APEX MACHINE & TOOLS

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APEX UNIVERSAL TOOL & CUTTER GRINDER

MODEL: AG-310T

APEX Universal Tool & Cutter Grinder is a precision, accurate and versatile machine suitable for grinding and sharpening of cutting-tools like milling cutters of all types, reamers, taps, form- tools, spiral milling hob-cutters and also grinding of snap and other gauges. The versatility of the machine with standard and optional accessories make the machine suitable for cylindrical, both external as well as internal, along with surface grinding operations, simultaneously.

TECHNICAL SPECIFICATIONS

✓ Maximum Swing Diameter		
✓ Swing with raise blocks (Optional)	:	280mm
✓ Height of Table to Work Head center	:	440mm.
✓ Admit between tailstock centers	:	125mm.
✓ Admit between work head and tailstock	:	480mm.
center	:	380mm.
✓ Working area of table	:	125mm x 750 mm.
✓ Longitudinal movement of table	:	400mm.
✓ Cross Traverse	:	185mm.
✓ Vertical movement of wheel-head	:	280mm.
✓ Swivel of table	:	45° on either side
✓ Fine adjustment of table	:	±9° on either side
✓ Swivel of wheel-head through		
✓ Horizontal axis	:	350°
✓ Vertical axis (AG-310T)	:	90° either side
✓ Least count of dial for cross and vertical traverse	:	0.02 mm
✓ Speed on wheel spindle	:	3000 / 3400 RPM.
✓ Max. Dia. of grinding wheel	:	200mm.
✓ Max. Width of grinding wheel	:	20mm
✓ Main motor	:	0.5kw / 0.75 HP
✓ Approx weight of the machine	:	750 kg.
✓ Power Source	:	A.C 440V

DESCRIPTION AND MAIN FEATURES

1. The machines are manufactured conforming to IS-standards. The machine castings are artificially seasoned to enable maintain its quality, precision and durability over a longer period of time

2. The Wheel-spindle is of selected alloy-steel, heat-treated, precision ground and runs on selected precision preloaded spindle bearings, grease packed for life. The wheel-spindle accommodates easily interchangeable arbors.

3. Easy access to control elements. 3-way control to table movements. Table runs on hardened and ground rollers to give positive and accurate control.

4. The Wheel-head pillar is of larger diameter and is designed to dampen vibrations. Exposed portion protected against dust by telescopic bellow guards.

TRANSPORT

The machines are delivered from our Works, either mounted onto a wooden platform or, enclosed in a wooden pack completely sealed one. In either case, the machines are delivered in a completely assembled condition. To avoid any damage to the roller-guide way, the table is slightly lifted from the rollers and four nos. of metal chips are provided on the four corners of the table and cross-slide and clamped in position with clamps and bolts on two ends. Prior to installation of the machine, it is necessary to take out the metal chips and let the table rest on rollers.

Once the machine packing is opened, the machine should be moved on rollers to the working-site. Excessive impact should be avoided while moving the machine. Care should be taken that the table is duly secured in position with clamps. As mentioned above the clamps are to be taken out only after the machine has been shifted to the desired position. Further care has to be taken during shifting of the machine to work- site that the cross-slide is at the extreme front position (Inside position). Since the tables are free on rollers now, it could fall down. As such, make sure that the Table-stoppers are clamped in position.

FOUNDATION & MACHINE INSTALLATION

Though special foundation is not necessary for this machine, it just needs to be erected on a solid floor. For this 3 or 4 nos., 14mm diameter, holes are provided for foundation bolts, generally "x9" long. The approximate hole-distance is shown in FIG-2. Steel-wedges - of taper 1:20 have to be placed underneath the machine, near the foundation bolts or at the four corners of the machine to facilitate leveling of the machine. The level has to be checked with a precision level block (spirit-level) placed on both longitudinal as well as transverse positions of the table (A & B) as shown in FIG-2. After leveling is done, the machine is to be grouted with cement mortar which is allowed to dry and harden for about 24-30 hours. The protective coating (oil/grease) is applied to all parts of machine which are not painted. This coating must be cleared/wiped away with the help of kerosene before setting the machine into operation. All the moving slides and tables must be oiled properly to reduce friction.

CAUTION:

Fluids containing alcohol or acetylene should never be used for cleaning the machine as this would spoil the paint. While installing the machine please ensure that it has not been damaged in any case while in transit. Also check up if the consignment for completeness of the consignment with reference to the Invoice-copy enclosed with the machine. Any damage or shortfall must be intimated immediately.

COMMISSIONING & OPERATION OF THE MACHINE:

The machine is connected to the mains through a terminal box placed at the rear of the Machine from where the wires are connected to the main-line. Please ensure that the Voltage and frequency confirm to the motors supplied with the machine. Special care has to be taken to connect the earth wire or neutral conductor before starting the motors.

SETTING THE MACHINE INTO OPERATION:

Before setting the machine into operation, the operation maintenance manual must be read thoroughly to get well-acquainted with the machine and its accessories and their operation.

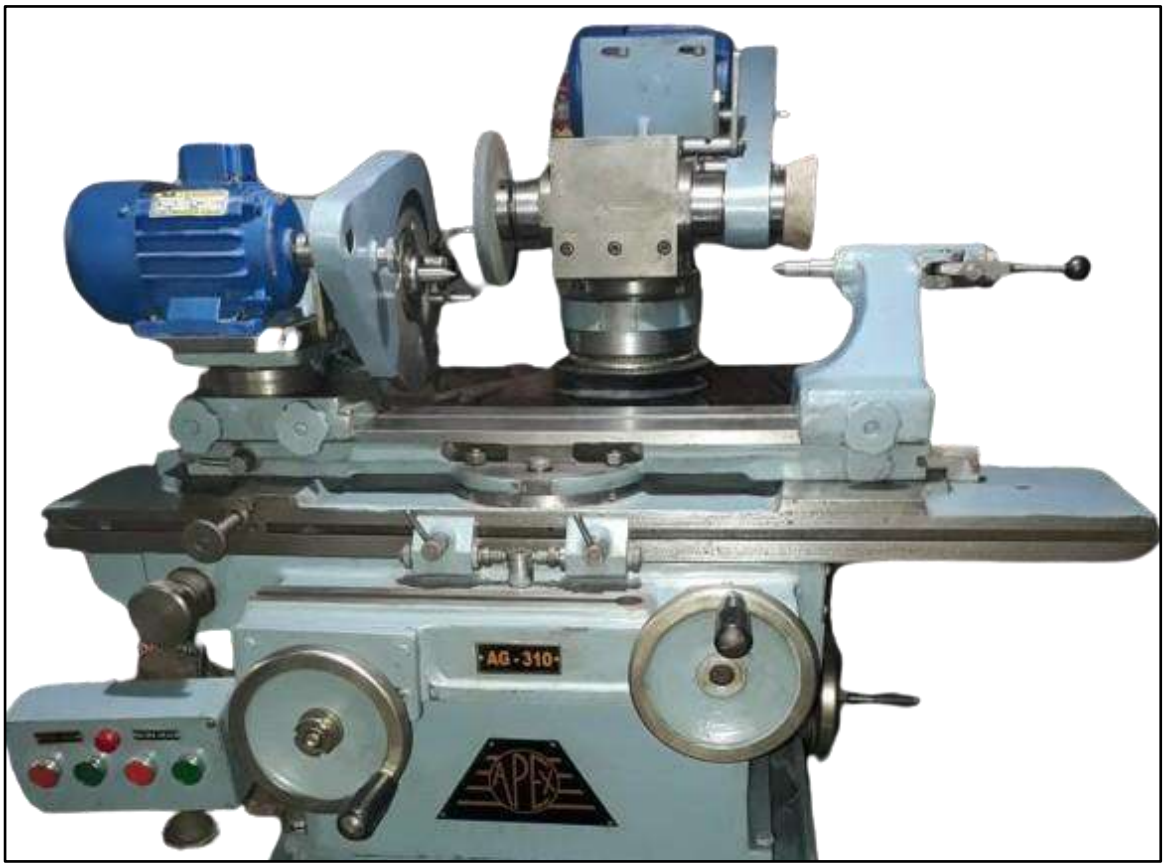
In order to maintain precision standards of the machine the following points are to taken care of:

1. Special care has to be devoted to lubrication, as most of the remote moving parts Have been provided with oil-line connected to a manual lubrication-pump provided at the side of the machine and also through oil-nipples provided on the parts on the machine which got to be lubricated at weekly intervals.
2. The machine should be kept clean and free from dust and dirt. The machine should be cleaned before leaving after the shift is over.
3. The grinding dust should be removed or cleaned at intervals and special care is taken while using coolant equipment on the machine.
4. The machine should never be cleaned with compressed air as it drives the grinding dust in between the sliding parts and other precision components of the machine as this would harm the precision and operative life of the machine.
5. The machine must not be overloaded for safety reasons.
6. Instructions for machine operations given in this manual must be followed. Tools or similar job should not be placed or rubbed on ground or scraped surfaces/ portions of the machine.
7. While machine is being operated make sure to use wheel-guards and crack-free grinding-wheels to avoid any accident.

