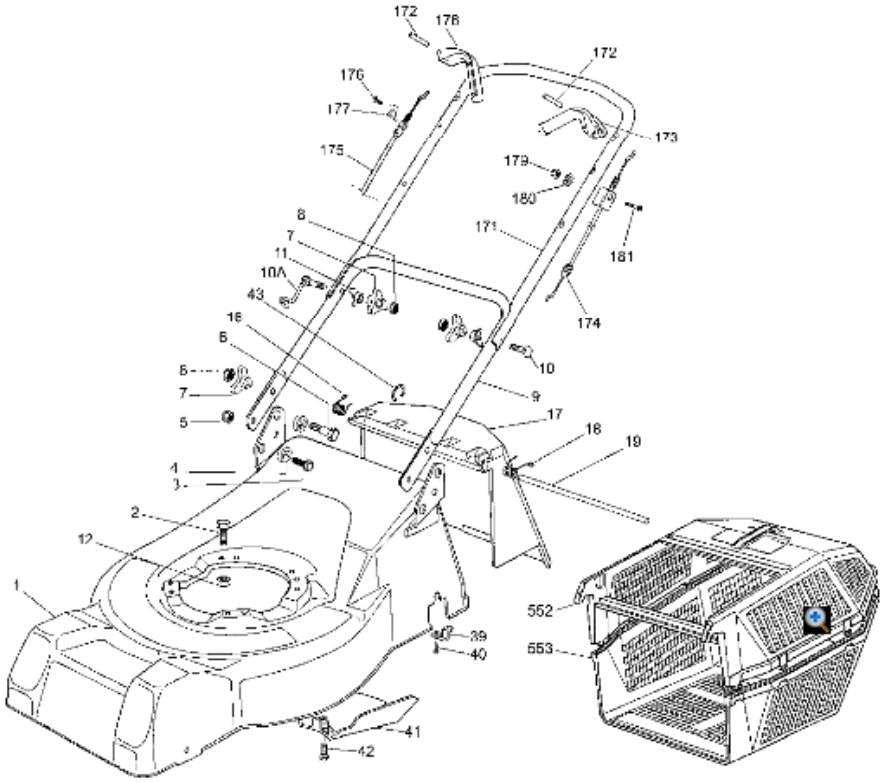
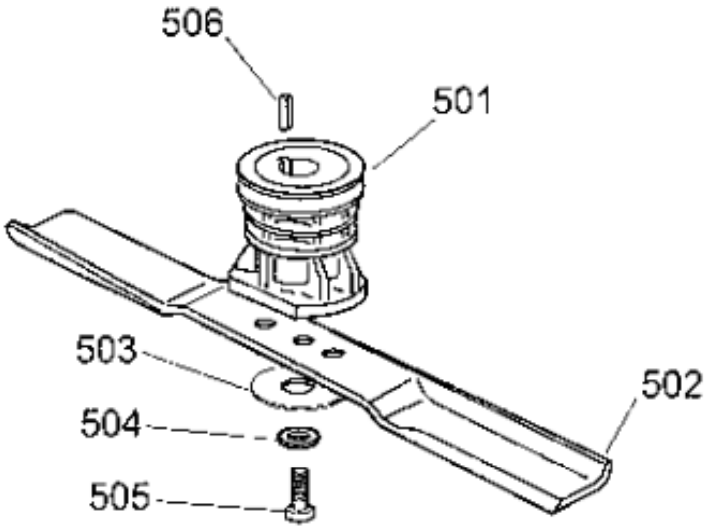
Design for Manufacture

