

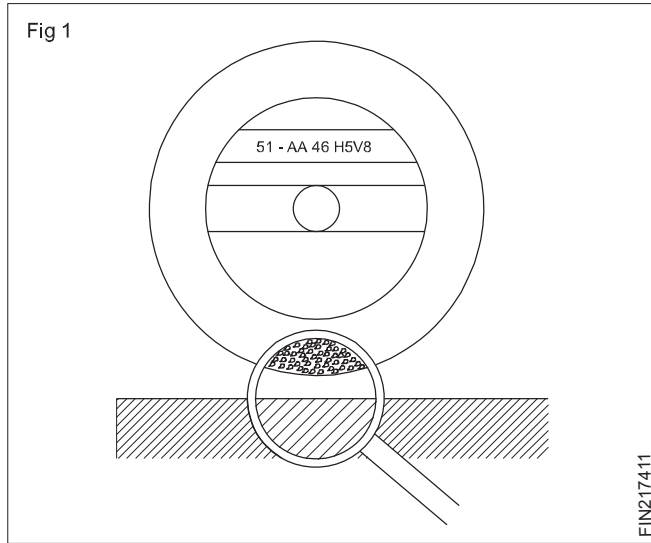
Standard marking system for Grinding wheels

Objectives: At the end of this lesson you shall be able to

- interpret the marking on a grinding wheel
- specify a grinding wheel.

Introduction

Standard wheel - markings specify all the important wheel characteristics. The marking system comprises of seven symbols which are arranged in the following order. (Fig 1)



Example (Marking system)

51 - A 46

Specification of grinding wheels

A grinding wheel is specified by the standard wheel markings like diameter of the wheel, bore diameter of the wheel, thickness of the wheel type (Shape) of the wheel.

Example

32 A 46 H8V

250X20X32-

Straight wheel

Table 1 shows the relative position measuring of the marking system

TABLE 1

Position 0	Position 1	Position 2	Position 3	Position 4	Position 5	Position 6
Manufacturer's symbol for abrasive (Optional)	Type of abrasive grit size	Grain size	Grade	Structure (Optional)	Type of bond	Manufacturer's own mark (Optional)

51

A

46

H

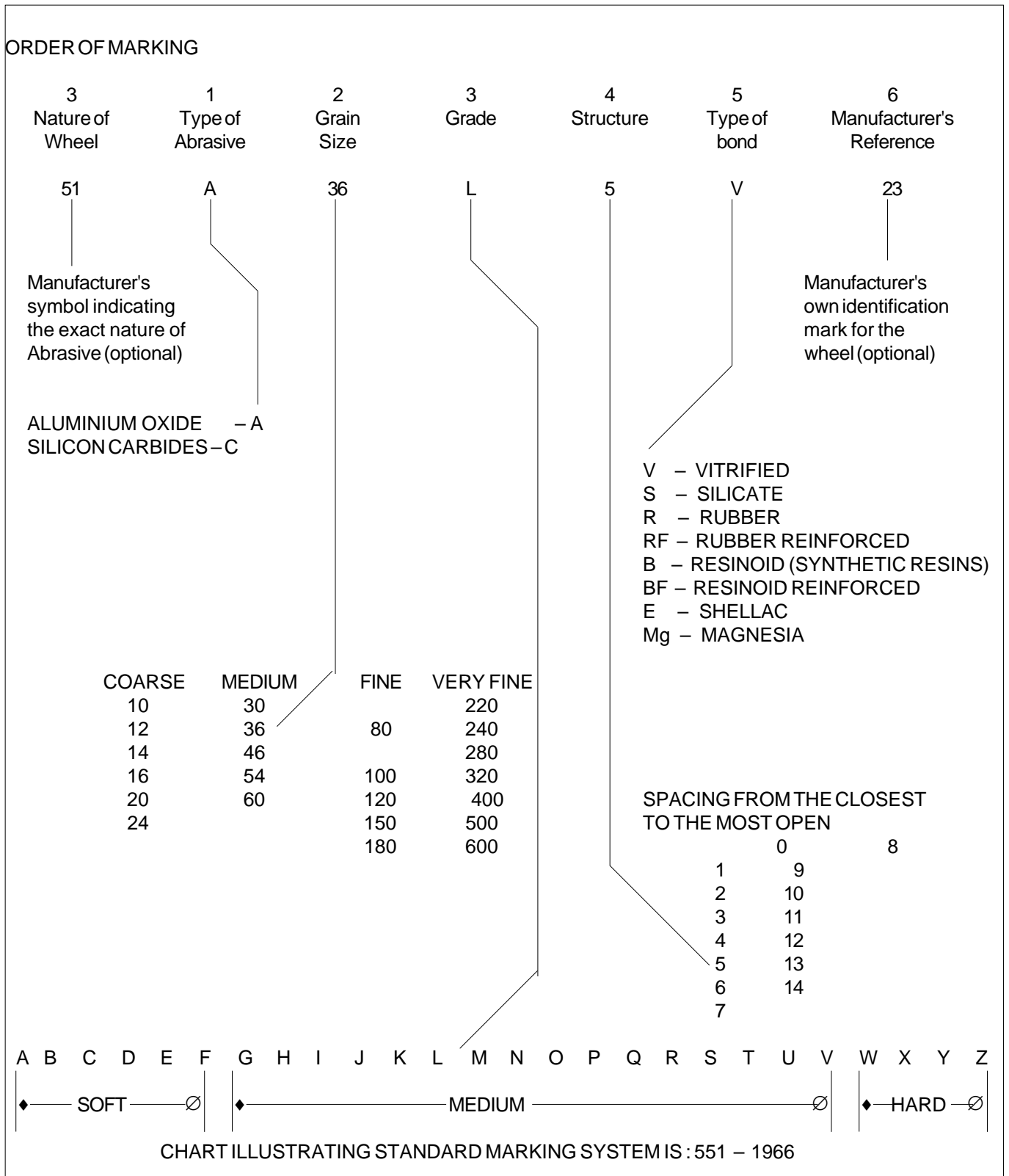
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V