LUBRICATION:

The wheel - spindle bearings are grease-packed for life but it is recommended to check up and refill after a year or so. It needs to be done by qualified and skilled technicians.

The Work-head and motor bearings are lubricated with grease. The filling is expected to reduce during periodical check-up of the machine.



CYLINDRICAL GRINDING ATTACHMENT

CYLINDRICAL GRINDING ATTACHMENT:

This attachment consists of motor and motor plate mounted onto the standard work-head, Pulleys (driver and driven), belt and belt cover and a set of dog-carriers to rotate the job.

This attachment is suitable for grinding of cylindrical tapered diameters and faces of cutting Tools like reamers, end-mill-cutters, and other parts used in jigs and fixtures and press- Tools. This also serves as the work-head for Internal grinding attachment.

The cylindrical grinding can be done by using work-head and right hand tail-stock which is spring-loaded and operated by a lever. The cylindrical grinding can be done either by rotating the shaft within centers or by holding in chuck alone.

For grinding large faces as that of gear blanks, side and face cutters, slitting saws, gear-cutlers or any found job that can be conveniently accommodated in work-head spindle, the work-head Is swiveled at 90 degrees to the table axis and light grinding process taken across the face of the work.

SPECIFICATIONS:

MAXIMUM DIAMETER OF JOB	_____	_____	260mm
MAXIMUM LENGTH OF JOB	_____	_____	400mm
MAXIMUM WEIGHT OF JOB	_____	_____	15 Kgs.
GRINDING WHEEL SIZE	_____	_____	100mm to 150mm
SPINDLE SPEED	_____	_____	250 RPM

SURFACE – GRINDING

This machine can be adopted for small surface grinding operations. The job is mounted onto a permanent magnetic chuck or any vice. The grinding wheel is brought in position as shown in FIG - 003 and grinding process is performed by reciprocating the work-table.

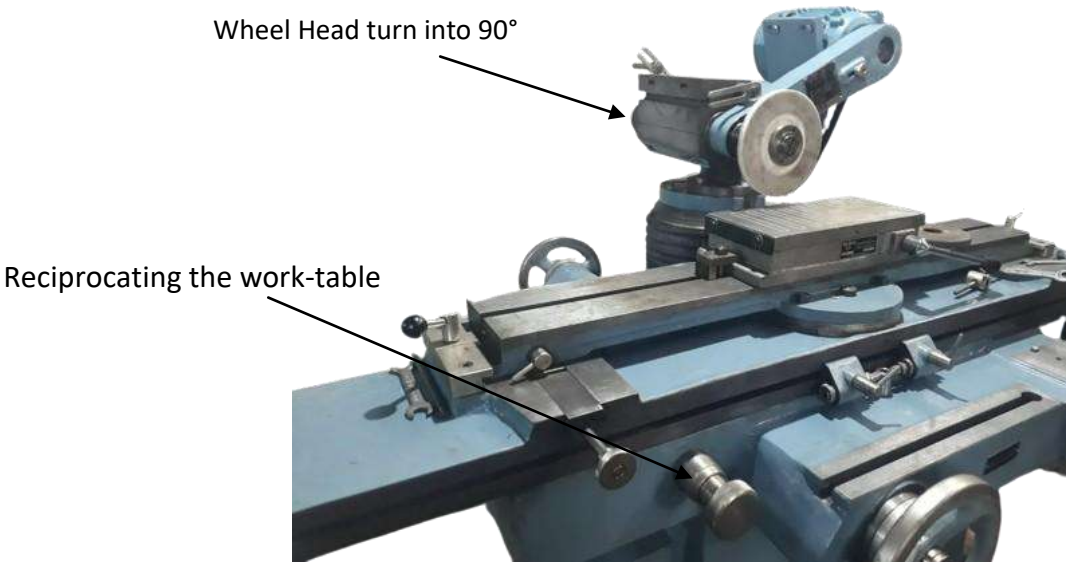


FIG-003

Wheel dressing is done by the dresser supplied with the machine, but for better results a small M.S. Block 40x40x60mm holding 50mm long diamond dresser is placed onto the magnetic chuck and the wheel is dressed accordingly.

The coolant can also be used for better results. But it needs special coolant equipment with proper collection trays and metal or plastic flexible coolant nozzle with flow-control Cock.

WHEEL RECOMMENDED FOR SURFACE GRINDING:

HIGH SPEED STEEL	_____	_____	AA60K5
HARDENED STEEL	_____	_____	A46-54/A60
MILD STEEL/UNHARDENED	_____	_____	A46-54
CAST IRON	_____	_____	GC60

INTERNAL GRINDING:

This attachment is used for bore-grinding of any bore in cutters, jig-bushes, collars or any work of similar nature. The bore to be ground may be either parallel or a taper one.

In normal practice this attachment is mounted on the top of the wheel-head. The grinding Wheel on the right hand end of the wheel-spindle is removed and a large driving pulley is substituted on the spindle. The column of the wheel-head spindle is in this case, set at ZERO degrees.

The cylindrical grinding work-head fitted with motor and suitable self-centering chuck is then used to hold and rotate the job during grinding process.

It is a common practice to ensure that the work-head and internal grinding attachment are at the same height to achieve better results. Also, for accurate results, the work-head spindle should be aligned parallel to the table traverse by means of a dial-indicator.

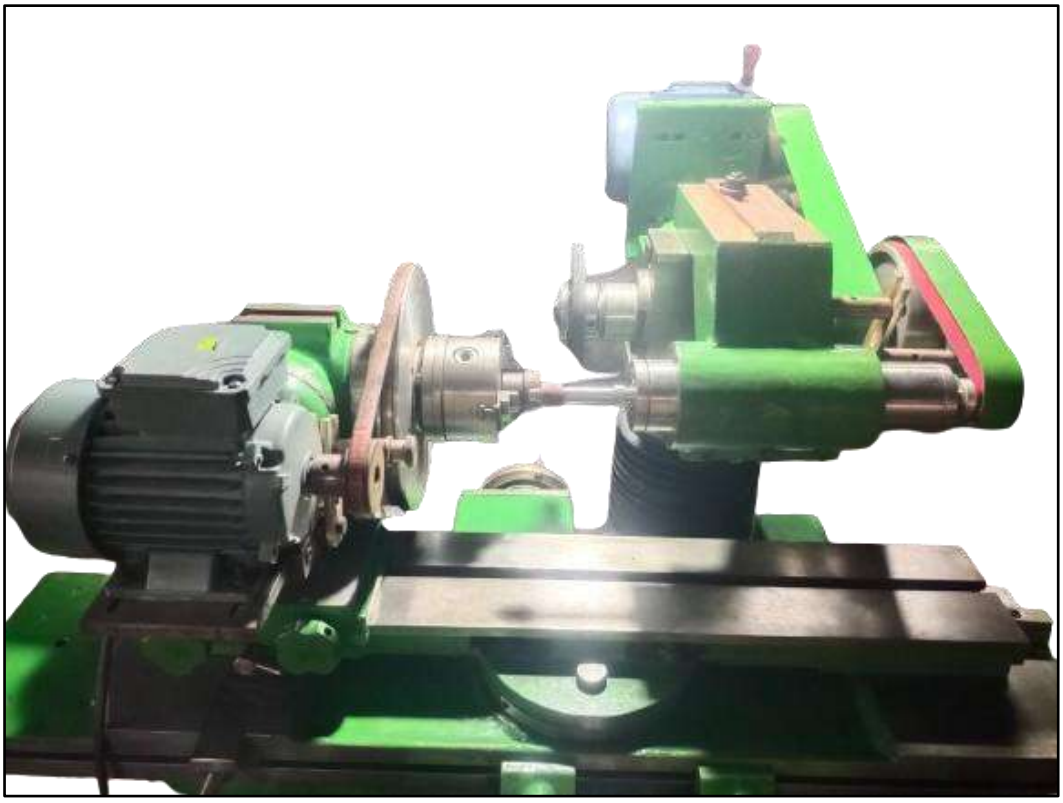
It is a common practice to use coolant while grinding process is carried out for batch- production process and also use of Three-point guide steady is advisable where the job is of a longer length.

