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CUSHION TESTING APPARATUS AND METHOD

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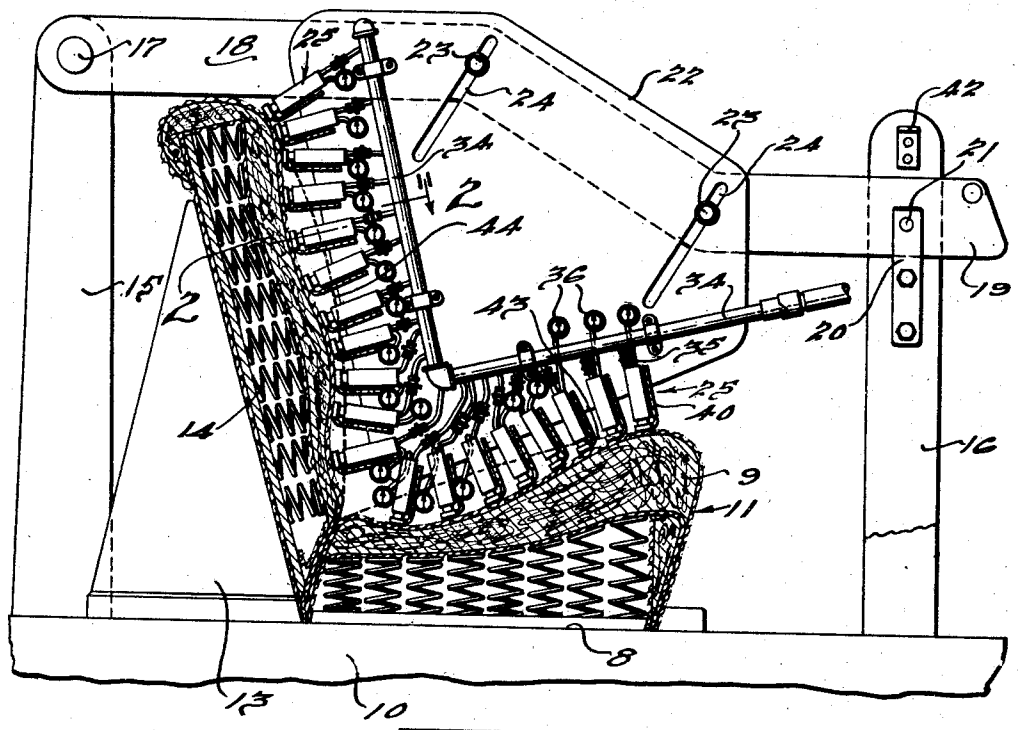


Fig. 1.

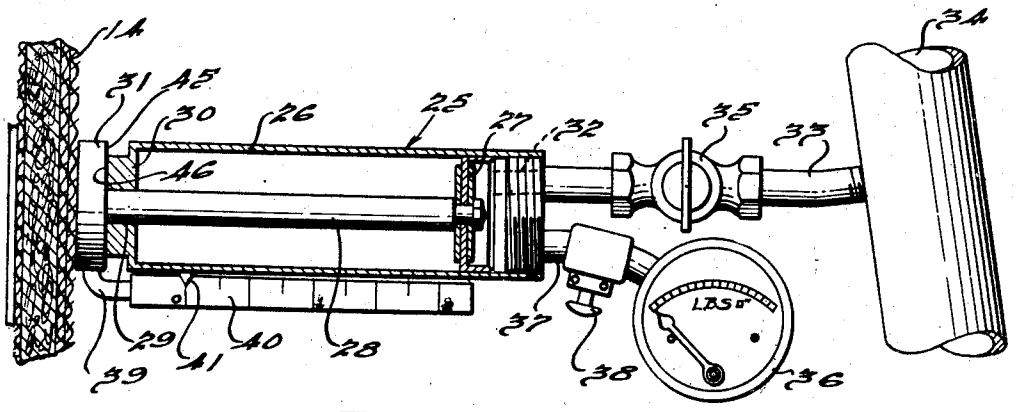


Fig. 2.

