FIGS. 2a and 2b show a different embodiment of a holder 1' for use in imparting compressive or bending stress to a sample 2' by using coils 7' which expand when heated, similar to those described in connection with FIGS. 1a and 1b. The holder 1' is the same as the holder 1 of FIGS. 1a and 1b except that the coils 7' are engaged with a movable sample holding member 4 and extend between the movable sample holding member 4 and the metallic connecting member 5.

The holder 1' is preferably used in a case where a weather-fastness test is to be performed on a material having a low expansibility, such as a plastic plate or a coated plate. In such a case, when the sample is mounted at a low temperature, the coils 7 expand and contract in the same way as described above, but repeatedly impart increasing compressive stress to the sample 2' as the temperature rises, and the generation force is varied as the weather-fastness test is conducted. As with the embodiment of FIGS. 1a and 1b, by loading at a high temperature, the holder will exert a tensile stress on the sample as the temperature falls. Similarly, by changing the coils to a material which contracts when it is heated causes the holder to operate in the reverse manner.

The sample 2' as shown is, because it is so thin, actually bent by the action of the compressive force on the ends thereof. Thus, for a particular type of specimen, the holder can be used to apply repeated bending stress.

FIGS. 3a-3c show another embodiment of a holder 8 for use in imparting stress to a sample, such as a plastic material or a coated material. The holder 8 has a rectangular frame 8a provided with an opening 8b in the central portion thereof. A sample 2' is mounted on the front surface of this holder, and slide rods 6 are fixedly mounted by metallic mounting members 9 to the opposite side surfaces of the holder frame 8a so that the slide rods 6 can incline rearwardly of the frame at a predetermined angle in planes parallel to the side surfaces. Coils 7' similar to those described in connection with the embodiments of FIGS. 1a and 1b and FIGS. 2a and 2b but which contract as the temperature rises, are provided around the slide rods 6, and fixed at the end portions thereof which are toward the metallic mounting members 9 on the slide rods 6, and at the other end portions thereof to end portions of a metallic sample-bending member 10 slidable on rods 6. The metallic sample-bending member 10 consists of a bar the cross section of which is a square portion with a triangular portion projecting toward the sample with the apex of the triangular portion of this member contacting the rear surface of the sample 2'.

The coils 7' on this holder 8 are made of a material which contracts and expands repeatedly with the increase and decrease of the temperature. As these coils 7' expand and contract, the metallic sample-bending member 10 is moved upwardly and downwardly along the slide rods 6 and the apex of the member 10 which contacts the rear surface of the sample 2' is moved vertically on the sample surface. Consequently, stress, the level of which corresponds to the angle at which the slide rods 6 are fixed and the position of the sample-bending member 10, is imparted as bending stress to the sample 2' from the rear surface thereof with the stress increasing as the temperature rises so as to contract the coils 7'. Accordingly, a weather-fastness test can be conducted by repeatedly imparting bending stress to the sample with the generation of the force for causing the stress to be varied in the same manner as in the holders described in connection with FIGS. 1a and 1b and FIGS. 2a and 2b. As with the holders of FIGS. 1a-2b, the coils 7' of the holders of this embodiment can be placed above the sample bending member, or the sample can be mounted in a high temperature environment or the material of the coils 7' can be changed to one which expands when heated, and the different modes of operation can be obtained as with the holders of FIGS. 1a-2b.

FIG. 6 shows the results of accelerated weather-fastness tests conducted in a polyester seat material for an automobile. Referring to the figure, curves a, b, c, for which the time scale is hours, represent the results of weather-fastness tests conducted by using the accelerated weather-fastness test machine shown in FIG. 4 with various holders, and curves d, e, the time scale for which is months, the results of outdoor exposure tests. Table 1 shows the test conditions under which the tests to produce the data for curves a, b and c were conducted, in which a represents the test method according to the present invention, and b and c conventional test methods.

TABLE 1

Test Conditions Corresponding to the Curves a, b, c			
Curve	Test Temperature °C.	Light source lighting conditions	Holder used
a	63	Brightness cycle	FIG. 1
b	63	Continuous irradiation (Constant lighting)	FIG. 5b
c	63	Brightness cycle	FIG. 5a

(Note 1) A black enamel-coated black panel thermometer was set in the same position as the sample surface so that the maximum temperature of the sample surface could be measured as a test temperature.
(Note 2) In the brightness cycle, a 3.8-hour light source lighting period and a one-hour lights-out period were alternately repeated.

The curve d shows the results of an outdoor exposure test conducted with a sample attached to the holder of FIG. 1, and the curve e the result of an outdoor exposure test conducted with a sample attached to the holder of FIG. 5a.

A comparison of the curves of FIG. 6 shows:

(1) the method a can accelerate the testing to about three times as fast as that of c;
(2) the method d can accelerate the testing to about one and a half times as fast as that of e;
(3) in methods a, d and e, ΔE, namely the color difference as measured according to JIS 28730-1980, increases substantially linearly with the passage of time. Accordingly, these results have good correlation;
(4) unlike the graphs referred to in (3) above, b and c are not in good correlation with d and e.

As is clear from the above, the weather-fastness test method according to the present invention accelerates the tests to two to three times as fast as that of a conventional accelerated weather-fastness test method, and is well correlated with an outdoor exposure test method. Moreover, in the outdoor exposure test, the test can accelerate to about one and one-half times as fast as that of a conventional outdoor exposure test, and a complete article with the material to be tested thereon in its intended form is not required for exposure, so that a large space to carry out exposure is unnecessary. Accordingly, the expenses can be cut down greatly in all cases, i.e. economical tests can be conducted.

What is claimed is:

1. A method for carrying out a weathering test on a sample, comprising: