

UNIVERSAL JOINTS

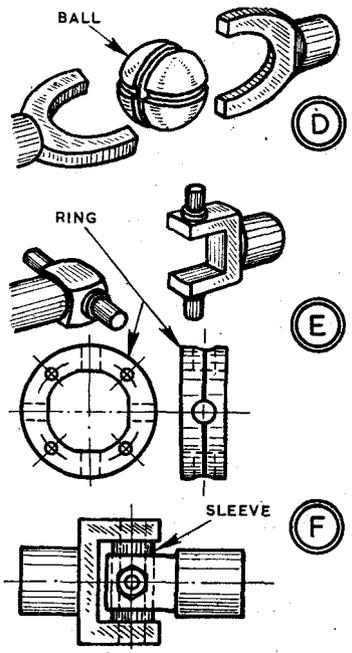
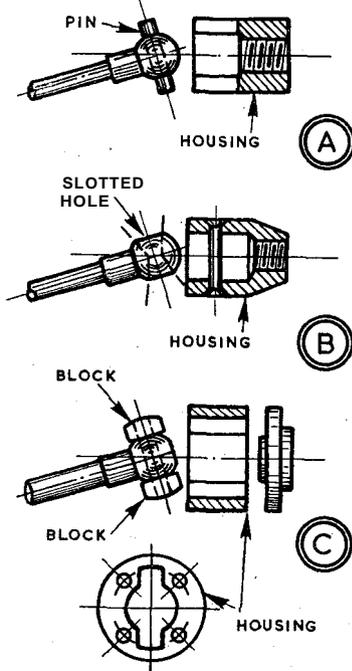
By GEOMETER

LIKE a flexible coupling, a universal joint transmits drive between shafts disposed at an angle, but has advantages of compactness and strength, since it is entirely of metal. Not depending on the flexibility of any of its members, but sliding or rotating contacts, it is able to work with reasonable durability at considerable angularity, and according to requirements can be arranged in a variety of ways.

A simple universal joint, as at A, consists of a ball on one shaft, a housing on the other, the ball carrying a cross pin, and the housing being slotted to accept it. The weak part of such a joint is the line contact between the round sides of the pin and the flat edges of the slots. This in conjunction with the combined sliding and rotating movement can give rise to fairly rapid wear. Nevertheless, the joint is a useful one in small sizes, with the housing of mild steel, case-hardened, and the pin of silver steel or cast steel, hardened and tempered.

A typical example is the propeller shaft drive for a boat, when the housing can be a type of nut screwed to the crankshaft, and the ball machined from bar stock, with a boss to screw to the propeller shaft, or to push on and be brazed.

If it is desired to "streamline" a universal joint—to work with less resistance to forward motion in water, the components can be arranged as at B. The ball is provided with a slotted hole, and the housing carries a fixed pin, which must either be soft enough to burr into countersinks or, if hard, short enough for the housing to be slightly burred over the ends—to prevent the pin slinging out. The slot in the ball can be made by "wringing" the drill carefully with which the hole has been drilled.



Cardan joint

The pin type universal joint which is mechanically correct in that it eliminates line contacts, and so possesses maximum durability, is the cardan joint, as at C. In this, the cross pin through the ball is fitted with a rectangular block each end. The housing is slotted for the blocks; and the action when the joint is rotating is a sliding movement of the blocks in the housing, and a rotary oscillating movement of the pin in the bores of the blocks.

The cross pin and blocks centre housing and shaft in one plane; and the blocks are curved on their outside edges to centre from the bottom of the slots in the other plane. For convenience when machining the slots,

the housing usually has both ends open, and is bolted to a flange on the driving or driven shaft—otherwise, with one end closed, considerable difficulty would be experienced in producing true parallel-sided slots.

An ingenious universal joint, as at D, comprises a ball with a pair of grooves machined at right-angles, which are engaged by two flat-sided forks. Each fork can slide in its own groove, or twist the ball round in the other fork. This type of universal joint can be employed to operate the front brakes of cars—when the ball must be situated above or below the swivel pin axis, to prevent the action of braking the steering.

Another type of universal joint is as at E. One shaft carries a cross pin at the end, and the other has a fork with two pins. A ring made in halves to bolt together has four bores at right-angles to enclose the pins. The bearing surfaces are large for the rotary oscillating movements.

A universal joint employing two forks can be arranged as at F. One fork carries a large cross pin and a sleeve. The sleeve is placed in the fork and the pin pushed through, and there is a central cross-wise hole through both to take a bolt which passes also through the other fork, and, fitted with a nut and lock-nut, completes the assembly. □