

Gear finishing Process

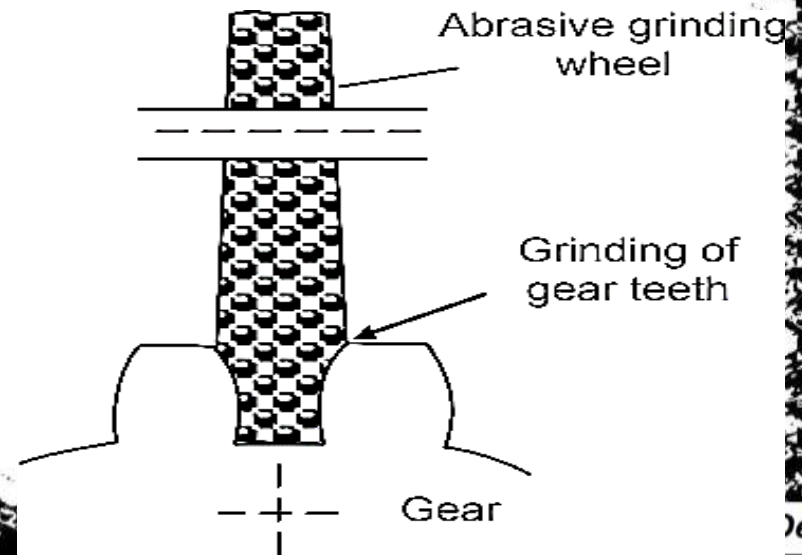


Grinding

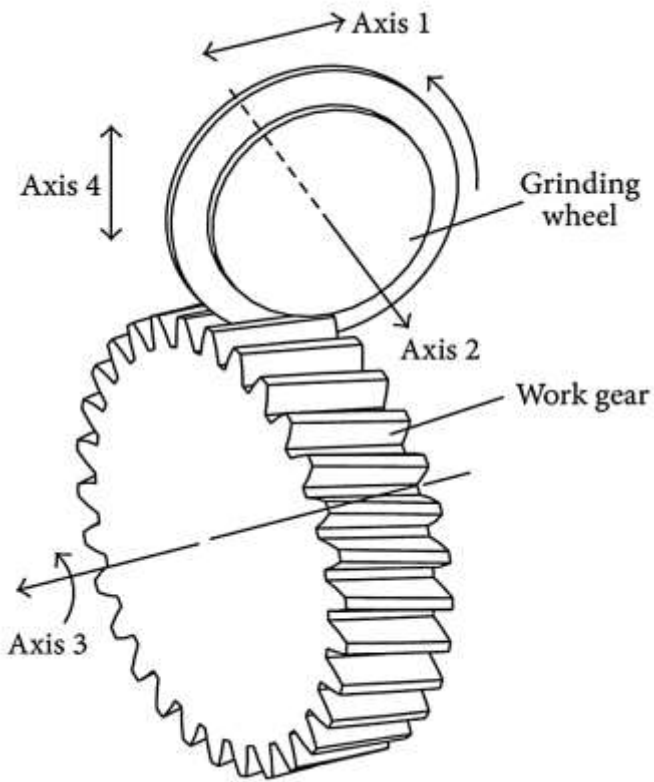
Principle:-

- It is a finishing process to remove considerable amount of the metal after heat treatment to obtain predetermined quality gear.
- In this operation abrasive grinding wheel of a particular shape and geometry are used for finishing of gear teeth.
- Gear to be finished is mounted and reciprocated under the grinding wheel. Each of the gear teeth is subjected to grinding operations this way. There are *three* general methods of gear grinding

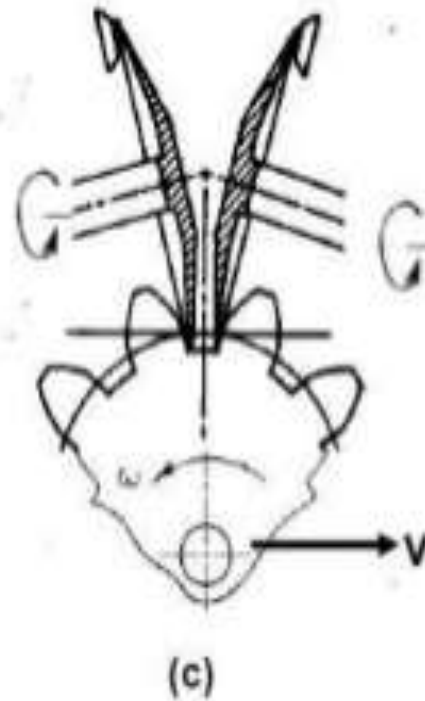
1. Form wheel grinding
2. Generation grinding
3. Threaded wheel grinding



