Balancing of Wheels with Tires fitted

In the manufacture of wheels and tires, the occurrence of unbalance is unavoidable. In order to eliminate the detrimental effects of static and dynamic unbalance on steering characteristics and the wheel bearings, it is the general practice today to balance the wheels with tires fitted. Wheel balancing for high-speed vehicles is particularly important, and must therefore be carried out with particular care.

Unbalance is understood to mean an unequal mass distribution in a revolving body.

Static unbalance arises in a wheel with the tire fitted, when mass distribution about the axis of rotation is uneven. This kind of unbalance manifests itself in wheel shimmy or wheel-bouncing when the car is in motion.

Dynamic unbalance is present when mass distribution, seen from the central plane of the wheel, is uneven. This kind of unbalance manifests itself in wheel tramp, when the car is in motion. Balancing of wheels must be carried out carefully in order to achieve smooth steering. Excessive unbalance leads to premature destruction of the wheel bearings and premature wear in the steering assembly units, particularly at high speeds.

The generally adopted method of clamping weights between the tire and the wheel flange is not permissible for reasons of safety.

For this reason, balancing weights in Model 190, as in other Mercedes-Benz models, are fitted and locked in slots on the wheel disk. This method of attachment is the surest method of preventing the balancing weights from working loose. On the circumference of each wheel disk are four slots, situated at 90° intervals.

It is extremely rare that the angle of unbalance happens to coincide with one of the four wheel-disk slots.

Any force which is determined by angle and magnitude, can, however, be resolved, in a very simple manner, into two related components, at 90° to each other. This resolution of forces is also applied in this case by resolving the magnitude of unbalance into the two vertical components which pass through the slots in the wheel disk. This practice, which is common in mathematics, is used in correcting both static and dynamic unbalance. The magnitude and angle of static and dynamic unbalance can be determined together or separately, depending on whether the balancing machine which is available determines the static and dynamic unbalance together, or separately in two planes. For this reason, the four slots are situated on both sides of the wheel disks. It is advisable to follow the instructions supplied by the manufacturer of the balancing machine.

The large Schenk balancing machine resolves angle and magnitude of unbalance automatically into the components corresponding to the two slots.

If no fully-automatic machine is available, it is necessary first of all to determine the angle and magnitude of unbalance by some other method. To resolve the unbalance a so-called polar diagram is employed (Fig. 40 — 2/1).

