

# Quieten the fan in your computer

*Are you plagued by a noisy fan in your computer? We show you a number of ways to go about making it a lot quieter.*

By LEO SIMPSON

Let's face it, users of personal computers have been really put upon. Not only do they have to put up with inscrutable instruction manuals and impenetrable software, they also have to listen to the noisy fans in their machines.

There are two main reasons why the fans in computers are so noisy. First, nearly all fans are rigidly mounted within the power supply case. That means that all the noise

they generate is amplified by the resonant metalwork of the computer.

Second, many of the fans are very noisy in themselves and many are noisy right from the day they were installed by the manufacturers. Some have slack and noisy bearings, some produce a lot of hum and some have poor blade design and so make a lot of wind noise.

But whatever the cause of the

noise problem, it is not helped by mounting the fan rigidly. In fact, many fans are rivetted to the power supply case.

## **What can you do?**

The first hurdle is to gain access to the fan. In many computers, this is not easy. The fan is built inside the switchmode power supply. It provides cooling for the power supply as well as the rest of the computer circuitry.

To gain access to the inside of the computer you will need the correct screwdriver or nutdriver. Using the wrong screwdriver can butcher the screws on your computer. At the very least, this looks messy. At worst, it may prevent you from getting inside the metalwork. So use

the correct screwdriver (see the article on screws and screwdrivers elsewhere in this issue).

There is one trap to be aware of in selecting the correct screwdriver. Some computers made in Asia use screws that look like the Phillips type. However, Phillips screwdrivers don't fit too well. You may find that Pozidriv screwdrivers are a better fit even though superficially, they are not Pozidriv screws.

Having extracted the power supply from the computer chassis, you now have to gain access to the interior. On IBM PCs, you may find that one of the screws holding the power supply case together has no screwdriver slot. This fiendish device is a "drive screw" and is designed to stop you from opening up the case.

If you have a good pair of pliers you may be able to get a grip on the head of this screw and so remove it. Failing that, you may have to cut a slot in the head, using a hacksaw or a small abrasive cutting wheel in a Dremel Moto-tool or Arlec Super-tool.

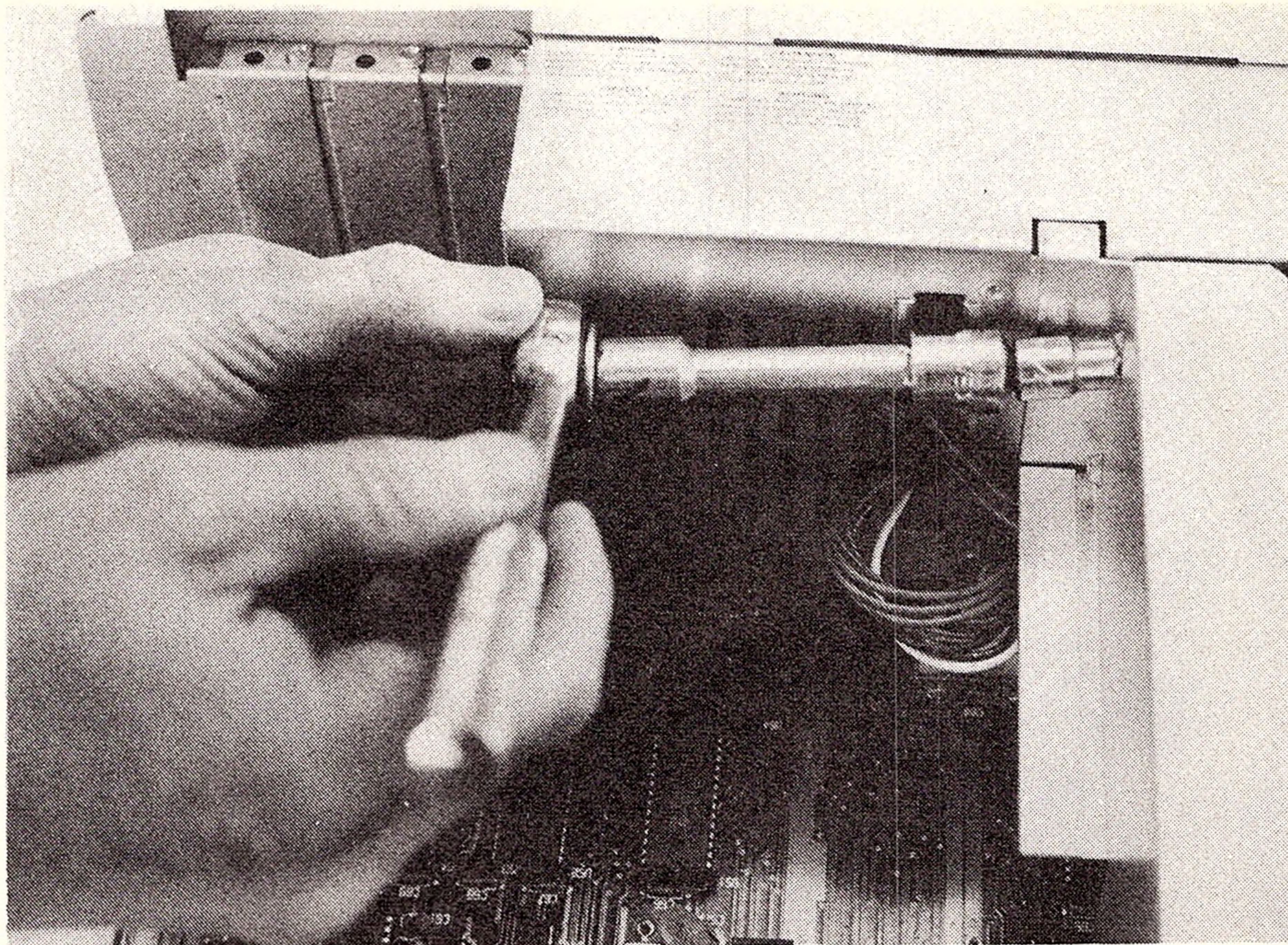
When you get the screw out, throw it away. You should replace it with a self-tapper having a proper slot or Phillips head.

