CHAPTER THREE
DRAW FRAME

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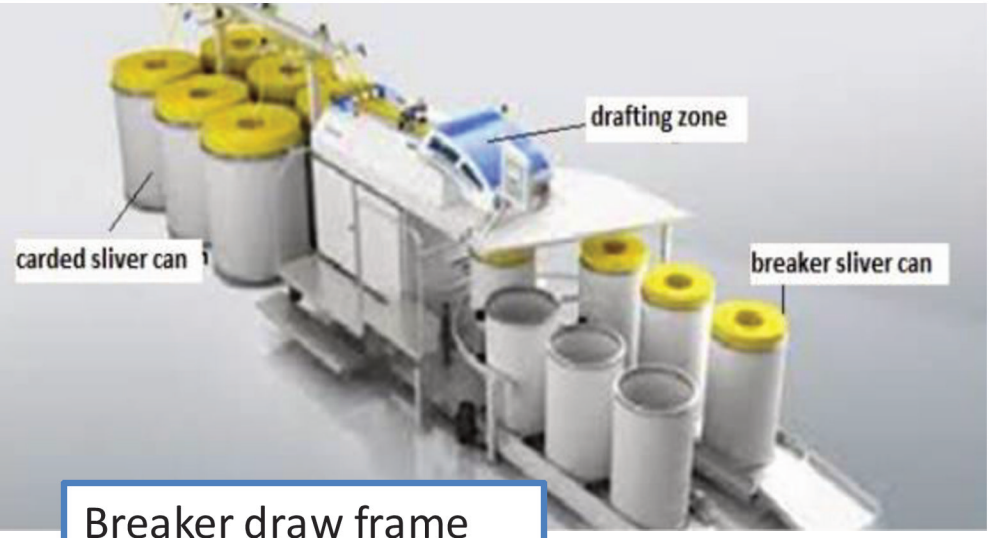
Functions of Draw Frame Machine:

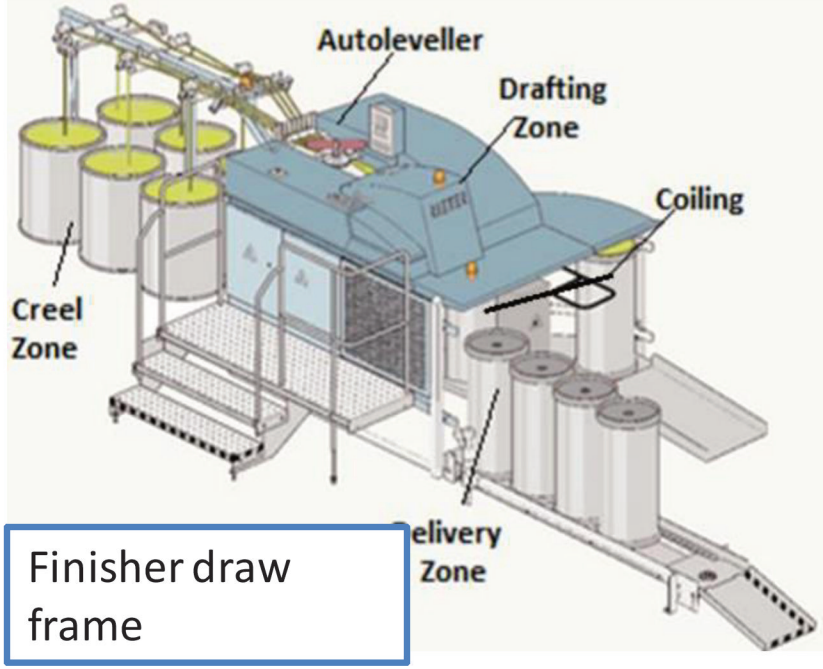
❑A draw frame has the following objectives:

✓**Improving material Evenness**

Draw frame primarily improves medium term and especially long term sliver evenness through doubling and drafting. The number of doublings lie in the range 6 to 8 and so is the range of draft; as a result, the input and output material is almost same in terms of liner density. Drawing is done in two stages; at breaker and at finisher draw frames.



