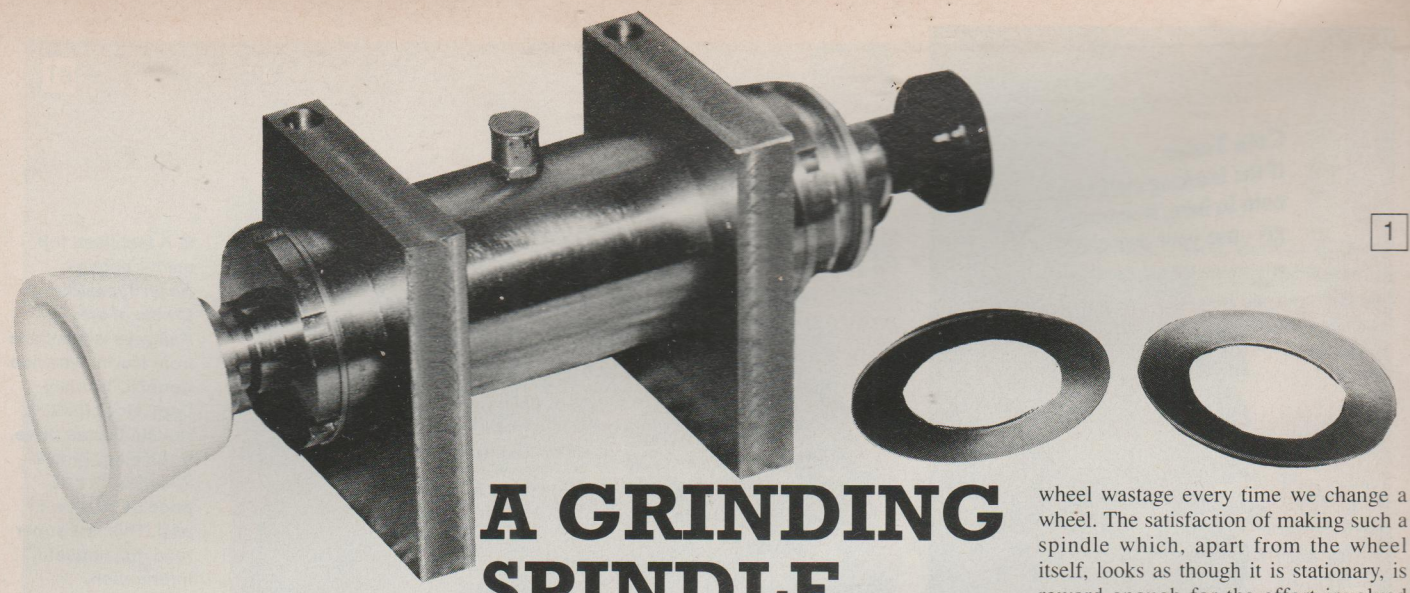


1

A GRINDING SPINDLE

The completed grinding spindle.

1: A pair of bearing disc springs, as used in the construction of this tool.

D. Broadley,
describes the factors influencing the design and then tells how to make a grinding spindle head

● *Part 1*

The real heart of a good machine tool stems from the quality of its machine spindle. The lathe is a prime example of this statement, the lathe spindle having a particularly heavy duty to perform even in a light duty machine. However the model engineer has a requirement for a variety of light but precise machine spindles which are, with care, within the capability of the average amateur and of modest cost. This series of articles will deal mainly with the design and manufacture of a light but precise grinding spindle but will finally extend the exercise to the design of a unit capable of carrying an MT2 spindle of somewhat greater load carrying capacity. The design principles are however the same.

