

Operating Instruction Manual For Nann Indexing Units Type PT and PT/W

**For Unit Typ PT 11
Serial No.
Supplied:**

Contents Index:

1. Technical Specifications	Page 2
2. Delivery and Installation	Page 3
3. Method of Operation	Page 5
4. Maintenance	Page 6
5. Correction of Faults	Page 8
6. Operation Diagrams	Page 9
7. Drawings – Spare Parts Lists	

1. Technical Specifications:

1.1: Dimensions: Page 14

1.2: Increased Clamping Capacity: Page 15

1.3: Technical Data:

air pressure required: 4 – 8 atu (55-115 p.s.i.)

water extracted by air filters and lubrication unit

Electrical connection: 220V, 50 cycles

Other voltages on request

Maximum Load for micro switches: 220 V : 5 A
24 V = : 3 A
inductive

Surface of clamping piston: approx 66 cm²

Axial pressure of clamping sleeve at 6 atu: (85 p.s.i.)

Approx: 360 kp

Index time: approx. 0,2 sec.

Collet: K 28 DIN 6341

Standard No.: 367 E

Clamping capacity: 22 Ø

Increased Clamping Capacity: Page 15

Minimum index angle: 26°

Maximum index angle: 120°

Available indexing plates: 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10 – 11 – 12 – 13 – 14
and irregular divisions

Indexing accuracy: +- 5 angle minutes

Concentricity: 0.03 mm clock reading

Direction of rotation: clockwise viewed from collet head

2. Delivery and Installation

2.1.: The indexing unit can be supplied in two different executions:

1. Standard execution for electrical control (PT).
Three solenoid valves are housed inside the valve block mounted onto the indexing unit:
 - Valve 1: Clamping
 - Valve 2: Indexing
 - Valve 3: Index piston return

In the second waterproofed housing the 2 micro switches are located. Both switches mounted in pairs are protected against water by means of a silicon rubber coating. They have the following functions:

Switch 1.31: Controls the indexing pawl:

Is operated when the dividing plate is released and can be used for cycle control

Switch 1.31: Controls the indexing cylinder:

It is operated as soon as the indexing piston returns to its starting position. By means of this switch the air supply to the indexing piston is stopped on completion of the indexing operation.

The connection wires for the solenoid valves and micro switches are housed in a separate waterproof compartment from where a multi core cable leads to the outside. The cable end is fitted with a 10 pin plug and the corresponding plug socket added to it if no electrical control box is ordered with the indexing unit.

2. Execution for pneumatic control (PT/W)
This unit is supplied without the solenoid and micro switch blocks. The compressed air is supplied through 3 (minimum NW5) size tubes. For the controls we recommend the use of three 3/2 way valves of minimum N5 capacity. The impulses should be given for only 0.5 seconds during the indexing and indexing piston return movements.
The clamping cylinder air is exhausted when unclamping.

2.2 Control Boxes:

For operating the Type PT units on different machines three different control boxes covering the electrical connections and incorporating switch gear, fuses and micro switches can be supplied.

1. Control box VPT 03:
Simple control box with main switch, safety fuse control light, connection plug, 2 limit switches for clamping and indexing, suitable for machines with manual feeds. The limit switches connected to the control box by cables 3 m long are to be mounted on the machine at suitable locations.
They are operated by cams of levers:
Limit switch "Clamping": For clamping in loading area
Limit switch "Indexing": For indexing at the point where workpiece and tool out of contact

2. Control panel VPT 04:
Milling or drilling machines with automatic feeds (rapid approach feed – rapid return movement) can with the help of this control panel and in combination with the indexing unit PT, be converted to semi automatic machines. After every indexing operation the micro switches built into the indexing unit are via the control panel giving a starting impulse to the machine to release the next machining cycle. The number of indexes is counted by a pre-selection counter, when the selected number of indexes has been reached no starting impulse is transmitted, so that the completed workpiece can be replaced by a new blank.
3. Control panel VPT 05:
This unit differs from the VPT 04 only by the inclusion of additional controls added to permit double indexing. Double indexing is applied if the indexing movement required exceeds 120°. When the double indexing is in operation, the unit automatically indexes twice before the machining cycle starting impulse is transmitted to the machine.

2.2 Setting up

The indexing units Type PT can be mounted in either horizontal or vertical position. For this purpose 4 fixing holes for Allen screws M 10 are provided in both directions. Generally the indexing unit is not directly secured to the machine table but mounted onto an adaptor plate.

