Constructing a COIL WINDER *with automatic feed*

A ***series in*** which H. D. ***WOODWARD*** describes the ***construction of a unit of value to model*** engineers who are ***interested in all electrical matters***

NEEDING a portable machine to wind coils and transformers I decided to take time off from model-making to construct one to my own design. I had no means for casting metal and therefore decided to use a piece of hardwood for the base. If metal sheet is used for the base, wood can still be used for. the headstock, thereby cutting out a casting.

The end supports of the spools or coil formers can be suitable pieces of angle iron. And if there is a means of making castings, the finished winder will look that much better in all respects.

The two sides, ends and top of the base are cut out, making sure that they are square all over. Clearance holes are then drilled and countersunk at the ends of the front and rear pieces respectively, for the 2 in. x No. 8 woodscrews for assembly. The top of the base is drilled around its edges likewise, and the holes countersunk for the screwheads.

Spot the holes for the screws as the parts are dealt with, and drill these positions to suit the screw. In this case, a $\frac{1}{8}$ in. drill will receive and guide the screw home. If this is not done, the screw may snap off and ruin the position. A little oil on the screw thread will help to drive it home. I have mentioned this in what may be thought unneccessary detail for the benefit of those who may have difficulty in working with hardwoods. When the base has been assembled, fill the screwheads with plastic-wood, and sandpaper level and smooth.

Making the headstock

The headstock is constructed from hardwood. The diameters of the bored holes which receive the ball-races need not be strictly adhered to, but for accurate alignment of both spindles it is best to obtain races of like diameter. This permits the respective blocks to be clamped together whilst boring on the face-plate. This is done, of course, after the blocks have been shaped.

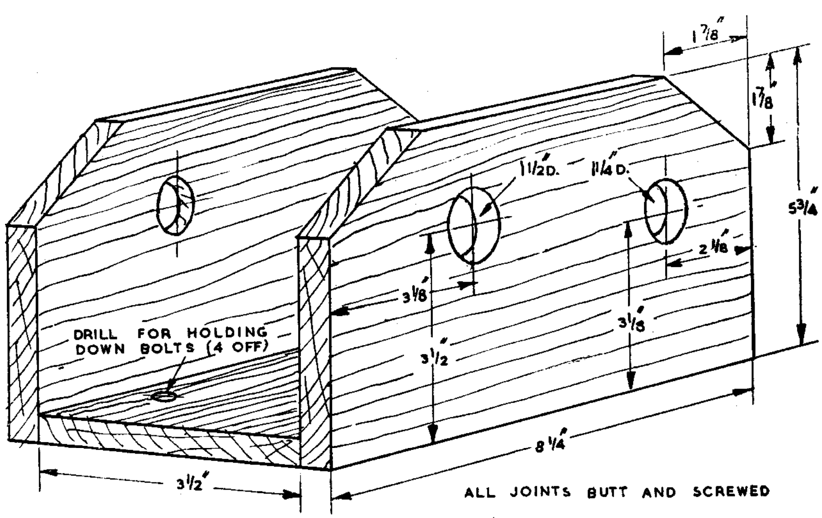
When the boring operation has been carried out, the blocks can be left clamped together to enable the screw holes to be drilled at the base of the blocks. The blocks are then marked " front " and " rear," and separated. Note that the higher of the two holes is the chuck spindle, which is to the front of the machine.

As an example of bearing size, an Enox cutter of $1\frac{1}{4}$ in., can be used in the drilling machine to cut the circular holes for the bearings. It is wiser to use a pilot of $\frac{1}{4}$ in. rod in the saw, rather than a $\frac{1}{4}$ in. drill, as the drill flutes may wear the pilot hole larger, and the saw will then cut an oversize hole. The cut or feed, can penetrate the wood for only $\frac{1}{4}$ in. by this method, but it can be overcome by dealing with the front and rear holes first while the blocks are clamped together. The inner-sides can be dealt with after unclamping. The little blind centres that the saw would not reach can easily be knocked out, leaving the holes perfect.

