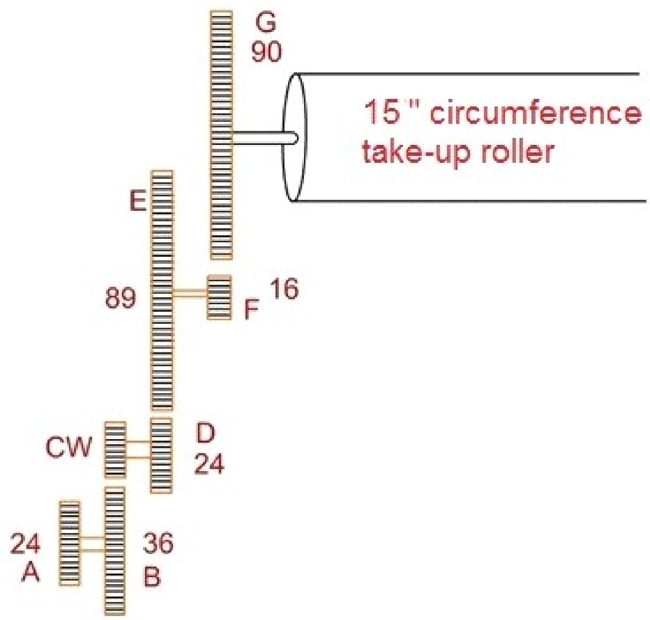
Time: 1 Hours **2nd CLASS TEST of B. Tech. EXAMINATION 2024-25** Total Mark: 20

Subject Name: **Fabric Technology II** Code:

B	C	T	4	0	2

SECTION A	Marks
1) Attempt all question in brief.	**2x2=4**
a) Classify Take up motion	
b) Name the shuttle checking devices.	
SECTION B	
2) Attempt any one of the following:	**1x6=6**
a) Draw overpick mechanism.	
b) Draw cam beat up mechanism.	
SECTION C	
3) Attempt any two of the following:	**2 x 5 =10**
a) Derive the expression for power of picking.	
b) What is sley eccentricity ratio? Write its effect on fabric property.	
c) Calculate the practical dividend for the following given take up arrangement. 	

Classify Take up motion

5.2 Types of Take-up Motion

There are two types of take-up motion:

1. Negative take-up motion
2. Positive take-up motion.

Positive take-up motions are classified into two types. These are:

1. Intermittent: a. direct type
   b. indirect type
2. Continuous: indirect type

Name the shuttle checking devices.

1. Swell and swell spring
2. Check strap.

Draw overpick mechanism.