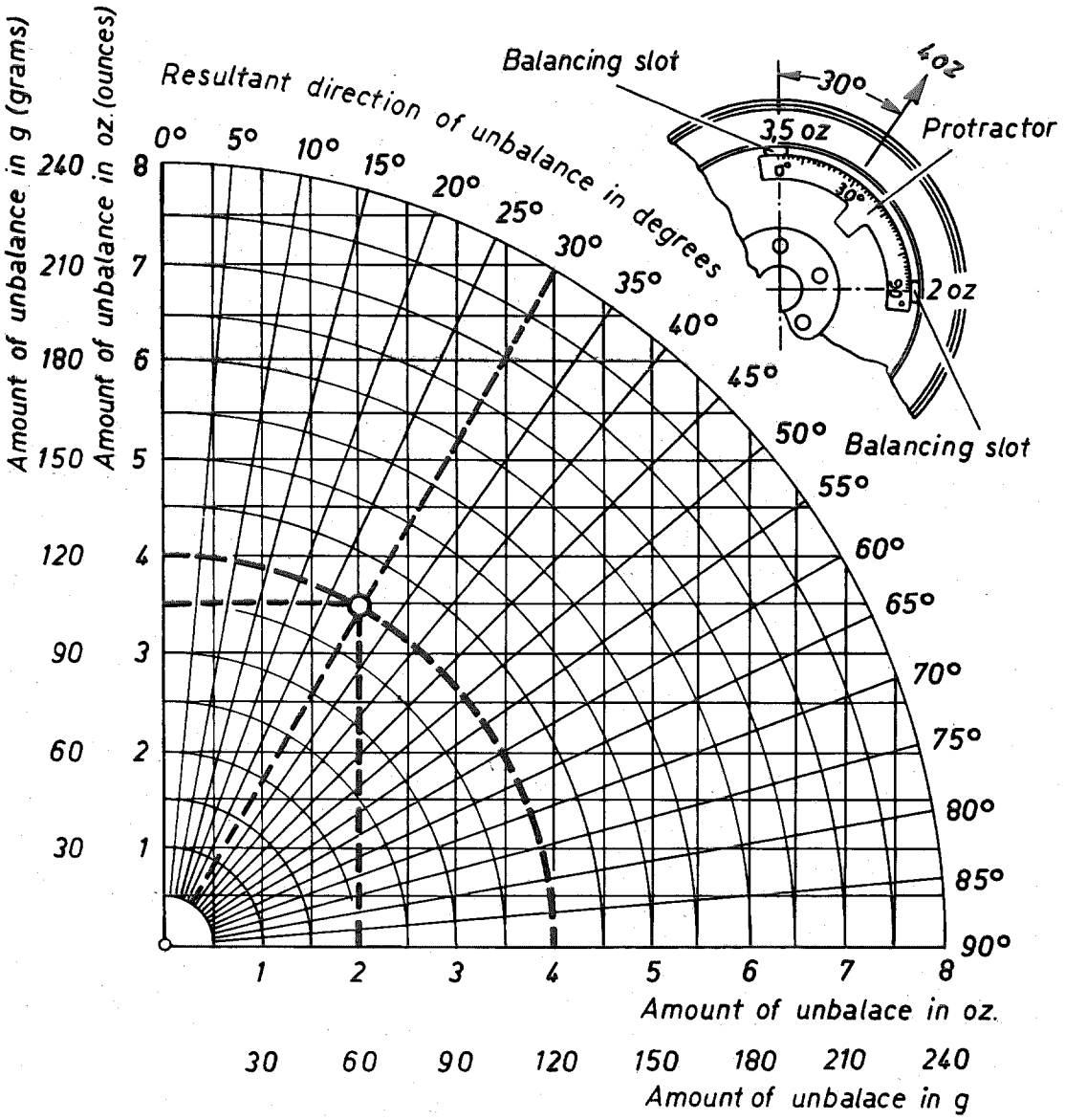

Fig. 40 — 2/1

The following procedure should be adopted:

1. The angle of unbalance must be marked on the tire or the rim and measured in degrees with a protractor (see Fig. 40 — 2/1). Place the protractor in position so that the 0 mark is lined up with one balancing slot and the 90 mark is lined up with the other.

Note: If a regular protractor is not available one can very easily be made in the workshop.

2. Example:

   Unbalance = 80 g.
   Angle = 30°.

   Now find on the polar diagram the intersection of the arc for an unbalance of 80 grams with the 30° radial.

   Proceeding from the point of intersection, the component for the 0° slot is seen on the vertical axis scale to be 70 grams, and on the horizontal axis scale the component for the 90° slot is 40 grams (see Fig. 40 — 2/1, thick lines).

3. After the value of the components has been established on the polar diagram, use a standard commercial tire clamp to fit the appropriate weights into the balancing slots. In doing this, use the tire clamp to press the tire off the rim and insert the sprung steel blade of the weight into the slot and lock it in position (Fig. 40 — 2/2).

   The balancing weights are available in a range from 25 grams to 155 grams in steps of 10 grams. If a weight is required which lies between these values, take the next heaviest balancing weight and reduce it to the requisite weight.

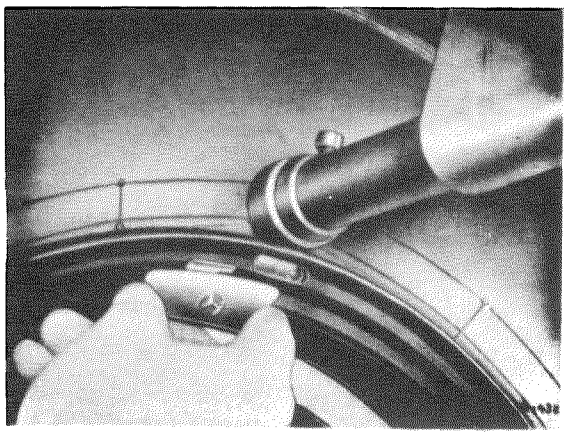

Fig. 40 — 2/2

Note: A polar diagram is attached to some balancing machines to facilitate rapid determination of the weights to be inserted into two of the slots.

Always wash the wheels with tires fitted before balancing.