Belt clearance aperture

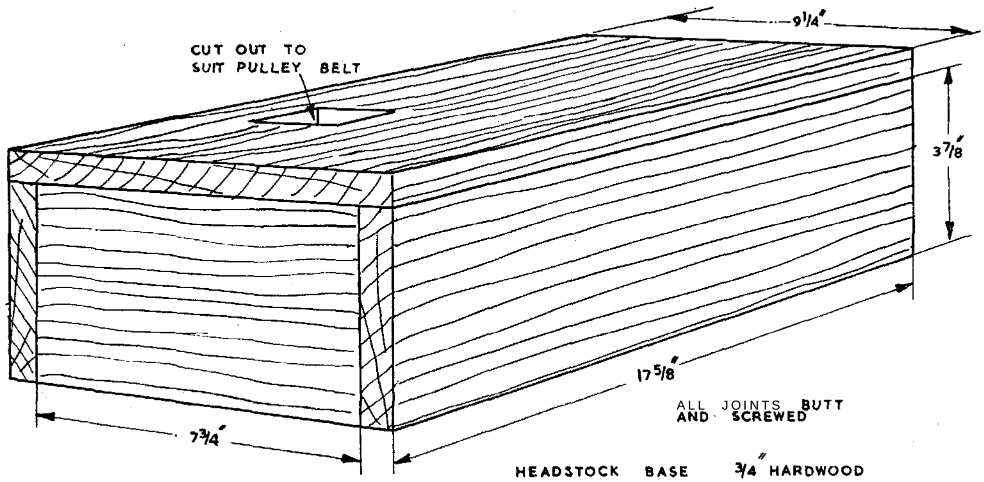
The clearance aperture for the main drive belt on the headstock distance separating-block can next be dealt with. The assembled headstock is placed in position on the base, and the holes for the holding-down bolts, allowing for belt aperture, are marked, drilled and cut-out. It is as well to mention that the type of belt I used for the primary drive was a length of $\frac{1}{4}$ in. round plastic-the type that is joined by heating the ends. The secondary belt was from a vacuum cleaner. Circular section plastic or leather belting can be used. Of the three beltings, leather is the noisiest. The assembled headstock is permanently bolted in position.

Mild steel was used for the mandrel. The stock was turned between centres to the dimensions shown. The finished diameter of the portion between the bearings, which were to carry the pulley, is $\frac{9}{16}$ in. This diameter can be $\frac{3}{4}$ in. if a piece of