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CUSHION TESTING APPARATUS AND METHOD

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8 Claims. (Cl. 265—14)

This invention relates to an improved cushion testing apparatus and method.

One of the main objects of the invention is the provision of apparatus of this kind from which may be determined the deflection rates of a plurality of related portions of cushions at diverse amplitudes of deflection.

Another object of the invention is the provision of apparatus of this kind from which can be determined the unit pressure required to deflect each of a plurality of related portions of a cushion to the normal load deflection contour thereof.

A further object of the invention is to provide testing apparatus of this kind which retains both the back and seat cushions of the seat structure in their normal load deflecting contour along the transverse plane of the cushions while readings are taken of the pressure required to further deflect related areas of the cushion predetermined distances from such contour.

An additional object of the invention is the provision of apparatus of this kind which is adapted for accurately comparing the deflection characteristics of cushions with those of standard cushions having acceptable characteristics.

A still further object of the invention is to provide an improved cushion testing method which enables accurate ascertaining of the resiliency characteristics of a cushion existing when supporting an occupant.

An illustrative embodiment of the invention is shown in the accompanying drawing, in which:

Fig. 1 is a side elevational view of cushion testing apparatus embodying the invention and illustrating, in transverse section, a vehicle seat having cushions under examination.

Fig. 2 is an enlarged fragmentary sectional view taken on the line 2—2 of Fig. 1.

In the form of the invention illustrated in the drawing, the improved cushion testing apparatus comprises a support 10 on which a seat, generally designated by the numeral 11, is mounted. The support 10 has an upstanding pedestal 13 against which the seat back cushion 14 is disposed and a horizontal surface 8 upon which the seat cushion 9 is positioned. A pair of posts 15 and 16 are disposed in back and in front of the position occupied by the seat 11 respectively. Pivotally mounted at 17 on the post 15 is a lever member 18 which extends above the seat 11 and which has a free end portion 19 receivable on a bracket 20 carried by the post 16. The free end portion 19 of the lever member 18 may be secured against displacement by a pin or bolt 21 which may be extended through registering apertures in the lever member 18 and post 16, as illustrated in Fig. 1.

A fixture 22 preferably comprising a metal is adjustably mounted on the lever member 18 by bolts 23 which extend through elongated slots 24 formed in the fixture. The slots 24 are so positioned as to accommodate movement of the fixture 22 in a direction inclined with respect to the generally converging planes of the back cushion 14 and the seat cushion of the vehicle seat when the lever member 18 is disposed in its operative position illustrated in the drawing. The bolts 23 serve to releasably secure the fixture 22 in an adjusted position.

Two series of aligned expansible units, generally designated by the numeral 25, are mounted on the fixture 22 and positioned so as to conform generally with the converging planes of the seat back 14 and seat cushion 9. Each expansible unit 25 includes a cylinder 26 having a piston 27 therein to which is attached a piston rod 28. One end of the piston rod 28 extends through an opening 29 in an end wall 30 of the cylinder and is provided with a contacting head 31. Each cylinder 26 has a fluid pressure inlet 32 connected with a source 34 of fluid pressure. A valve 35 is provided in the conduit 33 between the fluid pressure source 34 and the inlet 32 of the cylinder. A pressure recording gauge 36 is connected to the inlet end of the cylinder 26 by a conduit 37 in which is provided a push button or other type of valve mechanism 38. The contact head 31 of each expansible unit 25 is provided with an angle bracket 39 to which is attached a scale 40 having graduations representative of distance marked thereon. An indicating pointer 41 projecting outwardly from the wall of the cylinder 26 cooperates with the scale 40 in indicating the distance of movement of a contact head 21 from its fully retracted position or from a position intermediate the length of stroke thereof.

