

Conical Male Object Angle Measuring Instrument using Simple Projector

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Abstract— The given name of the new angle measuring instrument is Angle projector. An instrument for angle measurement based on main scale and vernier scale readings has been designed. It has the advantage of simplicity, and consequently provides easy operation and an inexpensive instrument. Measurement technique is based on one reference “+” mark. That “+” mark used to measure the conical object specific angle.

Key words: Cone Angle Measuring Instrument, Angle Measuring Instrument, Simple Projector, Taper Angle, Angle Projector

I. INTRODUCTION

Angle projector is an instrument, It is used to measure the taper angle of the conical male object. A large scale industries used several methods to measure the angle of conical male object like as CMM, Sine bar, Profile projector. But small scale industries not possible to buy a this kind of machines. Because its price range and working time is very high. But this measuring instrument exited the this kind of problems. Even not to need skilled employee, unskilled employee easy to operated this instrument. One of the major advantages of this measuring instrument is fully worked on manually.

II. EXISTING MEASURING INSTRUMENT

Already the several conical male object measuring methods available in the industries. But the manual measuring methods are very few in market. Mostly sine center used to manually for measure the angle of conical male objects.

A. Sine centre

The sine centres are used to measure the angle accurately or for locating any work to a given angle within much closed limits. Sine centre are made from High Carbon, High Chromium corrosion resistant steel, hardened, ground and stabilized. A special type of sine bar is sine centre which is used for conical objects. It cannot measure the angle more than 45 degrees. Two cylinders of equal diameter are attached at the ends, the axis of these two cylinders are mutually parallel to each other and also parallel to and equal distance from the upper surface of the sine center. The distance between the axes of the two cylinders is exactly 50 or 100 in British system and 100, 200, 300, mm in Metric system. Some holes are drilled in the body of the bar to reduce the weight and to facilitate handling. Sine centre itself is not a complete measuring instrument. Another datum such as surface plate is used as well as auxiliary equipment notably slips gauges. Sine centre is basically a sine bar with block holding centres which can be adjusted and rigidly clamped in any position. These are used for inspection of conical objects between centres. These are

used up to inclination of 45°. Rollers are clamped firmly to the body without any play. This is a very useful device for testing the conical work centered at each end.

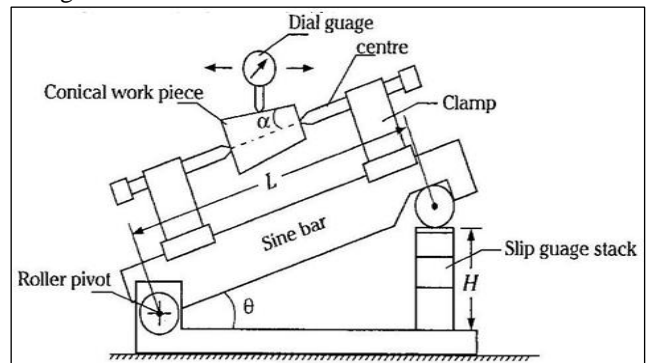


Fig. 1: Sine centre

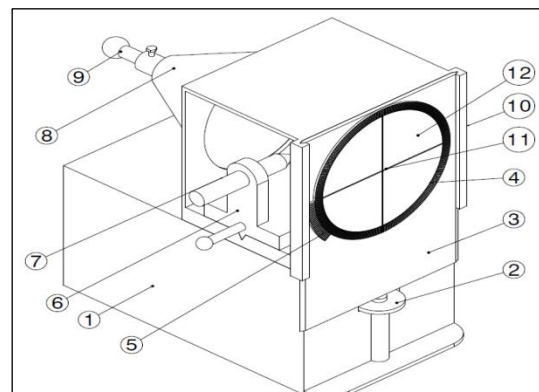
B. Problem identification of sine centre

- 1) High cost of measuring instrument.
- 2) Operation time is high.
- 3) Working principle is difficult.
- 4) Cannot measure the angle more than 45 degrees.
- 5) Source of errors in sine centre
 - Error in distance between roller centers.
 - Error in slip gauge combination.
 - Error in checking of parallelism.
 - Error in parallelism of roller axes with each other.

C. Solution of the problem

- 1) Instrument price is reduced.
- 2) The problem of measuring time is reduced.
- 3) Easy manual working method.
- 4) Accuracy is increased.
- 5) Angle measuring limit 0 to 360 degrees.