ALL JOINTS BUTT AND SCREWED

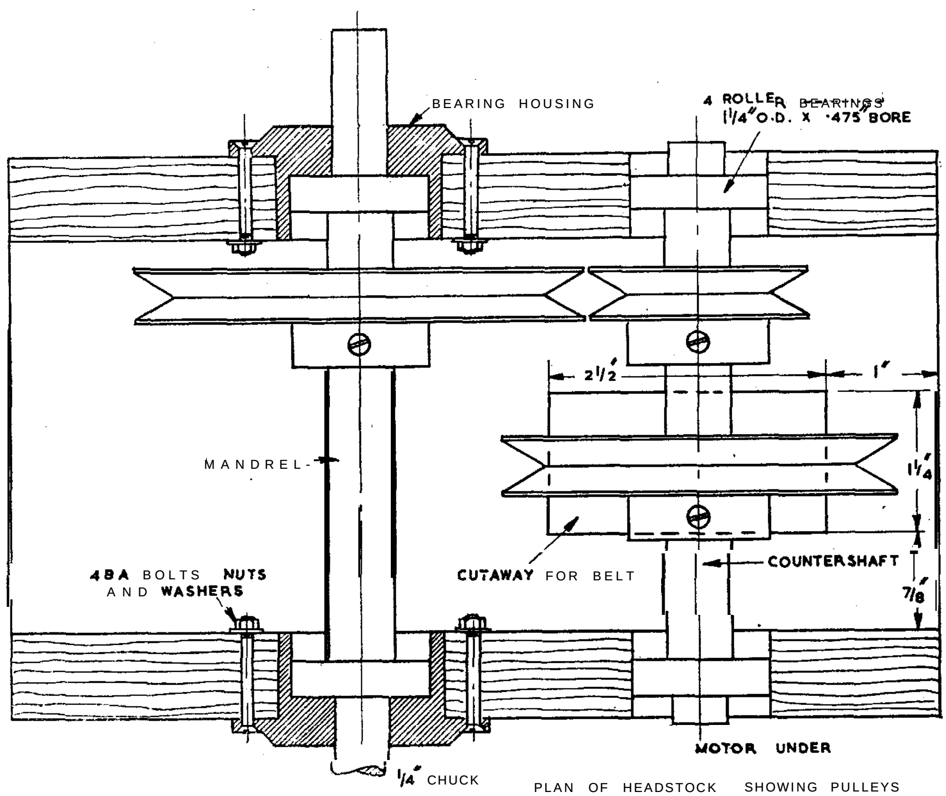
HEADSTOCK 3/4" HARDWOOD



round stock is at hand, but it must be skimmed-up to run true between centres. If this diameter is chosen, the pulley bore will be that much larger. The pulleys can be fabricated from metal, as has been described in MODEL ENGINEER in the past.

The chuck used is the ¼ in. Jacobs type, with a tapered bore. Any type of chuck may be used, as long as it is true. If the chuck has a taper, it is wise to turn the mandrel bearing and pulley sizes first, leaving the chuck taper until an accurate test is made of the angle the topslide has to be set over. Using a Jacobs chuck, a start can be made by setting the topslide over to 1¼ degrees, the incomplete mandrel being removed temporarily while a piece of round stock is chucked in the three-jaw.

To turn test-tapers by trial and error, adjust the topslide in between until a locking fit has been obtained.



PLAN OF HEADSTOCK SHOWING PULLEYS

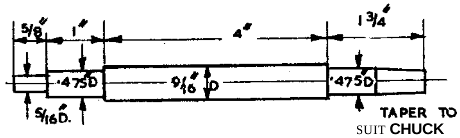
Before testing, smooth the tapers each time with fine emerypaper. When a satisfactory fit has been obtained. lock the tonslide and do not remove the tool. Remove the test-piece from the chuck, and mount the mandrel between centres, taking fine cuts, and testing between each cut, with the chuck to be used. If the chuck is threaded on, approach the work with similar precaution.

Mild steel was again used for the wuntershaft, and it was turned likewise in between 'centres. The diameter of this can be the same as the mandrel. It is made long enough to be carried by the bearings in their housings. The headstock can be kept its correct distance apart at the top, with a block of wood, but it must not interfere with the free housing to take a turn-counter for winding operations.

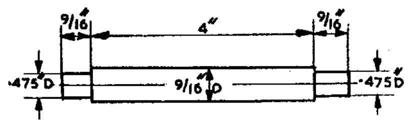
A bracket is made to carry the counter, and attached with $\frac{3}{16}$ in. countersunk nuts and bolts. This bracket also prevents the rear mandrel bearing from being forced out. That is, it prevents end-float of the mandrel, and is a means of adjusting it endwise by suitable packing washers bearing on the outer diameters of the bearings and the bracket.

The front mandrel-bearing housing is a more solid job because of its outer flange retainer. A flange can also be turned to the same proportions as this for the other bearings if desired. If a turn-counter is to be fitted, the mandrel should have a 2 BA thread tapped centrally. This can be done when held in the three-jaw chuck for ex-RAF unit. It is supplied with three leads. One is neutral, the others are for forward and reverse. It is a high-speed motor, with a shaft 1 in. long x $\frac{1}{4}$ in. diameter. Its speed is reduced via the stepped down pulleys to some 200 r.p.m. It is further reduced to selective speeds by the constructed rheostat, giving five speeds in all. Also, a control switch for forward or reverse is mounted on the front panel, as is the rheostat.