The next job is to inspect the fan which will normally be attached to the lid of the case. It pulls air through holes in the case and blows it out through a hole or louvres in the rear of the computer metalwork.

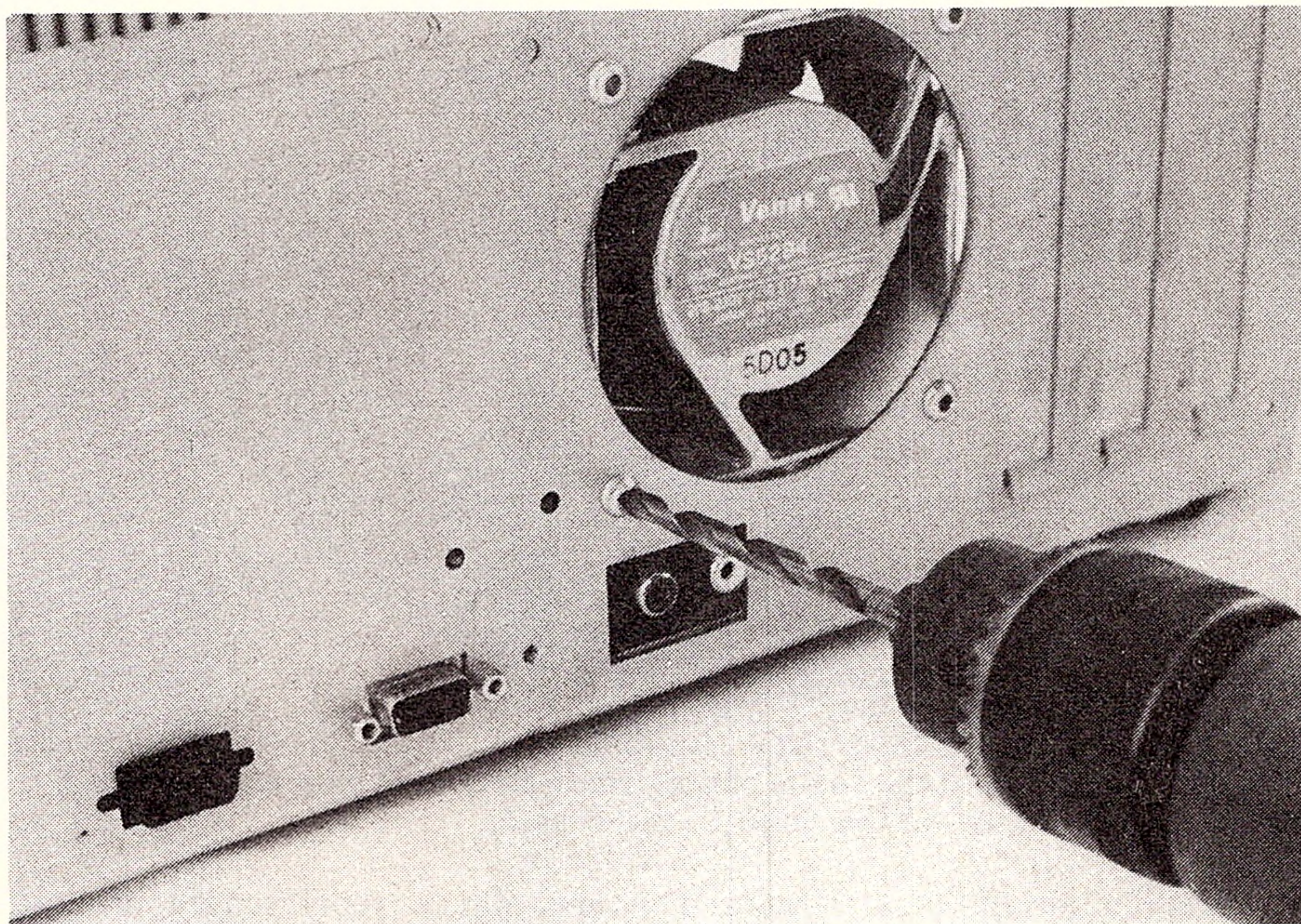
The first question to be answered is whether it is a DC or an AC fan. On most computers the fan will be a 12V DC model and it will usually be a brushless type. It makes sense for the manufacturers to use a 12V DC fan since it means they don't have to worry about supplying a 110VAC or 240VAC fan to match the AC supply line — the switchmode supply does it all for them.