Preferably mount the indexing unit in horizontal position to prevent swarf from clogging the collet.

Should it be necessary to mount the unit in vertical position, incorporate a suitable clearance in the mounting plate to facilitate the discharge of swarf which is dropping through the collet bore.

To protect the collet slots from clogging with swarf, they may be filled with Silicon – rubber. On units mounted in horizontal position the coolant can be fed from the rear through the collet. In this way swarf build up in the collet can be reduced or prevented. The limit switch activating the indexing is operated by a suitable cam designed in such a way, that the indexing takes place when the tool is clear of the work piece and the limit switch remains activated until the machine table returns to its indexing or starting position.

If the operating cam is short and slides over the limit switch, the unit will index on both the machine table forward and return movements.

An air filter and lubrication unit must be fitted as close as possible to the indexing unit, it is essential that the compressed air is filtered and lubricated.

3 Method of operation:

3.1 Clamping:

A single acting spring returned clamping cylinder is built into the PT indexing unit. Via the thrust needle bearing (5) the piston (6) activates the pressure sleeve (60) which by means of its internal cone closes collet (61). The collet is firmly screwed into spindle (32/33) and secured. This spindle rests on thrust needle bearing (31) supported by cylinder cover (12). Since the collet remains stationary and is closed by the moving pressure sleeve. The length tolerance is not affected if the blanks vary somewhat in diameter.

A length stop can if required be screwed into the internal thread of the counter nut (34 or 65), alternatively a recess may be ground in the collet bore (Recess D Diameter x l x d Diameter) to provide for depth location.

The clamping cylinder is operated by the 3/2 way solenoid valve located in the middle and the air delivered through the bore provided in the housing casting. When the air is exhausted the clamping cylinder is returned by means of eight pressure springs.

3.2. Indexing:

The indexing is effected by the rotary cylinder arrangement. It consists of cylinder housing (17) 2 covers (18 + 19), feed sleeve (22) and the two index piston segments 20. Of these two piston segments one is screwed and sealed to the cylinder and the second one to the feed sleeve. Via the two solenoid valves connected to the delivery bores of the housing casting the air is supplied to the cylinder through the nozzle fittings (30). If required the indexing speed can be altered by reducing the bore of the nozzle fittings. The feed pawl (40) is located on bearing bolt (41) which is mounted and soldered onto the index sleeve. During the indexing movement the feed pawl (40) with its tapered front, lifts the index pawl (50) and then turns the disengaged indexing plate until the index pawl drops into the next division. On completion, the air is directed to the opposite side of the rotary piston segment rotating the indexing sleeve back to its starting position. The index plate is mounted on spindle (32/33) by means of adaptor sleeve (39) thereby transmitting the indexing movement directly onto the thread of the collet. The collet itself is secured in the spindle with counter nuts (34 or 65) and the spanner socket (33) welded directly into the bore of spindle (32). The pressure sleeve is driven only by its location on the collet taper. During the indexing movement the index pawl (50) is lifted and via operating pin (73) activates one of the two microswitches (79). The micro switch remains activated until the index pawl drops into the next division.

When starting the index movement cam (44) mounted on the index sleeve is activating the second micro switch (79).

The indexing cylinder is working without seals.

The moving parts are precision ground and adjusted to close limit fits to provide best possible sealing. It is therefore essential that the compressed air is filtered clear of water and is properly lubricated. To prevent unnecessary loss of air, the supply to the indexing cylinder should be cut on completion of each indexing operation.

4. Maintenance:

4.1: Exchanging the collet

Proceed as follows:

1. Clean the pressure sleeve, collet adaptor thread, spindle and counter nut, connecting surface of collet and counter nut.
2. Screw collet into the spindle until the taper is making contact with the pressure sleeve, but allow sufficient clearance for easy loading of blanks
3. Profile collets may require to be orientated
4. Clamp work piece with compressed air
5. Firmly tighten counter nut (32 or 65)
6. Index and re-tighten counter nut

When removing the collet proceed in reverse order

4.2: Exchanging the indexing plate:

1. Unscrew lock nut (35)
2. Disengage the index pawl by inserting releasing pin (64)
3. Release the clamping sleeve (39) by gentle blows in the indexing plate
4. Remove the indexing plate and mount the replacement in such a way that the feed pawl (40) is not jammed and enters freely in one of the indexing plate grooves.
5. Re-insert the clamping sleeve and re-tightens the lock nut

4.3: Lubrication

For lubricating the indexing units a good quality slide oil with a viscosity of 4.5°E at 50°C is to be used.