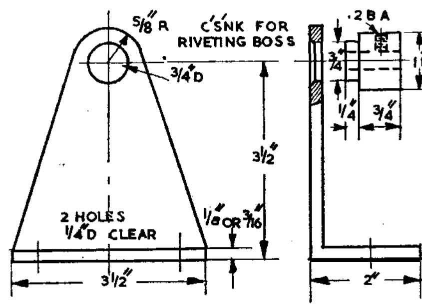
A warning light is mounted on the front panel. It is in circuit with the tension arm micro-switch, and when a snag occurs during coil-winding, the tension arm swings forward, taking up the slack. This expands the tension spring, which is attached to it and also to the micro-switch, and the latter cuts off the current. As the



MANDREL



COUNTERSHAFT



TAILSTOCK BRACKET

running of the pulleys, or prevent belt removal if endless belts are to be used. The headstock is eventually cased with hardboard or three-ply.

The top cover should be furnished with woodscrews, to facilitate inspection or change of belt. Black-japanned woodscrews are best for this. Hinges could also be used for the lid, but the screw method is the stronger. A toolrest can be made, just below centre height, to increase the use of the machine. Metal threaded distance-rods can also be used for the spacing of the headstock members. Whitworth $\frac{3}{8}$ in. screwed full length, with washers and nuts, is suitable. Alternatively bar left parallel between the headstock can be turned down and screwed $\frac{3}{8}$ in. Whit. at its ends.

The pulleys are made to the dimensions shown, and should be a sliding fit on the mandrel and crankshaft. They are placed within the headstock, and- the mandrel and crankshaft put through their respective bearing housings, the pulleys being threaded on. The bearings at one end of each spindle can be forced on before insertion *; the* rear bearings should be a slightly easier fit to tap on. The mandrel has been left longer to protrude outside the rear of the drilling. This is a means of securing a]gear wheel to the end of the mandrel, or a small pulley, to drive the turn-counter at an identical revolution to the mandrel. The alternative method is to shoulder the mandrel down to take a pulley.

Before casing the headstock, it is well to provide support blocks for the hardboard. Four of these are fitted at the angles. The blocks can be secured with either panel pins, or 1½ in. x No. 6 woodscrews. It is as well to drill through the headstock hardwood first with a handbrace, so that the pins or woodscrews, pass through it easily. They can be punched home or countersunk. The casing of the headstock is secured with $\frac{3}{4}$ in. panel pins. Joints in the woodwork are stopped with plastic wood.

The countershaft spindle is end-capped with simple discs of sheet metal. End-float can be dealt with as described earlier. The operator's light can be made from any materials at hand. It is situated at the top of the headstock. The wiring for this can be passed down within the headstock and through the base, and a switch fitted.

The motor for the drive is a 24 v. tension arm returns to normal the micro-switch remakes the circuit. When a snag occurs. the motor automatically -cuts out, and the warning light appears. The warning device could also be a buzzer.

A transformer is housed within the base of the machine. Its range is input 240 v., output 12/24 v. at 7 amp. Its windings were wound' on the machine described. The 24 v. tapping is used for the motor, and the 12 v. for the operator's light and the warning light.

If a motor of the mains type (operating direct from the mains voltage) is at hand, it would replace the transformer, and three-step pulleys could take care of the speed control. Vacuum cleaner belts can expand to enable a belt to be shipped over the pulley steps.

The tailstocks used are ex-RAF lever supports. They have been provided with longer barrels to support the spindles and take a locking lever. Suitably shaped angle-iron could have been used for the tailstocks, and provided with wllars to take the spindles and locking levers.

(To be continued on April 28)