## Reducing the voltage

Assuming that it is a 12V DC fan, you can usually gain a worthwhile reduction in noise merely by reducing the voltage fed to it. We suggest you try reducing the voltage to around 9V. This gives quite a marked reduction in noise while not making a big difference to the air-flow.



Removing the power supply from your IBM-compatible is a matter of using the correct nutdriver or 1/4-inch drive socket spanner. Don't forget to disconnect the mains cord before starting work.



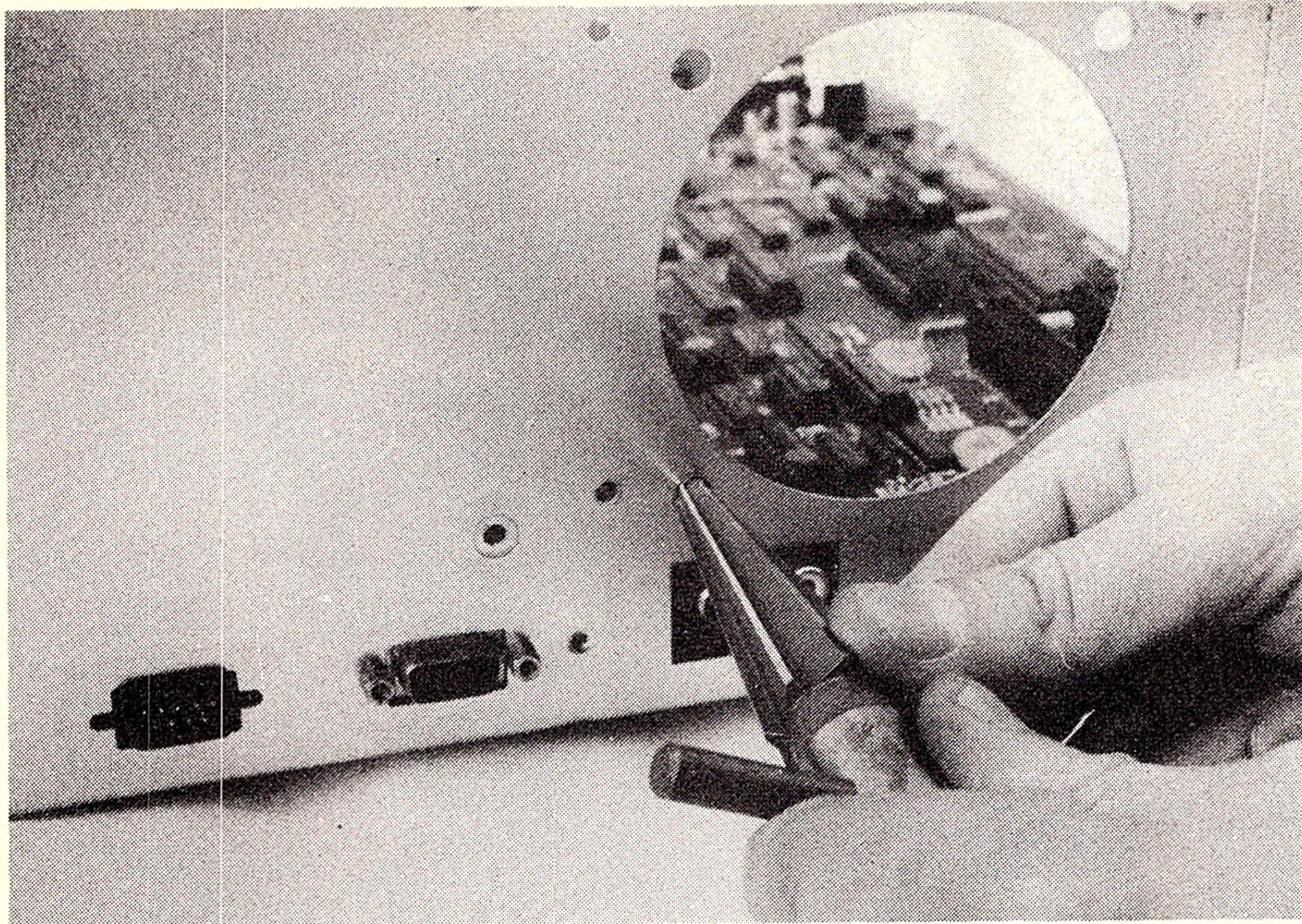
On many computers, such as this Tandy 1000, the fan will be rivetted to the case. Turn the chassis upside down while drilling out the rivets so that metal swarf does not fall into the computer.

Do not reduce the voltage to the fan below 8V. Many fan motors will not work reliably below 8V.

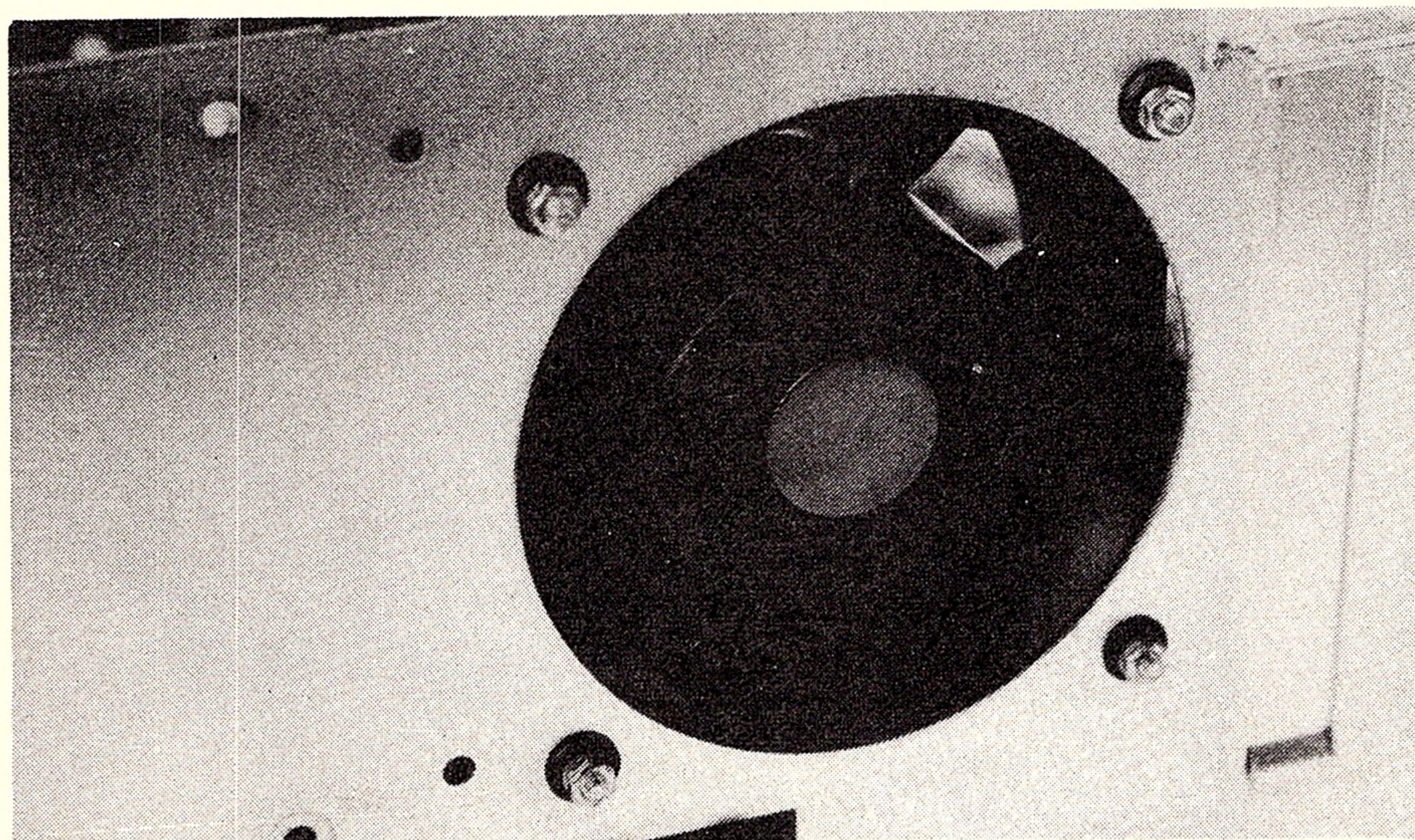
There are two ways to reduce the voltage to the fan. One is to connect a 2.7V or 3.3V 1W zener diode in series with one of the supply leads. The second method is to connect a 5 watt resistor in series with the supply leads. The value of the resistor will have to be calculated.