8

Chart illustrating the standard marking system is : 551-1966 (Table - 2)

TABLE 2



Construction of the grinding wheel

Objectives: At the end of this lesson you shall be able to

- state the different types of abrasives and their uses
 - state the different grain sizes and their uses
 - state the different grades of grinding wheels
 - state the structure of a grinding wheel
 - name the bonding materials used for grinding wheels.
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In order to suit the grinding wheel for different work situations, the features such as abrasive, grain size, grade, structure and bonding materials can be varied.

A grinding wheel consists of the abrasive that does the cutting, and the bond that holds the abrasive particles together.

Abrasives

There are two types of abrasives.

Natural abrasive

Artificial abrasive

The natural abrasives are emery and corundum, These are impure forms of aluminium oxide.

Artificial abrasives are silicon carbide and aluminium oxide.

The abrasives are selected depending upon the material being ground.

'Brown' aluminium oxide is used for general purpose grinding of tough materials.

'White aluminium oxide is used for grinding ferrous and ferrous alloys.

'Green' silicon carbide is used for very hard materials with low tensile strength such as cemented carbides.

Grain size (Grit size)

The number indicating the size of the grit represents the number of openings in the sieve used to size the grain. The larger the grit size number, the finer the grit.

Grade

Grade indicates the strength of the bond and, therefore, the 'hardness' of the wheel. In a hard wheel the bond is strong, and securely anchors the grit in place and, therefore, reduces the rate of wear. In a soft wheel, the bond is weak and the grit is easily detached resulting in a high rate of wear.

Structure

This indicates the amount of bond present between the individual abrasive grains and the closeness of the individual grains to each other. An open structure wheel will cut more freely. That is, it will remove more metal in a given time and produce less heat. It will not produce such a good finish as a closely structured wheel.

Bond

The bond is the substance which, when mixed with abrasive grains, hold them together, enabling the mixture to be shaped to the form of the wheel, and after suitable treatment to take on the necessary mechanical strength for its work. The degree of hardness possessed by the bond is called the 'grade' of the wheel, and indicates the ability of the bond to hold the abrasive grains in the wheel. There are several types of bonding materials used for making wheels.

Vitrified bond

This is the most widely used bond. It has high porosity and strength which makes this type of wheel suitable for high rate of stock removal. It is not adversely affected by water, acid, oils or ordinary temperature conditions.

Silicate bond

Silicate wheels have a milder action and cut with less harshness than vitrified wheels. For this reason they are suitable for grinding fine edge tools, cutters etc.

Shellac bond

This is used for heavy duty, large diameter wheels where a fine finish is required. For example, the grinding of millrolls.

Rubber bond

This is used where a small degree of flexibility is required on the wheel as in the cutting off wheels.

Resinoid bond

This is used for speed wheels. Such wheels are used in foundries for dressing castings. Resinoid bond wheels are also used for cutting off. They are strong enough to withstand considerable abuse.