III. BLOCK DIAGRAM OF TANMETER



- | | |
|-----------------|---------------|
| 1. Base | 7. Center |
| 2. Rotating Nut | 8. Cone Cover |
| 3. Pad | 9. Torch |
| 4. Main Scale | 10. Guide Way |

- 5. Vernier Scale
 - 6. Carriage
 - 11. Reference “+” Mark
 - 12. White Screen
- Fig. 2: Angle Projector Block Diagram

IV. DESCRIPTION OF IMPORTANT PARTS

A. Base of angle projector

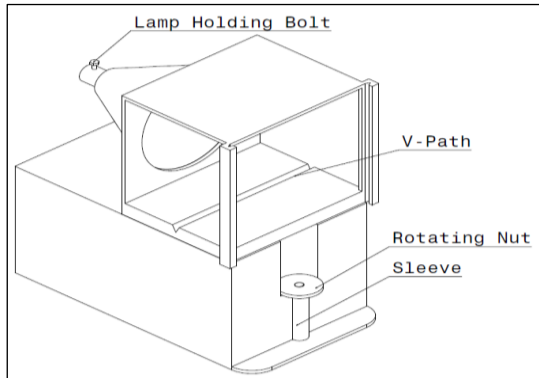


Fig. 3: Base of angle projector

The angle projector Bottom base is made of hardened, corrosion-resistant stainless steel with a satin chrome finish that helps reduce glare. The lamp holding bolt is used to hold the torch. The v-pathway used to guide the carriage. The rotating nut is used to lift the pad setup. The rotating nut freely to rotate the 360 degrees.

B. Pad

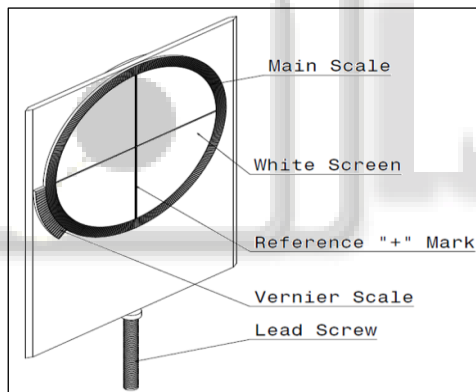


Fig. 4: Pad of angle projector

Pad is placed on front side of the angle projector. Its moves 90 degree vertically by using rotating nut and guide way. The lead screw directly attached to the pad. So rotating nut lift the lead screw and the pad setup also lifted this process. The pad also has some measuring parts. In this setup the main scale placed to rotates 360 degree freely. Main scale and white screen are single part. If you rotate main scale also rotates the white screen. The reference “+” Mark placed on a white screen. This mark is used to measure the angle of conical male object. The main scale moves over the vernier scale.

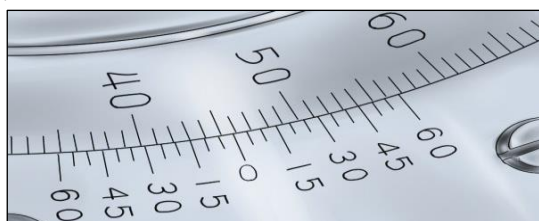


Fig. 5: Vernier Scale

The main scale has a 360 degree. The angle projector Vernier scale may have graduations of 5' (minutes) or 1/12°. Each space on the Vernier scale is 5' less than two spaces on the main scale. Twenty four spaces on the Vernier scale equal in extreme length twenty three double degrees. Thus the difference between the space occupied by 2° on a main scale and the space of the Vernier scale is equal to one twenty-fourth of 2°, or 5'. The working principle of simple projector is similar to the vernier bevel protractor. The white screen is partially transparent sheet. Its used to show the object shadows.

C. Carriage

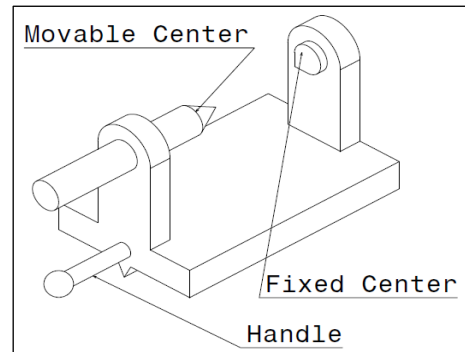


Fig. 6: Secondary Carriage of Tanmeter

Carriage is moving part. It's moving over the v-path. It has two centers. One is fixed center and another one is movable center. Those two centers are used to hold the workpiece or conical male object. Handle is used to move the carriage.