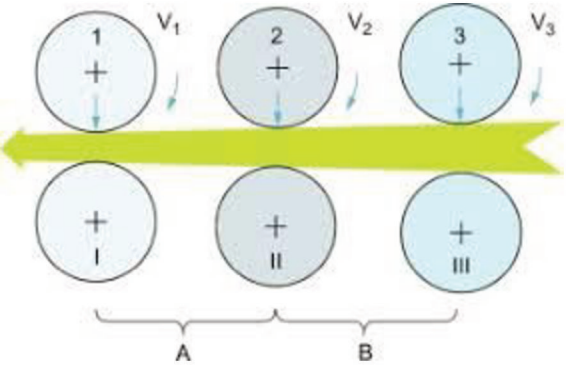
Breaker draw frame



Finisher draw frame

❑Therefore, two passages of drawing with eight ends (sometime six) each time would produce a single sliver consisting of 64 strands. This helps in reducing variations.

✓ **Parallelization :** To achieve an optimal value for the strength of yarn, fibres must be arranged parallel to each other and along the axis of yarn. Draw frame fulfils this task by way of the drafting by rollers. The amount of draft to be applied immediately after the card cannot be very high as fibre entanglement is very high and the strand is thick and weak. As such, draft has to be increased gradually.



- The speed of the rollers increase in the direction of fiber movement (the arrow): - V3<V2<V1.
- The Draft in the portion represented by B is Break Draft

Break Draft (BD = v2/v3

- The Draft in the portion represented by A is the Main Draft.

Main Draft(MD = v1/v2

- So Draft increases gradually in the direction of fiber movement (V1/V2 > V2/V3), I,e Break draft is less than main draft

Total Draft =DB*DM

TD= V2/V3 * V1/V2

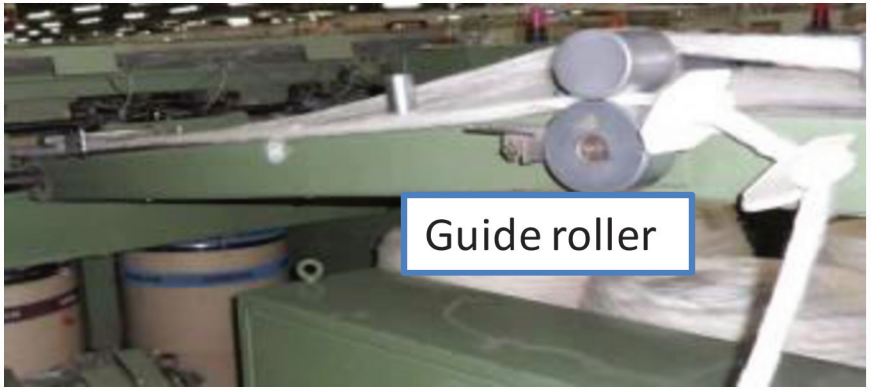
TD= V1/V3

- ✓ **Blending/mixing** of slivers of different types of fibers in desired proportion by doubling and drafting process.
- ❑ Doubling is the process of combining 4/6/8 slivers into a single sliver by drafting. Doubling Reduces unevenness in the slivers by compensating the thin place of one sliver by thick place of the other sliver.
- ✓ **Dust removal:** Draw frame is a machine where a very high degree of fibre/fibre friction takes place in the drafting zone; this is ideal for separating dust. Many modern draw frames have appropriate suction removal systems; more than 80% of the incoming dust can be extracted.

DIFFERENT ZONES OF DRAW FRAME MACHINE

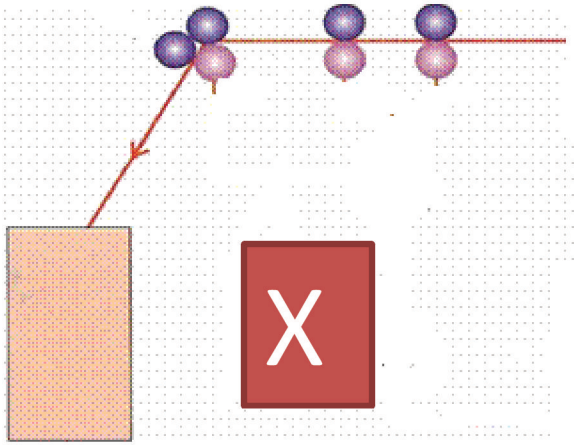
✓**CREELING ZONE:** It is known as feeding zone. Creel is a plain polished steel surface. Slivers from the cans are passed over it and taken to the drafting zone. 6-8 feed slivers passing through guide roller, guide bars & feed to drafting zone.

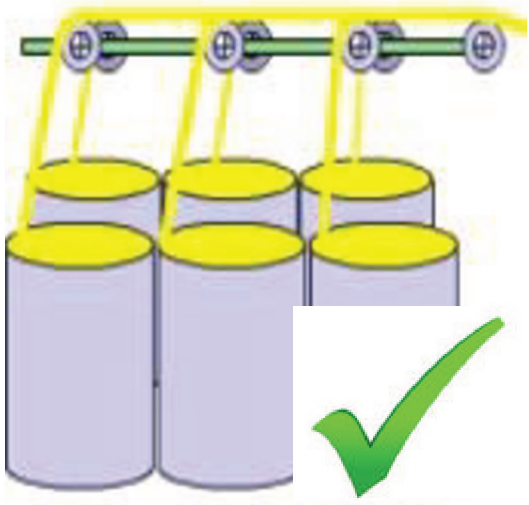
Guide Roller : guides the passage of feed slivers and act as a stop motion when feed sliver breaks



✓**Auto leveller:** The main task of auto levelling is to eliminate deviations in mass per uni t length. Auto leveler reduces or increases the draft and removes unevenness in the feed slivers.

- ❑ Creel must be designed in such a way to:
- ✓ Prevent false draft.
- ✓ Provide stop motion to stop the machine in case any one sliver is absent
- ❑ The following precautions must be taken to avoid false draft
- ✓ Smooth running of creel rollers
- ✓ Smooth surface of the creel rollers to avoid jamming of slivers in grooves/cuts which may present on the roller surface
- ✓ Withdrawing slivers from cans perpendicularly to prevent the rubbing of the slivers against the edges of ca riation.





❑The slivers from the creel should enter drawing zone closely adjacent to each other, but not on top of each.

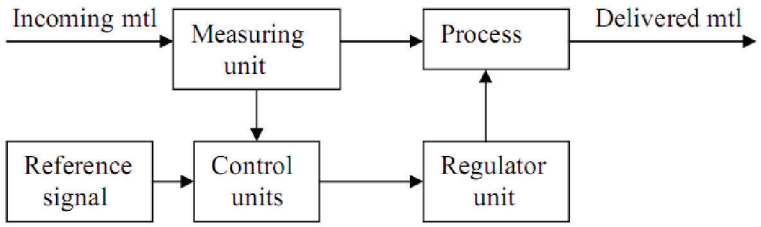


Fig A

Autoleveller may classified into two main groups according to the basic principle of operation –

i) ***Open loop autoleveller:*** The open loop control principle, which can be used for the correction of fairly short term variations. The control unit compares the measurement signal with the reference signal which in this case represents the mean output reqd. The control unit accordingly increases, leaves unaltered, or decreases the output of the regulatory which in turn provides a variable speed to the back of front rollers of the process to give the reqd draft