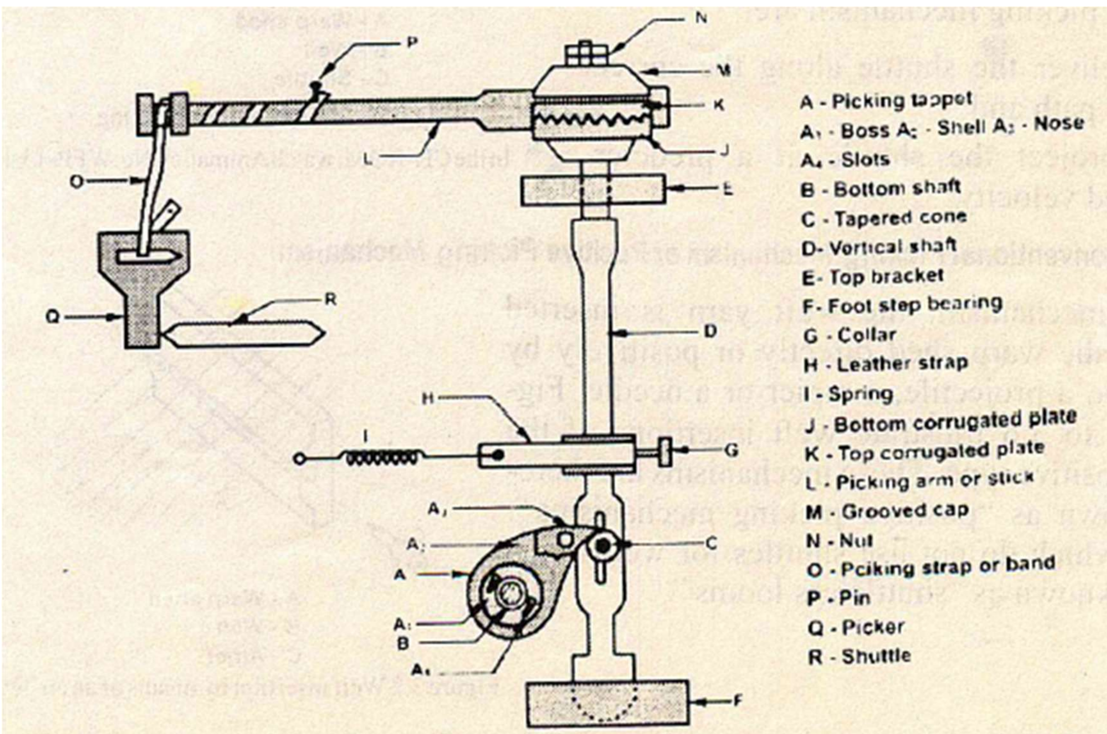


Figure 3.7 Cone overpick mechanism

Draw cam beat up mechanism.