D. Black cloth

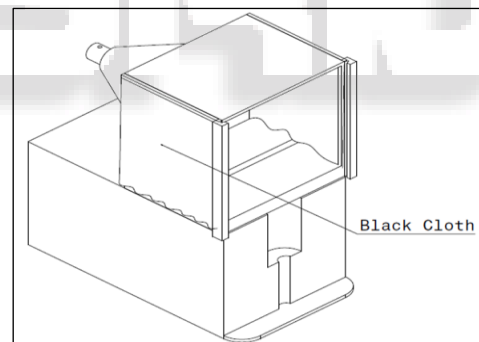


Fig. 7: Black cloth

Black cloth is used to block the sun light or other light source inside the instrument. It has placed on right and left side of the instrument.

E. Torch

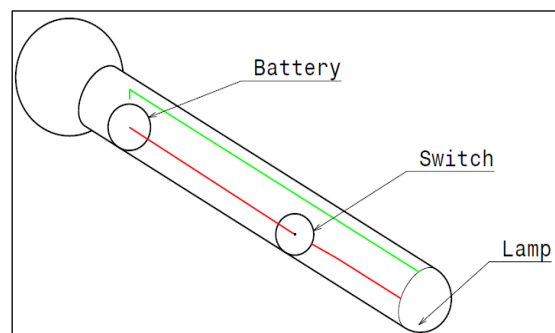


Fig. 8: Lead screws of Tanmeter

Torch is produce the light source. It has one LED light, Button cell and one micro switch. In this circuit diagram is shown in figure 8.

V. CONSTRUCTION OF ANGLE PROJECTOR

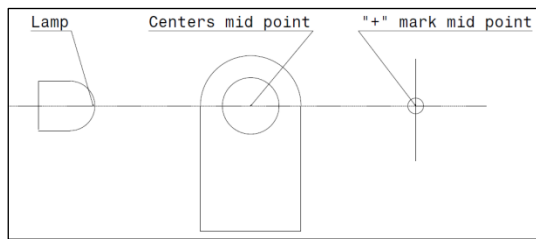


Fig. 9: Simple construction diagram

In this setup of angle projector the lamp, centers and main scale "+" mark midpoint are placed on parallel line to horizontally. This arrangement is used to measure the angle of conical male object.

VI. WORKING PROCEDURE OF ANGLE PROJECTOR

- 1) Fit the conical male object in carriage by the use of centers.

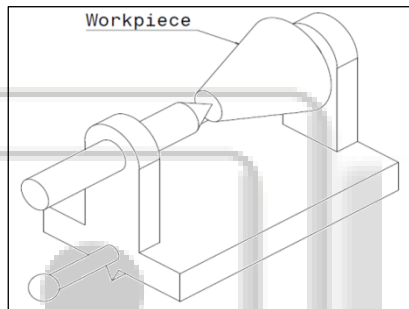


Fig. 10: Catching centres

- 2) Place the carriage inside the angle projector.
- 3) Set the correct position to main scale and vernier scale.

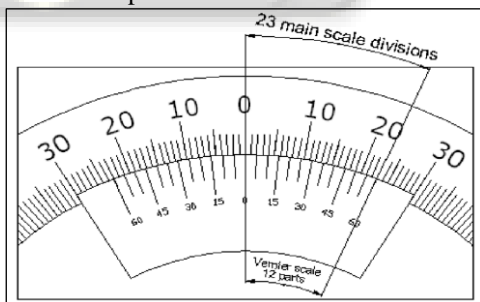


Fig. 11: Initial arrangement

- 4) Close the black cloth.

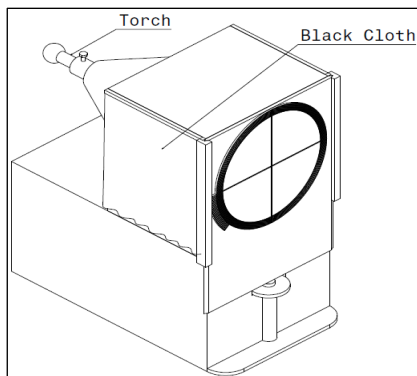


Fig. 12: Arrangement method

- 5) Switch on the torch and set the correct position. Then tight the lamp holding bolt.
- 6) Now the workpiece (or) conical male object shadow appear on the white screen.

