

## GAUTENG DEPARTMENT OF EDUCATION

## SENIOR CERTIFICATE EXAMINATION

## MOTOR MECHANICS SG

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NOTE: Any other correct answer not mentioned in this memorandum may be accepted as correct.

## QUESTION 1

- 1.1 A = Volumetric efficiency (2)
- 1.2 C = change alternating current to direct current (2)
- 1.3 B = stator (2)
- 1.4 B = hydrogen (2)
- 1.5 C = 15:1 (2)
- 1.6 A = the quantity of fuel injected (2)
- 1.7 C = an electrical switch (2)
- 1.8 C = flammable liquids (2)
- 1.9 A = uncovers the spill port (2)
- 1.10 B = that portion of the stroke during which fuel is actually forced into the combustion chamber (2)
- 1.11 B = is made up of 80% iso-octane and 20% heptane (2)
- 1.12 B = conductor (2)
- 1.13 C = resistor (2)
- 1.14 B = positive castor angle (2)
- 1.15 A = bring the wheels back to the straight ahead position after rounding a corner. (2)

**[30]**

## QUESTION 2

$$\begin{aligned}
 2.1 \quad BP &= 2\pi NT \\
 &= \frac{2\pi \times 2800}{60} \times 250 = 73\,313,3 \text{ W} \\
 &= 73,3 \text{ kW}
 \end{aligned}
 \tag{4}$$

$$\begin{aligned}
 2.2 \quad ME &= \frac{RD}{AD} \times 100 \\
 &= \frac{50}{60} \times 100 \\
 &= 83,3 \%
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 2.3 \quad CR &= \frac{CV + SV}{CV} & CV &= \frac{\pi D^2}{4} \times L \\
 &= \frac{308 + 40}{40} & &= \frac{70}{10} \times \frac{70}{10} \times \frac{80}{10} \times \frac{\pi}{4} \\
 &= 8,7:1 & &= 308 \text{ cc}
 \end{aligned}
 \tag{8}$$

2.4

2.4.1 Indicated power is the theoretical or calculated power that the engine should generate without considering any mechanical losses. 4x1=(4)

2.4.2 Brake power is the actual power generated by an engine and is measured at the flywheel. 2x1=(2)  
[20]

## QUESTION 3

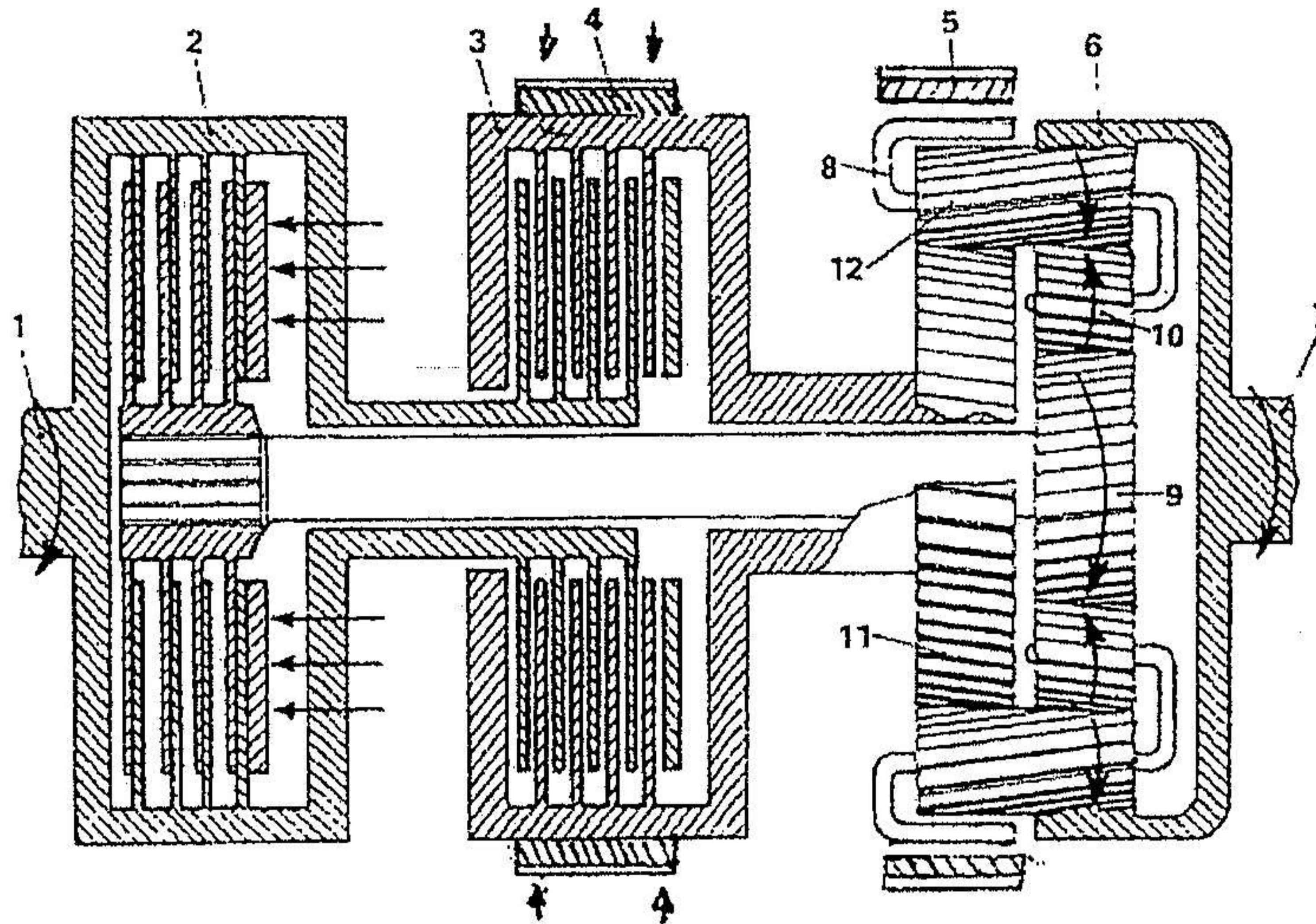
3.1 The number of gear ratios provided by the gearbox is doubled by the two-speed final drive. (2)

3.2 Two permanent reductions in the final drive system (2)

3.3 The drive wheels are much larger than those of motor vehicles. Need more torque to get into motion (2)

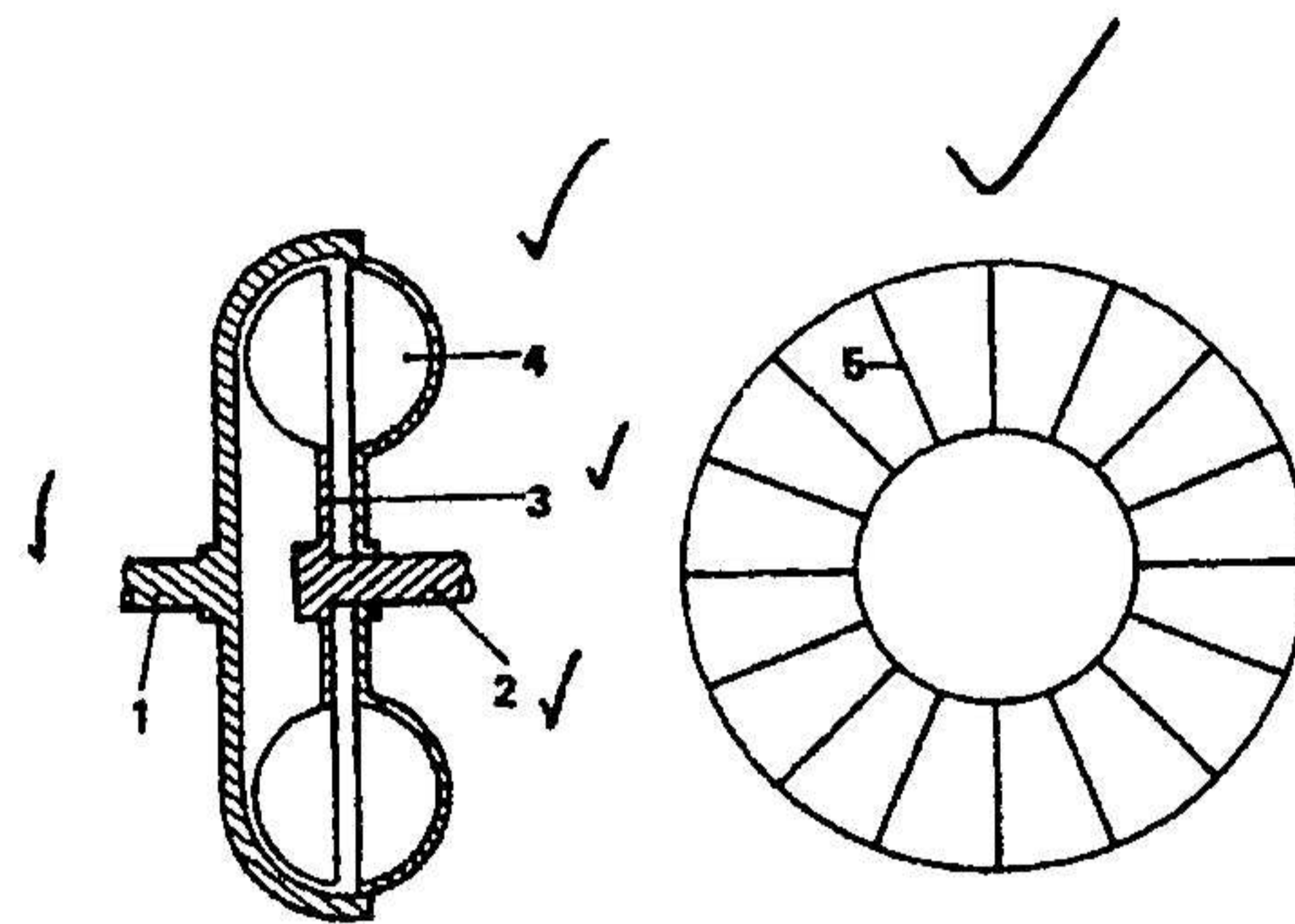
3.4 Tandem drive (2)

3.5



(13)

3.6



(5)

3.7

- Pull away much more smoothly
- Dispenses with foot-operated clutch pedal
- Oil serves as shock absorber
- Serves as flywheel

2x1=(2)

3.8

- Power lost by slip
- Higher fuel consumption
- Higher idle speed required

2x1=(2)

3.9

Stator rotates in same direction as pump and turbine.

(2)  
[32]

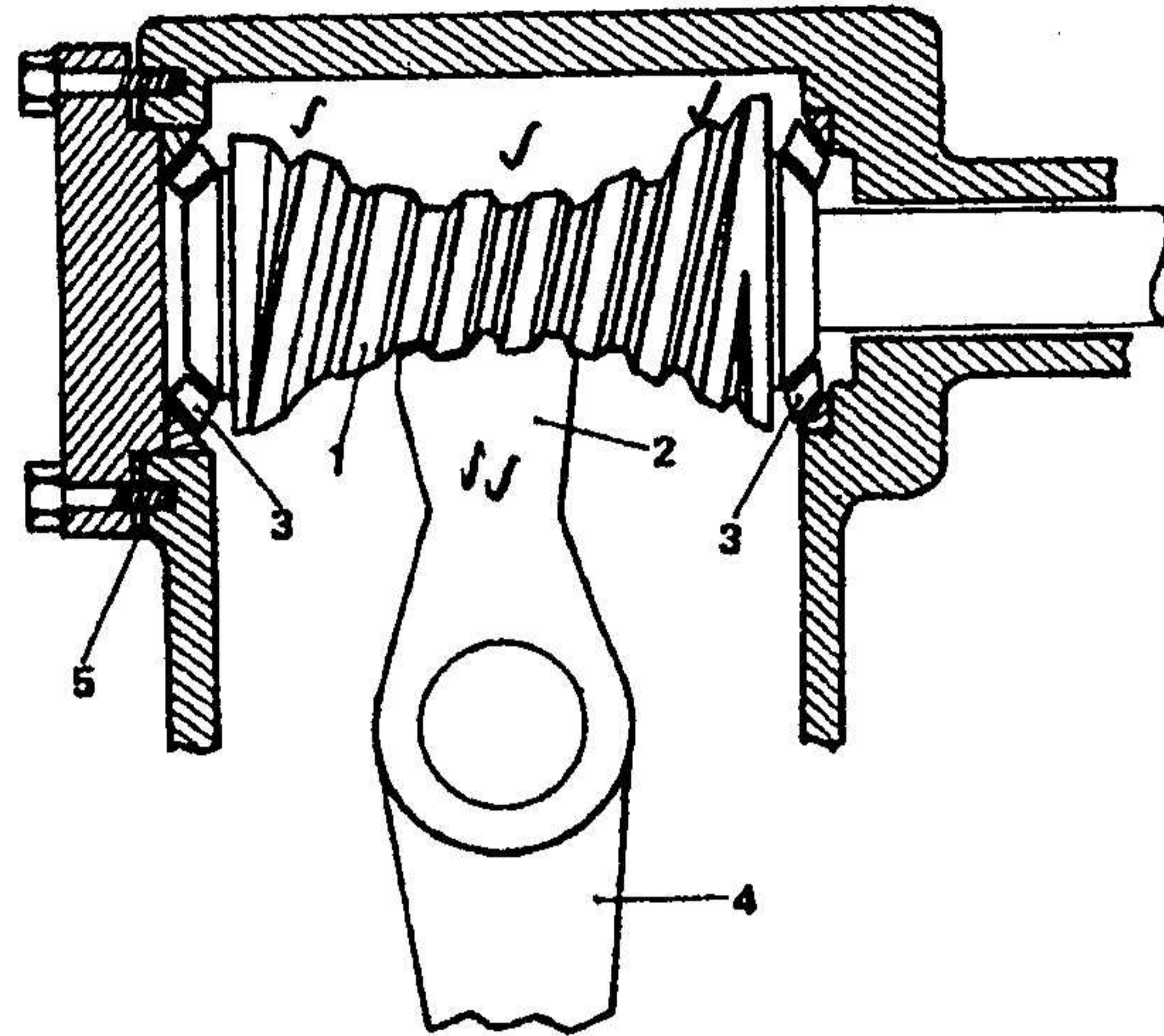
### QUESTION 4

4.1

- Dampens road shocks
- Higher leverage
- Converts the rotary motion of the steering wheel into a reciprocating motion of the front wheels

2x1=(2)

4.2



Sketch = 5  
Labels = 5 (10)

4.3

- Absorbs engine power
- Road feeling on steering wheel is lost.
- More wear on moving parts
- High manufacturing cost

3x1=(3)

4.4

The equal distribution of all weight around the axis of rotation in the rotation plane

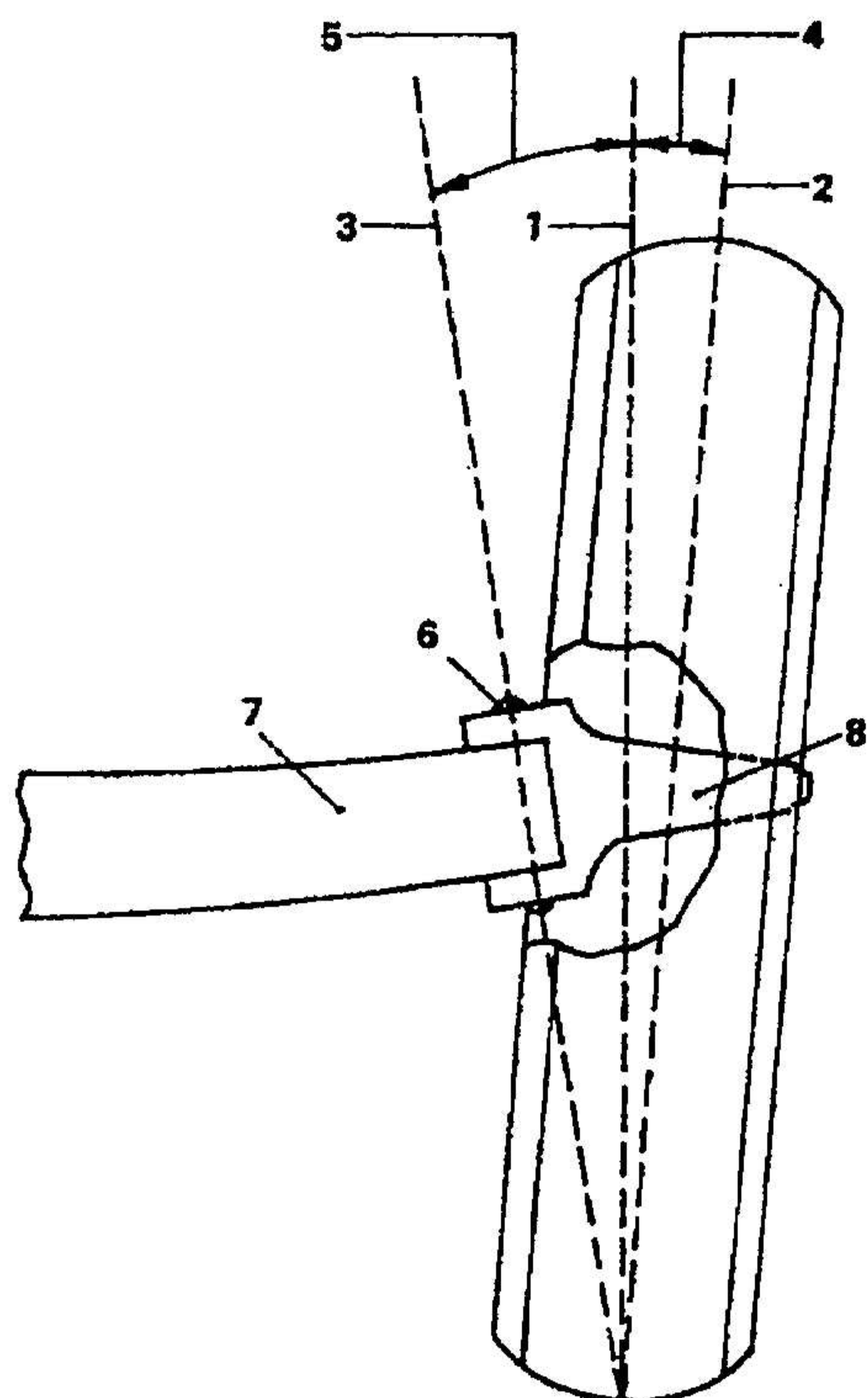
2x1=(2)

4.5

- Condition of road wheels
- Tyres should be the same size.
- Tyre pressure should be the same.
- All tyres should be checked for roundness.
- Check run out of tyres.
- Check front wheel bearings.
- Check ball joints.
- Check steering box for abnormal play.

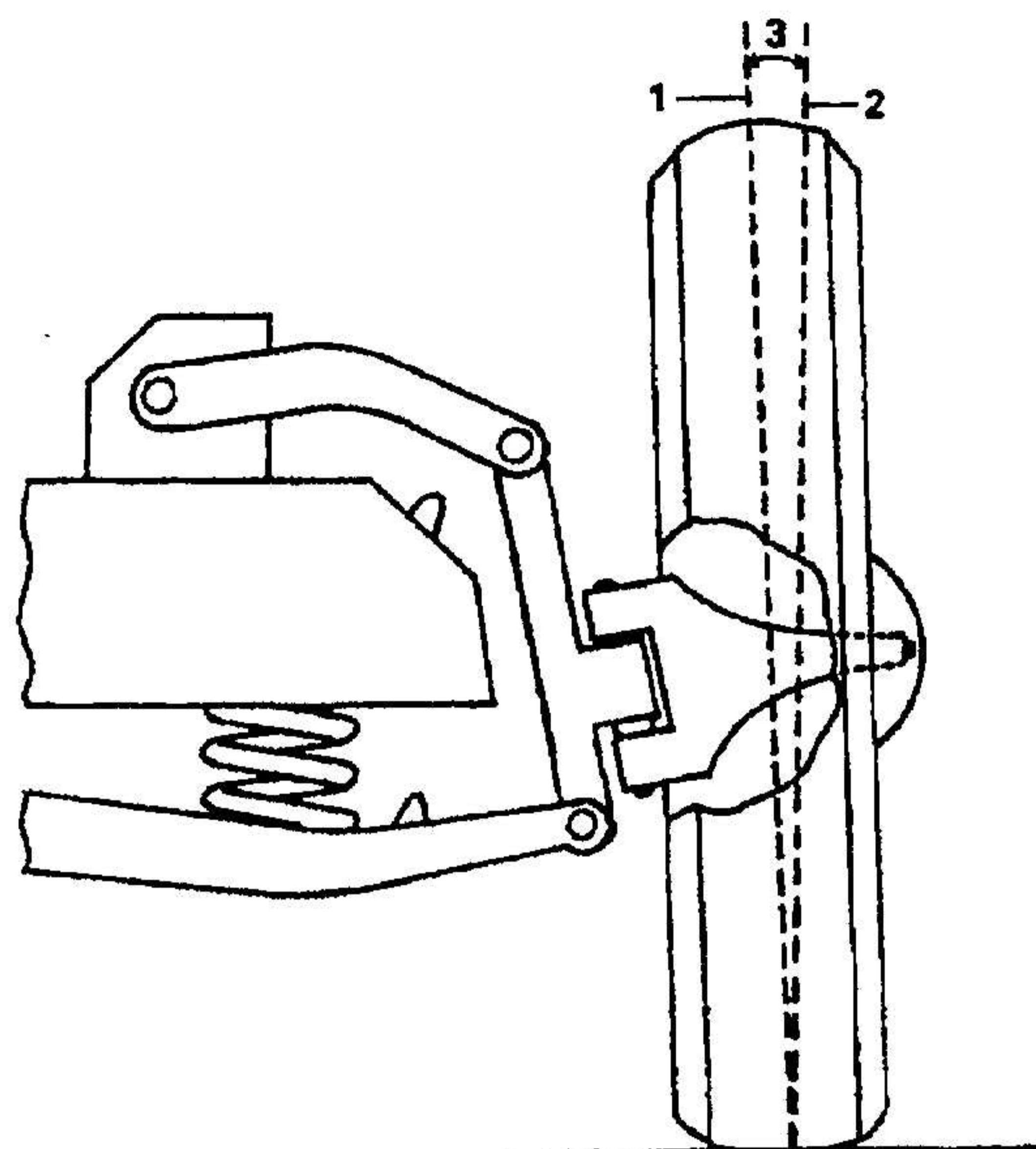
5x1=(5)

4.6  
4.6.1



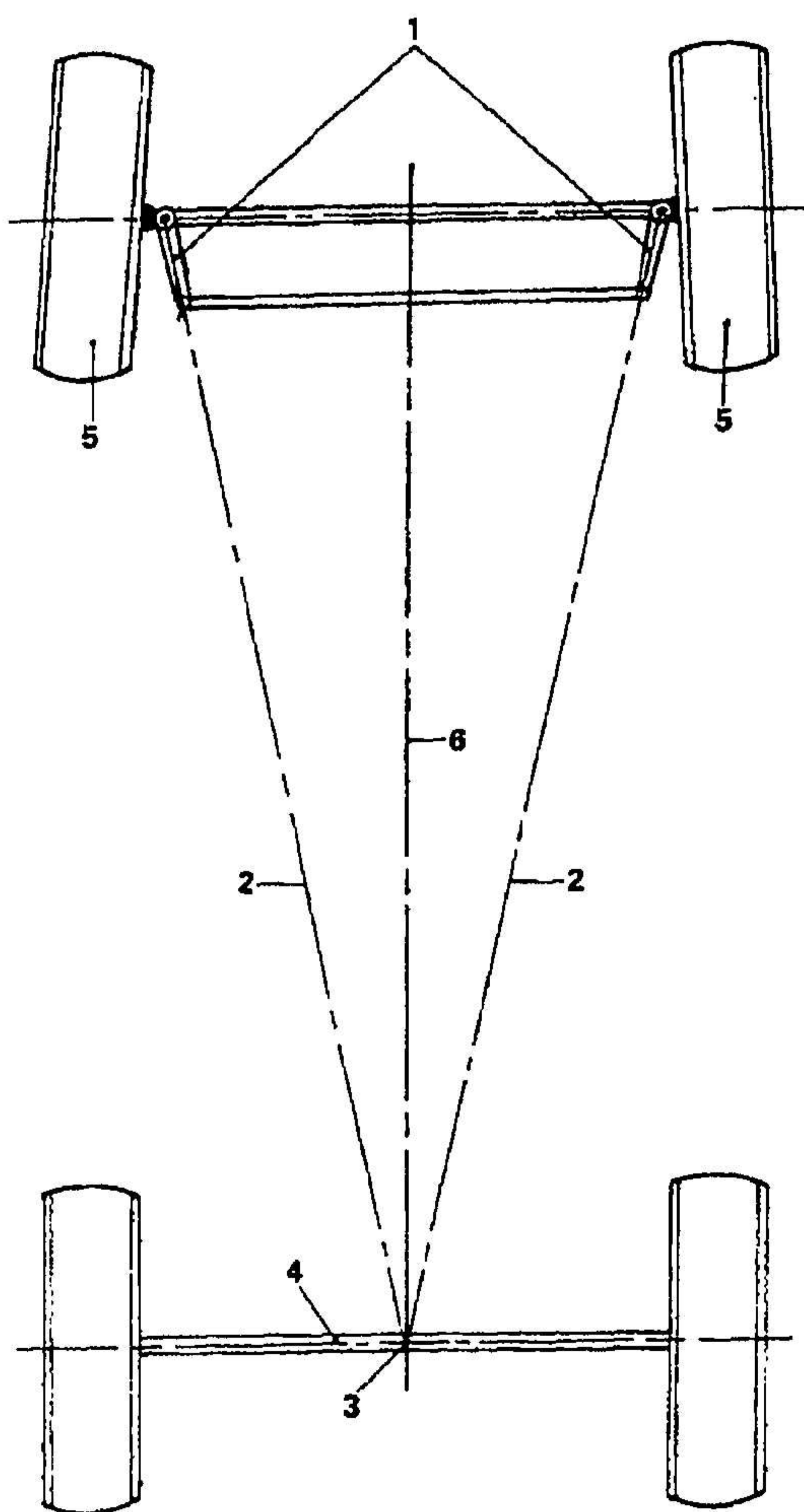
(5)

4.6.2



(5)

4.6.3

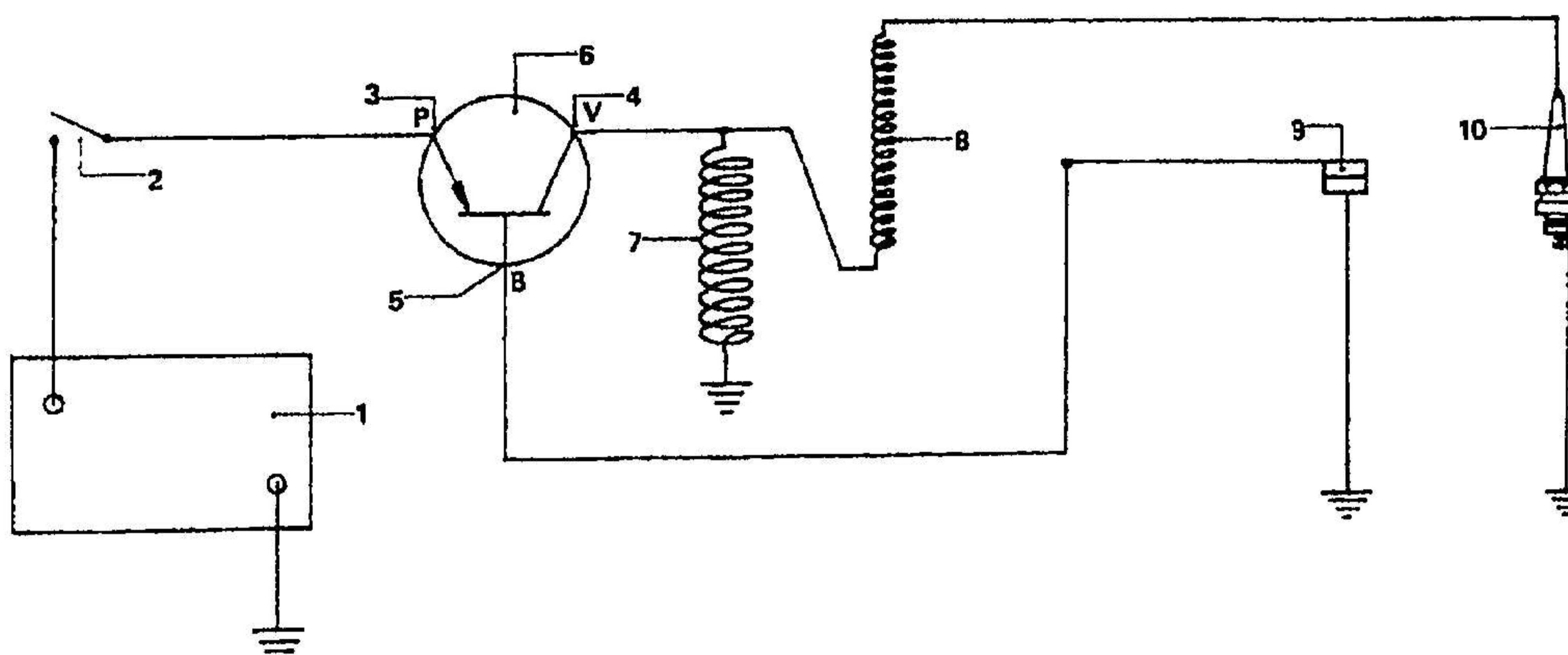


(8)

[40]

## QUESTION 5

5.1



(10)

- 5.2
- Electrical drilling machine
  - Timing light
  - Valve-grinding machine
  - Engine diagnostic machine
  - Electrical testing apparatus

(5)

- 5.3
- Driver fatigue eliminated
  - Improved fuel consumption
  - Set speed constantly controlled

3x1=(3)

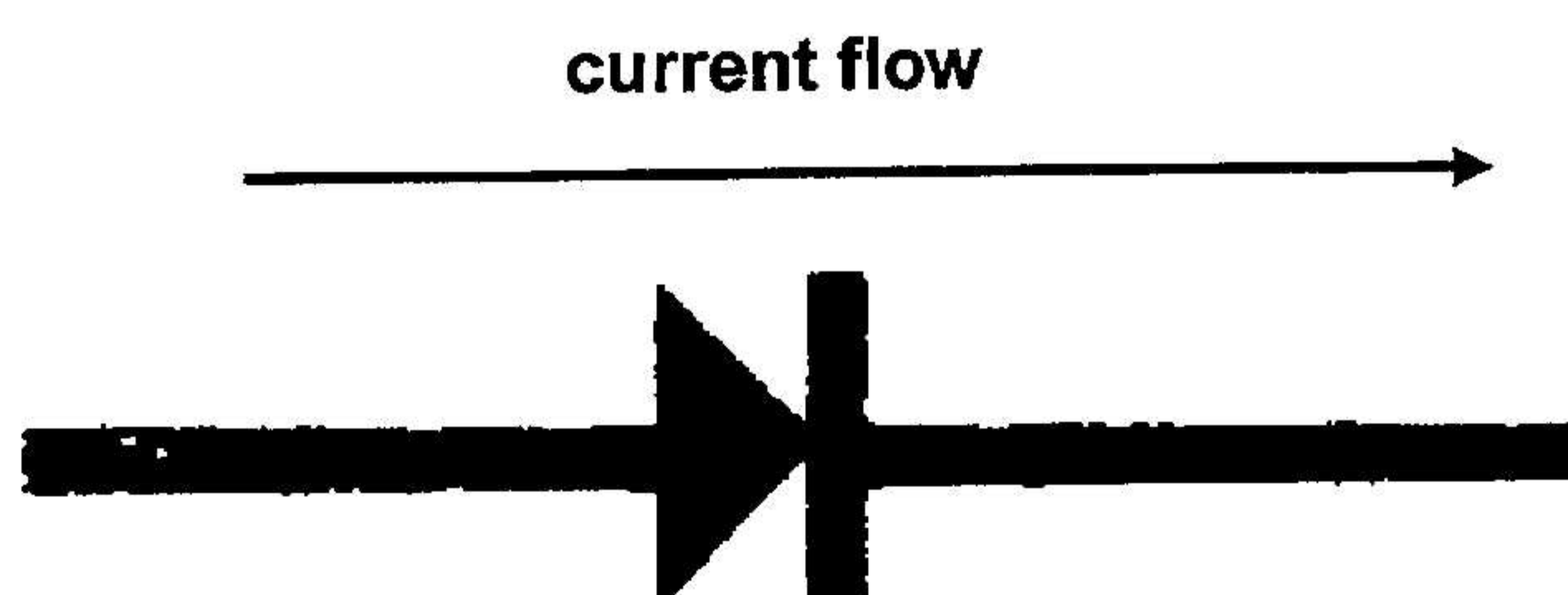
- 5.4
- Transistor very sensitive
  - Transistor should be kept cool
  - High cost

3x1=(3)

5.5 When a conductor cuts through the magnetic lines of force

2x1=(2)

5.6



(3)

- 5.7
- Permanent Magnet
  - Electro Magnet

2x1=(2)

5.8 Six

(2)

5.9 Base

(2)

5.10 Transistor does not expose primary circuit to high voltage.

2x2=(4)

**[36]**

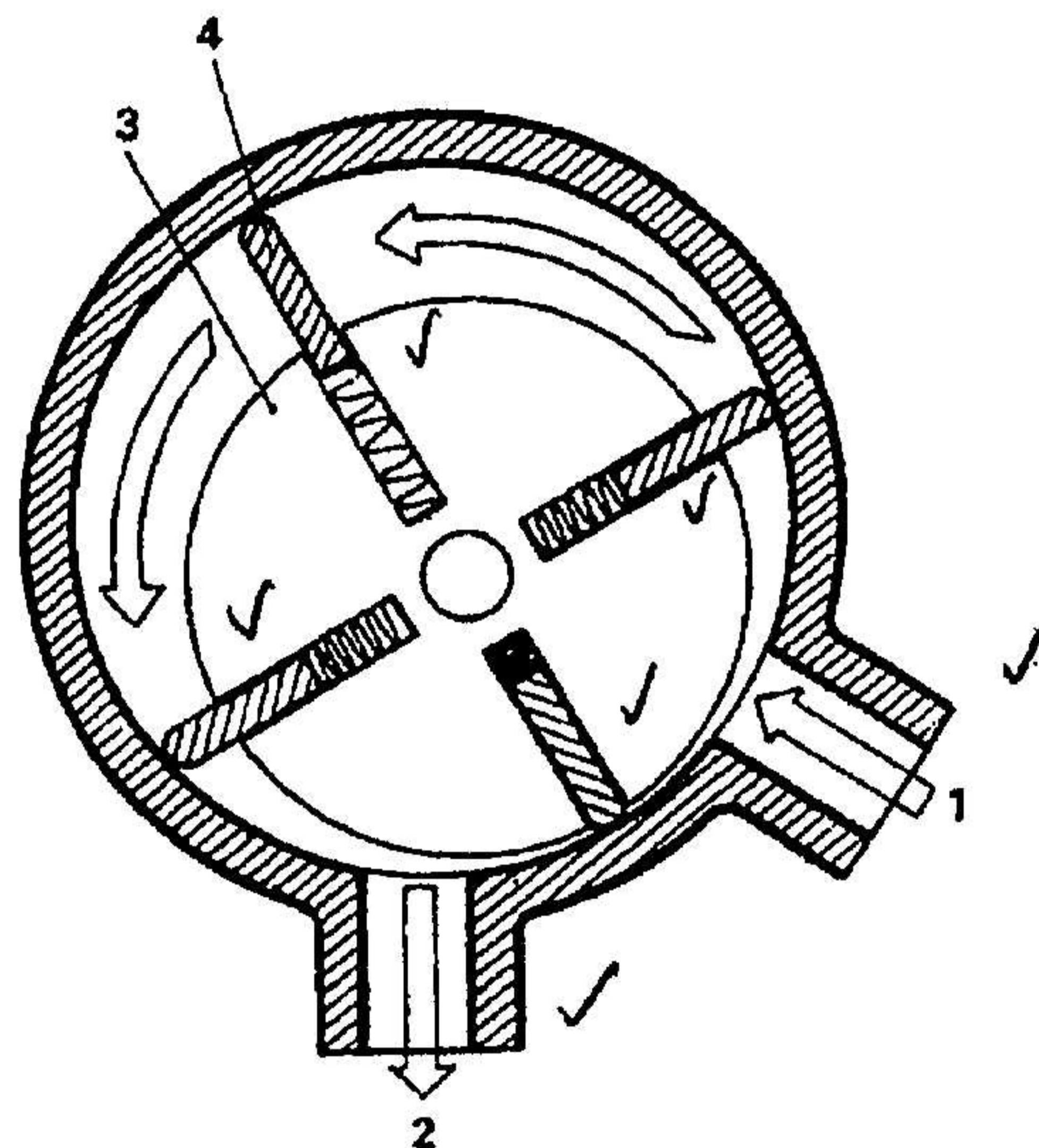
## QUESTION 6

- 6.1.1 Heat value of a fuel is the amount of heat released during total combustion of 1 kg of fuel in the presence of an adequate supply of oxygen. 4x1=(4)
- 6.1.2 Volatility is the ease with which a fuel is transformed from a liquid to a vapour. 3x1=(3)
- 6.1.3 Pre-ignition occurs when the air / fuel mixture is ignited by any means other than the spark between the spark plug electrodes. 3x1=(3)

- 6.2
- Phasing (1)
  - Calibration (1)

- 6.3
- Ensures immediate closure of the injector valve
  - Prevents dribble from injector nozzle
  - Decreases pressure in pipes to injectors
- 2x2=(4)

6.4



Drawing = (6)  
Labels = (4) (10)

- 6.5
- Simple design and fewer moving parts
  - Variable venturi opening provides a constant air flow.
  - Increase in volumetric efficiency
  - Single jet used
  - No complicated compensation systems
- 5x1=(5)

6.6 To prevent rapid upward movement of the piston during acceleration 5x1=(5)

- 6.7
- Plunger
  - Barrel
  - Delivery valve
- (3)

- 6.8
- Control idle speed
  - Control constant speed
  - Control maximum speed
- (3)

**TOTAL: [42] 200**

## GAUTENGSE DEPARTEMENT VAN ONDERWYS

## SENIORSERTIFIKAAT-EKSAMEN

## MOTORWERKTUIGKUNDE SG

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LET WEL: Enige ander korrekte antwoord wat nie in die memorandum genoem word nie, mag as korrek aanvaar word.

## VRAAG 1

- 1.1 A = Volumetriese doeltreffendheid (2)
- 1.2 C = die wisselstroom in gelykstroom om te skakel (2)
- 1.3 B = stator (2)
- 1.4 B = waterstof (2)
- 1.5 C = 15:1 (2)
- 1.6 A = die hoeveelheid brandstof wat ingespuut word (2)
- 1.7 C = 'n elektriese skakelaar (2)
- 1.8 C = ontvlambare vloeistowwe (2)
- 1.9 A = stortpoort ontbloot (2)
- 1.10 B = daardie gedeelte van die slag waartydens brandstof in die ontbrandingskamer ingespuut word (2)
- 1.11 B = uit 80% iso-oktaan en 20% heptaan bestaan (2)
- 1.12 B = geleier (2)
- 1.13 C = resistor (2)
- 1.14 B = positiewe naspoorhoek (2)
- 1.15 A = die wiele terug te bring na die reguitvorentoe-posisie nadat daar om 'n draai beweeg is. (2)

**[30]**



**VRAAG 2**

2.1  $RD = 2\pi NT$

$$= \frac{2\pi \times 2800}{60} \times 250 = 73313,3 \text{ W}$$

$$= 73,3 \text{ kW} \quad (4)$$

2.2  $MD = \frac{RD}{AD} \times 100$

$$= \frac{50}{60} \times 100$$

$$= 83,3 \% \quad (2)$$

2.3  $KV = \frac{SV + VV}{VV}$

$$= \frac{308 + 40}{40}$$

$$= 8,7:1$$

$SV = \frac{\pi D^2}{4} \times L$

$$= \frac{70}{10} \times \frac{70}{10} \times \frac{80}{10} \times \frac{\pi}{4}$$

$$= 308 \text{ cc} \quad (8)$$

2.4

2.4.1 Aangeduide drywing is die teoretiese of berekende drywing wat 'n enjin behoort te ontwikkel, sonder inagneming van meganiese verliese. 4x1=(4)

2.4.2 Remdrywing is die werklike drywing wat 'n enjin ontwikkel en word by die vliegwiël gemeet. 2x1=(2)  
[20]

**VRAAG 3**

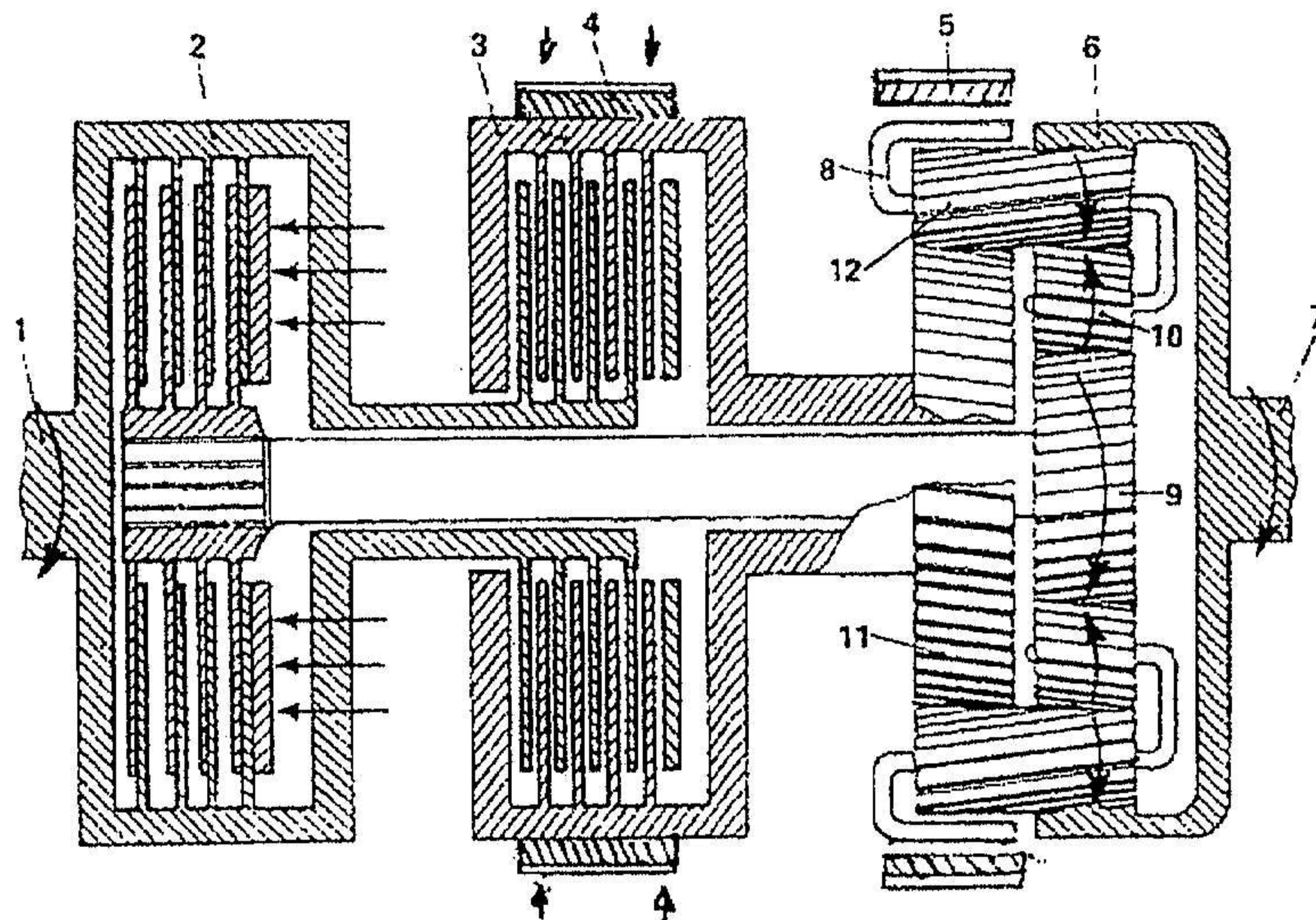
3.1 Die getal ratverhoudings wat deur die ratkas voorsien word, word deur die tweegang-eindaandrywing verdubbel. (2)

3.2 Twee permanente reduksies in die eindaandrywing-stelsel. (2)

3.3 Die aandryfwiele se diameter van hierdie voertuie is groter as dié motorvoertuie. Meer wringkrag is nodig om in beweging te kom. (2)

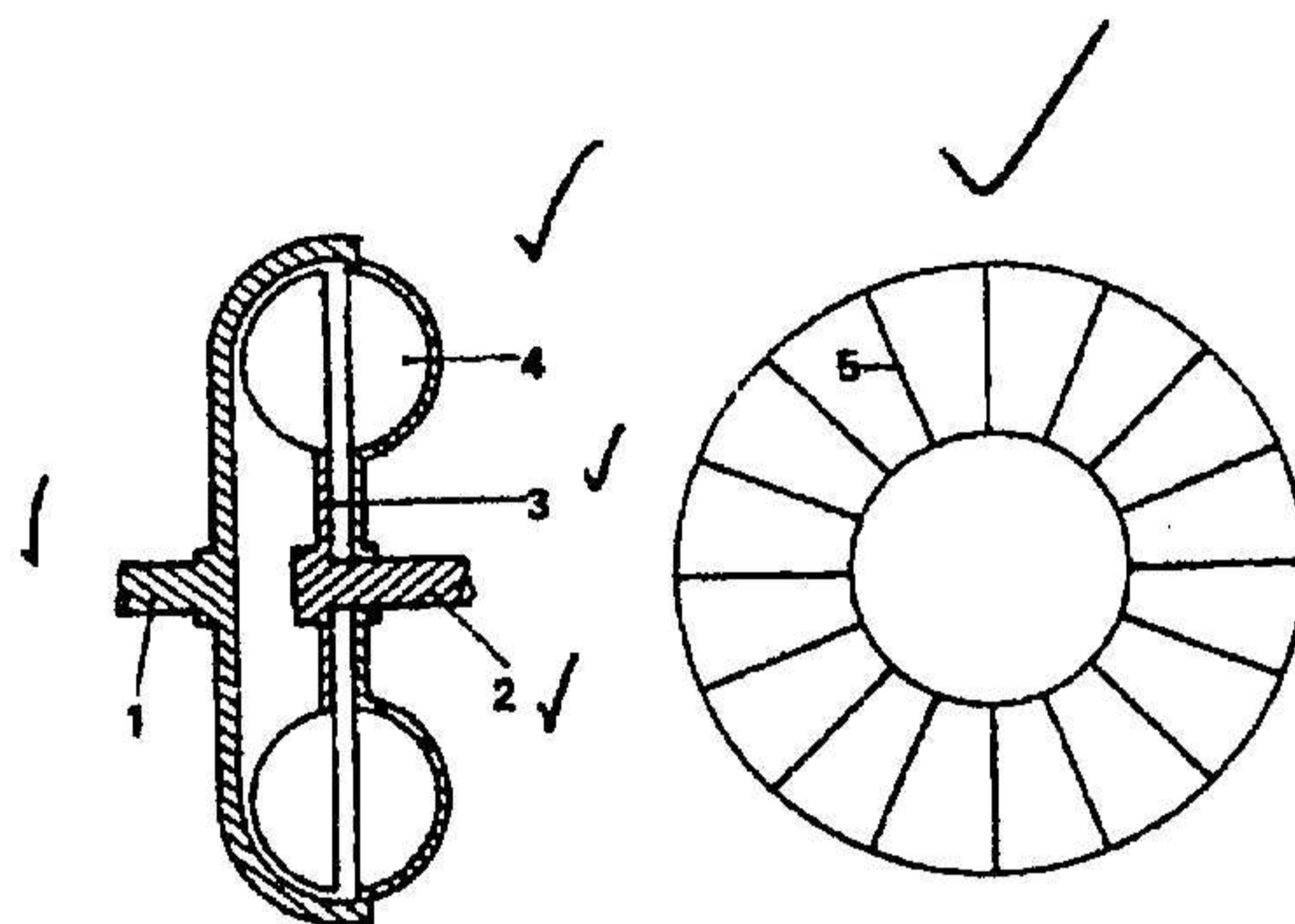
3.4 Tandem-aandrywing (2)

3.5



(13)

3.6



(5)

3.7

- Trek baie gladder weg
- Doen weg met koppelaarpedaal
- Olie dien as skokdemper
- Dien as enjinvliegwiël

2x1=(2)

3.8

- Drywingsverlies weens glip
- Hoër brandstofverbruik
- Hoër luierspoed benodig

2x1=(2)

3.9

Stator draai in dieselfde rigting as pomp en turbine.

(2)  
[32]

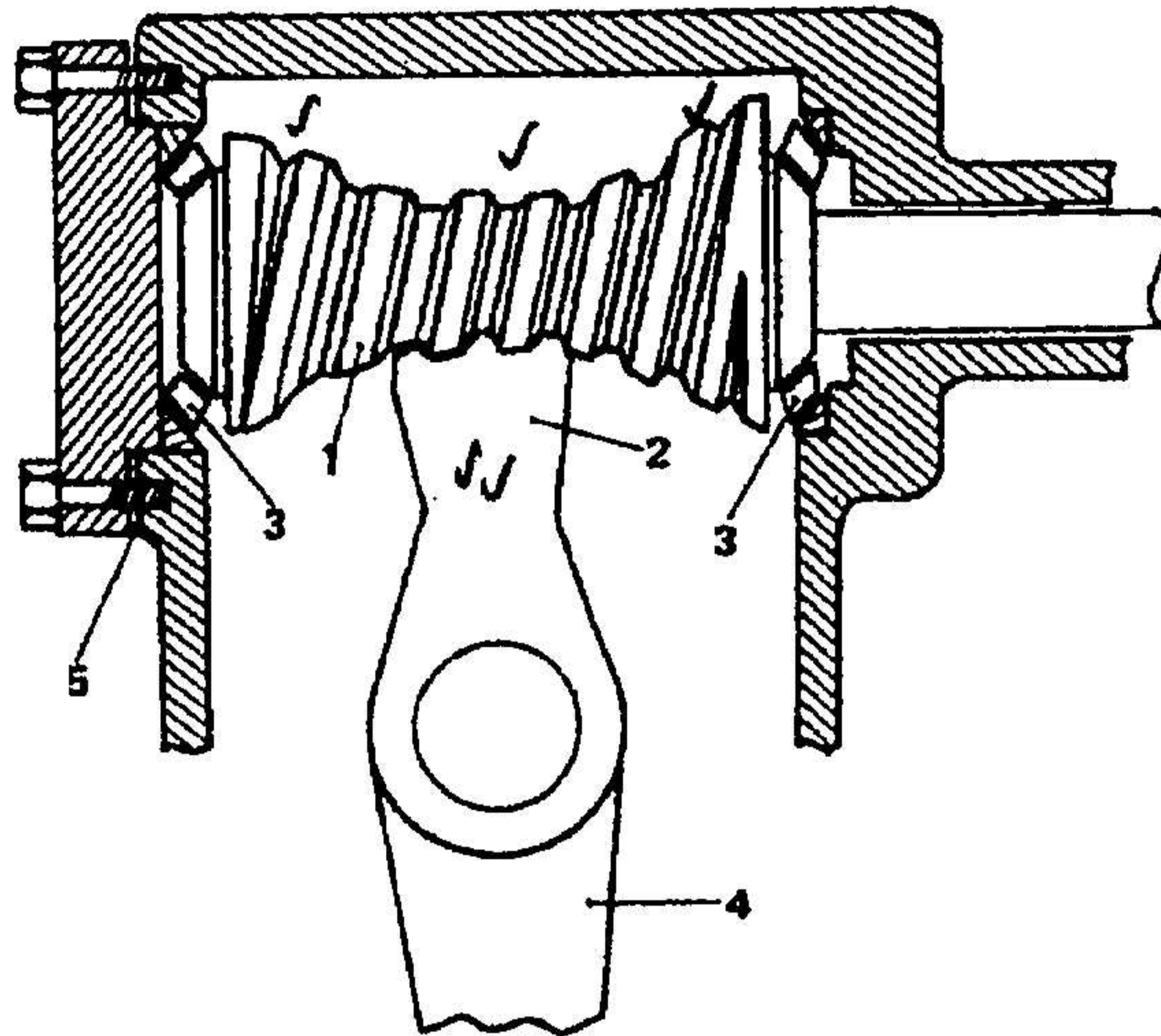
#### VRAAG 4

4.1

- Absorbeer padskokke
- Verhoog hefvoordeel
- Sit die draai beweging van die stuurwiel om na 'n soortgelyke beweging deur die voorwiele

2x1=(2)

4.2



Skets = 5  
Byskrifte = 5 (10)

4.3

- Verlaag enjin se krag
- Padgevoel op stuurwiel gaan verlore.
- Meer slytasie by bewegende dele
- Vervaardigingskoste hoog

3x1=(3)

4.4

Die eweredige verspreiding van al die massas om die rotasie-as in die rotasievlak

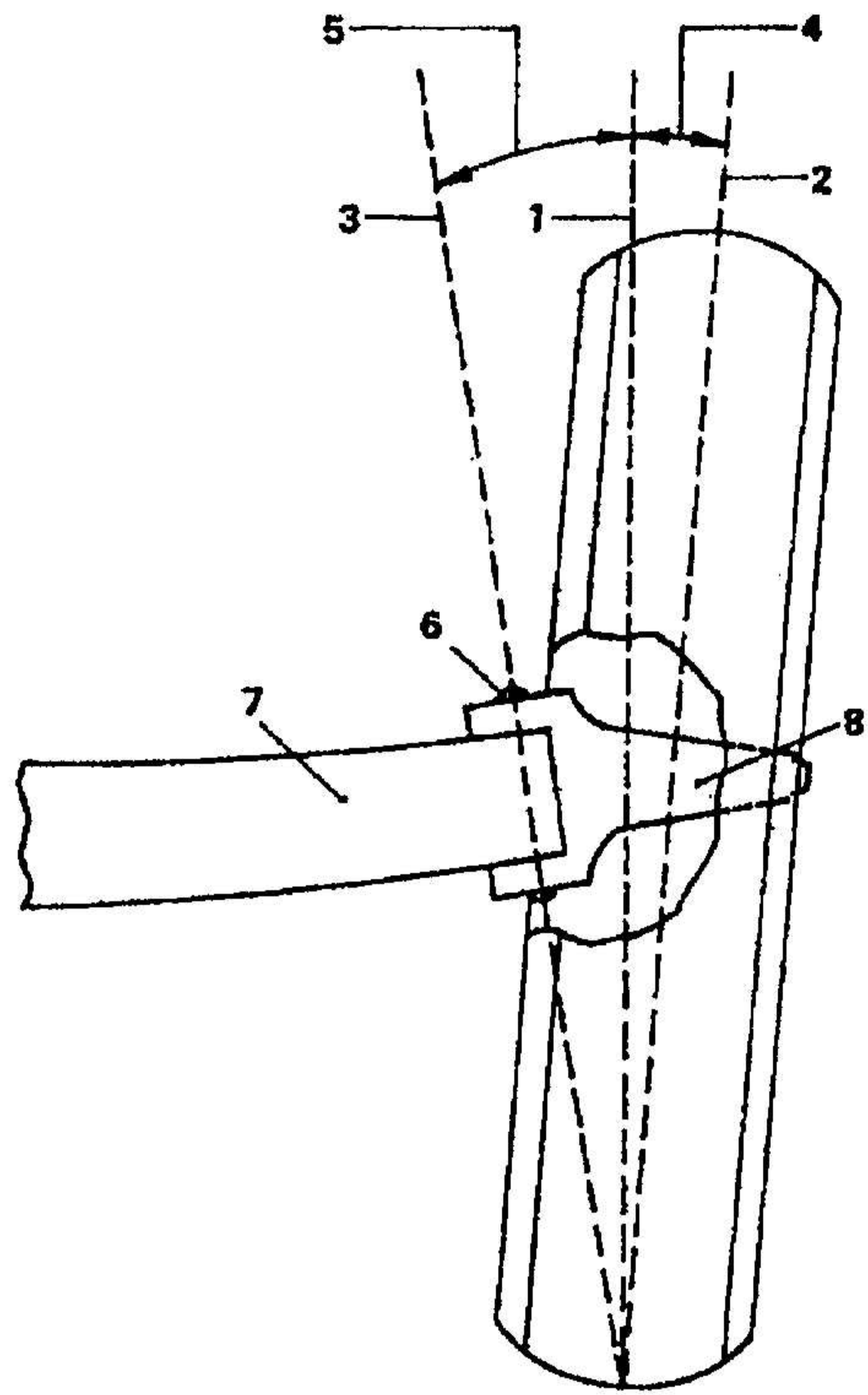
2x1=(2)

4.5

- Toestand van bande
- Bande moet dieselfde grootte wees.
- Banddruk moet dieselfde wees.
- Ondersoek alle bande om te sien of hulle rond is.
- Ondersoek bande vir wielslingering.
- Ondersoek voorwiellaers.
- Ondersoek stuurkoppelings.
- Ondersoek stuurkas vir abnormale speling.

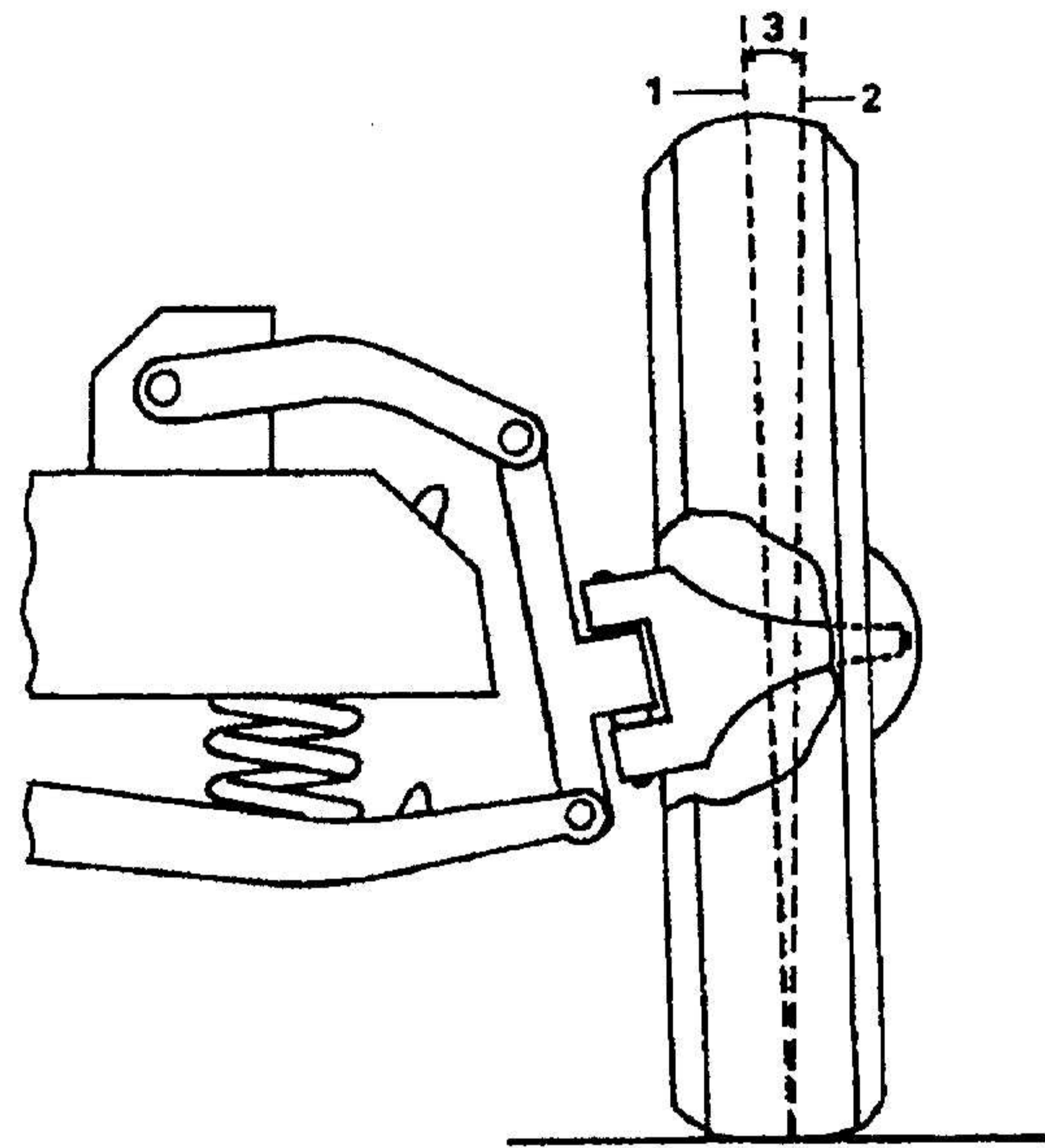
5x1=(5)

4.6  
4.6.1



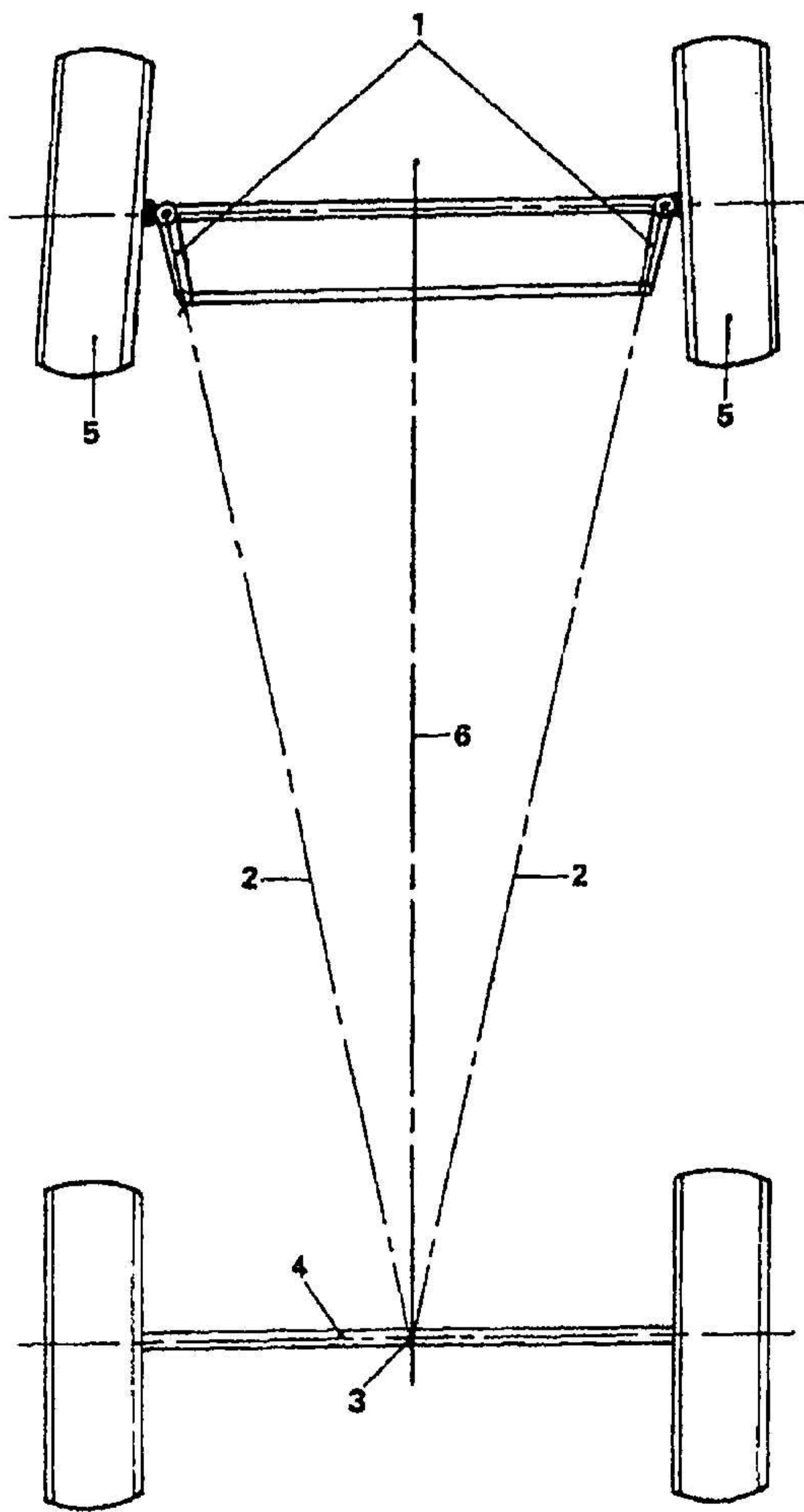
(5)

4.6.2



(5)

4.6.3

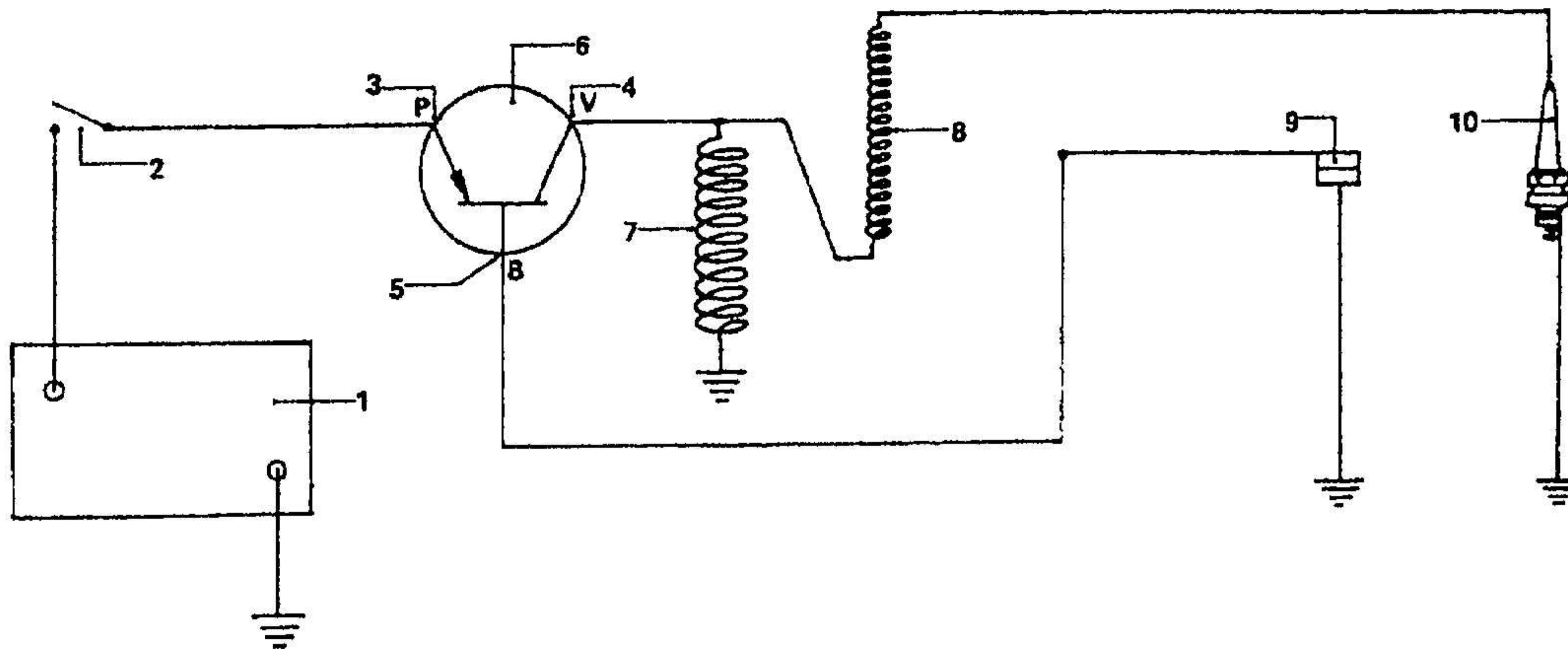


(8)