With better quality fans, the current drain or the wattage will be stamped on the fan housing. For example, a Commodore PC5 that we modified used a Papst model 8312 DC fan rated at 1.8 watts. To find the current drain, we divided the wattage by 12V to get a current drain of 150 milliamps (ie,  $1.8 \div 12 = 0.15A = 150mA$ ).

To calculate the resistor value,



To mount the fan compliantly, you need to ream out the mounting holes to take small grommets. Again, turn the chassis upside down so that any metal shavings fall out.



This photo shows how the fan mounting screws are held in grommets to prevent transmission of fan noise to the chassis.

we then divided the wanted voltage drop by the current:  $R = 3 \div 0.15 = 20\Omega$ . Therefore, we could have used a  $22\Omega$  or  $18\Omega$  resistor, rated at 5 watts.

### Zener diode

If you don't know the fan's current drain, it is easier to use a zener diode to drop the voltage, because no calculations are required.

To fit the zener diode (or resistor) in place, cut the positive supply wire to the fan and strip about 6mm of insulation from the two wire ends. Tin the wires with solder and

then slip a short length of heat-shrink sleeving (say 30mm) over one wire. Now clip the leads to the zener so that they are about 10mm long.

Solder in the zener diode so that the positive end (cathode — the end with the stripe) is connected to the incoming supply. The negative end connects to the fan. That done, slide the sleeving over the zener, to cover both connections, and shrink it in place.

### Compliant mounting

While reducing the voltage to a

DC fan can give a worthwhile reduction in noise, you can obtain a much bigger reduction by mounting the fan compliantly.

This involves the use of screws and nuts supported by small grommets. The grommets provide mechanical isolation for the fan and cut down on the transmission of noise through to the power supply case and then to the rest of the computer's metalwork.

Fig.1 shows the method of mounting the fan. The four screw holes in the lid of the power supply case are drilled out to take small grommets. We used small grommets made by Advanx, type A1, and these needed a chassis hole 1/4-inch in diameter.

Then the fan is secured using 3mm screws, nuts and washers.

Often, as we mentioned above, the fan will be rivetted in place. This means that you will have to drill the rivets out. Use a drill which is no larger than necessary. We suggest a 3/16-inch or 7/32-inch drill. Then use a tapered reamer to open the holes in the power supply cover to 1/4-inch.

Don't drill the holes to this size as there is a chance that the resulting holes will not be round.

Having removed the fan, you can decide whether or not to replace it. Having proceeded this far, you may like to try the effect of oiling the bearings. You will need to strip off the cover on the motor shaft and then use a pair of fine circlip pliers to remove the circlip and then disassemble the fan.

Take care with the disassembly. If the fan has roller bearings they are likely to be spring-loaded and will flick out to be lost forever.

### Fan replacement

Frankly, we don't think it is worth trying to oil the fan motor's bearings. It is just too much trouble. If the bearings are noisy, we suggest replacement of the fan.

If you do decide to replace the fan, it is better to go for a fan rated at 220VAC instead of one rated at 12V DC. All things being equal, a 220VAC fan operating at 50Hz will always be quieter than a DC fan, and this seems to apply even to brushless (electronically commutated) versions.

On the other side of the coin, DC fans apparently last longer than AC fans because they have less internal heat dissipation.