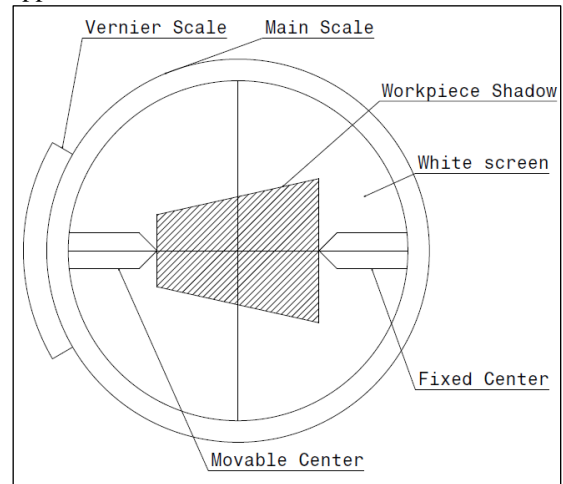


Fig. 13: Shadow appear screen

- 7) Then rotate the rotating nut, automatically the pad moves vertically. Positioning the reference "+" mark midpoint on angle line of workpiece shadow.

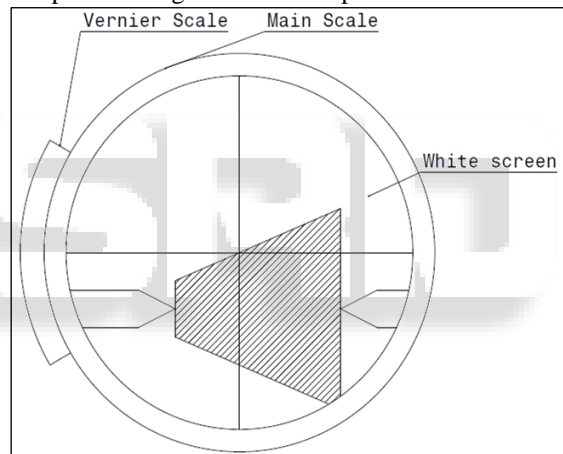


Fig. 14: Reference "+" mark initial position

- 8) Now rotate the main scale then set the reference line and angle line of shadow workpiece join together.

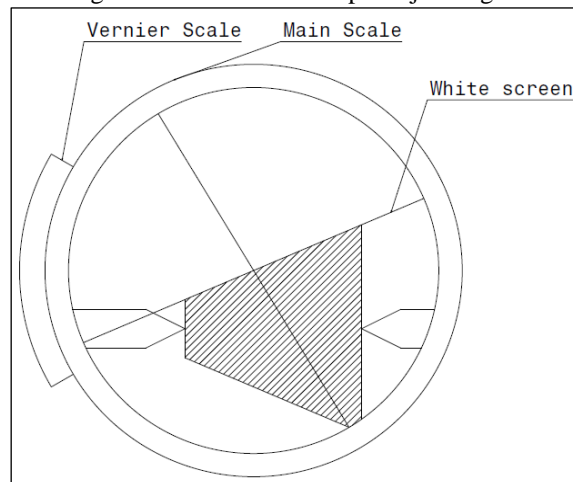


Fig. 15: Measuring method

- 9) Take the readings and tabulated that values. Least count = 5'

Sl No.	Main Scale Division	Vernier Scale Division With LC	Total Reading
	Degree °	$(VSD \times LC)'$	
01			

Table 1: Find the angle of conical male object

VII. THREE DIMENSION MODEL PHOTOGRAPH

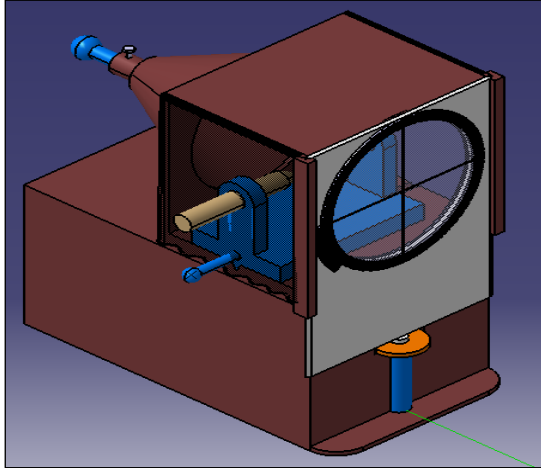


Fig. 16: 3D model of angle projector

A. Advantages

- 1) High degree of accuracy.
- 2) Simple in construction.
- 3) Easy to measure the angle.
- 4) Low cost of instrument.
- 5) Fully worked on manually.

B. Disadvantage

- 1) Not measure the conical female objects

VIII. CONCLUSION OF PAPER

Now a days large scale industries are using a coordinate measuring machine to measure the angle of conical male objects. But it's fully worked on electric power and small scale industries not possible to buy an expensive machines. Available manual measuring machine are few in the market like as sine centre method. But its working procedure is very difficult, number of the components and cost also high. Angle projector introduced by the solution of that kind of problems.

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