[40]

## VRAAG 5

5.1



(10)

- 5.2
- Elektriese boormasjien
  - Tydlig
  - Klepslypmasjien
  - Enjindiagnose-masjien
  - Elektriese toetsapparaat

(5)

- 5.3
- Bestuurdervingvermoëidheid geëlimineer
  - Beter brandstofverbruik
  - Gestelde spoed konstant beheer

3x1=(3)

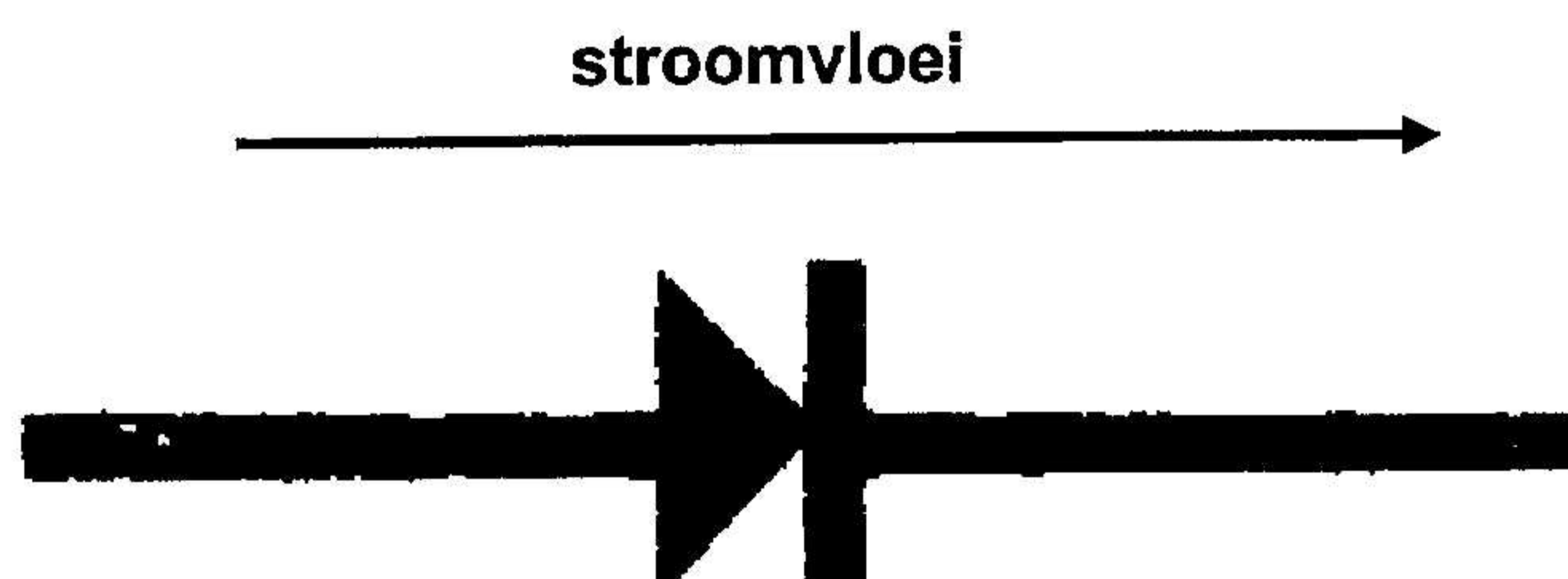
- 5.4
- Transistor baie sensitief
  - Transistor moet koel gehou word
  - Hoë koste

3x1=(3)

5.5 Wanneer 'n geleier deur 'n magneetveld beweeg

2x1=(2)

5.6



(3)

- 5.7
- Permanente magneet
  - Elektromagneet

2x1=(2)

5.8 Ses

(2)

5.9 Basis

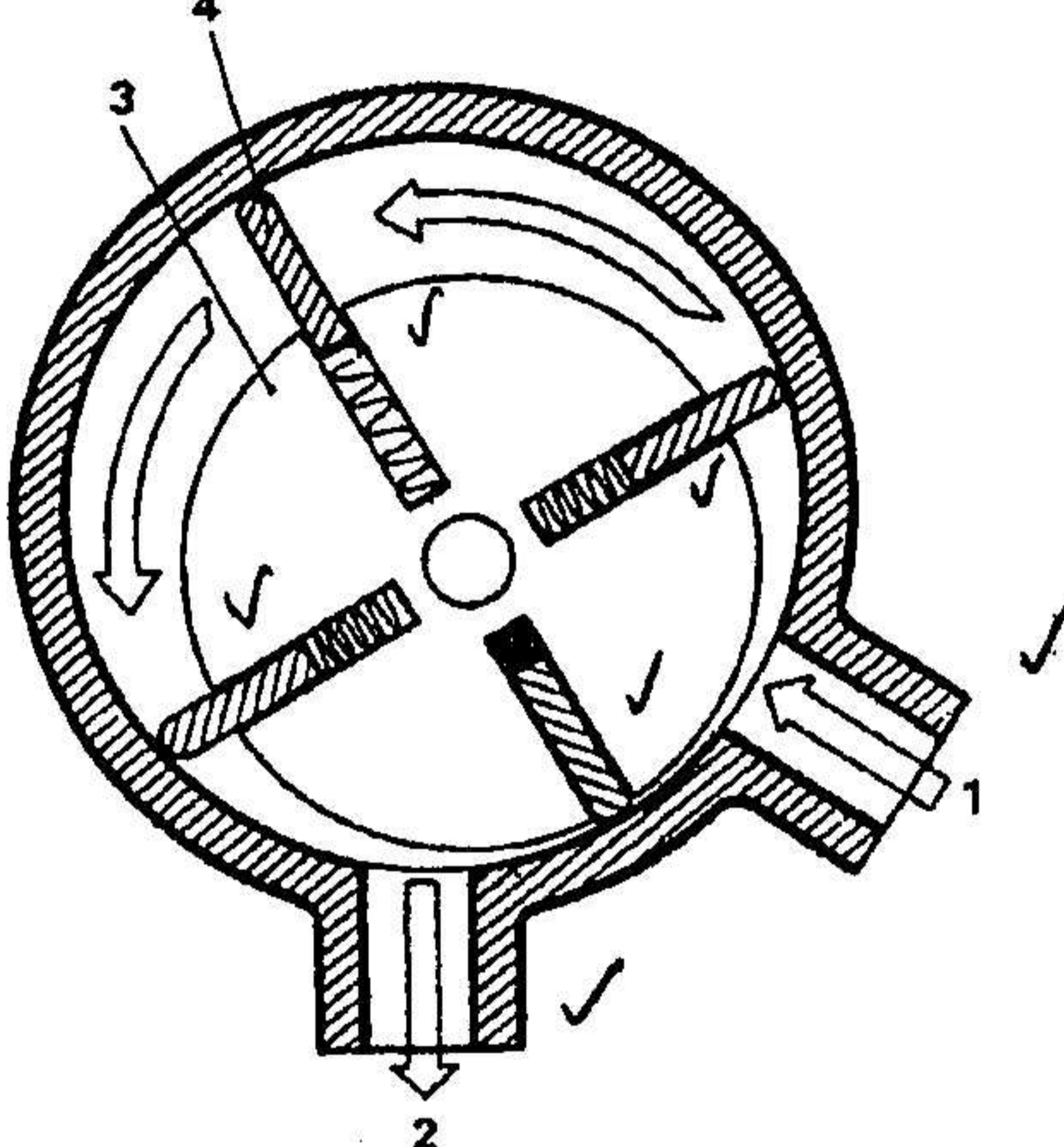
(2)

5.10 Die transistor stel nie primêre stroomkring bloot aan hoë spanning nie.

2x2=(4)

[36]

## VRAAG 6

- 6.1.1 Hittewaarde van 'n brandstof is die hoeveelheid hitte wat vrygestel word tydens die algehele verbranding van 1 kg brandstof in die aanwesigheid van genoegsame suurstof. 4x1=(4)
- 6.1.2 Vlugtigheid is die geredelikheid waarmee brandstof vanaf 'n vloeistof in 'n damp verander word. 3x1=(3)
- 6.1.3 Voorontsteking vind plaas wanneer lug/brandstof-mengsel ontsteek word op enige ander manier, buiten deur die vonk tussen die vonkpropelektrodes. 3x1=(3)
- 6.2
- Fasering (1)
  - Kalibrering (1)
- 6.3
- Verseker onmiddellike sluiting van injektorklep.
  - Voorkom nadrup vanuit injektornossel.
  - Verlaag druk in pyleidings na injektors. 2x2=(4)
- 6.4
- 

Skets = (6)

Byskrifte = (4) (10)
- 6.5
- 'n Eenvoudige ontwerp en minder bewegende dele
  - Veranderbare-venturi-opening verskaf konstante lugvloei.
  - Verhoog volumetriese doeltreffendheid.
  - Slegs een sproeier word gebruik.
  - Geen ingewikkelde kompenseerstelsels nie. 5x1=(5)
- 6.6 Voorkom dat suier te vinnig op beweeg gedurende versnelling 5x1=(5)
- 6.7
- Plunjer
  - Silinder
  - Leweringsklep (3)
- 6.8
- Beheer luierspoed
  - Beheer konstante spoed
  - Beheer maksimum spoed (3)

**TOTAAL: [42]**  
**200**