During operation of the foregoing testing apparatus, the lever member 18 is swung in a counterclockwise direction from the position shown in Fig. 1 in order to elevate the fixture 22 and expansible units carried thereby so as to facilitate placement of a seat for test. During positioning of the seat, the free end portion 19 of the lever may be seated upon a bracket 42 in order to support the lever. When the seat is so positioned, the top surface of the seat cushion 9 and front surface of the back cushion 14 have the contours illustrated by dotted lines 43 and 44 respectively. The contact heads 31 of the expansible units which act upon the seat cushion 9 are arranged

on or substantially tangent to a curve which corresponds to the normal load deflection curve of the upper side of the seat cushion 9 when the latter is supporting an occupant of average weight. The contact heads of the expansible units which act upon the back cushion 14 are also arranged on or substantially tangent to the curve to which the front side of the back cushion 14 is deflected by the pressure applied thereon by the occupant. The fixture 22 is then adjusted relative to the lever member 18 and so set by the bolts 23 as to bring the contour of the upper side of the seat cushion 9 to its normal load deflection contour and the contour of the front side of the back cushion 14 to its normal load deflection contour when the lever member 18 is rotated to rest upon the bracket 20. All of the expansible members are in their contracted state during this initial setting of the apparatus.

After the apparatus has been set in the foregoing manner and as illustrated in Fig. 1, fluid medium is supplied to the respective expansible units in order to urge the contact heads thereof outwardly thus further deflecting the upper side of the seat cushion 9 and the front side of the back cushion 14 from their normal load deflection contours. The contact heads of each expansible unit may, if desired, be forced outwardly a uniform predetermined amount and the pressure exerted at each of the areas of the cushion with which the respective contact heads engage may be ascertained by individual operation of the pressure gauge controlling valve 38 thereof. From this data may be plotted a load deflection curve representing the deflection rates of the respective areas of the cushions. These deflection rates are truly representative of the deflection rates occurring during use of the seat by an occupant for all portions of the seat in the plane at which the tests are made are stressed in a manner similar to that existing during normal service use of the cushions.

If desired, the above apparatus may also be used to advantage to ascertain the unit pressure required to initially deflect each of the adjacent areas of the seat cushions 9 and 14 with which the contact heads engage. This may be accomplished by setting the apparatus as described above so as to deflect the cushions to their normal load deflection contours and thereafter projecting the contact heads against the cushion surfaces with only sufficient force to overcome the opposition presented by the resiliency of the cushion structures. In other words, a reading of the pressure is taken at the instant the surface 45 of each head 31 parts from the surface 46 of the adjacent end wall of the cylinder 26. This occurence may be detected upon the scale 40 by observation of the initial movement of the pointer 41 from the 0 line of the scale. In this manner, both seat and back cushions, such as those used in furniture and vehicles, may be tested to ascertain whether successively adjacent areas conform in resilient characteristics to the acceptable characteristics of standard cushions. The seat 11 may be shifted longitudinally with respect to the fixture 22 and expansible units 25 in order to test the cushions at selected locations throughout their length.

Although but one specific embodiment of the invention is herein shown and described, it will be understood that various changes in the size, shape and arrangement of parts may be made without departing from the spirit of the invention.

I claim:

1. Apparatus for testing a cushion comprising a support, a fixture shiftably mounted on said support, a plurality of piston and cylinder units carried by said fixture, each having a contact head arranged substantially tangentially with respect to the normal load deflection contour of said cushion, means for selectively supplying fluid under pressure to each of said pistons, and means on each of said units for measuring the amplitude of deflection of the portion of said cushion with which each contact head engages and the pressure required to produce such deflection respectively.

2. Apparatus for testing a cushion comprising a support, a fixture shiftably mounted on said support, a plurality of expansible members carried by said fixture, each having a contact head arranged substantially tangential with respect to the normal load deflection contour of said cushion, means for selectively supplying fluid under pressure to each of said expansible members for urging the contact head thereof against the portion of said cushion with which it registers, and means on each of said units for measuring the amplitude of deflection of the portion of said cushion with which each contact head engages and the pressure required to produce such deflection respectively.