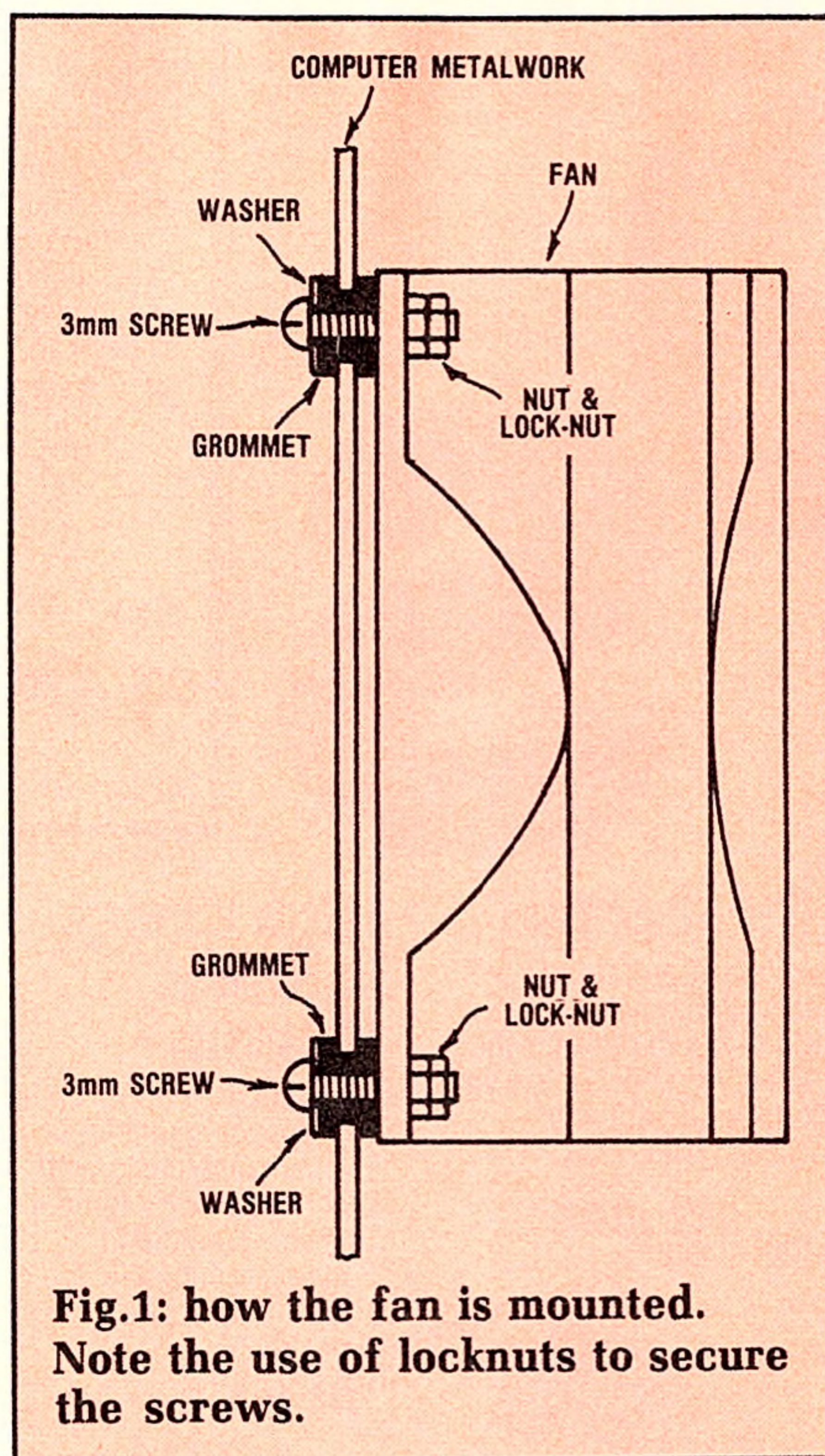
The latter point is significant because the noisiest fans we have come across have been AC fans with failed bearings. When you replace the fan, choose a brand of known good quality. You don't want to go through this same process in six months' time.

As far as we know, fans are not specifically made for operation at 240VAC but those rated at 220VAC will work quite happily. If the fan in your computer is a nominal 3-inch type (ie, 80 x 80mm), we recommend the Papst model 8850. This is a very quiet fan with a rated capacity of 21.8 CFM (cubic feet per minute).

If you are going to purchase a fan of Taiwanese origin, we suggest you test it for noise before fitting it. We have found that some Taiwanese fans are not reliable.

### Cautions and provisos

Before you decide to dive into



**Fig.1: how the fan is mounted.**  
Note the use of locknuts to secure the screws.

your machine, there are some points to consider. First, don't on any account meddle with a machine which is still under guarantee. Any

modification, no matter how trivial, may void the guarantee.