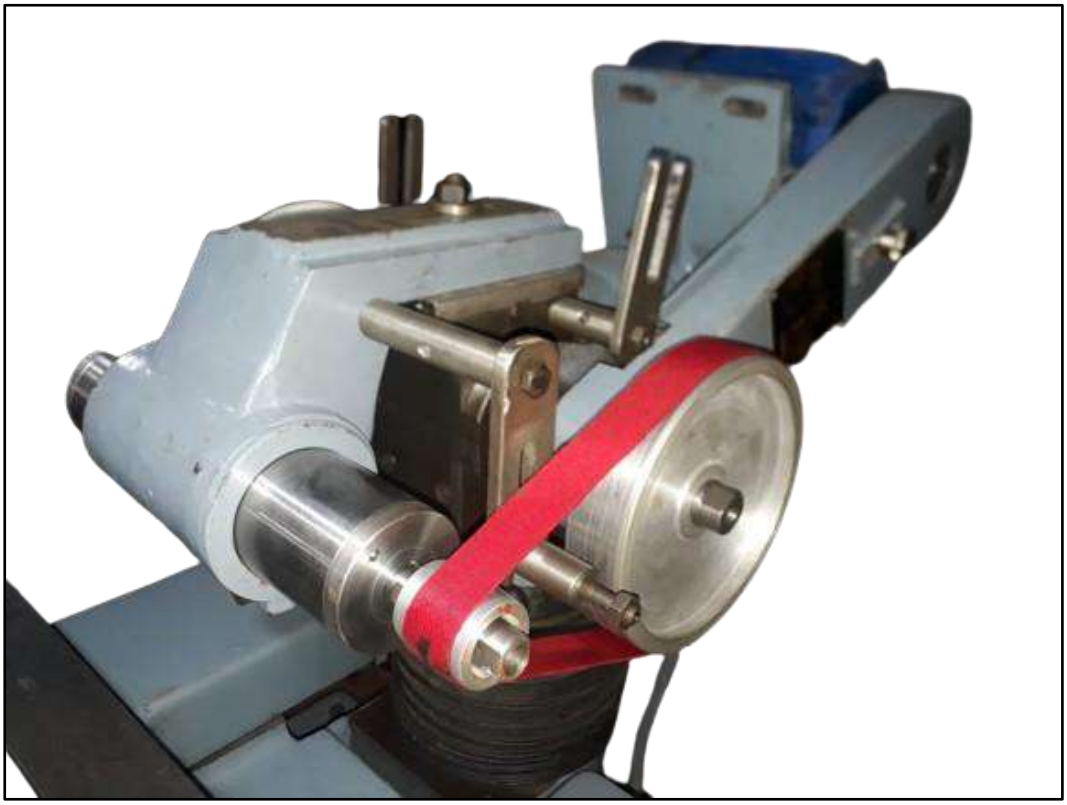
SPECIFICATIONS:

MAX. WEIGHT OF JOB	_____	_____	10 KGS
MIN. DIA. WHICH CAN BE GROUND	_____	_____	5MM
R.P.M. OF IG SPINDLE	_____	_____	18000/20000 RPM

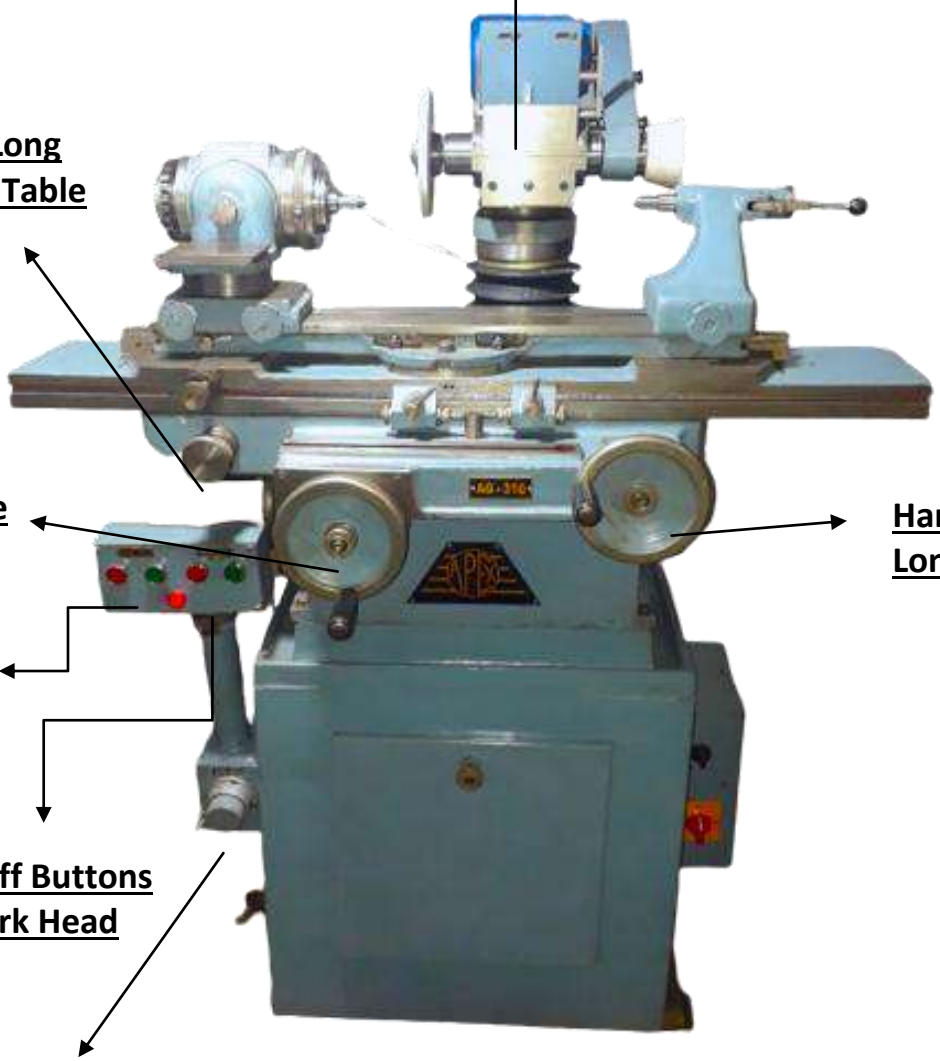
In this case a set of grinding wheel adaptors for straight wheels and collet type adaptors for mounted point wheel is provided along with.

INTERNAL GRINDING ATTACHMENT



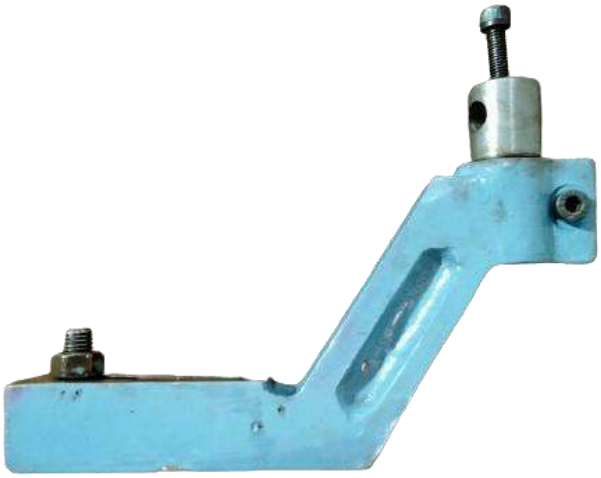


Model AG-310T



75mm WHEEL ADAPTOR

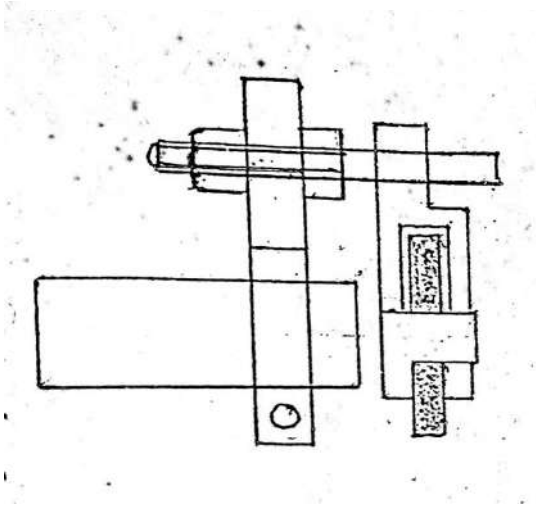
130mm WHEEL ADAPTOR



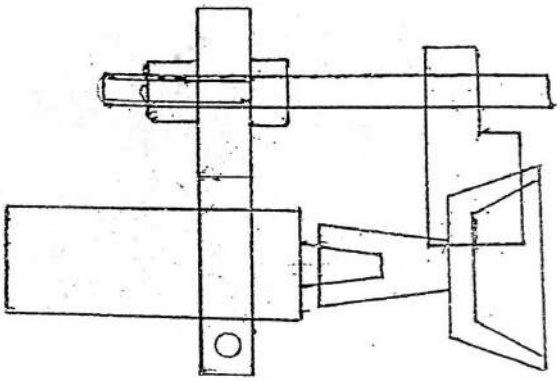
WHEEL DRESSOR

DEAD CENTRE HEIGHT GAUGE FOR WHEEL HEAD HEIGHT SETTING

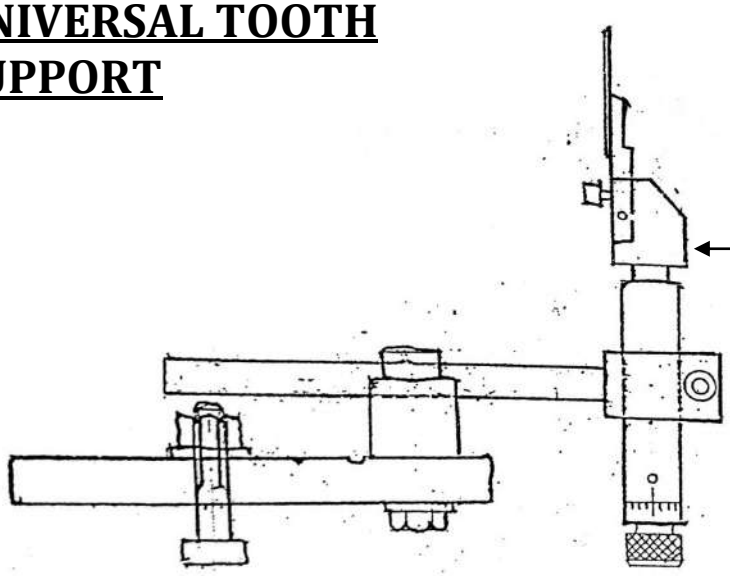
WHEEEL GUARD FOR 175Ø WHEELS



WHEEEL GUARD FOR 100Ø & 80Ø CUP WHEELS



UNIVERSAL TOOTH SUPPORT



FINGER REST

CLEARANCE ANGLE SETTING DEVICE USED ON TAILSTOCK

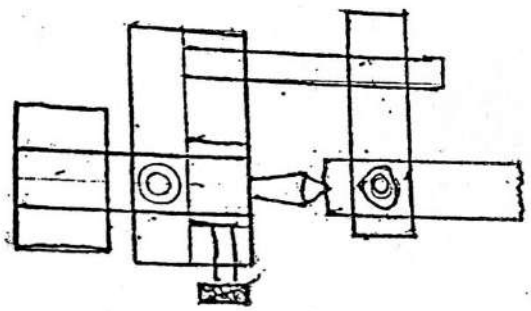
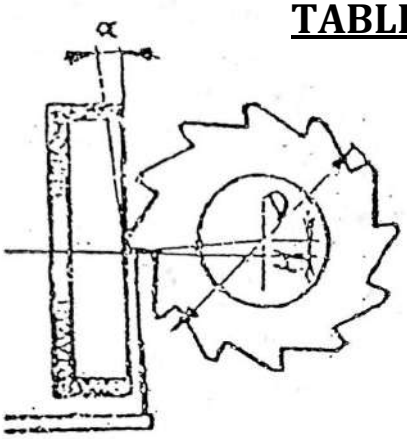
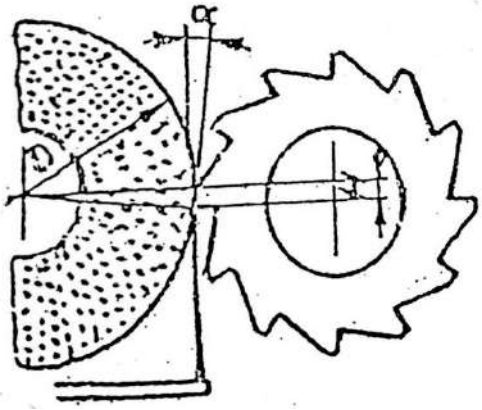
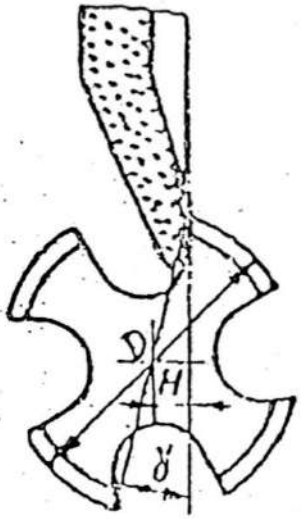
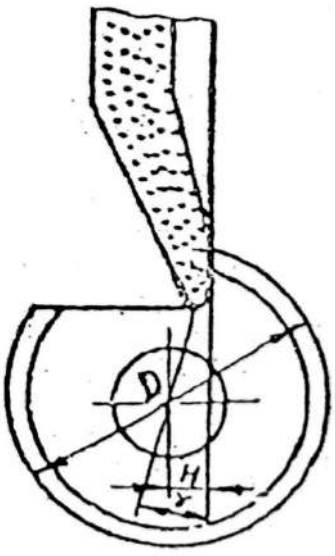


TABLE FOR SETTING HEIGHT/DISTANCE 'H' FOR DIFFERENT CUTTERS





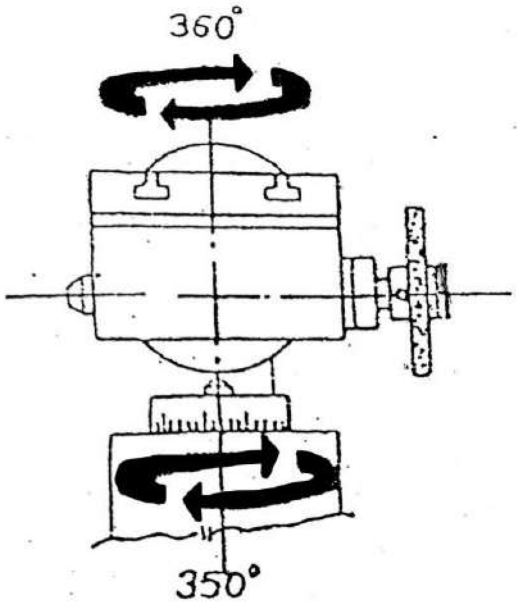


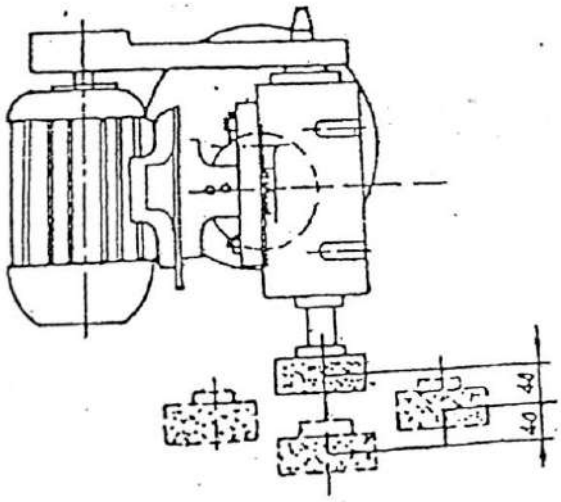


		H_{mm}								
	α (γ)	3°	4°	5°	6°	7°	10°	12°	15°	20°
Dmm	6	0,16	0,21	0,26	0,31	0,37	0,52	0,62	0,78	1,02
	8	0,21	0,28	0,35	0,42	0,49	0,69	0,83	1,04	1,36
	10	0,26	0,35	0,44	0,52	0,61	0,87	1,04	1,30	1,71
	12	0,31	0,42	0,52	0,63	0,73	1,04	1,25	1,56	2,05
	14	0,37	0,49	0,61	0,73	0,85	1,22	1,46	1,81	2,39
	16	0,42	0,56	0,70	0,84	0,98	1,39	1,66	2,07	2,74
	18	0,47	0,63	0,78	0,94	1,10	1,56	1,87	2,34	3,07
	20	0,52	0,70	0,87	1,05	1,22	1,74	2,08	2,59	3,42
	22	0,58	0,77	0,96	1,15	1,34	1,90	2,29	2,85	3,76
	25	0,65	0,87	1,09	1,31	1,52	2,17	2,60	3,24	4,27
	28	0,73	0,98	1,22	1,46	1,71	2,43	2,91	3,63	4,76
	32	0,84	1,12	1,39	1,67	1,95	2,78	3,33	4,14	4,47
	36	0,94	1,26	1,57	1,88	2,19	3,13	3,74	4,66	6,16
	40	1,05	1,40	1,74	2,09	2,44	3,46	4,16	5,20	6,83
	45	1,18	1,57	1,96	2,35	2,47	3,90	4,68	5,82	7,70
	50	1,31	1,75	2,18	2,61	3,05	4,34	5,20	6,48	8,54
	56	1,47	1,95	2,44	2,83	3,41	4,86	5,82	7,25	9,58
	63	1,65	2,20	2,75	3,29	3,84	5,47	6,55	8,15	10,8
	70	1,83	2,44	3,05	3,66	4,27	6,07	7,28	9,07	12,0
	75	1,96	2,62	3,27	3,92	4,57	6,50	7,80	9,70	12,8
	80	2,09	2,79	3,49	4,18	4,88	6,93	8,32	10,4	13,7
	85	2,22	2,97	3,71	4,44	5,18	7,37	8,84	11,0	14,5
	90	2,35	3,14	3,92	4,70	5,49	7,80	9,36	11,6	15,4
	95	2,48	3,32	4,14	4,96	5,79	8,23	9,88	12,3	16,2
	100	2,62	3,49	4,36	5,23	6,10	8,67	10,4	13,0	17,1
	105	2,75	3,66	4,58	5,49	6,40	9,12	10,9	13,6	18,0
	110	2,88	3,84	4,80	5,75	6,70	9,50	11,4	14,2	18,8
	120	3,14	4,19	5,23	6,27	7,31	10,4	12,5	15,5	20,5
	125	3,27	4,36	5,45	6,53	7,62	10,9	13,0	16,2	21,4
	130	3,48	4,54	5,67	6,79	7,92	11,3	13,5	16,8	22,3
	140	3,66	4,89	6,10	7,32	8,53	12,1	14,6	18,1	24,0
	150	3,92	5,24	6,54	7,84	9,14	13,0	15,6	19,4	25,6
	160	4,18	5,58	6,98	8,36	9,75	13,9	16,6	20,7	27,4
	170	4,45	5,93	7,41	8,88	10,4	14,8	17,7	22,0	29,1
	180	4,71	6,28	7,85	9,41	11,0	15,6	18,7	23,3	30,8
	190	4,97	6,63	8,28	9,93	11,6	16,5	19,8	24,6	32,5
	200	5,23	6,98	8,72	10,5	12,2	17,4	20,8	25,9	34,2
	210	5,50	7,32	9,15	11,0	12,8	18,2	21,8	27,2	35,9
	220	6,76	7,67	9,59	11,5	13,4	19,1	22,9	28,5	37,6
	240	6,28	8,37	10,5	12,5	14,6	20,8	24,9	31,1	41,0
	250	6,54	8,72	10,9	13,1	15,2	21,7	26,0	32,4	42,8

- **The eccentricity of 40 mm between revolving column axis and swing centre of T.W. Hd. Helps in extending the position in the cross direction thereby indirectly increasing cross traverse.**

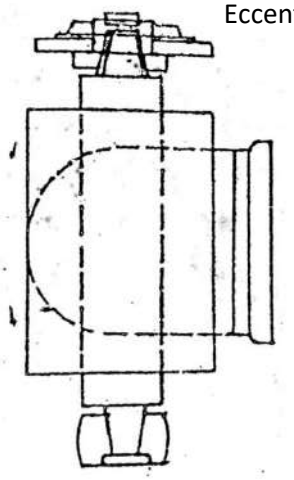
Tilting Wheel Head



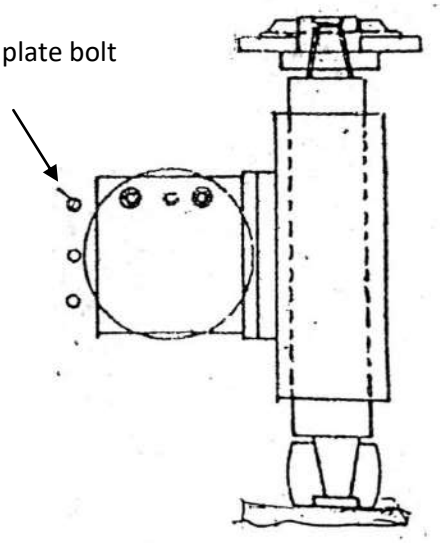


Wheel Head Swivel & Tilting

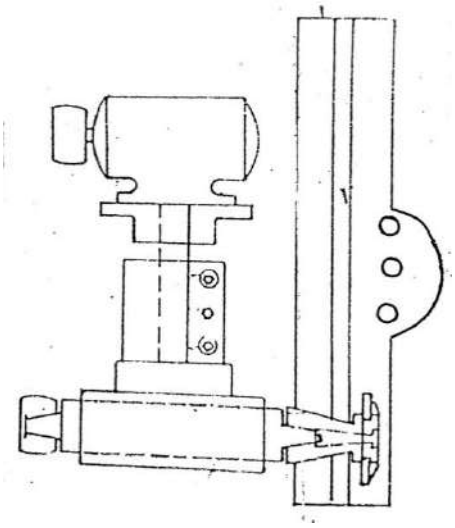
To rotate the wheel head according to your desire works, to loose eccentric plate bolt and set your working angle it may be 90 degree, 45 degree and etc.....
And use 130mm wheel adaptor, 75mm wheel adaptor as per your work.