3. Apparatus for testing a cushion comprising a support, a fixture shiftably mounted on said support, a plurality of expansible members carried by said fixture, each having a contact surface portion arranged substantially on a curve of a predetermined contour of said cushion, means for selectively supplying fluid under pressure to each of said expansible members for urging the contact surface thereof against the area of said cushion with which it registers, and means on each of said units for measuring the amplitude of deflection of the portion of said cushion with which each contact head engages and the pressure required to produce such deflection respectively.

4. Apparatus for testing seat and seat back cushions while the latter are assembled in their normal converging planes comprising a support, a fixture shiftably mounted on said support for movement in a direction inclined with respect to said converging planes of said seat and seat back, a plurality of expansible members on said fixture arranged in converging series generally parallel to the converging planes of said seat and seat back respectively, each of said series of expansible members having a contact surface arranged substantially on a curve corresponding with the normal load deflection contours of said seat and seat back cushions respectively, means for selectively supplying fluid under pressure to each of said expansible members for urging the contact head thereof against the portion of said cushion with which it registers, and means on each of said units for measuring the amplitude of deflection of the portion of said cushion with which each contact head engages and the pressure required to produce such deflection respectively.

5. Apparatus for testing seat and seat back cushions while the latter are assembled in their normal converging planes comprising a support, a fixture shiftably mounted on said support for movement in a direction inclined with respect to said converging planes of said seat and seat back, a plurality of expansible members on said fixture arranged in converging series generally parallel to the converging planes of said seat and seat

back respectively, each of said series of expansible members having a contact surface arranged substantially on a curve corresponding with the normal load deflection contour of said seat and seat back cushions respectively, means for releasably fixing said fixture in a selected position such that said seat and seat back cushions are deflected to their normal load contour, means for expanding said members under pressure, and pressure indicating mechanism on each of said expansible members for indicating the pressure required to initially deflect the respective areas of said cushion with which said contact surfaces engage beyond their normal load deflection contour.

6. Apparatus for testing a resiliently yieldable cushion comprising a cushion support, a fixture support adjacent said cushion support, a fixture shiftably mounted on said fixture support movable toward and away from said cushion support, a plurality of expansible units on said fixture each having a member provided with a cushion contacting surface and projectable toward said cushion, the contacting surfaces of said members being arranged when retracted on a curve corresponding with the normal load deflection curve of said cushion, means for releasably holding said fixture in a selected position such that the portions of said cushion engaged by said contact surfaces are deflected to their normal load contour, means for expanding said expansible units under pressure to deflect said portions of said cushion beyond said normal load contour, and pressure indicating mechanism on each of said expansible members for indicating the pressure required to initially deflect the respective areas of said cushion with which said contact surfaces engage beyond their normal load deflection contour.

7. Apparatus for testing a resiliently yieldable cushion comprising a cushion support, a fixture support including a pivotal lever extending over said cushion support having one end pivotally mounted beyond one extremity of said cushion and its other end releasably fixed at a location beyond the opposite extremity of said cushion, a fixture adjustably mounted on said lever intermediate its ends, a plurality of expansive cushion contact members mounted on said fixture and engageable with said cushion by pivotal movement of said lever, said contact members being so constructed and arranged when retracted as to deflect portions of said cushion to their normal load contour when said lever is pivoted to a predetermined position, means for expanding said contact members under pressure to deflect said cushion beyond its normal load contour, and indicating apparatus for indicating the pressure required to so deflect said cushion and the amplitude of the resulting deflection.

8. The method of ascertaining the deflection rates of selected portions of a resiliently yielding cushion which comprises, deflecting successive areas of said cushion located adjacent a transverse plane thereof to the contour imparted thereto in service by a normal load distribution, deflecting each of said successively adjacent areas of said cushion a predetermined amount from said contour, and measuring the pressure required to deflect each of said areas beyond said contour.

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