Wheel inspection and wheel mounting

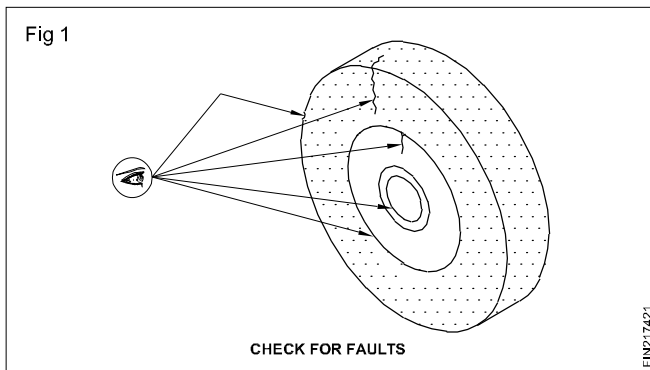
Objectives: At the end of this lesson you shall be able to

- brief steps involved in grinding wheel inspection
- state the procedure for mounting of grinding wheel.

Wheel inspection

The wheel selected may have been damaged during transport or storage and must be carefully inspected before use.

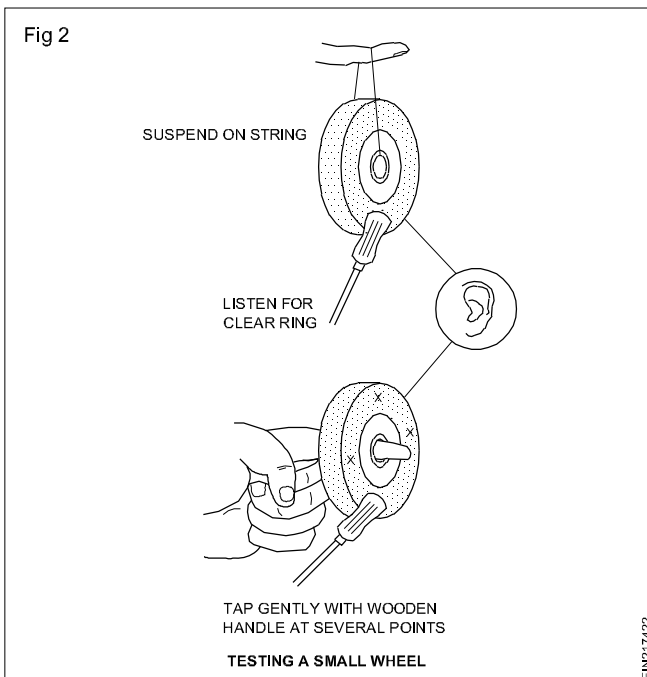
Visual inspection (Fig 1)



Look for

- Broken or chipped edges.
- Cracks
- Damaged mounting bushing
- Damaged paper washers

Testing for cracks (Fig 2)



Test a wheel for cracks by the following method

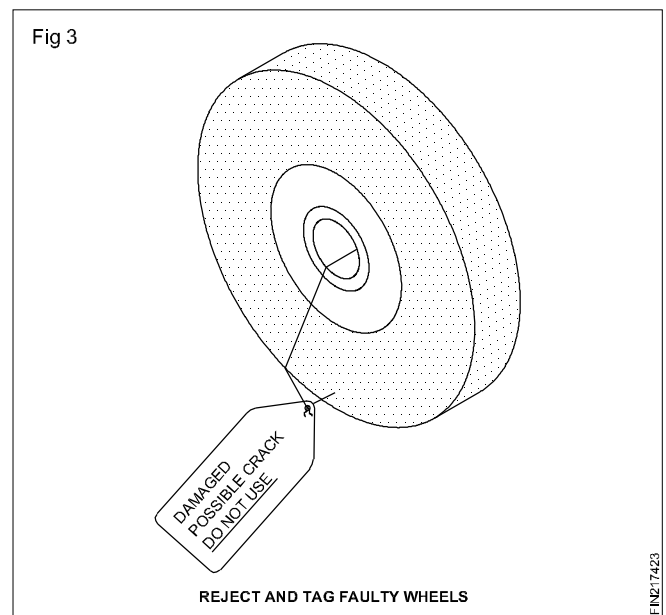
- Suspend the wheel on a piece of string or support it with one finger through the bushing.
- Allow the wheel to hang free.
- Tap the wheel with a non-metallic object such as a small wooden mallet or tool handle.
- A clear ringing sound indicates that the wheel is not cracked.
- A dull sound means that the wheel is cracked and must not be used.