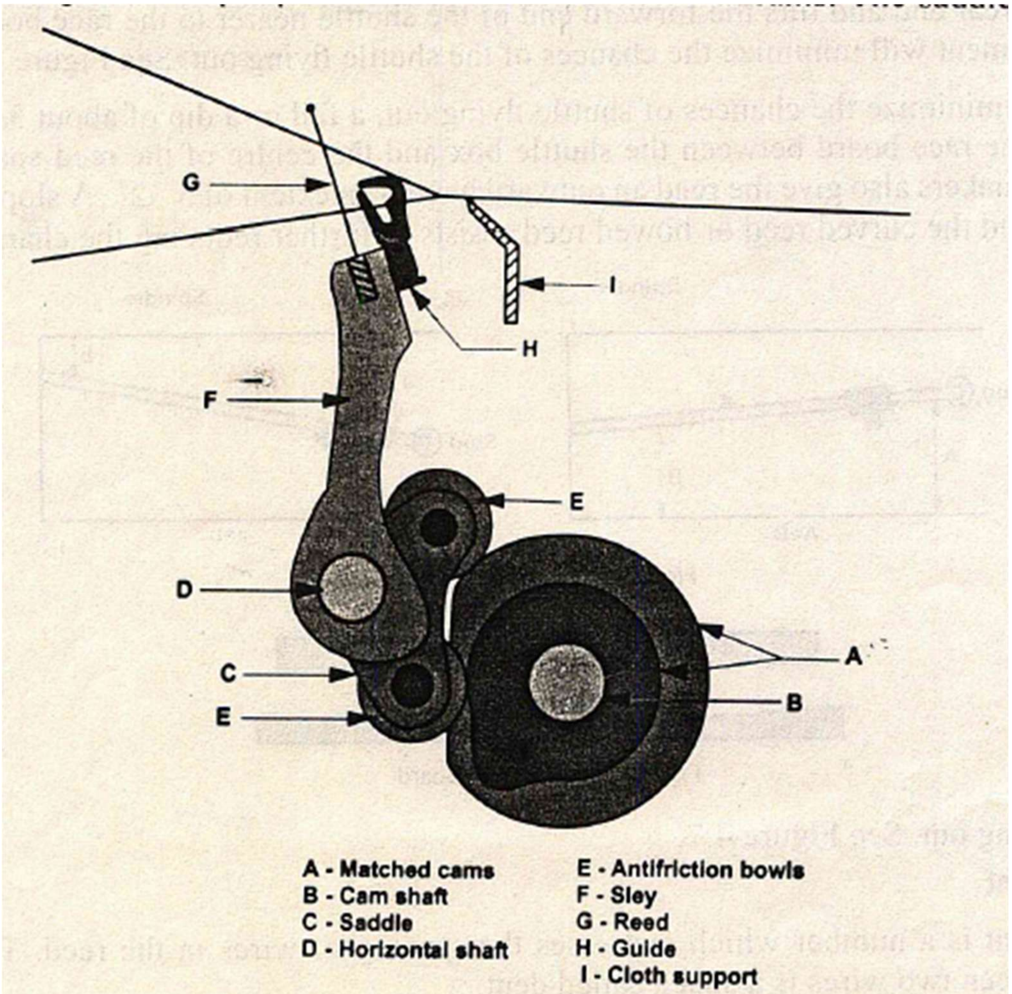


Figure 4.3 Cam beat-up mechanism

Derive the expression for power of picking.

3.8 Power Required for Picking

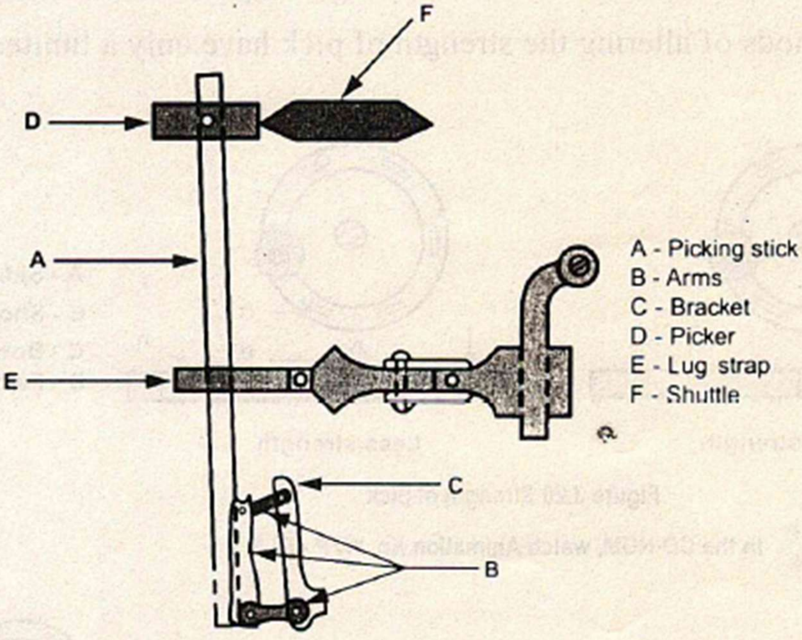


Figure 3.23 Link pick method

In the CD-ROM, watch Animation No. WFP - I 3.7

The energy usefully expended in accelerating the shuttle is equal to its kinetic energy when it leaves the picker. Hence,

$$\text{Energy/pick} = \frac{mv^2}{2} \text{ J},$$

where m is the mass of the shuttle in kg and v is its maximum velocity in m/s

$$\text{Power} = 1 \text{ W} = 1 \text{ J/s}$$

Thus, if p is the loom speed in picks/min, then

$$\text{Power for picking} = \frac{mv^2}{2} \times \frac{p}{60} \times \frac{1}{1000} \text{ kW}$$

This suggests that the power consumed increases at the same rate as the loom speed, but this is not so because the shuttle speed also tends to increase with the loom speed, for a given width of loom, so the power consumed increases more rapidly than the loom speed. Because of this, and in order to include the effect of the loom width, it is more useful to proceed as follows.

Let:

R be the useful reed space in cm (i.e. the width of the warp in the reed when the reed space is being fully utilized),

L be the length of the shuttle in cm, excluding its tapered ends,

θ be the number of degrees of crank shaft rotation occupied by the passage of the shuttle through the warp shed and

P be the loom speed in ppm.

