Differential screw fittings

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ACCORDING to' what may be required in a tool or mechanism, a very large axial force, or extremely fine adjustment, can be provided by a differential screw, using normal pitches of thread of robust proportions and ample strength. Even for applications where the function is fine adjustment, these are important factors; for a thread of very fme pitch has no great vertical height to withstand wear, much less provide considerable axial thrust without stripping.

A differential screw' is one having two different t.p.i. or pitches; and it is by using the difference between them that the force or tine adjustment is obtained. For any particular pitch (which is obtained by dividing 1 by the t.p.i.), a thread may be likened to a type of wedge. A large pitch (small number of t.p.i.) gives a steep wedge, and a small pitch a very slender one.

Now, two steep wedges of slightly different angle can be placed together in opposition. The variation from parallel is equal to that of a very slender wedge. This is similar to a differential screw. and it works as at *A*.

Making one forward turn with the screw from the left side, the space X is diminished by the difference between the movement of nut Y with the fine thread, and that of nut Z with the coarse thread. If nut Y has 10 t.p.i., the pitch is l/l0in., or 4/40in.; and if nut Z has 8 t.p.i., the pitch is 1/8 in. or 5/40 in. The difference is l/40 in., which is the pitch of a normal micrometer screw.

Consequently, using these substantial threads in a mechanism, it is possible to obtain the fine adjustment of a micrometer-or the force that attaches to l/40 in. pitch-without risking the stripping that could occur with a thread proportioned to l/40 in. pitch. Even threads of 4 t.p.i. and 5 t.p.i., which are very strong, give the equivalent of 1/20in. pitch; and at the other extreme, combinations of threads of line pitch (large numbers of t.p.i.), relatively weak though they may be, will provide an extremely fine adjustment when this and not force is the function required.

-The considerable force provided by a differential screw admits of assembling parts with the minimum risk of their working loose; and often no locking device is needed. A possible use in a small engine is as at B, for fixing the crankpin to the web of a cantilever crankshaft. The crankpin is a sleeve (with flange to keep the big-end of the connecting-rod on it) and is tapped with a fine thread, while. the crankweb is tapped with a coarser thread. The screw can be made to length-or cut to length after pulling the parts together.

The force available in such a double-pitch screw is particularly useful on occasion in a puller for separating taper-fitted parts. It can be arranged as at C. The normal pressure screw can have its usual relatively fine thread and be fitted 'into a sleeve with a coarser thread to the body of the puller. The pressure screw gives the setting and initial tightening. Then it is held while the sleeve is turned. This advances in the body and at the same time draws the pressure screw back; and the difference between the two movements is the actual advance. No hammering should be needed on the pressure screw.

Parts of jigs and tools can be pulled firmly together with a fitting as at *D*, obviating recesses or countersinks for screws-the ends of the screws going beneath the surface. Tightening by ordinary screwdriver gives sutffcient force with the fine functional pitch. Screws must be started with parts separated an appropriate distance (right) for correct final assembly (left).

Fine adjustment for the lens of a microscope can be arranged as at *E* (top) with a double-pitch screw; while tine adjustment for a tool (bottom) is possible through a sleeve with different pitches inside and out.

For the latter fitting, a backing screw is advisable to lock the tool with backlash upwards. In adjusting the sleeve, conditions as at F occur Backlash between sleeve and bar is correctly taken, but the tool is pulled downwards, leaving backlash beneath its threads. So a backing screw will prevent it from pushing down. ❑