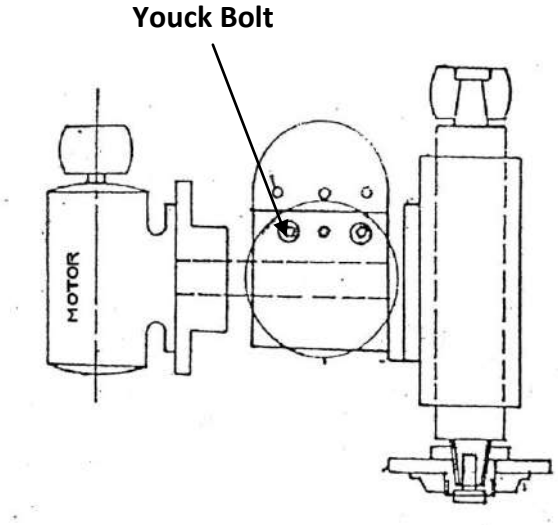
Wheel Head at 180 degree



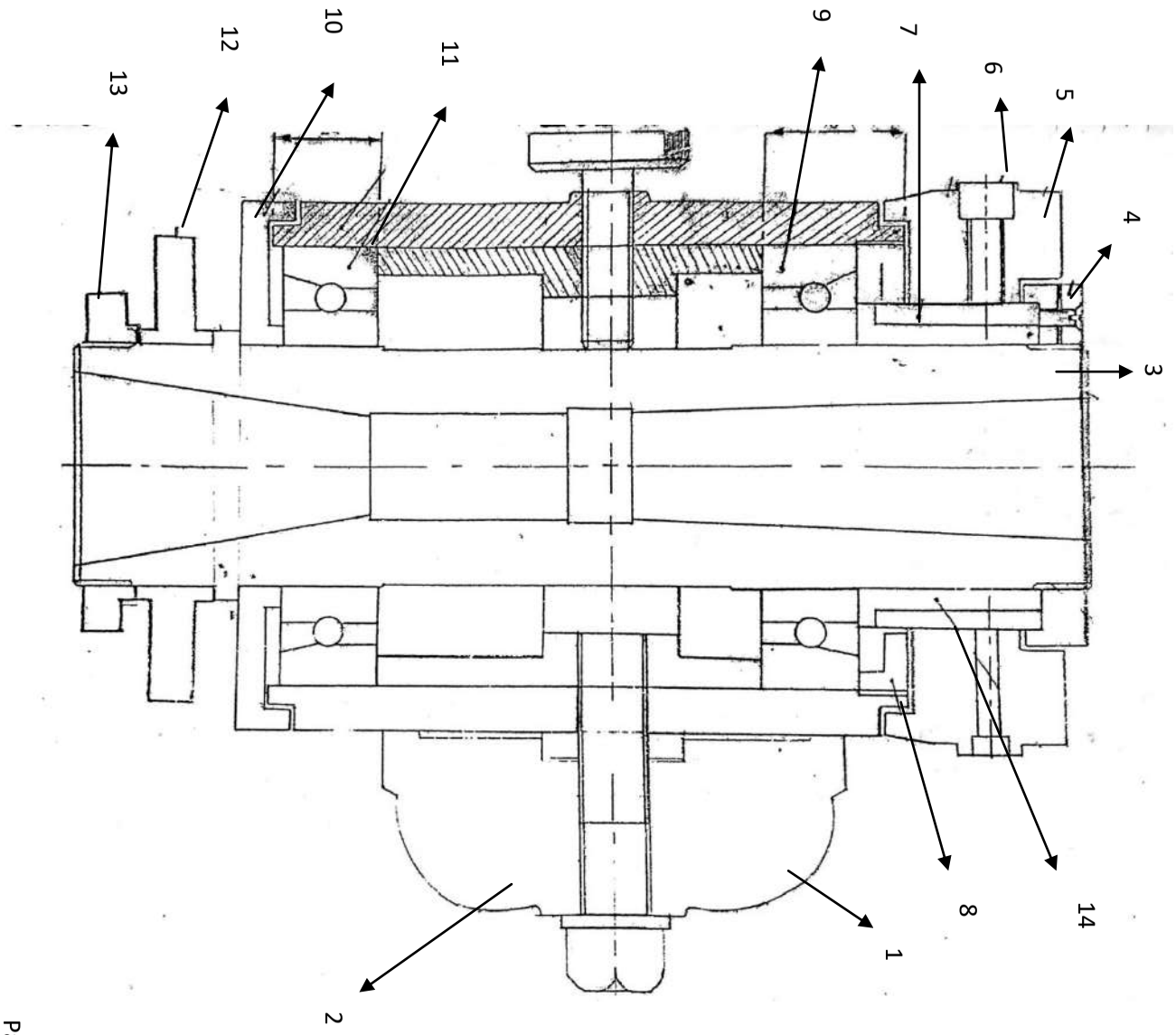
Wheel Head at 90 degree



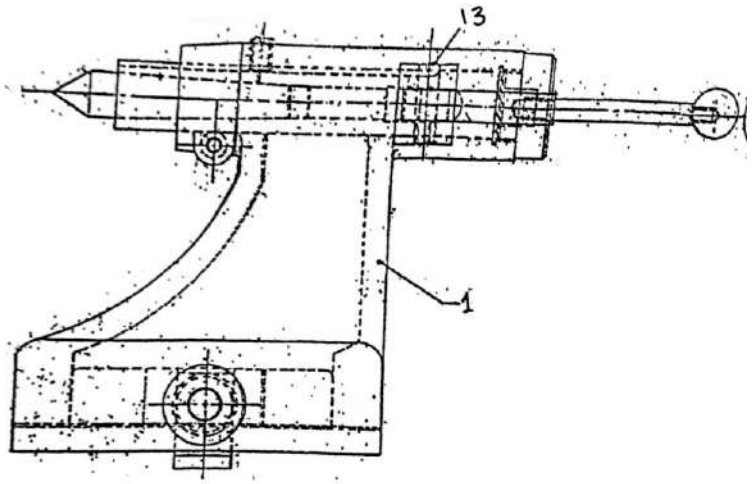
For extension of grinding wheel towards the working table you can use 75mm/130mm extension wheel adaptor

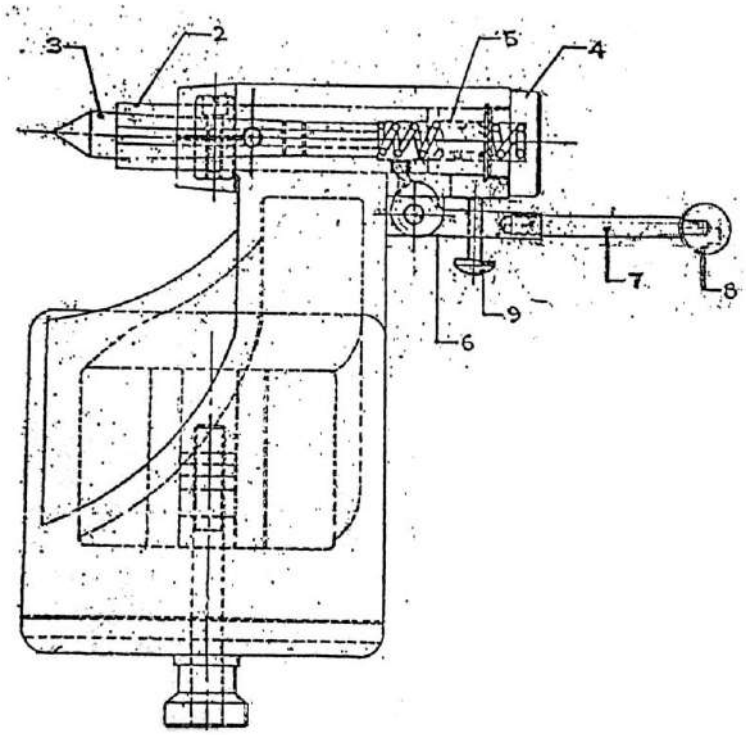


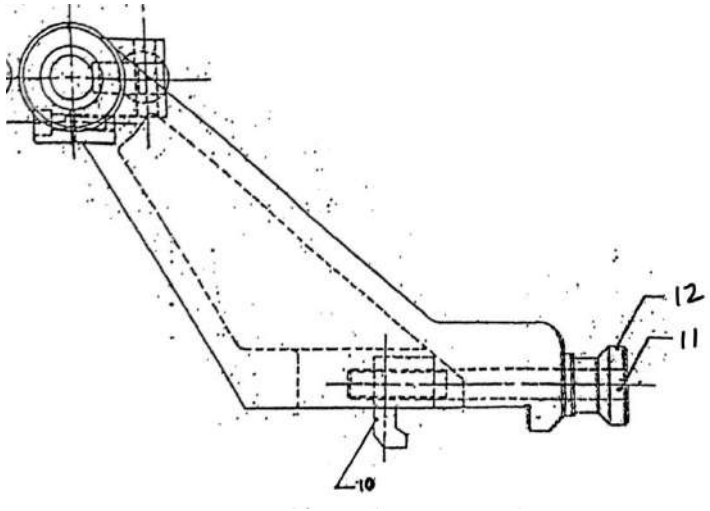
For tilting the wheel head according to your desire work you may loose the youck bolts and set thee degree according to your job



PART NO.	PART DESCRIPTION	NO.
1	ANGLE PLATE	1
2	BOLT M16	1
3	WORK SPINDLE	1
4	NUT (RING NUT)	1
5	DRUM GRADUATED	1
6	SCREW CLAMPING	1
7	BUSH	1
8	NUT EXTERNAL	1
9	BEARING 7211	2
10	FLANGE SEAL	1
11	THUMBLE CLAMPING	1
12	INDEX PLATE	3
13	NUT	1
14	BUSH (BEARING)	1





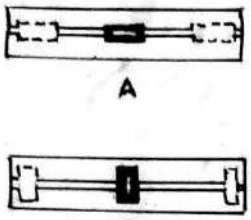
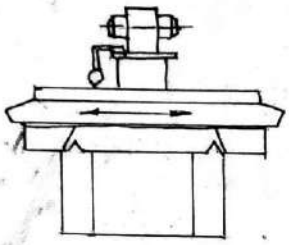
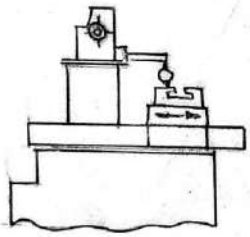
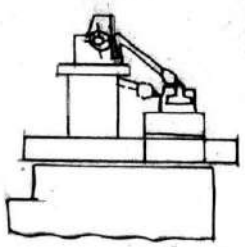


PART NO.	PART DESCRIPTION	NO.
1	TAILSTOCK BODY (BLOCK)	1
2	QUILL	1
3	CENTRE MT2	1
4	FLANG (SPRING RETAINING)	1
5	COMPRESSION SPRING	1
6	LEYER	1
7	HANDLE	1
8	KNOB	1
9	SCREW (THUMBLE) ADJUSTMENT	2
10	NOTCH - CLAMPING	1
11	STUD CLAMPING	1
12	KNOB CLAMPING	3
13	SCREW (FULCRUM)	1
14		1

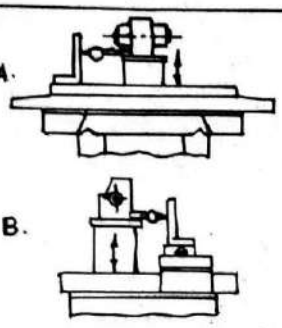
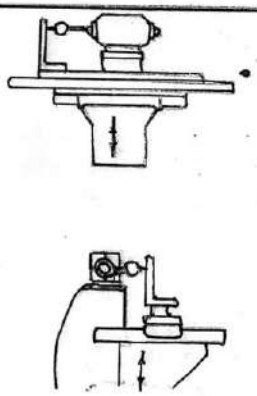
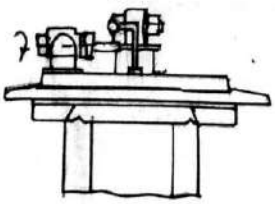
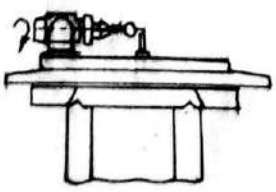
TEST CHART FOR UNIVERSAL TOOL AND CUTTER GRINDER

TYPE _____ ORDER NO _____ CUSTOMER _____

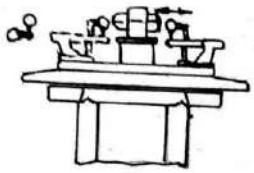
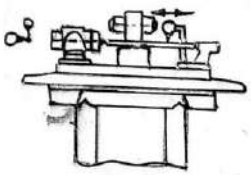
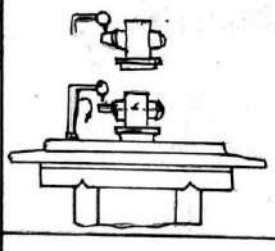
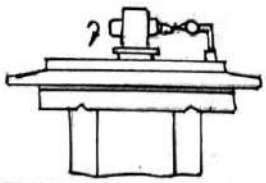
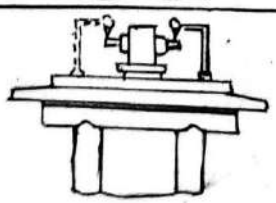
MACHINE NO _____ DATE _____ INSPECTOR _____

SL NO	TEST	FIGURE	MEASURING INSTRUMENTS	PURMISSIBLE ERROR IN MM	ACTUAL ERROR IN MM	INSTRUCTIONS FOR TESTING
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	FLATNESS OF THE TABLE: A) IN LONGITUDINAL DIRECTION B) IN TRANSVERSE DIRECTION		SPIRIT LEVEL WITH SENSITIVITY 0.03 TO 0.05 MM/M	A) ±0.04/1000MM B) 0.04/1000 MM	-----	TABLE IN MIDDLE POSITION SPIRIT LEVEL PLACED ON THE TABLE IN LONGITUDINAL AND TRANSVERSE DIRECTIONS IN CENTRE AND AT BOTH ENDS AND READINGS NOTED.
2	PARALLELISM OF THE LONGITUDINAL MOVEMENT OF THE TABLE WITH THE CLAMPING SURFACE OF THE TABLE.		DIAL INDICATOR	0.02/300MM	-----	DIAL INDICATOR MOUNTED AS SHOWN IN THE FIGURE WITH ITS FEELER SCANNING THE CLAMPING SURFACE OF TABLE. TABLE MOVED LONGITUDINALLY IN BOTH DIRECTIONS AND READINGS NOTED.
3	TRANSVERSE MOVEMENT OF THE TABLE PARALLEL WITH THE CLAMPING SURFACE OF THE TABLE		DIAL INDICATOR	0.01/100MM	-----	DIAL INDICATOR MOUNTED AS SHOWN IN THE FIGURE WITH ITS FEELER SCANNING THE CLAMPING SURFACE OF THE TABLE. TABLE MOVED TRANSVERSELY AND READINGS NOTED.
4	PARALLELISM OF THE FIXING SOLT OF THE CLAMPING SURFACE TO THE LONGITUDINAL MOVEMENT OF THE TABLE		DIAL INDICATOR.	0.02/300MM TRAVEL OF THE TABLE		INDICATOR FEELER SCANNING THE TSOLT AS SHOWN IN THE FIGURE. TABLE MOVED LONGITUDINALLY AND READINGS NOTED

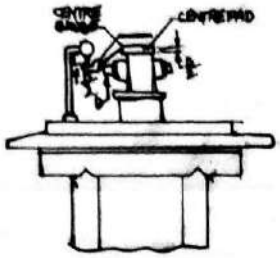
TEST CHART FOR UNIVRSAL TOOL AND CUTTER GRINDER

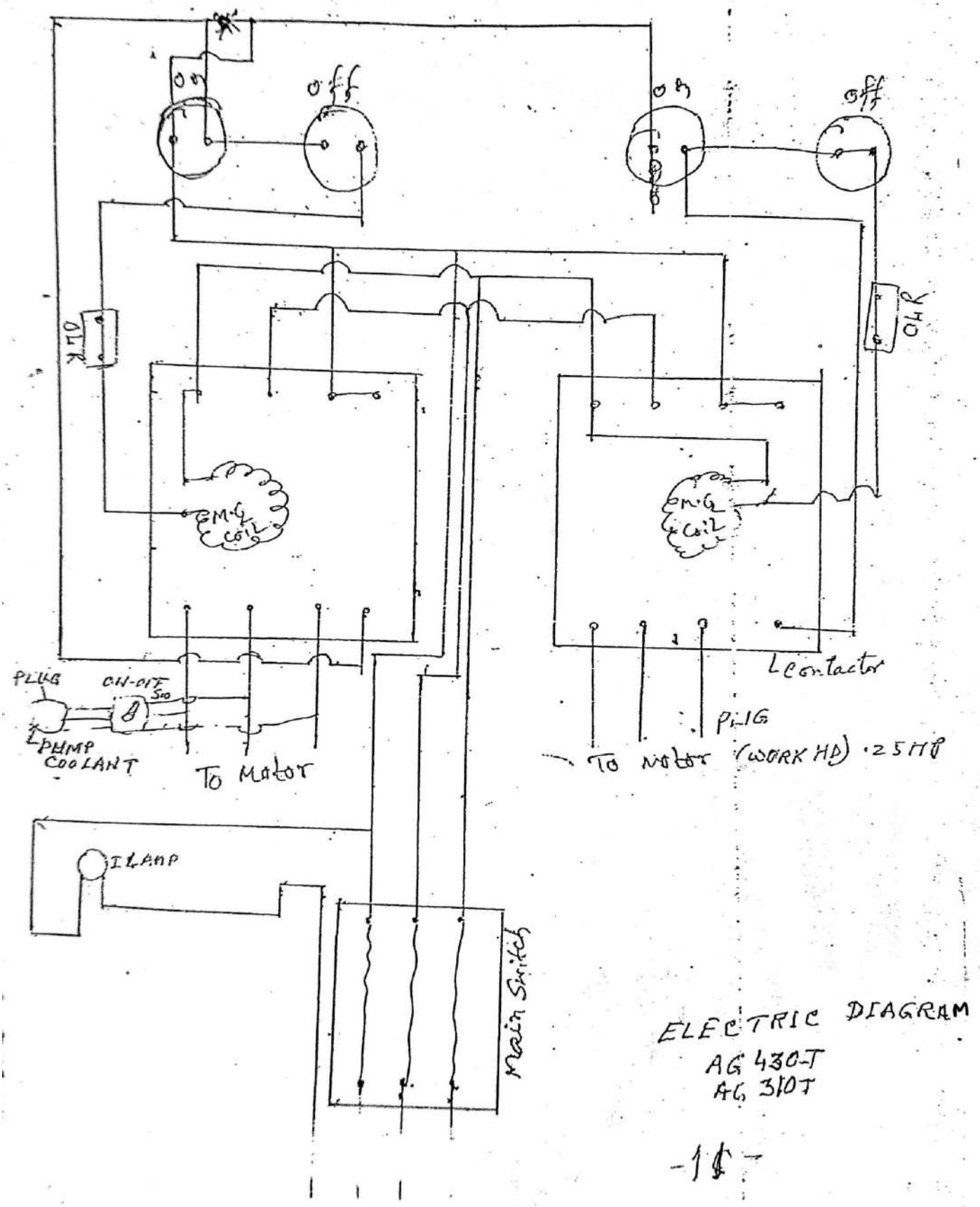
SL NO	TEST	FIGURE	MEASURING INSTRUMENTS	PERMISSIBLE ERROR IN MM	ACTUAL ERROR IN MM	INSTRUCTIONS FOR TESTING
(1)	(2)	(3)	(4)	(5)	(6)	(7)
5	SQUARENESS OF THE VARTICAL MOVEMENT OF GRINDING HEAD WITH THE CLAMPING SURFACE: A) IN PLANE THROUGH LONGITUDINAL AXIS OF THE TABLE B) PERPENDICULAR TO THE PLANE AT (A)		ENGINEER'S SQUARE DIAL INDICATOR	A) 0-03/100 MM TRAVEL B) 0-03/100 MM TRAVEL.	------	DIAL INDICATOR MOUNTED AS SHOWN IN THE FIGURES WITH ITS FELER SCANNING THE SQUARE WHICH IS FIXED ON THE CLAMPING SURFACE OF THE TABLE MOVE THE GRINDING HEAD UPWARDS AND DOWNWARDS AND NOTE THE READINGS.
6	SQUARENESS OF THE VARTICAL MOVEMENT OF TABLE WITH ITS CLAMPING SURFACE: A) IN A PLANE THROUGH THE LONGITUDINAL AXIS OF THE TABLE. B) IN A PLANE PERPENDICULAR TO THE PLANE AT (A)		ENGINER'S SQUARE DIAL INDICATOR.	A) 0-03/100 MM TRAVEL B) 0-03/100 MM TRAVEL.		DIAL INDICATOR MOUNTED AS SHOWN IN THE FIGURES WITH ITS FEELER SCANNING THE SQUARE WHICH IS FIXED ON THE CLAMPING SURFACE OF THE TABLE MOVE THE TABLE UPWARDS AND DOWNWARDS AND NOTE THE READINGS.
7	TRUE RUNNING OF THE WORK HEAD SPINDLE TAPER		TEST MANDREL 100MM LONG DIAL INDICATOR	0.01 MAXIMUM AMOUNT BY WHICH THE MANDREL RUNS OUT.		MANDREL MOUNTED IN THE TAPER OF THE SPINDLE INDICATOR MOUNTED ON THE TABLE WITH ITS FEELER SCANNING THE PERIPHERY OF THE MANDREL. MANDREL ROTATED SLOWLY AND READINGS NOTED
8	AXIAL SLIP OF THE WORK HEAD SPINDLE		DIAL INDICATOR BALL	0.01		BALL PLACED IN THE SPINDLE CENTRE AND INDICATOR SET ON THE BALL THE SPINDLE ROTATED SLOWLY UNDERAXIAL PRESSURE AND READINGS NOTED.

TEST CHART FOR UNIVERSAL TOOL AND CUTTER GRINDER

SL NO	TEST	FIGURE	MEASURING INSTRUMENTS.	PERMISSIBLE ERROR IN MM	ACTUAL ERROR IN MM	INSTRUCTIONS FOR TESTING
(1)	(2)	(3)	(4)	(5)	(6)	(7)
9	AXIS OF THE TAIL STOCK SPINDLE PARALLEL WITH THE LONGITUDINAL MOVEMENT OF THE TABLE A) IN VARTICAL PLANE B) IN HORIZONTAL PLANE		TEST MANDREL DIAL INDICATOR.	0.01/100MM TRAVEL.		TEST MANDREL HELD IN TAIL STOCK SPINDLE AND DIAL INDICATOR MOUNTED ON THE TABLE WITH ITS FELER SCANNING THE MANDREL DIAL INDICATOR MOVED IN BOTH DIRECTIONS AND READINGS NOTED IN HORIZENTAL AND VARTICAL PLANES.
10	TAIL STOCK AXIS IN LINE WITH WORK HEAD AXIS A) IN VARTICAL PLANE B) IN HORIZONTAL PLANE.		TEST MANDREL DIAL INDICATOR.	A) 0·02 B) 0·02		TEST MANDREL HELD BETWEEN CENTERS OF WORK HEAD AND TAIL STOCK AND DIAL INDICATOR MOUNTED ON THE TABLE WITH ITS FELER SCANNING THE MANDREL DIAL INDICATOR MOVED IN BOTH DIRECTIONS AND READINGS NOTED IN HORIZENTAL AND VARTICAL PLANES.
11	TRUE RUNNING OF GRINDING WHEEL SPINDLE		DIAL INDICATOR.	0.01		DIAL INDICATOR MOUNTED ON THE TABLE WITH ITS FELER SCANNING THE TAPER OR CYLINDRICAL PORTION OF THE SPINDLE. ROTATED SLOWLY AND READINGS NOTED.
12	AXIAL SUP OF THE GRINDING WHEEL SPINDLE		DIAL INDICATOR BALL	0·01		BALL PLACED IN THE SPINDLE CENTRE AND INDICATOR SET ON THE BALL. THE SPINDLE ROTATED SLOWLY AND READINGS NOTED.
13	GRINDING WHEEL SPINDLE AT EQUAL HIGHT FROM THE CLAMPING SURFACE.		DIAL INDICATOR.	0.02/300MM		DIAL INDICATOR MOUNTED ON THE CLAMPING SURFACE WITH ITS FEELER SCANNING THE SPINDLE PERIPHERY AND READINGS NOTED.

TEST CHART FOR UNIVERSAL TOOL AND CUTTER GRINDER

SL NO	TEST	FIGURE	MEASURING INSTRUMENTS	PERMISSIBLE ERROR IN MM	ACTUAL ERROR IN MM	INSTRUCTIONS FOR TESTING
(1)	(2)	(3)	(4)	(5)	(6)	(7)
14	COINCIDENCE OF DISTANCE OF REFERENCE SURFACE OF CENTRING GAUGE AND GRINDING SPINDLE.		TEST MANDREL DIAL INDICATOR CENTRE PAD AND CENTRE GAUGE	0·1	-----	SHORT CYLINDRICAL MANDREL HAVING DIAMETER D AND TAPER HOLE OF GRINDING HEAD (IF GRINDING HEAD SPINDLE IS PROVIDED WITH EXTERNAL TAPER THE GAUGING RING OF DIAMETER D IS MOUNTED ON THE SPINDLE TAPER) CENTRING GAUGE PLACED ON THE CENTRE PAD OF THICKNESS D/2 WHICH RESTS ON THE UPPER SURFACE OF GRINDING HEAD DIAL INDICATOR MOUNTED ON THE TABLE SURFACE WITH ITS FEELER SCANNING ALTERNATELY THE CYLINDRICAL SURFACE OF MANDREL AND REFERENCE SURFACE OF CENTRING GAUGE AND READINGS NOTED



ELECTRIC DIAGRAM

AG 430-T
AG 310T

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