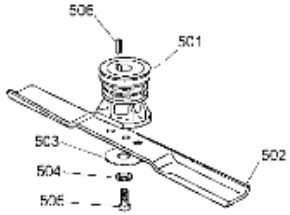
5. Transmission for self-propulsion

Transmission for self-propulsion

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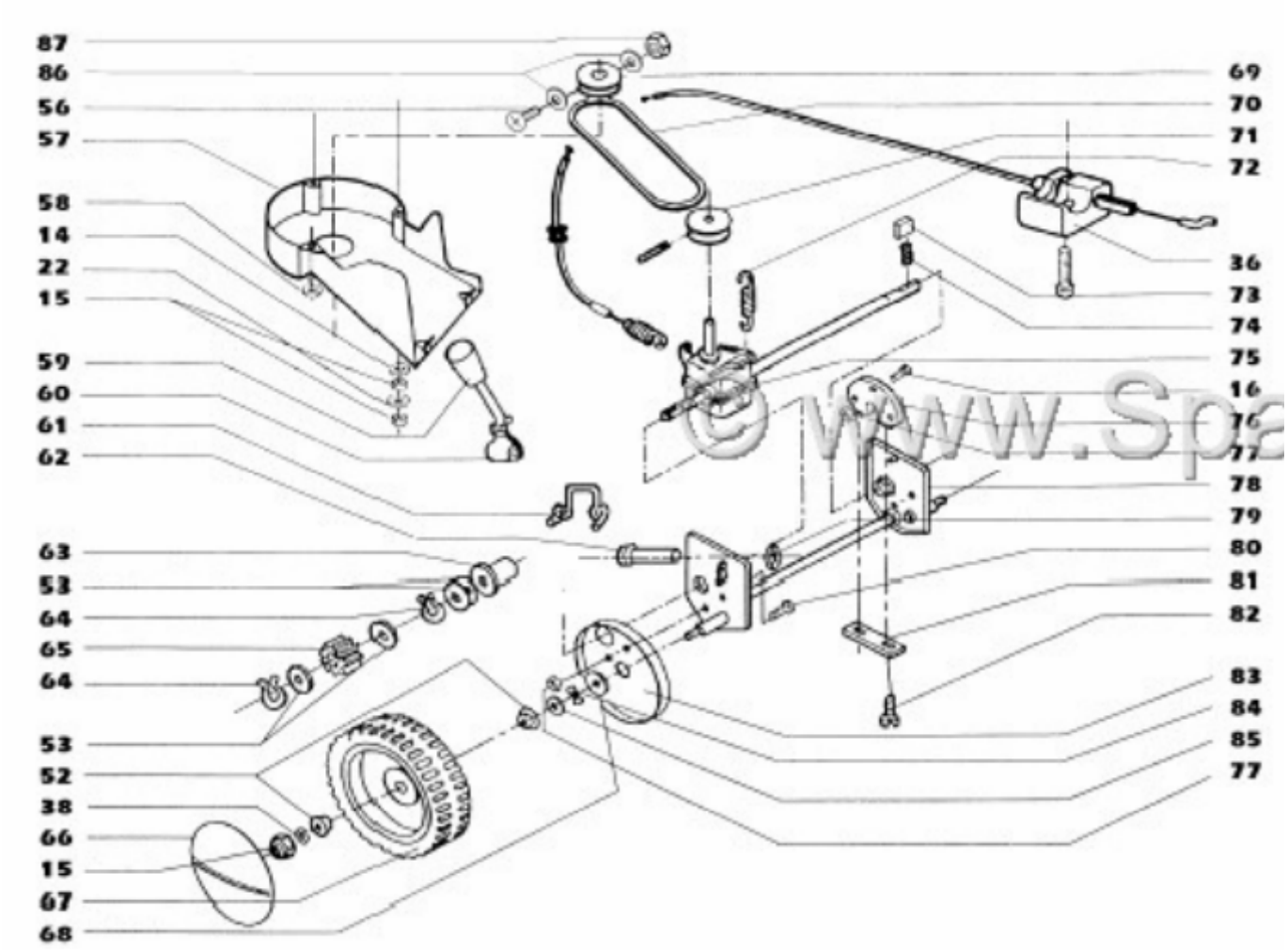






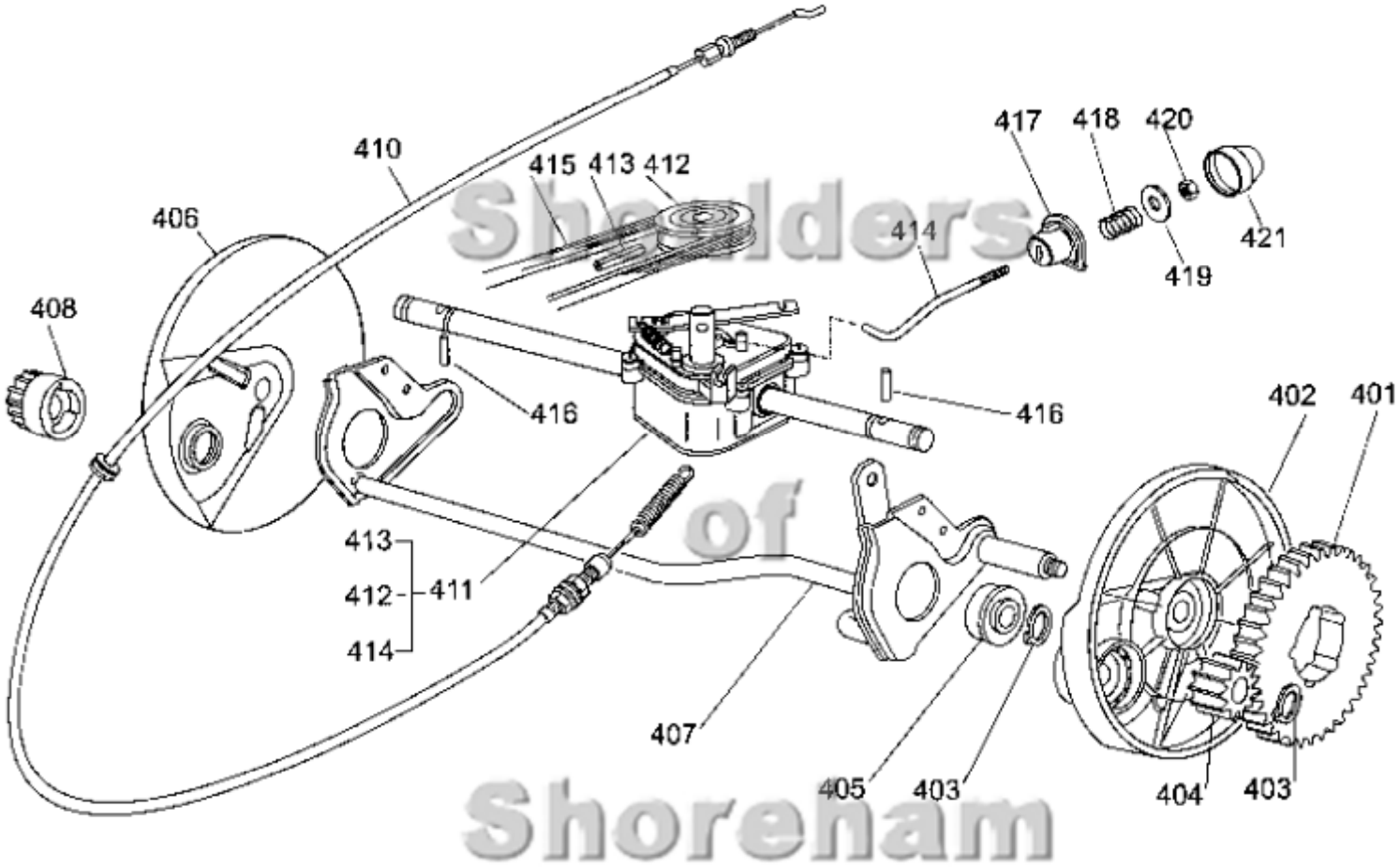
Transmission for self-propulsion

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Transmission for self-propulsion

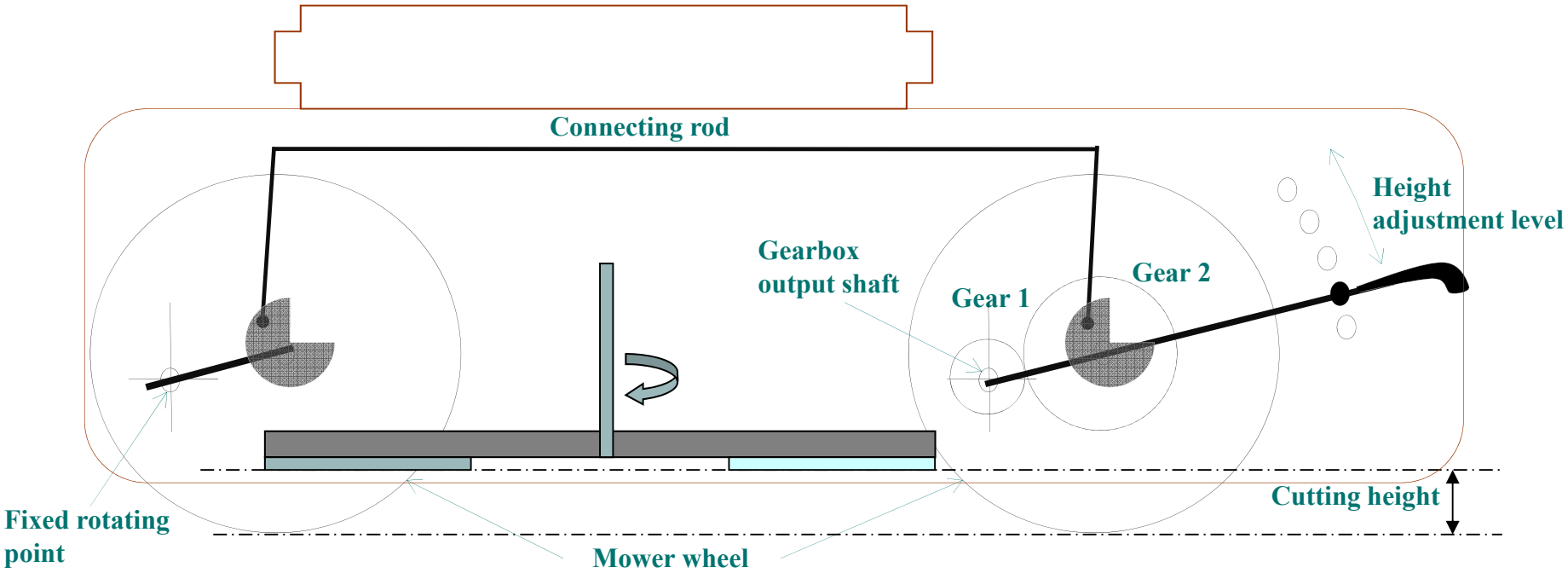


Shelders of Shorenam

Gears in the wheel for flexibility in height adjustment

Transmission for self-propulsion

University of Sussex



Transmission for self-propulsion

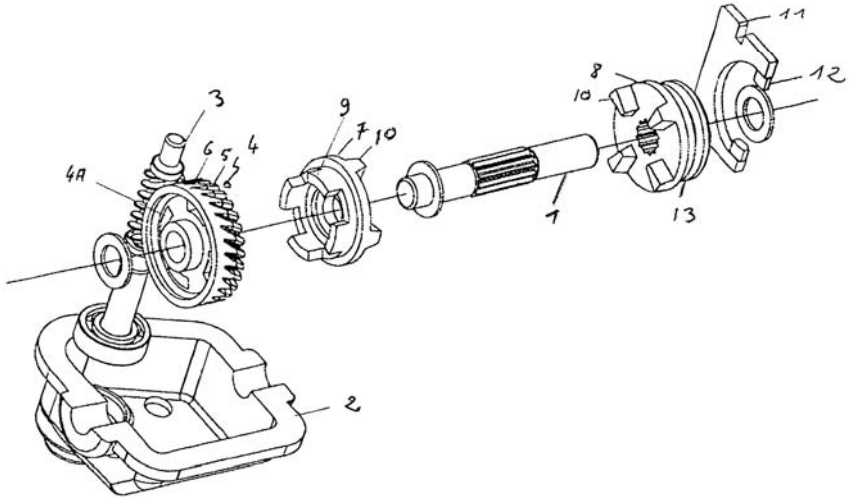
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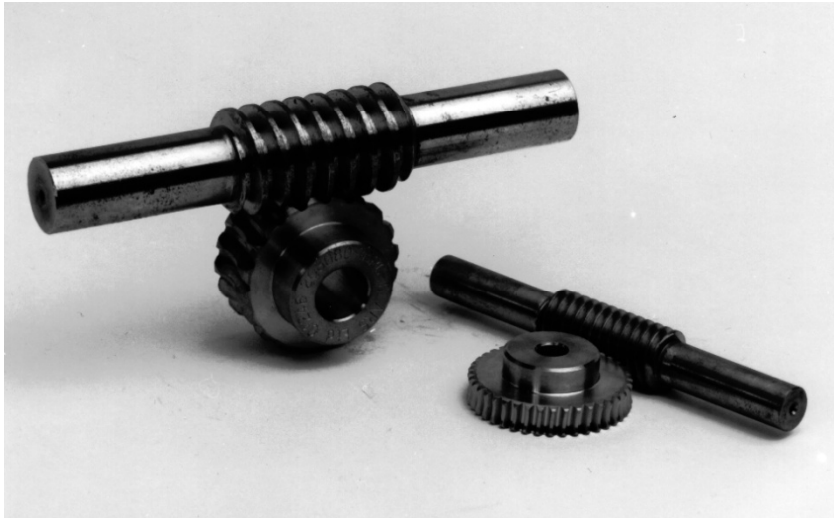








Transmission for self-propulsion



Worm gears

Gear ratio= no. of teeth of the worm gear to 1

GEAR	RATIO RANGE	PITCH LINE VELOCITY (m/s)	EFFICIENCY
Spur	1:1 to 6:1	25	98-99%
Helical	1:1 to 10:1	50	98-99%
Double helical	1:1 to 15:1	150	98-99%
Bevel	1:1 to 4:1	20	98-99%
Worm	5:1 to 75:1	30	20-98%
Crossed helical	1:1 to 6:1	30	20-98%

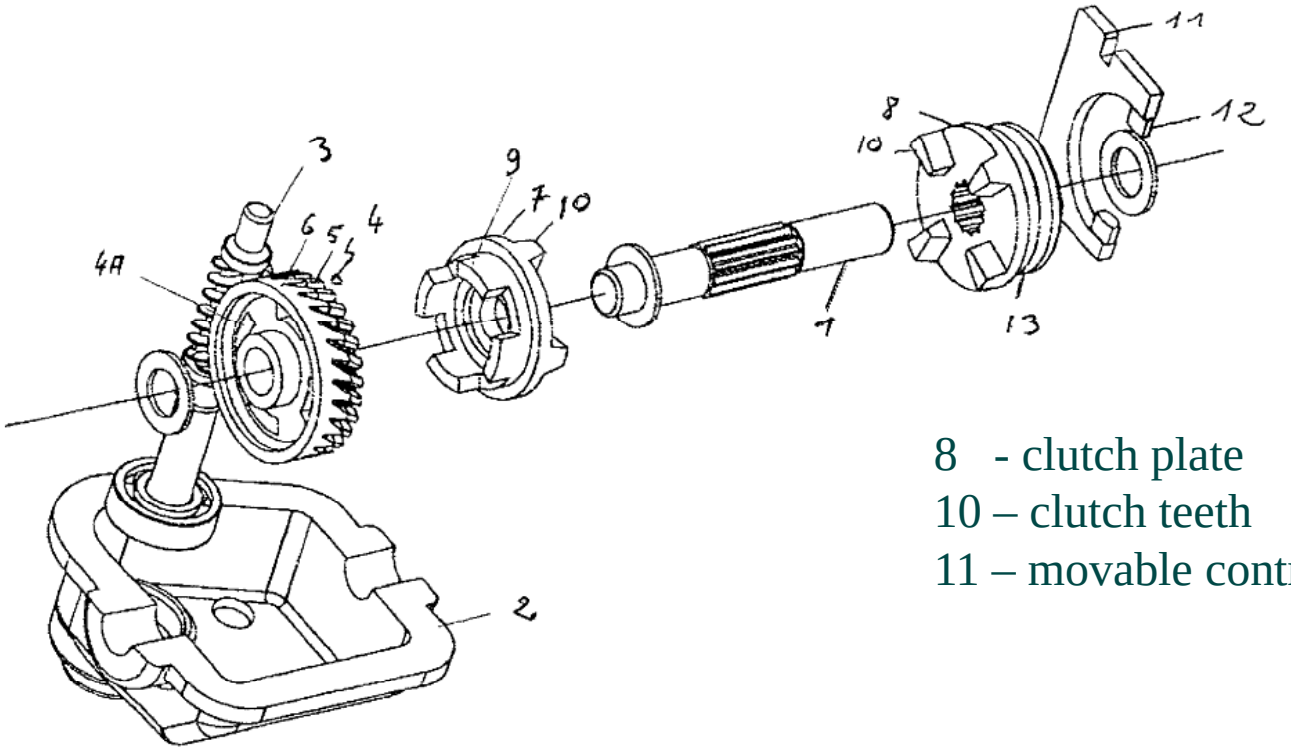
A US Patent for Lawnmover Transmission

US
University of Sussex


US006701796B2

(12) **United States Patent**
Blanchard

(10) **Patent No.: US 6,701,796 B2**
(45) **Date of Patent: Mar. 9, 2004**



8 - clutch plate
10 – clutch teeth
11 – movable control

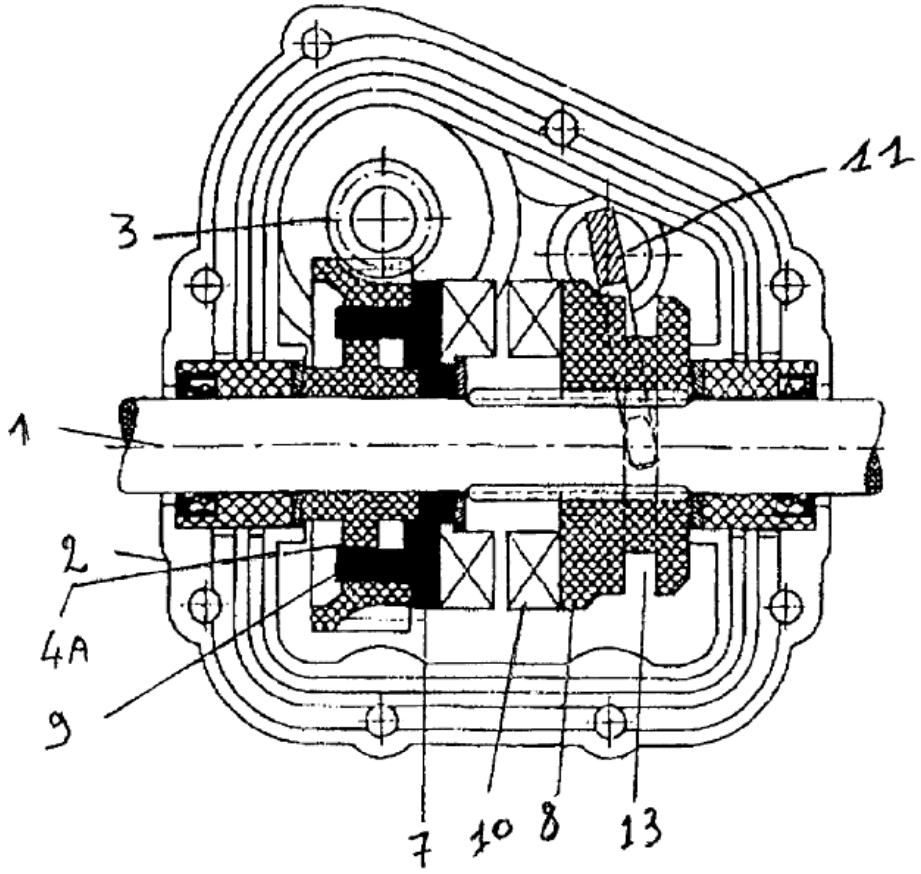
A US Patent for Lawnmover Transmission

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(12) **United States Patent**
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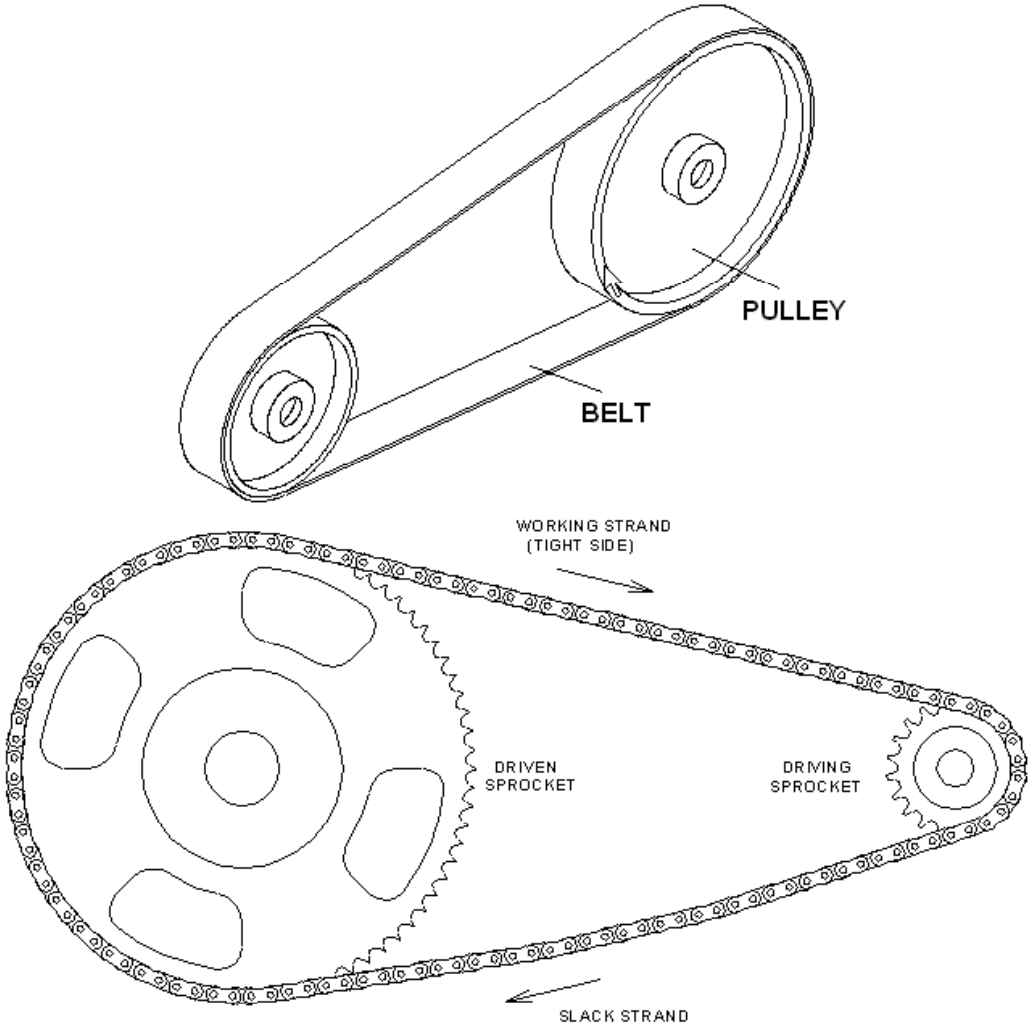
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8 - clutch plate
10 – clutch teeth
11 – movable control

Belt and Chain Drives

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Belt and Chain Drives

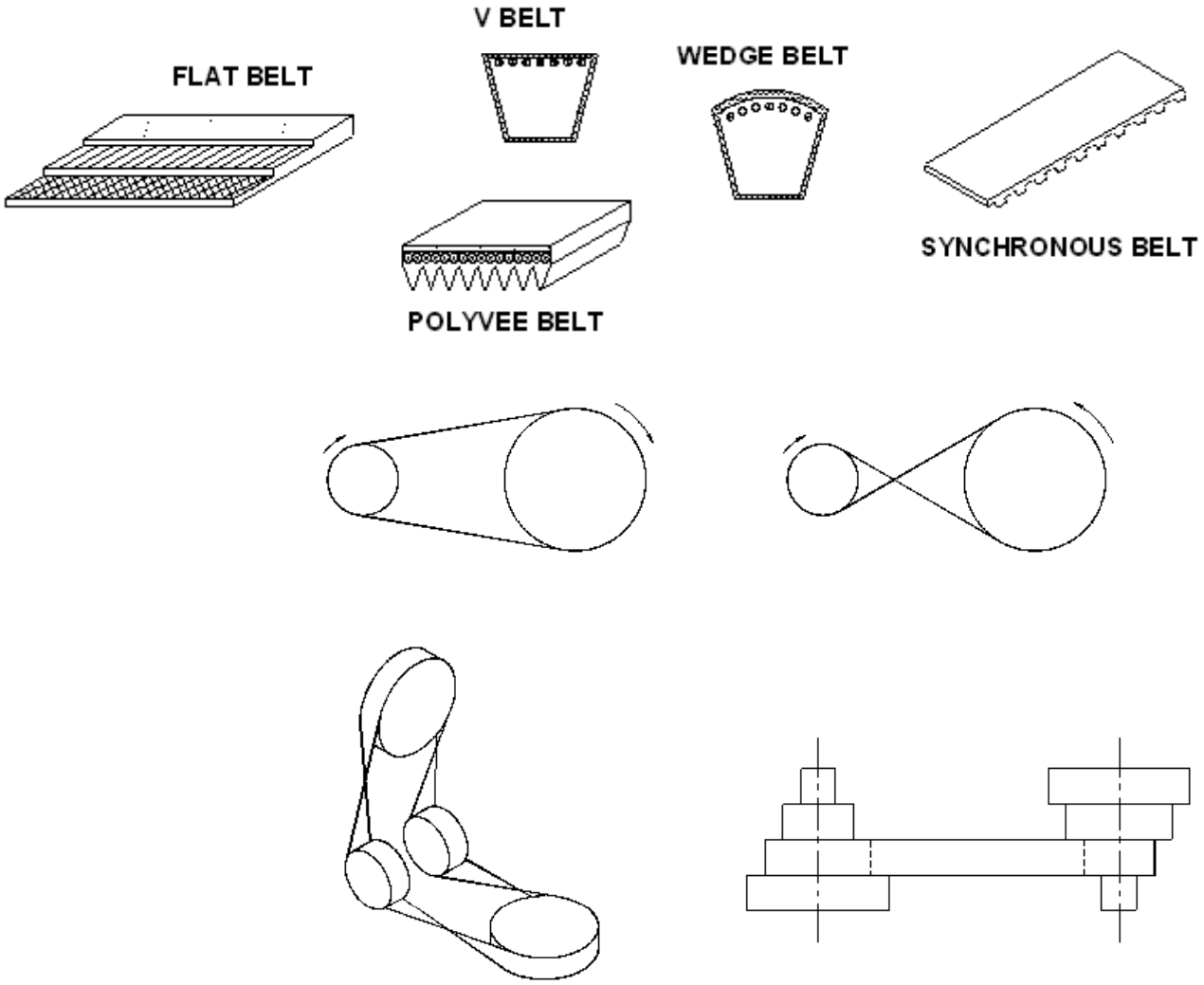
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- Belt drives have numerous advantages over gear and chain drives including easy installation, low maintenance, high reliability, adaptability to non-parallel drive and high transmission speeds.

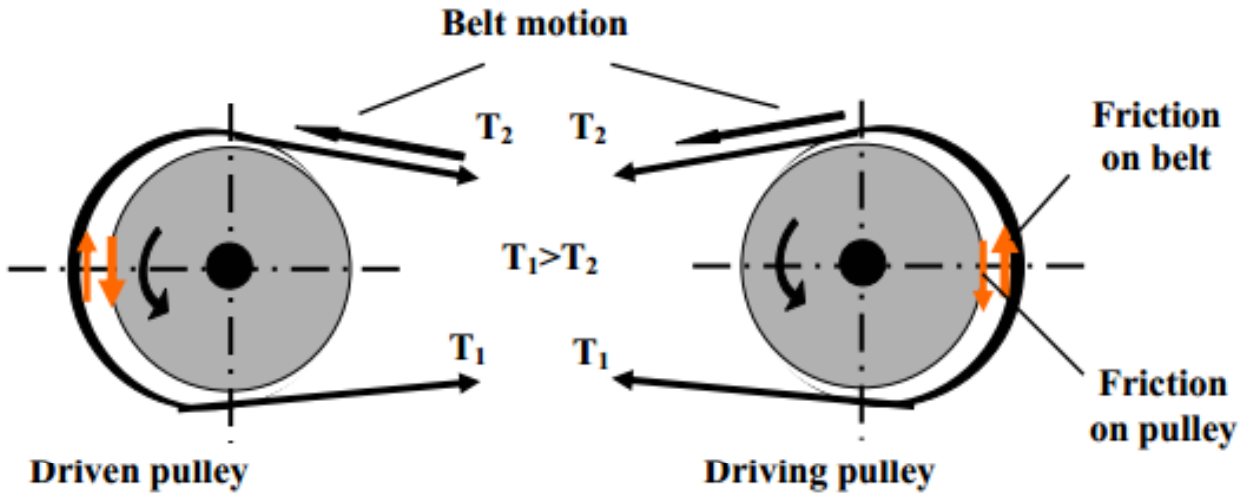
- Disadvantages of belt drives are their limited power transmission capacity and limited speed ratio capability. Belt drives are less compact than either gear or chain drives and are susceptible to changes in environmental conditions such as contamination with lubricants. In addition vibration and shock loading can damage belts.

Belt cross sections and pulley configurations

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Belt tensions



Tension ratio $= T_1/T_2$

Power transmission of belt drive

$$P = (T_1 - T_2)v$$

Belt performances

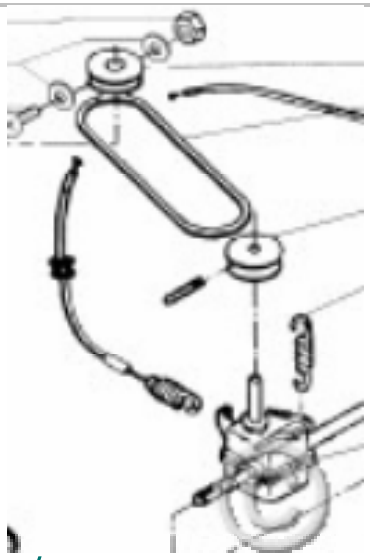
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PARAMETER	FLAT BELT DRIVE	V BELT DRIVE	WEDGE BELT DRIVE	SYNCHRONOUS BELT DRIVE
Optimum efficiency	98%	80%	86%	98%
Maximum speed (m/s)	70	30	40	50
Minimum pulley diameter (mm)	40	67	60	16
Maximum speed ratio	20	7	8	9
Optimum tension ratio	2.5	5	5	-

speed ratio = driving shaft speed / driven shaft speed

Transmission for self-propulsion example

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Given a lawnmower with:
lawnmower wheels radius r=0.07m,
engine speed 2600 rpm,
self propulsion speed is required to be v=1 m/s,
2 belt transmission pulleys have same diameters.
Find the worm gear ratio.

Solution:
Wheel speed ω=v/r=1/0.07=14.28 rad/s or 14.28/(2pi)=2.27rev/s

Or 2.27*60=136.4 rpm



Worm wheel teeth, i.e. the worm gear ratio:

2600/136.4 = 19.

(This corresponds to the case that the lawnmower wheel is directly fitted on the shaft of worm wheel)