Warning

Discard any wheel that:

- Shows any sign of damage.
- Does not ring clearly when struck.

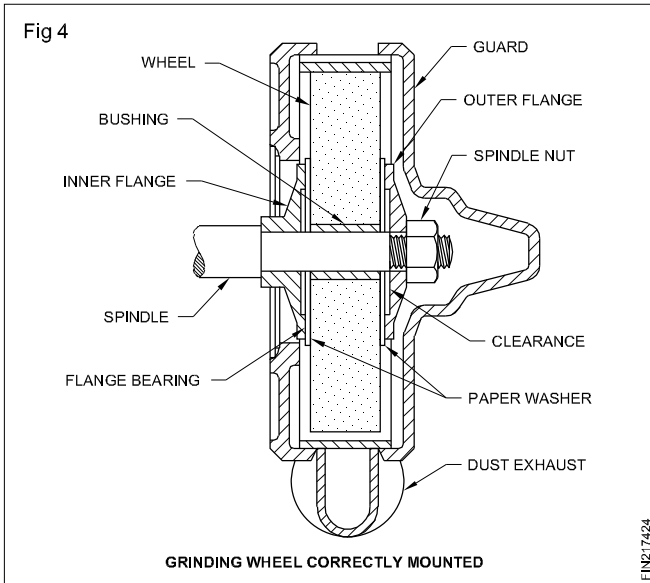
If you are in doubt, do not use the wheel. Clearly mark it and seek advice from your supervisor. (Fig 3)



Mounting the grinding wheel (Fig 4)

For correct and safe operation of a grinding machine it is essential to mount the grinding wheel correctly on the spindle.

Before fitting a new wheel, make sure that the spindle is completely clean and free from surface irregularities.



The spindle of the grinding machine includes an inner flange, an outer flange and a nut threaded on the spindle to hold the grinding wheel in position.

The inner flange must be fixed to rotate with the spindle.

Each flange has a dished face towards the surface of the wheel and has a true bearing surface at its area of contact.

Suitable paper discs are normally fitted to the wheel by the manufacturer.

Mounting procedure (Fig 5)

Mount the wheel on the spindle of the grinding machine as follows:

Check that the spindle surface is clean and free of irregularities. Clean with a dry cloth, if necessary.

Check that the inner flange is fixed to the spindle and that its bearing surface is clean and true.

Check that the wheel bush surface is clean and that it can fit easily, but not loosely, onto the spindle. Clean the bush before fitting the wheel on the spindle, if necessary.

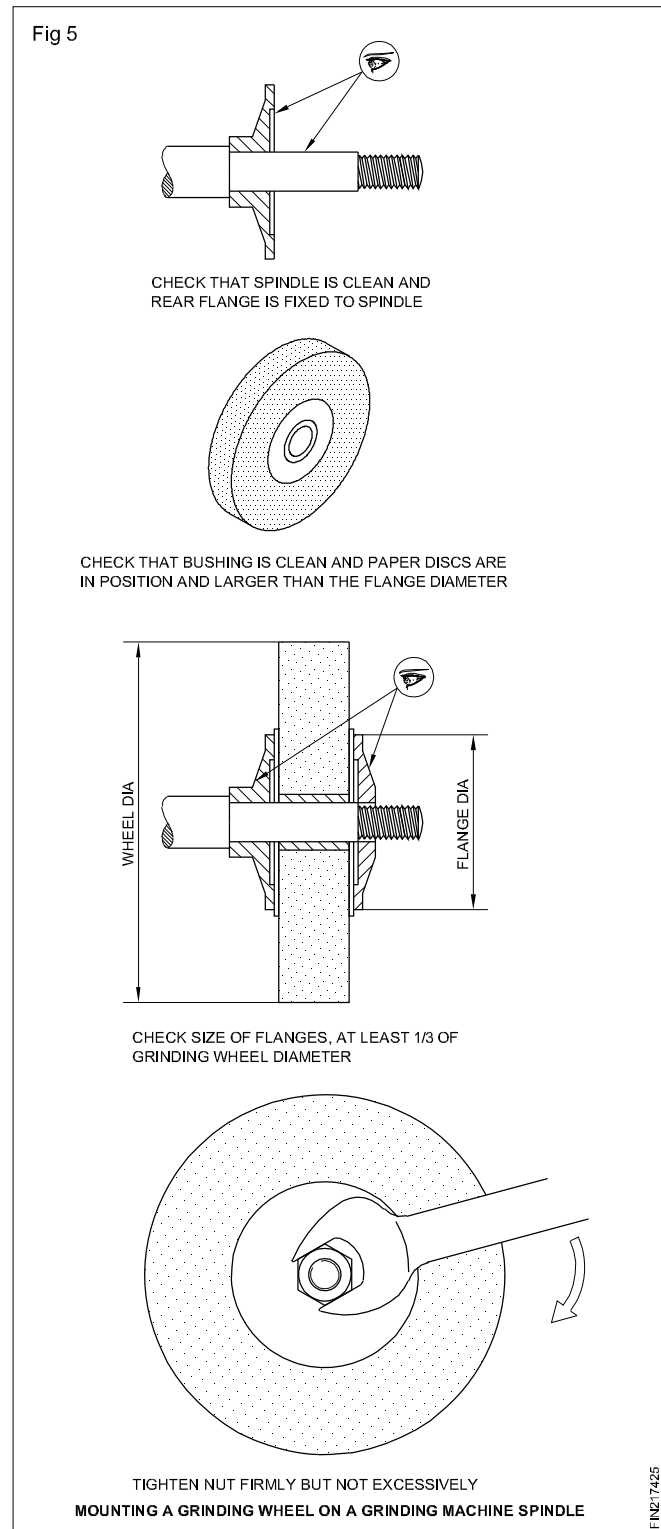
Check that each side of the grinding wheel is fitted with a soft paper disc of slightly larger diameter than the spindle flanges.