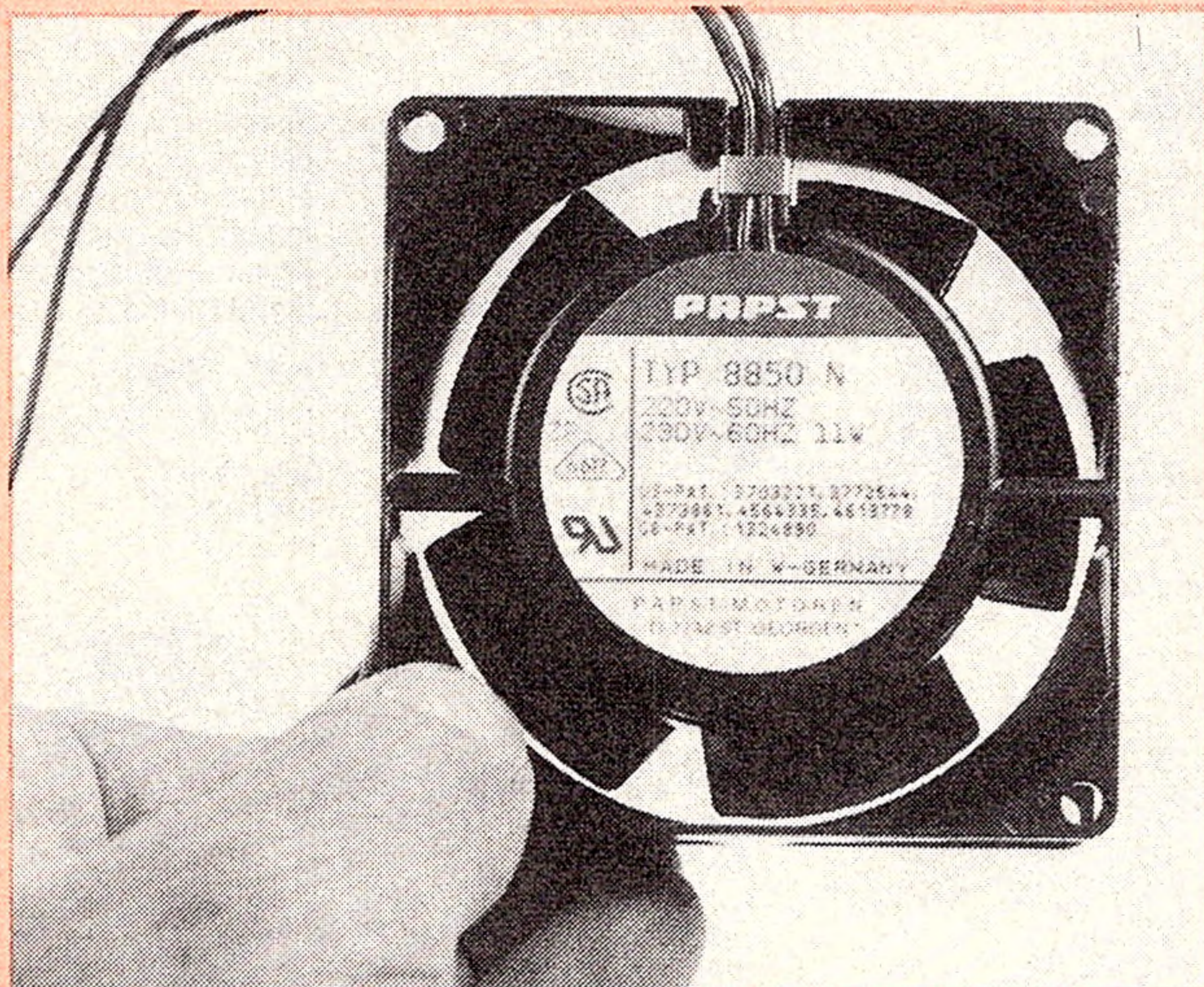
Second, if your computer is chock-a-block with peripheral boards and a hard disc drive, it may not be wise to reduce the voltage to the fan. It is possible that reduced voltage to the fan may cause the ventilation to be inadequate.

Third, if your computer has a hard disc drive, it is highly likely that most of the noise comes from the hard drive rather than from the fan. You can tell if this is the case by blocking off the fan vent with your hand.

If this causes a big reduction in noise, then it will be worthwhile to proceed with the above modifications. If not, leave it alone.