Then the time for the passage of the shuttle is:

$$t = \frac{\theta}{360} \times \frac{60}{P} = \frac{\theta}{6P} \text{ seconds}$$

and the distance moved by the shuttle is :

$$d = \frac{R + L}{100} \text{ m}$$

If v is the average speed of the shuttle during its passage through the shed,

then:

$$v = \frac{R + L}{100} \times \frac{6P}{\theta} = \frac{6P\,(R + L) \times 10^{-2}}{\theta} \text{ m/s} \quad \ldots\ldots\text{(i)}$$

We then have:

$$\text{work done/pick} = \frac{mv^2}{2} = \frac{36mP^2\,(R + L)^2 \times 10^{-4}}{q^2}$$

$$= \frac{18mP^2\,(R + L)^2 \times 10^{-4}}{2\theta^2} \text{ J} \quad \ldots\ldots\ldots\text{(ii)}$$

Hence:

$$\text{for picking} = \frac{mv^2}{2} \times \frac{P}{60} \times \frac{1}{1000} = \frac{18mP^3\,(R + L)^2 \times 10^{-4}}{\theta^2 \times 6 \times 10^4} \text{ kW,}$$

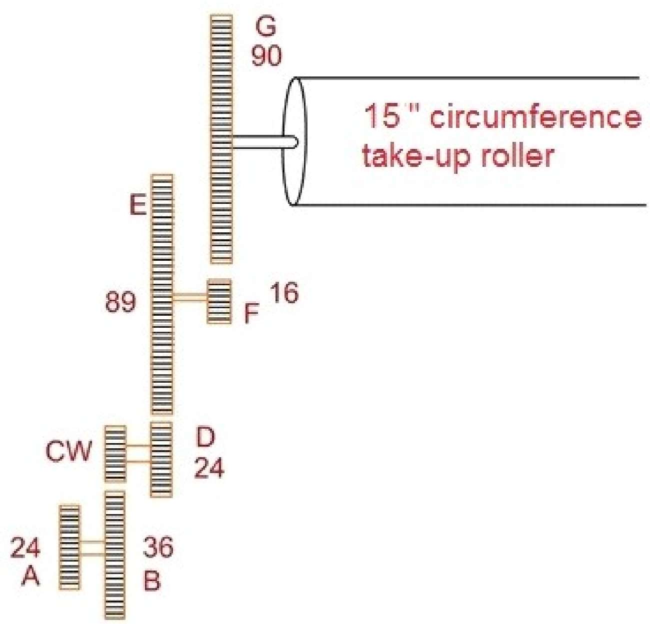
$$= \frac{3mP^3(R + L)^2 \times 10^{-8}}{\theta^2} \text{ kW}$$

What is sley eccentricity ratio? Write its effect on fabric property.

4.4.5 Sley Eccentricity Ratio 'e'

The sley eccentricity ratio 'e' is referred to as ratio r/l, where r is the radius of the crank circle and l is the length of the crank arm. This eccentricity ratio can be changed according to the requirements of loom design. High sley eccentricity facilitates the effectiveness of beat-up of weft. An increase in the eccentricity ratio would cause the sley to remain longer nearer its most backward position and thus give more time for shuttle flight. However, increasing the eccentricity ratio would increase the forces acting on the sword pins, cranks, crank arms and to some extent on the loom frame itself, resulting in excessive vibration. It is, therefore, necessary to manufacture a more rigid loom frame and robust loom parts. This would, of course, increase the cost of the loom.

a) Calculate the practical dividend for the following given take up arrangement.



Step - 1

When the pawl pulls one tooth, the the number of rotations made by the emery - roller end wheel.

$$= \frac{1}{24} \times \frac{36}{x} \times \frac{24}{89} \times \frac{16}{90} = \frac{0.0719}{x}$$

Step - 2

The length of cloth wound on the cloth roller for one pick in inches -

$$= \frac{0.0719}{x} \times 15$$

$$= \frac{1.07}{x}$$

Step - 3

$$\text{Picks/inch} = \frac{x}{1.07} = 0.934\ x$$

Step - 4

Theoretical divident = 0.934

Step - 5 Practical divident = 0.934 + 1.5 % of 0.934

= 0.948

= 0.95 (Ans.)