Check that the diameter of each spindle flange is at least one third the diameter of the grinding wheel.

Fit the grinding wheel to the spindle and place the outer spindle flange in position.

Tighten the spindle nut against the outer spindle flange with a spanner of the correct size.

Replace the wheel guard correctly



Caution

The nut should only be tightened sufficiently to hold the wheel firmly. If it is tightened excessively, the wheel may break.

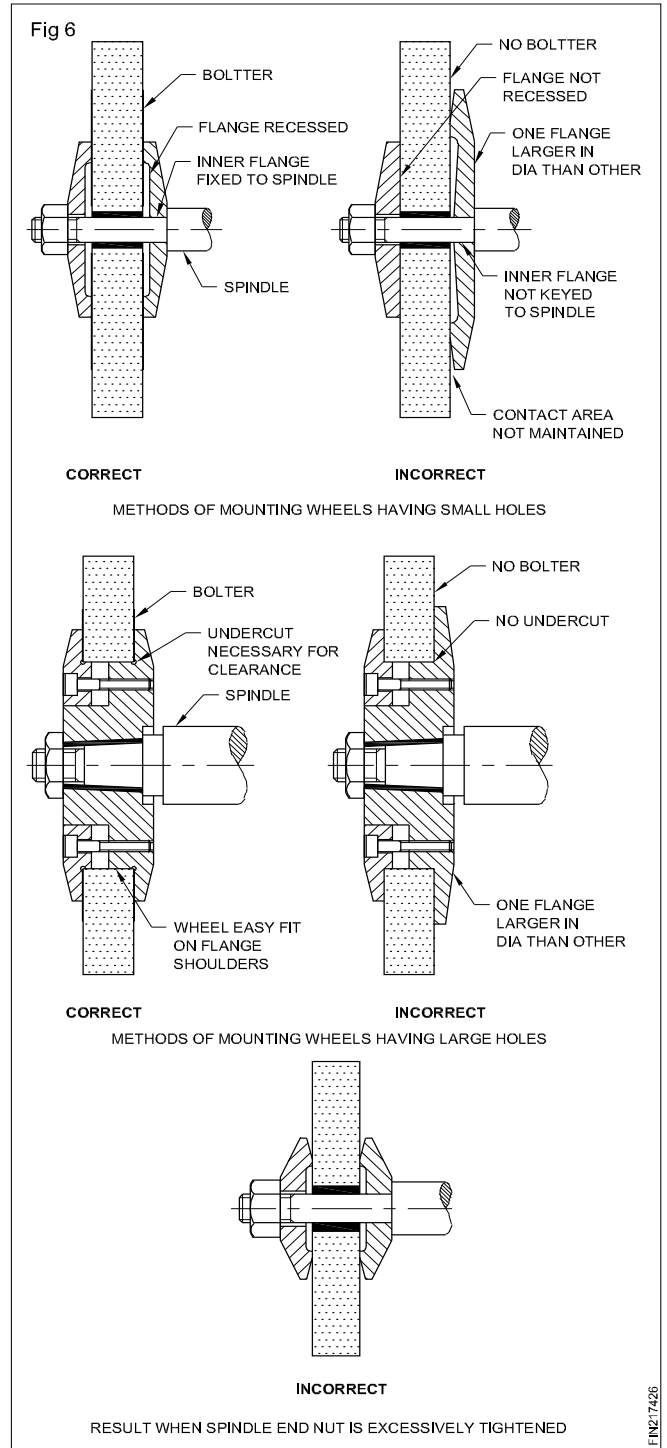
The nut is threaded onto the spindle in a direction opposite to the direction of rotation of the spindle.

