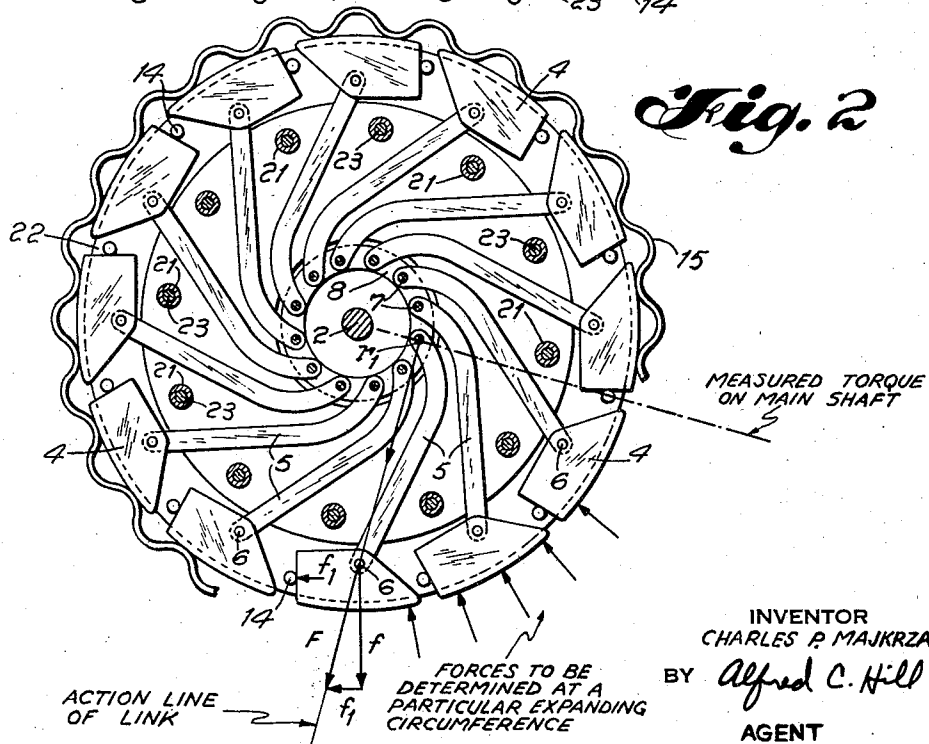


Fig. 2



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CONTACT PRESSURE INDICATOR

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6 Claims. (Cl. 73-161)

This invention relates to pressure indicators and more particularly to a pressure indicator for measuring the average contact pressure exerted by individual contacts of circumferential, resilient contact assemblies.

In the copending application of R. T. Adams and J. B. Harvey, Serial No. 476,416, filed December 20, 1954, entitled "Sliding Contact Device for Tuning Coils," there is disclosed a sliding contact for tuning coils wherein the sliding contact device includes a plurality of contact elements for engagement with the turns of a coil having an engagement pressure which may be easily adjusted by adjusting the circumferential tension of the contact device and having a resilient characteristic to enable the contact elements to follow variations in the surface of the coil and yet maintain the desired engagement between the contact elements and the turns of the coil. It is important in such arrangements that the engagement or contact pressure of the sliding contact and the coil be at an optimum. This is required since excessive contact pressures cause galling, cause production of undesired conductive shavings or particles, and require higher power for driving the sliding contact longitudinally of the coil and light contact pressures cause poor electrical contacts, high contact resistance and arcing.

Therefore, an object of this invention is to provide an indicator for measuring the average contact pressure exerted by the individual contacts of a circumferential, resilient contact assembly when expanded to a predetermined diameter, the diameter of a coil to be tuned.

A feature of this invention is the provision of an indicator fulfilling the object of this invention which comprises an axial shaft, a plurality of extensible members disposed in spaced circumferential relation to said main shaft, the extensible members engaging the inner surface of the resilient contact assembly, a torque applying means connected to said shaft, a plurality of members each connected to one of the extensible members and to said axial shaft to extend said extensible members radially from said shaft upon application of torque thereto for expansion of said contact assembly to said predetermined diameter and an indicator in communication with said torque applying means to register the average contact pressure exerted by the individual contacts of said contact assembly at said predetermined diameter.

Another feature of this invention is the provision of a signal, such as a light signal, incorporated as an integral part of the indicator of this invention to signify when the extensible members have expanded the contact assembly to the predetermined diameter.