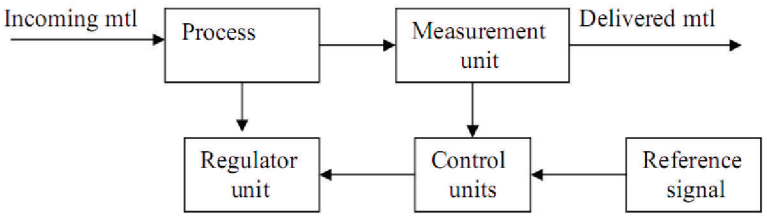
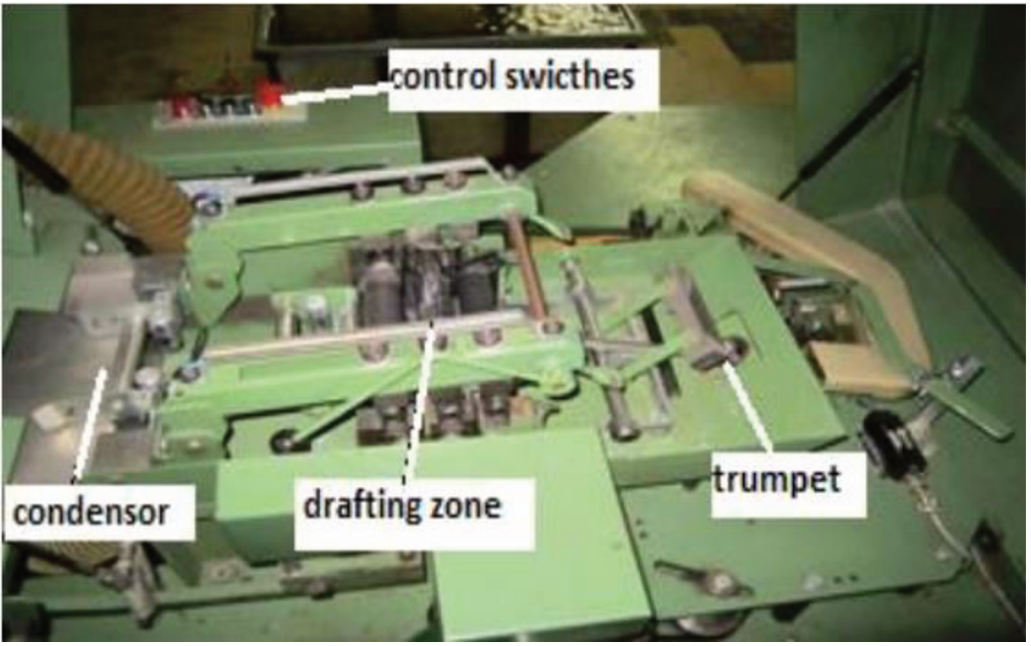


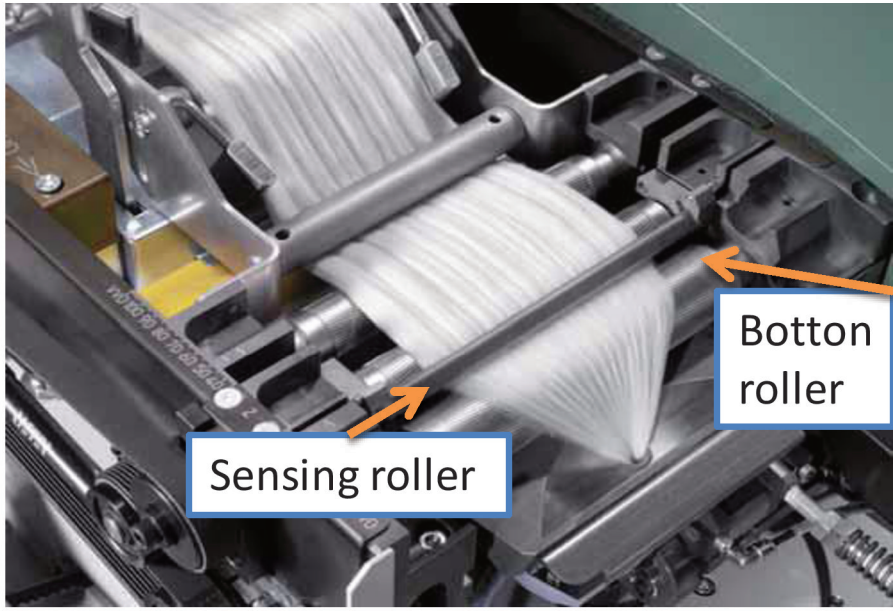
Fig B

ii)Closed loop Autoleveller: The closed loop principle is illustrated in fig (B); this system is used for the correction of long term & medium term variations. Again the measurement signal is compared with the reference signal by the control unit which then determines the output of the regulator which provides the variable speed to the process to give the reqd. draft.