- Run the wheel at its recommended speed in the grinding machine for at least a minute. Do not use the wheel during this period.

Points to note

Study these illustrations carefully and note the points to watch when mounting grinding wheels. (Fig 6)

Washer of compressible material such as card board, leather, rubber etc, not more than 1.5mm thick should be fitted between the wheel and flanges. This prevents any unevenness of the wheel surface is balanced and the tight joint is obtained.



Grinding wheel dressing

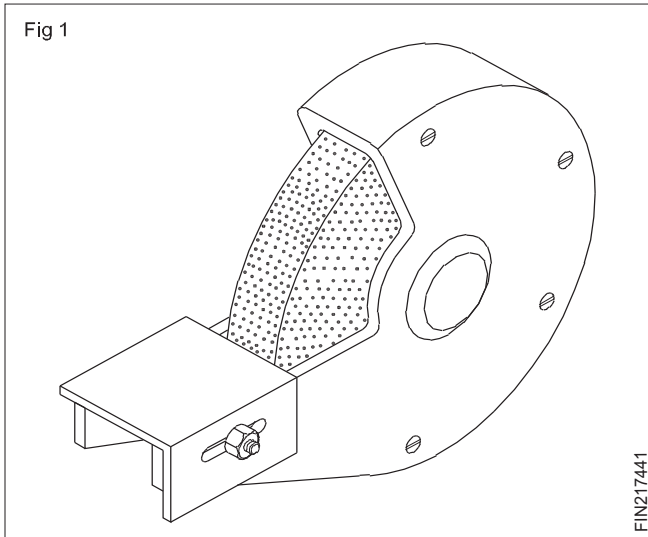
Objectives : At the end of this lesson you shall be able to

- differentiate between loading and glazing
- state the effects of loading and glazing
- differentiate between dressing and truing.

Grinding wheels become inefficient due to two main causes known as loading and glazing.

Loading

When soft materials such as aluminium, copper, lead etc. are ground, the metal particles get clogged in the pores of the wheel. This condition is called loading. (Fig 1)



Glazing

When a surface of the wheel develops a smooth and shining appearance, it is said to be glazed. This indicates that the wheel is blunt, i.e. the abrasive grains are not sharp.

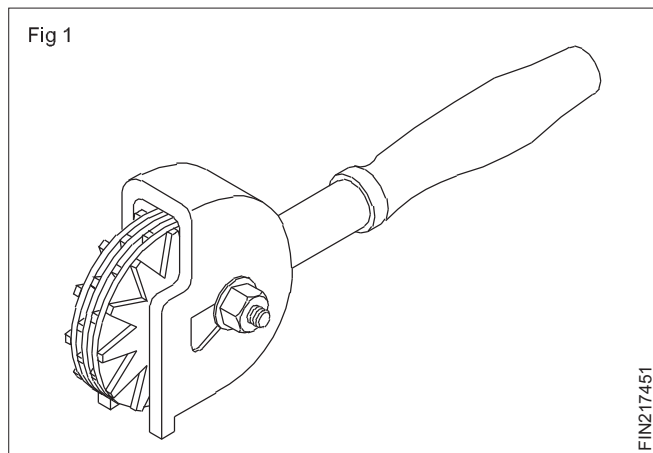
When such grinding wheels are used, there is a tendency to exert extra pressure in order to make the wheels cut.

Grinding wheel dressers

Objectives: At the end of this lesson you shall be able to

- name the common types of wheel dressers
- state the uses of each type of wheel dressers.

The wheel dressers used for off-hand grinders are star wheel dressers (Fig 1) (Huntington type wheel dresser) and diamond dressers.



The star wheel dresser consists of a number of hardened star-shaped wheels mounted on a spindle at one end and a handle at the other end.