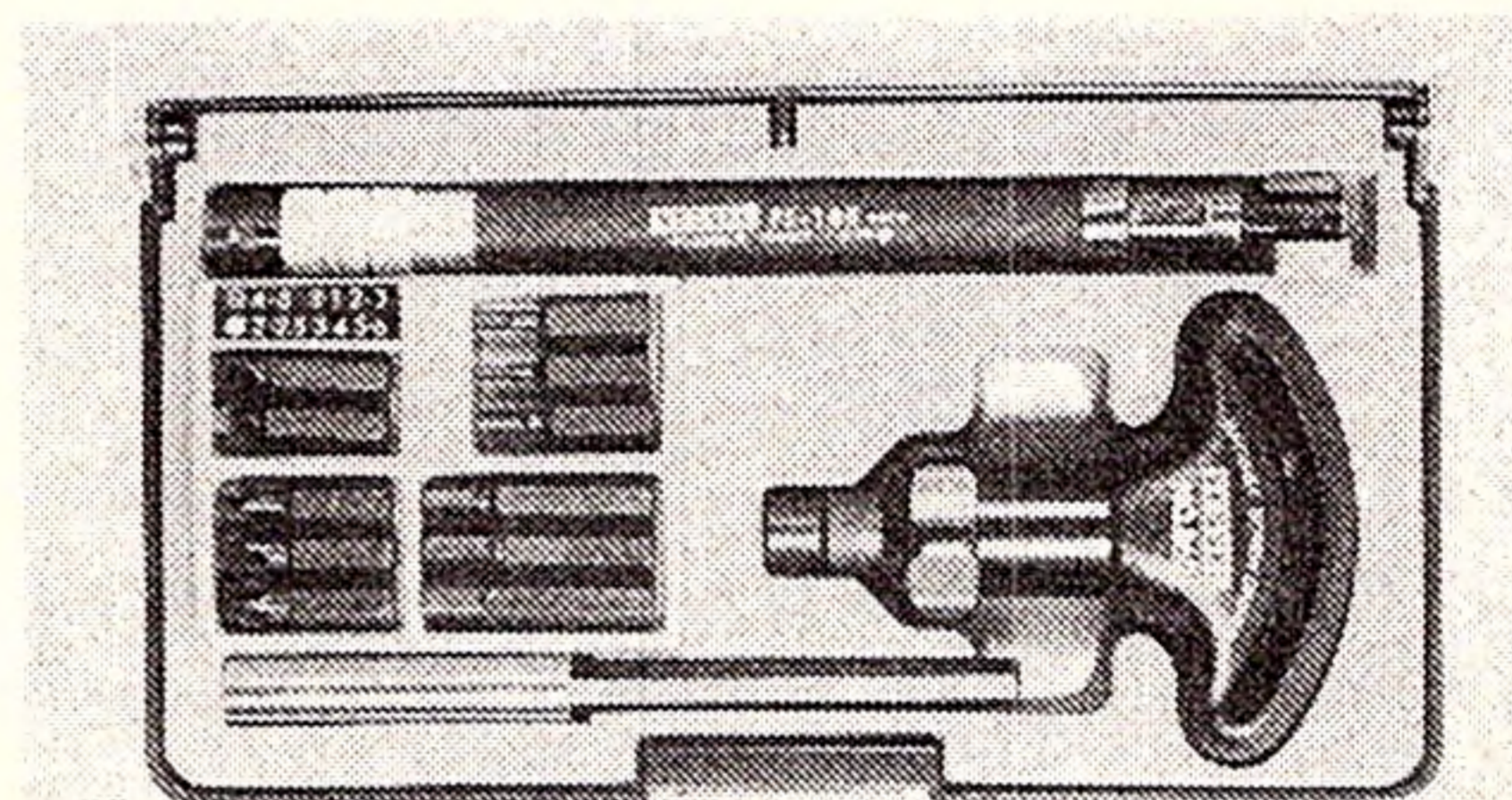
A final point to consider is the machine's ultimate resale value. If any modifications you make are visible and look amateurish, you will surely reduce the machine's resale value. Perhaps a reduction in noise is more important than resale value but it is still a point you should consider before proceeding with modifications.

## The Papst Model 8850: a quiet fan from Germany



For a really quiet fan, we recommend the model 8850 from Papst. This uses an induction motor with an external rotor motor. It is rated for 220VAC operation but operates quite happily at 240VAC. Its noise figure is quoted at 24dB A-weighted at an output of 21.8 CFM. This figure is obtained with the fan suspended in rubber bands. So, for minimum noise it needs to be mounted compliantly as described in this article.

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