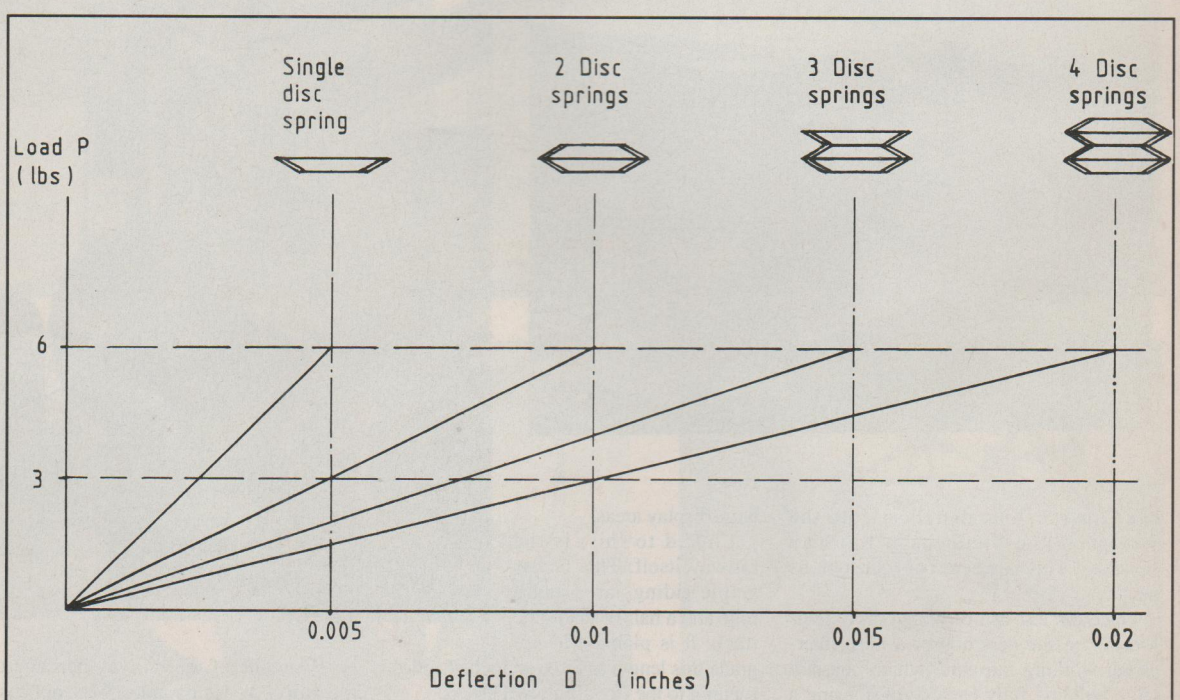
The Grinding Spindle

Much has already been written on the subject of grinding spindle head design, and it is difficult to state anything which has not been said or written before. However it is necessary to state the design principles involved. What we are after is a 4800 rpm free running and accurate spindle without end float in order basically to ensure stability of the grinding wheel. The loads involved are very low apart from loads in the grinding wheel itself and any preloads we must build into the spindle to ensure stability. These latter are also low but important to get right. Finally we need to be able to replace wheels easily and accurately in order to avoid regrinding and hence wheel wastage every time we change a wheel. The satisfaction of making such a spindle which, apart from the wheel itself, looks as though it is stationary, is reward enough for the effort involved apart from the fact that we finish up with a most universally useful tool.

The main element of our grinding spindle is to choose the correct bearings in an accurately machined housing with correct internal preload. All preload consists of is a method of spring loading one of the two ball races to adjust end float caused by axial tolerances (the difficulty of accurately measuring the distance between the inner races on the shaft and outer races in the housing) and any differential thermal expansion as inevitably one part of the spindle achieves working temperatures compared with another. A good high speed spindle is that critical.

The bearings chosen are relatively inexpensive angular contact or 'magneto' type which lend themselves particularly well to simple and practical methods of preload.

There are numerous ways of providing the necessary preload but the one chosen here is what I consider to give the most reliable and, for the amateur,



LOAD/DEFLECTION CHARACTERISTICS FOR DISC SPRINGS USED IN PARALLEL Fig.1