While dressing, the star wheel is pressed against the face of the revolving grinding wheel. The star wheel revolves and digs into the surface of the grinding wheel. This releases the wheel loading and dull grains, exposing sharp new abrasive grains.

Excessive pressure on the grinding wheel will lead to the fracture of the wheel, excessive heating of the wheel, weakening of bonding of the wheel and bursting of the wheel.

Dressing

The purpose of dressing is to restore the correct cutting action of the wheel. Dressing removes the clogs on the surface of the wheel and the blunt grains of the abrasive, exposing the new sharp abrasive grains of the wheel which can be cut and brought to shape efficiently.

Truing

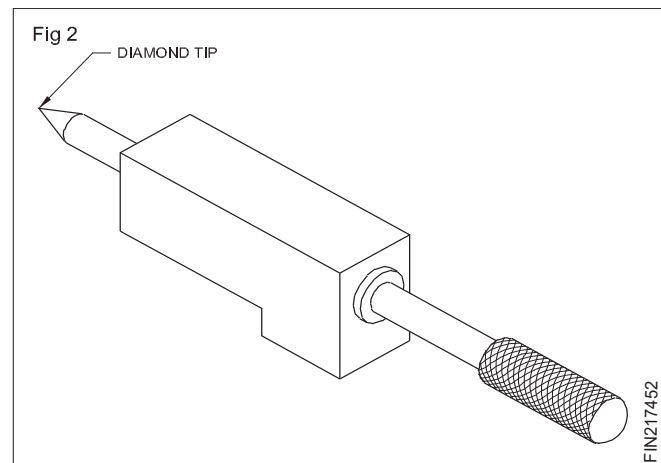
Truing refers to the shaping of the wheel to make it run concentric with the axis. When a new grinding wheel is mounted, it must be trued before use. The cutting surface of a new wheel may run out slightly due to the clearance between the bore and the machine spindle. Grinding wheels, which are in use, also can run out of true, due to uneven loading while grinding.

Dressing and truing are done at the same time.

Star wheels are useful for pedestal grinders in which a precision finish is not expected.

Star wheel dressers should be used only on wheels which are large enough to take the load.

Diamond Dressers (Fig 2)

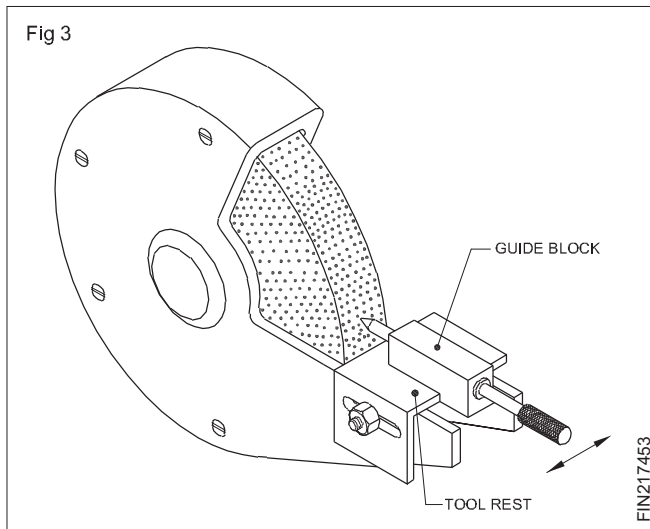


Bench type off-hand grinders used for sharpening cutting tools are usually fitted with smaller and rather delicate wheels.

These wheels are dressed and trued with diamond dressers.

Diamond dressers consist of a small diamond mounted on a holder which can be held rigidly on the work-rest.

How to use a wheel dresser (Fig 3)



For dressing and truing, the dresser is slowly brought in to contact with the wheel face and moved across.

The finish obtained depends on the rate at which the dresser is moved across the face.

For roughing, the dresser is moved faster.

For fine finish, the dresser is moved slowly.

Roughing will be efficient with a dresser that has a sharp point, while, for fine finishing, a blunt diamond dresser is more suitable.

Abrasive stick

When only a light dressing is required, abrasive sticks can also be used. There are abrasive materials made in the form of sticks for the convenience of handling.

Diamond dressers, if moved too slowly, can glaze the wheel.