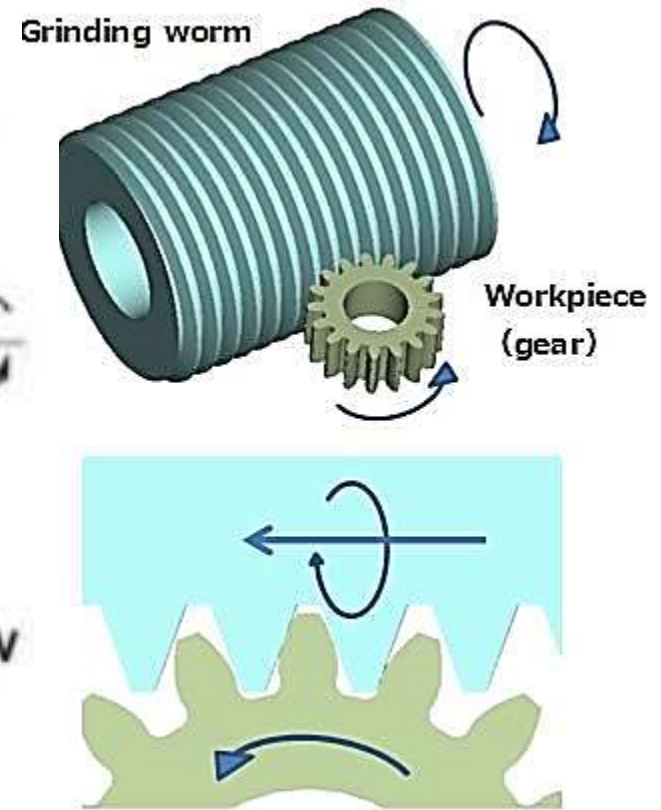
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Form wheel grinding