iii. Combined autoleveler combine the advantages oth both types and is the best

- ✓ **Drafting zone:** It is the zone for a process of decreasing the weight per unit length of sliver. It is mainly due to differential peripheral speed of the rollers. Number of pair of rollers are used in drafting arrangement. the negatively driven bottom top rollers are pressurized against the positively driven fluted bottom roller by top arm

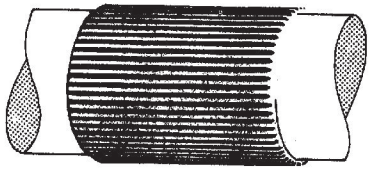




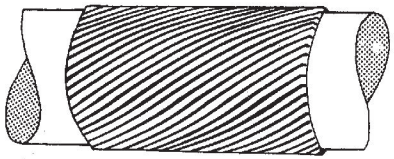
✓**SENSING ROLLER/SCANNING ROLLERS:** these rollers scan the thickness of the sliver and then the draft of the machine is regulated automatically.

✓**TRUMPET:** trumpet is also made of steel. Different hole size trumpets are used for different count. It is made of steel. Different hole size trumpets are used for different count.

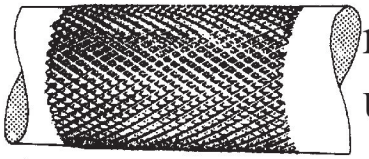
✓ Easy to adjust in all drafting arrangements, bottom rollers are made of steel and mounted in roller, ball or needle bearings. They are positively driven. These rollers have one of the following types of flutes:



Axial



spiral



Knurled

❑Knurled flutes are used on rollers receiving aprons. In draw frames, spiral-fluting rollers are used mostly. Top rollers can roll on spiral fluted bottom rollers more evenly and with less jerking and therefore spiral fluted rollers are preferred for high speed operation. Moreover, any defects in a flute spread out helically in the drafted material and in subsequent drafts get distributed uniformly along the length. The diameter of the bottom rollers in draw frames lies in the range 20-90 mm, but normally diameters between 25 and 50 mm are used.

❑Top rollers are coated with synthetic rubber. Hardness of this coating is specified in terms of degree shore. They are characterized as follows:

Soft: 600-700 shore
Medium: 700-900 shore
Hard: Above 900 shore

- The top roller synthetic rubber is periodically ground (called buffing) in order to maintain the roundness and smoothness. For better smoothness after buffing, the following methods can be applied:-
  - ✓ Applying a chemical film such as lacquer or other material
  - ✓ Acid treatment
  - ✓ Irradiation by UV light
- Pressure on top rollers is applied by any of the following means:

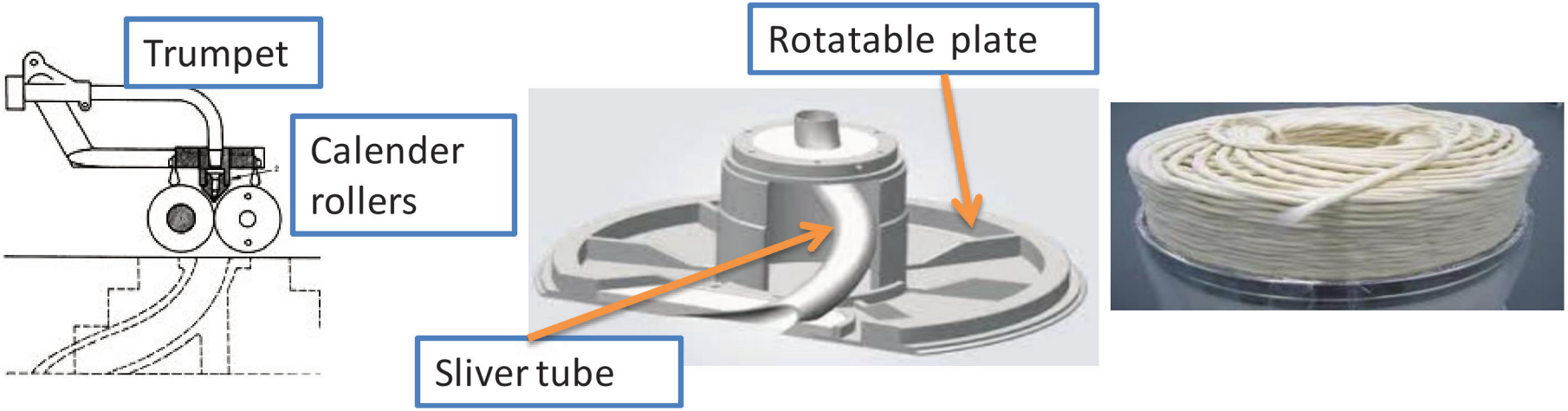
✓ Dead weight (now obsolete)

✓ By springs (MOST COMMONLY USED)

✓ Pneumatic (modern draw frames)

✓ Magnetic

- ✓ **Sliver Coiling:** The rotary movements are required for cycloidal coiling of the sliver. On the one hand, the rotatable plate must be rotated above the can, while the can itself must rotate, at a considerably slower rate, below the plate. A sliver tube is provided on the plate as a fixed part to guide the sliver from the calendar rollers into the can



$$d = k\sqrt{ktex};$$

where k=1.6-1.9, d= Trumpet diameter

❑ For synthetic fibres, bigger coiler tubes are used. This will help to avoid coiler choking and kinks in the slivers while coiling in the can.

IMPORTANT PROCESS PARAMETERS

❑Top roller weighting must be greater when Material thickness is more Fibre strand is softer Top roller shore hardness is low Bigger rollers are used. Friction is low between fibres and roller surface and also between fibres. No method is available to precisely calculate the pressure required to be applied and depends on the factory practice.

✓**CUT IN THE SLIVER:** To check cuts in the sliver, 2-3 meters of sliver is twisted and checked. If cuts are detected then

- ✓Check roller pressure
- ✓Check eccentricity of rollers
- ✓Check calendar roller grooves.

EFFECT:-Cut sliver will affect the quality of the roving and yarn. It will also adversely affect the working of the speed frames and ring frames and increase in the breakage rate.

✓**Auto leveller:** The main task of auto levelling is to eliminate deviations in mass per uni t length. Auto leveler reduces or increases the draft and removes unevenness in the feed slivers.

MATHEMATICAL PROBLEMS

✓ Eg1. Calculate the draft at drawing frame if the feeding sliver is 46 grains/yard, delivered sliver is 34 grains/ yard and the number of doublings is 6 and draft is 5

$$Actual\ draft = count\ fed\ x\ doubling\ /count\ delivered \quad (direct\ system)$$

= 46 *6/34

=8.12

✓Eg2. Calculate the grains/ yard of delivered sliver if feeding sliver is 84, doubling is 8 and the draft is 6 :

$$Actual\ draft = fed\ sliver\ x\ doubling\ /Delivery\ sliver$$

5 = 46*6/D.S

D.S = 46*6/5

=55.2

Surface speed = $\pi\ D\ N$

D = dia. of rotating element

N = rpm (no. of revolutions/min)

Mechanical Draft = $\frac{\text{S.S of Front roller } (\pi\ D\ N)}{\text{S.S of Back roller } (\pi\ D\ N)} > 1$

P = π DN /36 x 60 x del. sliver ct.(gr/yd) / 7000 x η x no. of m/c x no. of heads [lb/hr]