Off-hand grinding with bench and pedestal grinders

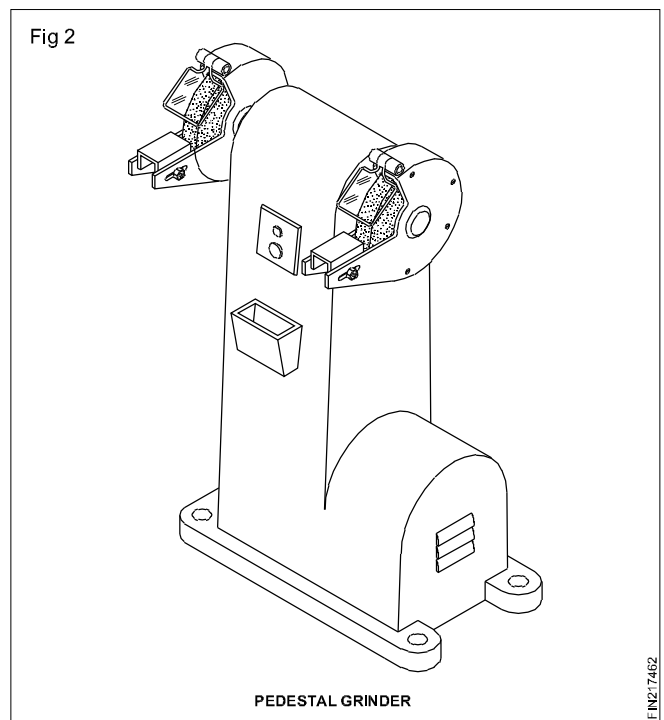
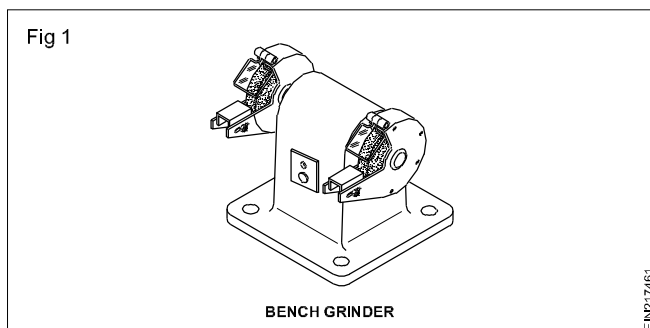
Objectives: At the end of this lesson you shall be able to

- state the purposes of off-hand grinding
- name the machines with which off-hand grinding is done
- state the features of bench and pedestal grinders.

Off-hand grinding is the operation of removing material which does not require great accuracy in size or shape. This is carried out by pressing the workpiece by hand against a rotating grinding wheel.

Off-hand grinding is performed for rough grinding of jobs and sharpening of scribers, punches, chisels, twist drills, single point cutting tools etc.

Off-hand grinders are fitted to a bench and pedestal (Figs 1 and 2)

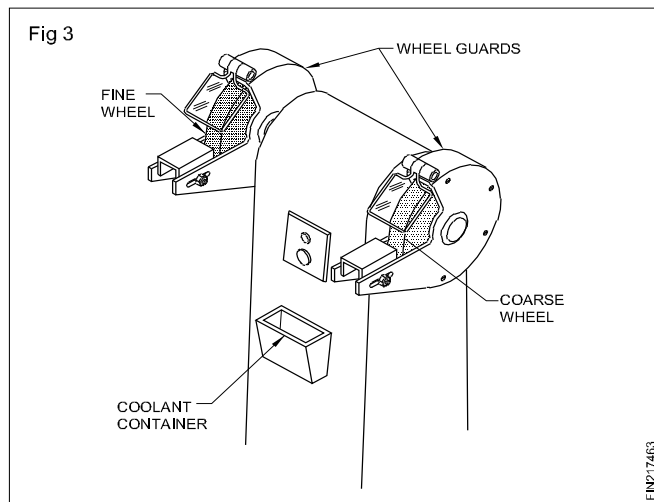


Bench grinders: Bench grinders are fitted on a bench or table, and are useful for light duty work.

Pedestal grinders: Pedestal grinders are mounted on a base (pedestal), which is fastened to the floor. They are used for heavy duty work.

These grinders consist of an electric motor and the spindle for mounting the grinding wheels. On one end of the spindle a coarse-grained wheel is fitted, and on the other end, a fine-grained wheel. For safety while working, wheel guards are provided.

A coolant container (Fig 3) is provided for frequent cooling of the work.



Adjustable work-rests are provided for both the wheels to support the work while grinding. These work-rests must be set very close to the wheels. (Fig 4)

Extra eyeshields are also provided for the protection of the eyes. (Fig 4)

