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Research Paper | Engineering

Design and Assembly of Worm Gear Reducer

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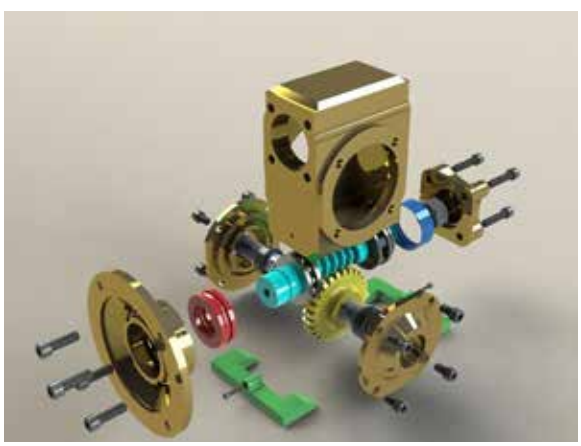
ABSTRACT

Worm gear speed reducers are comprised of the terms "gearbox" and "speed reducer" that are used interchangeably in the world of power transmission and motion control. Gearboxes are used for speed reduction and torque multiplication. A hybrid term of "gear reducer" is also commonly used when talking about gearboxes. This is simply a gearbox (or speed reducer, or gear reducer) with a motor directly mounted to the input. A gearbox designed using a worm and worm-wheel will be considerably smaller than one made from plain spur gears and has its drive axes at 90° to each other. With a single start worm, for each 360° turn of the worm, the worm-gear advances only one tooth of the gear. Therefore, regardless of the worm's size (sensible engineering limits notwithstanding), the gear ratio is the "size of the worm gear - to - 1". Given a single start worm, a 20 tooth worm gear will reduce the speed by the ratio of 20:1. With spur gears, a gear of 12 teeth (the smallest size permissible, if designed to good engineering practices) would have to be matched with a 240 tooth gear to achieve the same ratio of 20:1. Therefore, if the diametrical pitch of each gear was the same, then, in terms of the physical size of the 240 tooth gear to that of the 20 tooth gear, the worm arrangement is considerably smaller in volume. This paper talks about the 3-D design and assembly of a worm gear reducer using the design software tool from PTC, Creo Parametric 2.0. This CAD tool was instrumental in designing the 20 individual parts and hence creating the assembly of the gear reducer as a w hole. This project was aimed to test and optimize the CAD knowledge and sharpen the design skills. Creo Parametric is a very user-friendly design software which was very useful for this purpose. Furthermore, certain manufacturing activities like facing, cutting, milling and drilling activities were also completed on the designed parts. The manufacturing changes were reviewed in Vericut. Thus, to sum it up, designing a worm gear reducer takes a lot of patience and hard work, eventually leading to the potential development of 3-D design attributes.

KEYWORDS :



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I would further render my sincere thanks to Dr. Herli for believing my abilities and allotting the project for three months.

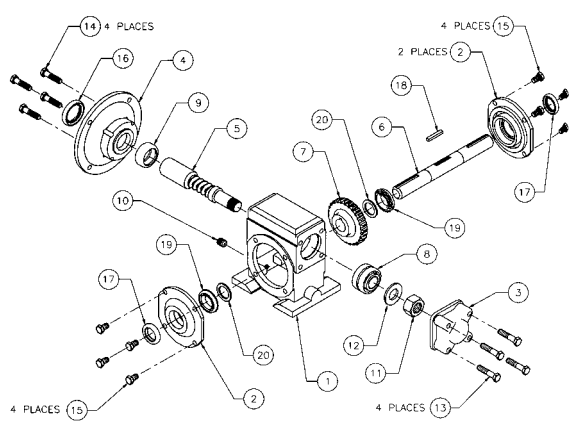
Last but not the least I would like to thank all the CAD Lab and library in charge of NJIT for their warm support and company during my research and completion of the project. I would also like to thank the Almighty for showering his blessings for the successful fulfilment of my project.

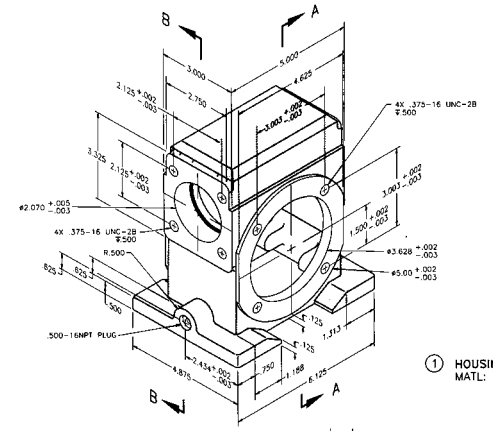
Design Layout:

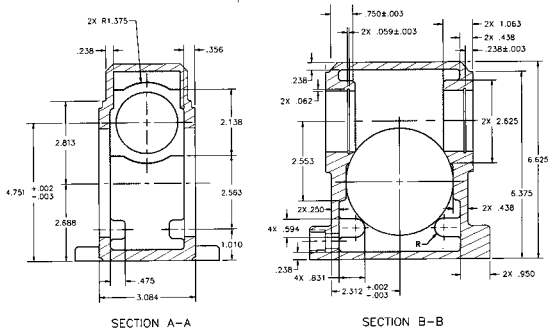
Assembly Name: Worm Gear Reducer
Advanced project: design changes may be required.

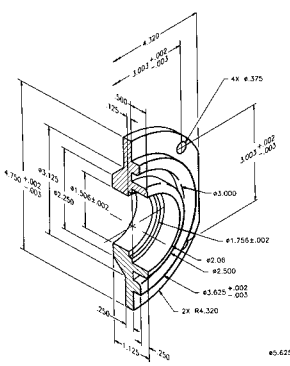
PARTS LIST:

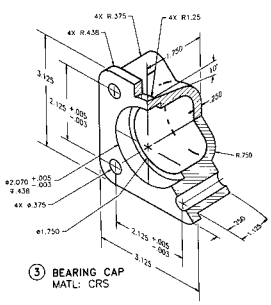
ITEM	QTY	NAME	DESCRIPTION	ITEM	QTY	NAME	DESCRIPTION
1	1	HOUSING		12	4	HIGH SPEED LOCKWASHER	TIMKEN TW-10S
2	2	RETAINING PLATE		13	4	MACHINE SCREW	.375-16UNC-2A X 1.813 HEX HEAD
3	1	BEARING CAP		14	4	MACHINE SCREW	.375-16UNC-2A X 1.625 HEX HEAD
4	1	MOTOR ADAPTER		15	8	MACHINE SCREW	.375-16UNC-2A X .625 HEX HEAD
5	1	HIGH SPEED SHAFT		16	1	HIGH SPEED OIL SEAL	PARKER 2-028
6	1	SLOW SPEED SHAFT		17	2	SLOW SPEED OIL SEAL	PARKER 2-020
7	1	WORM GEAR	BRONZE	18	1	SLOW SPEED KEYWAY	.1875 X .245 X 1.450
8	1	DBL. ROW TAPERED ROLLER BEARING	KOYO46T30305DJ/29.5	19	1	SNGL. ROW TAP ROLLER BEARING	KOYO 32005J
9	1	SNGL. ROLE CYL. ROLLER BEARING	KOYO CRL11	20	2	SLOW SPEED SPACER	TIMKEN TW-506
10	1	TAPER PLUG	500-16NPT PLUG				
11	1	HEX NUT	.875-16 UN-28				

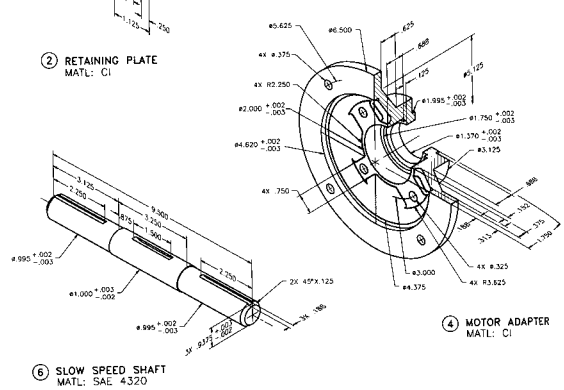


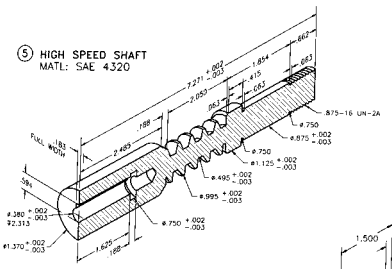




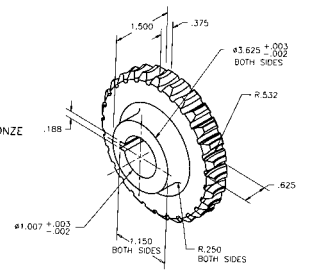








WORM GEAR DATA	
NUMBER OF THREADS	5
AXIAL PITCH	.628"
PRESSURE ANGLE	20°
PITCH DIAMETER	2.500
LEAD RIGHT HAND	3.142
LEAD ANGLE	11.91°
ADDENDUM	.125
WHOLE DEPTH	.281
CHORDAL THICKNESS	.163



SPUR GEAR DATA	
DIAMETRAL PITCH	8
NUMBER OF TEETH	27
PRESSURE ANGLE	20°
PITCH DIAMETER	3.375
BASE CIRCLE DIAMETER	3.6787
CIRCULAR PITCH	.3927
CIRCULAR THICKNESS	.1964
ROOT DIAMETER	3.125

Methodology for Design in Creo Parametric:

The basic tutorial guide for Creo Parametric 2.0 can be found here:

http://support.ptc.com/WCMS/files/141030/en/Primer_Creo_2.pdf

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