Generation grinding



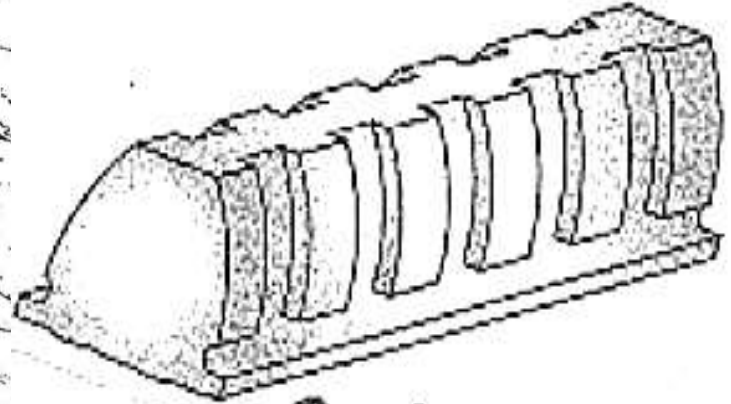
Threaded wheel grinding

Shaving

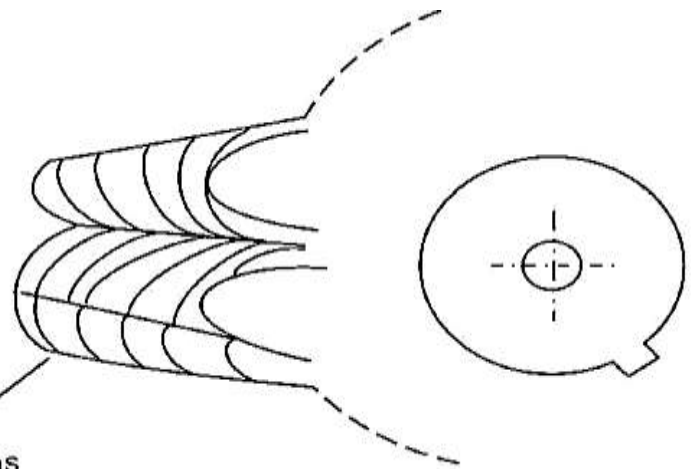
Principle: -

- Gear shaving process can be **linear or rotary**. In the linear type rack type cutter is used. While rotary method employs a pinion cutter.
- The cutter teeth are serrated to form a series of cutting edges.
- To obtain relative sliding action between the tooth profile the work gear and shaving cutter are set up in the gear shaving machine with cross axes.
- Due to the sliding action very small amount of material from the gear tooth is removed and finished profile surface is obtained.

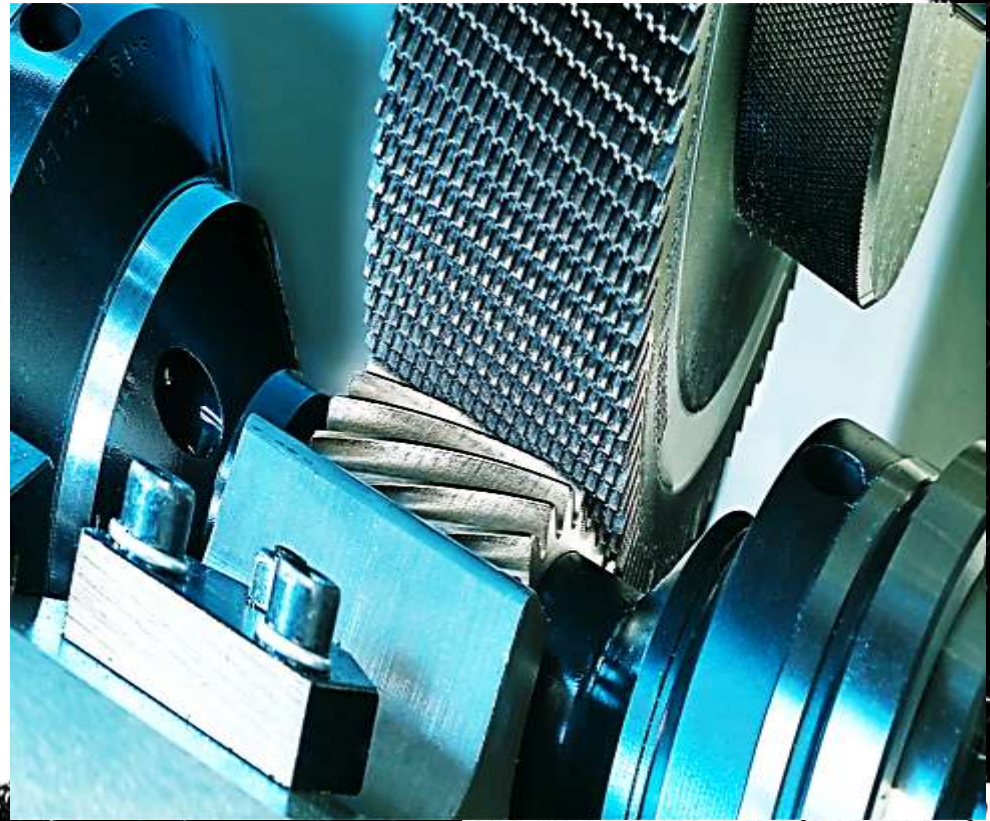
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**Shaving
Teeth**

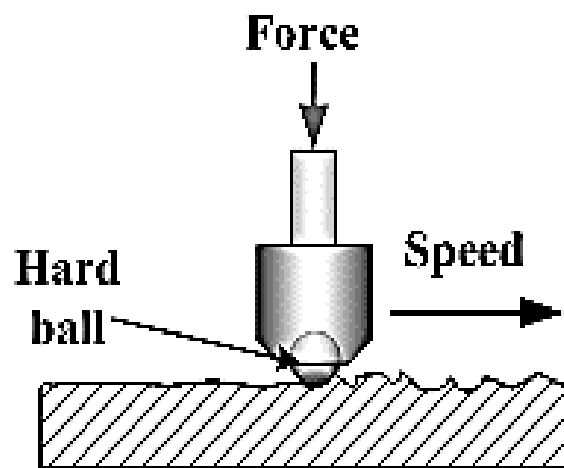


Serrations
on the teeth

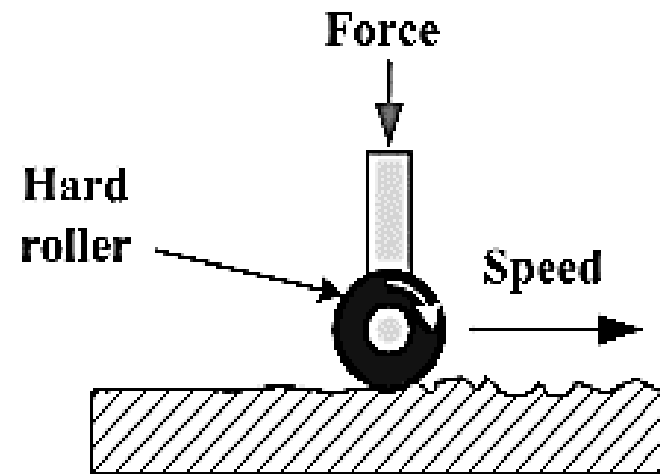


Burnishing

- **Principle:** - The operation consists essentially of rolling the work gear with one or several burnishing gears whose teeth are very hard, smooth and accurate. The latter gears are driven by a motor.



Ball burnishing



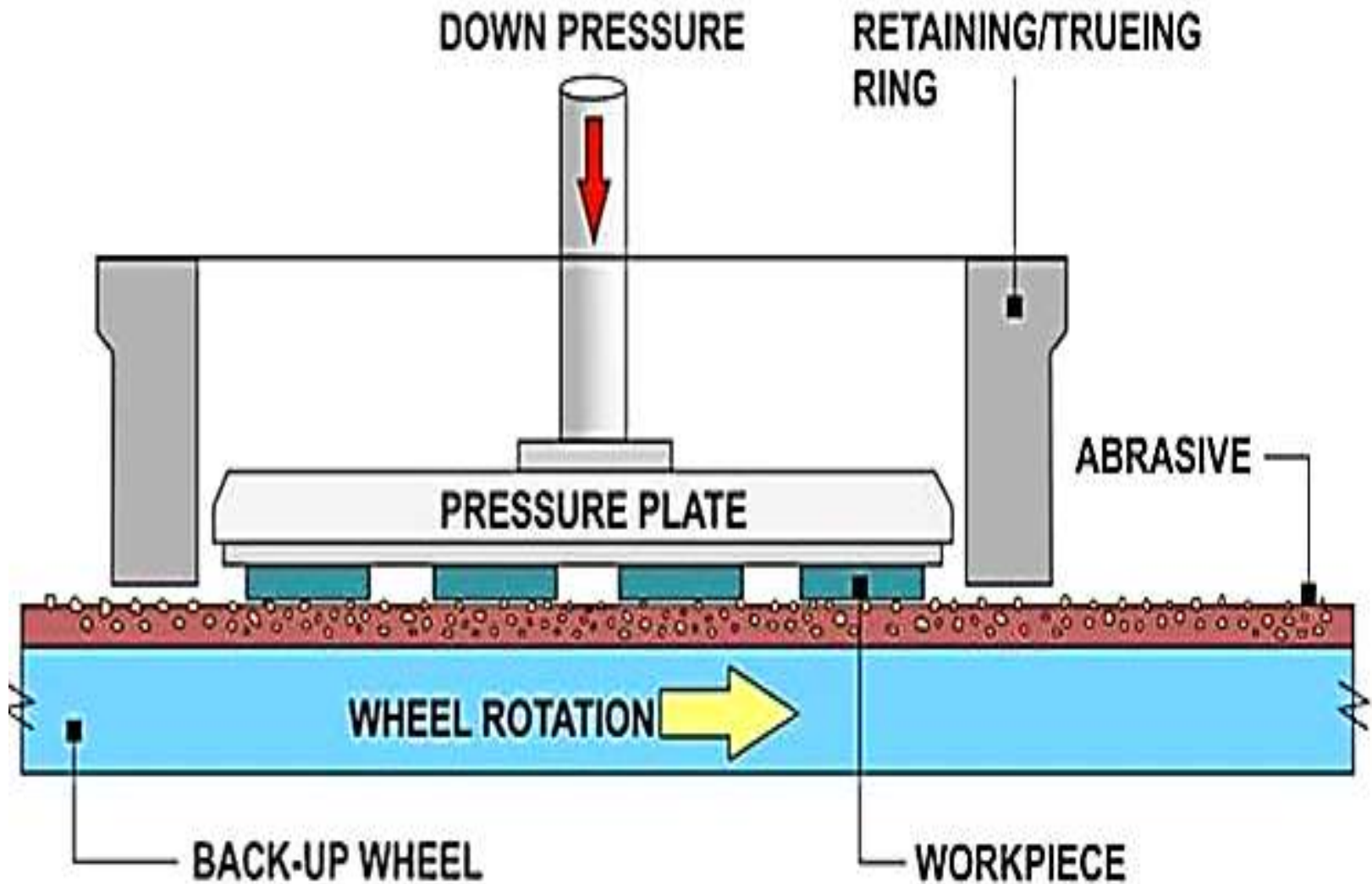
Roller burnishing

Gear Lapping

Principle:-

- It is the process of refining the gear element after the heat treatment. The process is done by rotating the gear and the lap tool as inter meshing gears, with abrasive compound forced between the teeth.
- It is the process used for improving surface finish by reducing roughness, waviness & other irregularities on the surface.
- Material for lapping tool can be natural or artificial abrasives depending on work piece material.
- Lubricant is used to hold or retain the abrasive grains during operation. Lapping operation is done two methods
 1. **Hand lapping:-** Work piece is held in hand & the motion of the other enables the rubbing of two surfaces in contact, this method is used for press dies, valve seats etc.
 2. **Machine lapping:-** It is done to obtain highly finished surfaces on work piece, like ball and roller bearings , engine parts.

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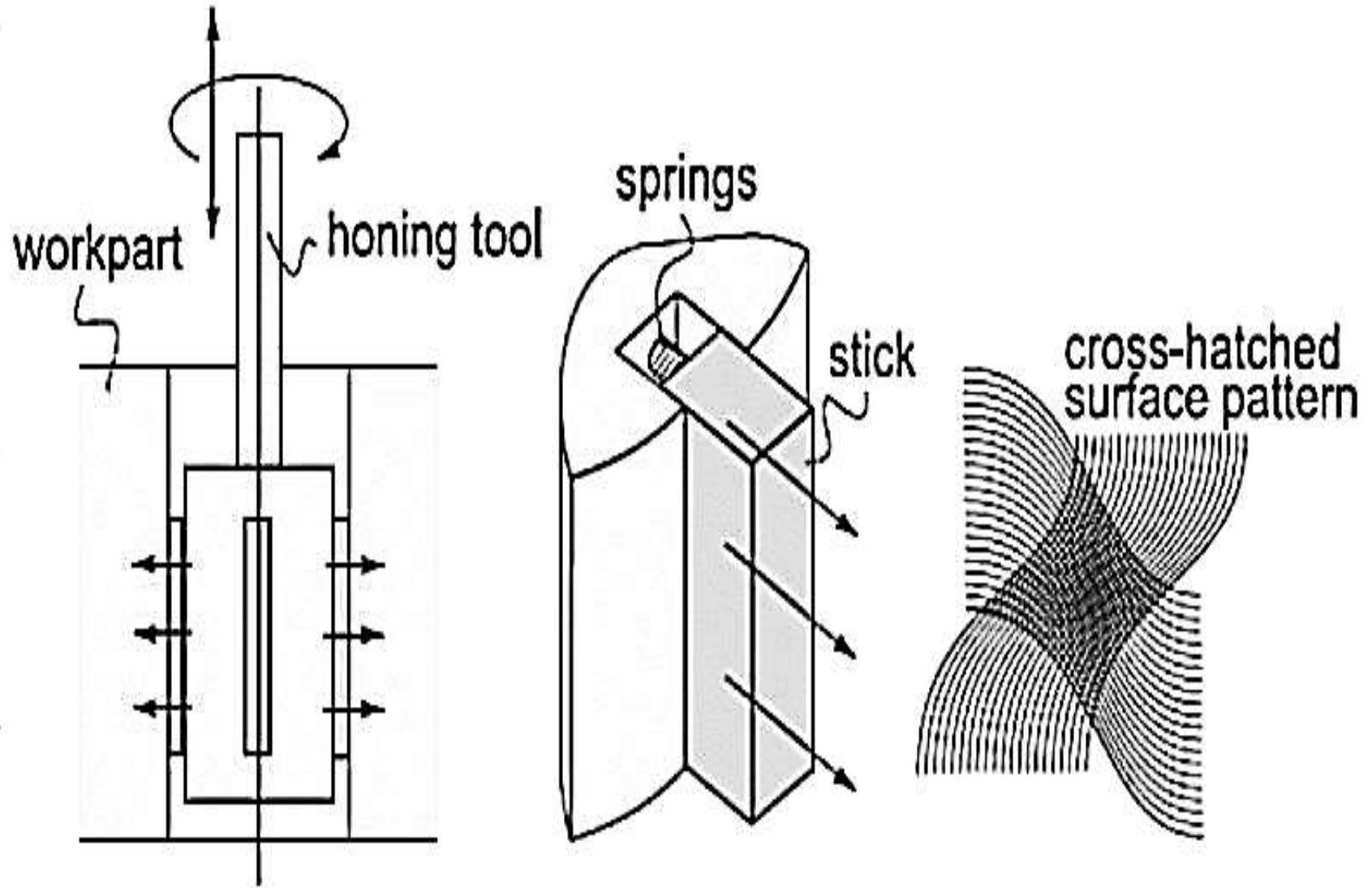
Gear Honing

