SPRINGS

Geometer describes the various types of springs encountered in the workshop

THE SPRING is an indispensable mechanical device based on the property of materials to return to their original shape if not stressed beyond a certain limit.

Long exploited, this property is still not always perfectly understood. Early man made use of it in steadying his descent from a tree top on a resilient branch, or when projecting an arrow from his bow. The pole lathe, the forerunner of machine tools, employed it in a springy sapling providing the reverse run of cord wrapped round the workpiece.

Modern springs, in the restricted sense of the term, are mostly of special steels, hardened and tempered to bestow resilience. All, however, work on one of two principles, or in complicated cases, a combination of the two. These are by torsion, or by bending, or by a combination of both.

Torsion springs

A and B illustrate torsion. When a bar is unstressed, the fibre or grain runs along it as a straight line. When the ends are gripped and twisted in opposite directions, torsion is applied, and the line is pulled round. On the torsion being released, the bar springs back and the line straightens again. This is the principle of the torsion bars employed on some car suspensions; it is also that of small circular coil springs.

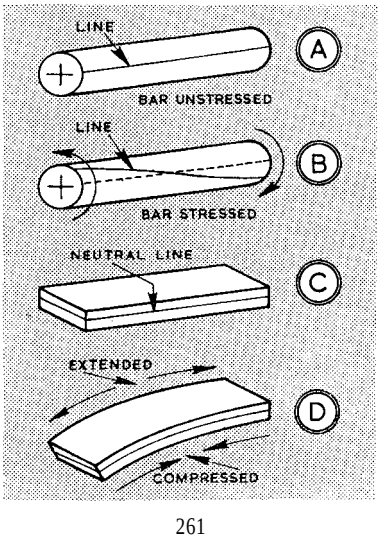
C and D show bending. In a flat plate or leaf, there is supposed to be a neutral line or plane along the centre. On a load being applied, the metal on one side of the neutral line is put in a state of tension, or extended, while that on the other side is compressed. At the neutral line, there is, of course, neither tension nor compression. On the load being removed, the plate or leaf springs back to its original shape.

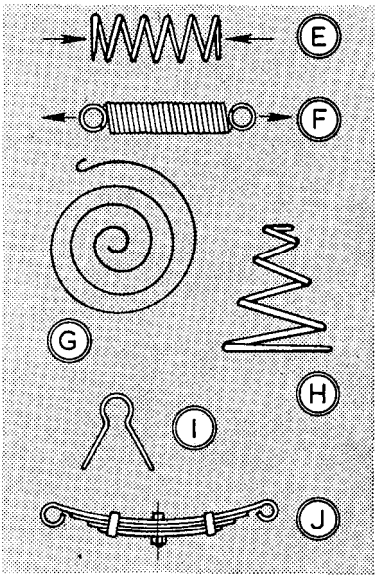
On some springs combining the two means, it is not easy for an outsider to decide just how much torsion or bending there may be-since it would be quite possible to bend the bar at B as well as twist it, and twist the plate at D as well as bend it-and both would continue to function as springs.

Of the many different types of springs, two are really common in regard to wide application-compression and tension (or extension). Both are wound circular from wire or rod. The compression spring, E, has the coils apart and is loaded in the direction of pushing them together. The tension spring, F, has the coils close together and is loaded to pull them apart. A compression spring is usually finished each end by a slight closing of the coils, then grinding, so that the last coil tapers off and the end is substantially square. A tension spring finishes in a small eye or loop, or with a hook each end.

A flat spiral spring, G, made from a long strip, is commonly called a clock spring-from long association with spring clocks, other applications being in watches, gramophone motors and the carriages of typewriters. This spring is housed in a circular casing and has a hook or hole at the outer end attached to the casing, and a hole at the centre end for a hook or pin on the shaft. Lubrication with light oil reduces friction.

A spring wound from wire or flat strip, circular and in the form of a cone, is a volute spring, H. This has various applications-a well-known





one being in the cap of circular torches to maintain the batteries in contact.

A spring as at I from flat strip, though often with longer legs, usually termed a lock spring-it being the type generally used, the eye portion fitting over a pillar, one of the legs bearing against the body, the other against the levers or bolt. A much heavier spring of the same general form, but with a pin instead of an eye, is a gun spring-from use in sporting gun breech and hammer mechanisms.

Leaf springs

The springs used on cars, when not torsion or coil pattern, are leaf type, J. In these, numbers and sizes of leaves are settled according to resistance and resilience required. The top leaf with eyes for mounting is the main leaf. Others are assembled on the centre bolt, and there are clips to hold them. In these springs, a certain degree of self-damping occurs from the friction of the leaves rubbing together and lubrication with grease or oil is generally desirable. ❑