The oil nipple (4) should receive daily several times 1 – 2 strokes of oil with an oil gun. The surplus oil will escape on the front of the pressure sleeve or lubricate the axial needle bearings.

The other moving parts are lubricated by the air lubricator. The lubricator should be adjusted to provide one drop of oil after approx. every 10 indexes.

4.4: Cleaning

Even when the unit is mounted in horizontal position and the collet well protected, swarf may load the collet and pressure sleeve. Due to this, for large batch work the collet may have to be removed from time to time for cleaning. In addition to the collet, also the pressure sleeve and the counter nut should be cleaned. During the re-assembly also ensure that the internal thread of spindle (32/33) is perfectly clean.

On every individual collet exchange these parts must be cleaned.

4.5: Dismantling the indexing unit

Should the unit for seal changes of cleaning purposes be dismantled, proceed as follows:

- 1.) Remove the collet and pressure sleeve
- 2.) Remove the indexing plate

- 3.) After unscrewing the 3 hexagon nuts (96) and the 6 Allen screws (88) the complete electrical block can be removed. Take care that the insulation of the wires leading from the switch block (71) to the solenoid block (101) do not suffer any damage
- 4.) Remove the two nozzle fittings (30) together with their O-rings (29) and (29)
- 5.) Unscrew the 4 Allen screws (27). The other 4 Allen screws (26) holding the index cylinder together should not be unscrewed. Now the complete indexing cylinder can be removed from the housing casting.
- 6.) Unscrew the 4 Allen screws (13) and remove the clamping cylinder cover (12) together with piston and seals.

4.6: Dismantling the indexing cylinder

After removing the circlip (38) the spindle 32/33 can be removed towards the front. Then after unscrewing the 4 Allen screws the front cover (18) and the cylinder housing (17) together with its mounted piston segment can be removed. The indexing cylinder and piston arrangement can now be cleaned and possible crusts removed.

The front radial needle bearing 15 can now if necessary be replaced. The two piston segments (20) are screwed and sealed to the feed sleeve (22) respectively to the index cylinder housing (17) and should if at all possible not be dismantled. Remounting would require correct re-alignment to within 0.01 mm in height as well as parallel setting. In addition any trace of metallic adhesive displaced when tightening the screws to secure the segments (20) must be removed to clear cover (19). Please note that the bearing bolt (41) holding the feed pawl is screwed and soldered onto the index sleeve.

Normally the indexing cylinder is replaced as a complete unit. Experience has shown that after extensive use not only the feed sleeve but also the piston segment bearing surfaces on covers (18) and (19) may be worn out.

4.7: Replacing the micro switch:

The two micro switches are supplied moulded in silicon rubber as one complete replacement unit complete with connection wires:

For fitting proceed as follows:

- 1) Remove the solenoid block cover (115) and identify the 6 connection wires which come from the micro switches. Cut these six wires near the terminal brackets to prevent mixing up the new leads when connecting the replacements
- 2) Unscrew the 6 Allen screws (88) and remove the complete switch block, but watch out for the two O-rings (86) and (87)
- 3) Remove the pin guide plate (72) together with end plate (76)
- 4) Remove stopper screw (84)
- 5) Extract the 2 cylindrical pins (78) and draw the micro switch unit out

During the re-assembly, take care when inserting the replacement wires to prevent any damage to their insulation. The easiest way is to feed the wires straight through the block (past stopper screw 84) and then feed them individually through the cross hole. In unusual cases the micro switch activating pins may have to be adjusted.

By displacing the switch block (71) in respect of the index unit housing 1 the operation stroke of the activating pins can be slightly extended or shortened.

5. Correction of faults:

5.1: Unit not clamping

Possible causes:

- 1) No compressed air on main connection.
- 2) No current on the solenoid valve.
- 3) Remove stopper screw (1) and check whether this connection has compressed air. If the air supply is available the following additional possibilities exist:
- 4) Collet not screwed in sufficiently and out of reach for the lift of piston (6) required to close the collet
- 5) Clamping cylinder completely clogged, requires dismantling and cleaning.