Principle

- It is a super finishing operation used for previously machined surfaces.
- It is used for finishing internal cylindrical surfaces, drilled or bored holes the tool is called as Hone which is made out of bonded abrasive stone made in the form of stick.
- The tool moves back & fourth while rotating about its axis. Honing operation can be done by two methods.



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Differentiate

Sr No.	Up Milling	Down Milling
1	There is a tendency to lift the work piece so extra clamping force is required	Forces are enough on job to press to press down. So no need of extra clamping forces
2	Cutter rotates against direction in which the work being fed	Cutter rotates in similar direction in which the work being fed
3	Cutting force varies from Zero to max.	Cutting force varies from max to zero
4	Chip thickness varies from minimum to maximum	Chip thickness varies from max to minimum
5	Higher surface finishing can be obtained	Obtains lower surface finish
6	Use of cutting fluid is difficult	Use of cutting fluid is easy
7	Job and tool movement is opposite direction	Job and tool movement in same direction

Sr No.	Gear Hobing Process	Gear Shaping
1	Generates teeth on gear by means of rotating cutter called as Hob.	Reciprocating motion of the cutter based on shaping process.
2	Hobbing produces a series of radial flats based on feed rate of Hob across the work	Shaping produces a series of straight line parallel to the axis of the gear. Surface finish may be better.
3	It use as multipoint cutter Know as Hob.	It uses a rack cutter or pinion cutter.
4	It is rapid, economical and highly productive.	It required more time than Hobbing.
5	It cannot generate internal gear	It can be used to produce internal gears also

Differentiate

Sr. No.	Honing	Lapping
1	To get high degree of surface finish as well as to correct the roundness, taper in the work.	To get geometrical true surfaces, correct minor surface imperfections and improve the dimensional accuracy.
2	Honing is slow speed finishing process.	Lapping is low pressure, low speed abrading process to refine surface finish.
3	It is rotates and reciprocate in the hole of work piece.	It is either rotary or reciprocating
4	It's applied to get high degree of surface finish as well as to correct the roundness, taper in the work.	It is applied to get geometrical true surfaces, correct minor surface imperfections and improve the dimensional accuracy.
5	Honing stones are used as cutter.	Abrasive particles are loaded on laps are used as a tool.
6	MRR in is 0.5 mm in primary and 0.01 mm for secondary.	MRR is 0 .005 mm to 0.01 mm
7	Used on internal and external cylindrical surfaces.	Mostly used on flat or regular surfaces.