The above-mentioned and other features and objects of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a cross-sectional view, partially in elevation and partially schematic, of the indicator of this invention; and

Fig. 2 is a cross-sectional view taken along lines 2-2 of Fig. 1.

Referring to Figs. 1 and 2, the contact pressure indicator of this invention comprises a housing 1 having an axial shaft 2 therethrough whose length and diameter are such that deformation thereof will not take place when subjected to a torque. A plurality of extensible

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members or pads 4 are equally spaced circumferentially about shaft 2. Each of the pads 4 are coupled to shaft 2 by means of arcuate link members 5, one end of which is connected in a pivoting manner by pivot pins 6 to pads 4 and the other end of which is connected in a pivoting manner by pivot pins 7 to collars 8 and 9 secured to shaft 2. A torque wrench 3 is coupled to shaft 2 to apply a torque to shaft 2 and at the same time measure the applied torque by means of pointer 10 and scale 11.

The torque wrench 3 may be any commercially available torque wrench. The torque wrench depicted is the flat beam type torque wrench which comprises a beam or measuring element 12, pointer 10 and scale 11 secured to the element 12. Upon application of a force at the handle 13, the measuring element 12 moves relative to pointer 10 due to the resilience of element 12. The scale 11 is calibrated in accordance with the resilience of element 12 and the length thereof to give a reading in the appropriate torque units, that is, inch-ounces or foot-pounds, etc. By employing a given conversion factor, the registered torque may be converted to the pressure exerted by the element being measured.

In the instant case, a torque is exerted on shaft 2 by wrench 3. The resultant rotation of shaft 2 is transmitted to link members 5 which have an action line or force directed tangential to the active pivot circle on shaft 2, that is, perpendicular to radius r_1 , as depicted by vector F in Fig. 2. This action line of link 5 exerts a component of force f_1 against guide pins 14. The action of guide pins 14 and arcuate members 5 cooperates to provide a radial movement of pads 4 and thus a radial force f . It is this radial force which is related to the torque applied that determines the opposing forces exerted by an expanded cylindrical member at a predetermined diameter.

In a reduction to practice twelve extensible members 4 and links 5 were employed and the wrench 3 registered the torque in inch-ounces. As the pads 4 are extended radially by the action of links 5 and guide pins 14 to a predetermined diameter through the operation of torque wrench 3, the torque necessary to expand the contact assembly 15 is read in inch-ounces on scale 11 of the torque wrench 3. By employing a conversion factor of one inch-ounce equals 55 grams, the radial force in grams exerted by the contact assembly may be obtained. The average force of each contact of the assembly is the force in grams divided by the number of contacts in the contact assembly 15.

A signalling arrangement is provided in conjunction with the wrench 3 to assure that the contact assembly 15 is expanded to the predetermined diameter before the operator takes a reading of contact pressure. The signalling arrangement includes a power supply 16, an indicating light 17 and an adjustable contacting device 18. Device 18 includes an adjustable portion 19 which moves with the shaft 2 and a stationary portion 20 which is fixed to housing 1. Portion 19 is adjusted to provide electrical continuity through portion 20, power supply 16 and indicating light 17 when sufficient expansion of assembly 15 has been achieved by the radial extension of pads 4 under control of guide pins 14, links 5 and torque wrench 3. When this point has been reached, the predetermined diameter of assembly 15, the light 17 will be turned on to indicate that the predetermined diameter has been reached and the force exerted thereby may be calculated by employing the conversion factor and the torque reading on scale 11. It is to be understood that the scale 11 may be calibrated to read directly the radial force exerted by the assembly 15.

During construction of this indicator, the extensible members or pads 4 are positioned to be in contact with

the respective guide pins 14 and the shaft 2 is positioned to cause the action line of links 5 to be at a tangent to the active pivot circle on shaft 2, that is, perpendicular to radius r_1 . By eliminating the spacers 21, the cover plate 22, through action of the screws 23, clamps the pads 4 in position to permit the machining of the pads accurately to the diameter at which pressure is to be measured when the instrument is in use. At this time the adjustable contact 19 is also set so as to later denote by signal, such as by light 17, this exact diameter position. However, by means of contact 19 a certain range of predetermined diameters may be accommodated by one particular indicator. By removing the cover plate and inserting the spacers 21 and replacing the cover plate 22, the linkages become free to move. This instrument is used to determine the opposing forces exerted by an expanding cylindrical member at a predetermined diameter and is especially useful in measuring contact pressure of electrical contact rings for operation on coils and cylinders.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claims.

I claim:

1. A pressure indicator for measuring the average contact pressure exerted by the individual contacts of a circumferential, resilient contact assembly at a predetermined diameter comprising an axial shaft, a plurality of extensible members disposed in spaced circumferential relation to said axial shaft, means for restricting the movement of said extensible members to a radial direction with respect to said shaft, said extensible members being adapted to engage the inner surface of said contact assembly, a torque applying means connected to said axial shaft, a plurality of members each connected to one of said extensible members and to said axial shaft to extend said extensible members radially from said shaft upon application of torque thereto for expansion of said contact assembly to said predetermined diameter, and an indicator in communication with said torque applying means to register the average contact pressure exerted by the individual contacts of said contact assembly at said predetermined diameter.

2. A pressure indicator for measuring the average contact pressure exerted by the individual contacts of a circumferential, resilient contact assembly at a predetermined diameter comprising an axial shaft, a plurality of extensible members disposed in spaced circumferential relation to said axial shaft, means for restricting the movement of said extensible members to a radial direction with respect to said shaft, said extensible members being adapted to engage the inner surface of said contact assembly, a torque applying means connected to said axial shaft, a plurality of members each connected to one of said extensible members and to said axial shaft to extend said extensible members radially from said shaft upon application of torque thereto for expansion of said contact assembly to said predetermined diameter, an indicator in communication with said torque applying means to register the average contact pressure exerted by the individual contacts of said contact assembly at said predetermined diameter, and a signalling means controlled by said torque applying means to signal when said contact assembly has been expanded to said predetermined diameter.

3. A pressure indicator for measuring the average contact pressure exerted by the individual contacts of a circumferential, resilient contact assembly at a predetermined diameter comprising an axial shaft, a plurality of extensible members disposed in spaced circumferential relation at one end of said axial shaft, means for restrict-

ing the movement of said extensible members to a radial direction with respect to said shaft, said extensible members being adapted to engage the inner surface of said contact assembly, a torque applying means connected to the other end of said axial shaft, a plurality of members each connected to one of said extensible members and said one end of said axial shaft to extend said extensible members radially from said shaft upon application of torque thereto for expansion of said contact assembly to said predetermined diameter, and an indicator in communication with said torque applying means to register the average contact pressure exerted by the individual contacts of said contact assembly at said predetermined diameter.

4. A pressure indicator for measuring the average contact pressure exerted by the individual contacts of a circumferential, resilient contact assembly at a predetermined diameter comprising an axial shaft, a plurality of extensible members disposed in spaced circumferential relation to said axial shaft, said extensible members being adapted to engage the inner surface of said contact assembly, a torque applying means connected to said axial shaft, a guide member contacting each of said extensible members to restrict them to movement in a radial direction, a plurality of arcuate members each pivotably connected to one of said extensible members and pivotably connected to said axial shaft for cooperation with said guide members to extend said extensible members radially from said shaft upon application of torque thereto for expansion of said contact assembly to said predetermined diameter, and an indicator in communication with said torque applying means to register the average contact pressure exerted by the individual contacts of said contact assembly at said predetermined diameter.

5. A pressure indicator for measuring the average contact pressure exerted by the individual contacts of a circumferential, resilient contact assembly at a predetermined diameter comprising an axial shaft, a plurality of extensible members disposed in spaced circumferential relation to said axial shaft, said extensible members being adapted to engage the inner surface of said contact assembly, a torque applying means connected to said axial shaft, a plurality of arcuate members each pivotably connected to one of said extensible members and pivotably connected to said axial shaft, said arcuate members being disposed to exert a force on said extensible members having an action line tangential to said axial shaft, a guide member contacting each of said extensible members to restrict them to movement in a radial direction from said shaft upon application of torque thereto for expansion of said contact assembly to said predetermined diameter, and an indicator in communication with said torque applying means to register the average contact pressure exerted by the individual contacts of said contact assembly at said predetermined diameter.

6. A device to simultaneously move a plurality of elements along radial paths radiating from a rotating shaft comprising a plurality of arcuate members each pivotably connected to one of said elements and pivotably connected to said shaft, said arcuate members being disposed to exert a force on said elements having an action line tangential to said axial shaft, and a guide member contacting each of said elements to restrict them to movement in a radial direction outwardly from said shaft.

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