5.2.: Collet not opening:

Possible causes:

- 1) Solenoid valve is faulty:
Check whether the air on delivery line 1 is exhausted (see paragraph 5.3.1). Possibly check with an air jet
- 2) Collet screwed in too deep
- 3) Collet completely clogged

5.3.: Indexing not over full index angle:

Possible causes:

- 1) Axial needle bearing (5) has been omitted when exchanging the collet.
- 2) Collet and pressure sleeve are clogged.
- 3) Collet and counter nut have not been cleaned sufficiently. Small chips of swarf have been clamped between the collet and the counter nut. Due to this the collet is pressed off centre in respect of the spindle axis. This increases the friction in some areas when indexing.
- 4) Is the current supply to the solenoid valve maintained throughout the indexing operation? Is the piston return solenoid valve released throughout the indexing movement?
- 5) Inadequate lubrication of the compressed air

5.4.: Indexing not working at all:

Possible causes:

- 1) No compressed air on main connection
- 2) No current on the solenoid valve
- 3) Solenoid valve faulty:
Remove stopper screw (2) and check whether this connection has compressed air.
- 4) Index piston segment not returning to its starting position on completion of index (see paragraph 5.5)

- 5) Index pawl not being disengaged
 - 5.1 Tension spring (42) broken
 - 5.2 Feed pawl worn

5.5.: Index piston not returning to starting position.

The tapered feed pawl front face is visible through the indexing plate groove in which the index pawl (50) enters, providing the piston has returned to its starting position. If this is not the case the following possible faults must be considered:

- 1) Return valve not receiving current
- 2) After removing stopper screw (3) check whether this connection receives compressed air
- 3) Index valve faulty so that the connection (2) fails to exhaust (check with air jet)
- 4) Feed pawl (40) due to incorrect fitting jammed between Indexing plate (46) and index sleeve (22)

6. Operation diagrams

6.1: Pneumatic diagram (page 16)

For indexing units Type PT/W the valves are obtained by the customer (see paragraph 2.1.2)

The indexing unit has 3 air connections (No. 1 – 3)

On standard units Type PT (with solenoid valves and micro switches, the 3 solenoid valves are mounted directly onto the unit and only one connection is required for the compressed air delivery. The unit is normally fitted with an adaptor fitting (thread M 10 x 1) suitable for flexible hose with 6 mm bore.

6.2: Wiring diagram (page 17)

All electrical connections are made by a 12 core cable approx. 3 m long fitted with a 10 pole plug. If the unit is ordered without a control box, the plug socket will be supplied loose but clipped to the plug.

Control gear:

- 1.31: Micro switch to control the index pawl
- 1.32: Micro switch to control the index piston end-position
- 4.01: Solenoid valve “clamping”
- 4.02: Solenoid valve “indexing”
- 4.03: Solenoid valve “indexing return”

When connecting the plug into the socket make absolutely certain that the two parts are fitted together in the correct position!

6.3: Simplest manually operated controls (page18)

This arrangement can be supplied as control box VPT 03.

The control gear is housed in a small box with perspex cover and fitted with 3 m long connection cables.

Control gear:

- 1.01: Main switch
- 1.02: Limit switch “clamping”
- 1.22: Limit switch “indexing”

- 1.31: Micro switch to control the index pawl
- 1.32: Micro switch to control the index piston end-position (switches off the solenoid valve "indexes return" on completion of the piston return movement)
- 3.01: Fuse (2.5A)
- 4.01: Solenoid valve "clamping"
- 4.02: Solenoid valve "indexing"
- 4.03: Solenoid valve "indexing return"
- 6.01: Indicator light control circuit

6.4: Circuit diagram for automatic control (page 19)

- If a machine equipped with automatic cycle (rapid approach-machining feed – rapid return) is to be controlled in combination with the indexing unit PT, the starting impulse is given by the micro switch 1.31 (control of index pawl) and transmitted via a control relay.

The automatic cycle can then be stopped via an impulse pre-selection counter.

A complete control panel designed to this layout (diagram page 19) and incorporating additional control relays can be supplied as complete control panel VPT 04.

Control gear:

- 1.21: Limit switch "unclamping"
- 1.22: Limit switch "indexing"
- 1.31: Micro switch to control the index pawl
- 1.32: Micro switch to control the index piston end-position
- 4.01: Solenoid valve "clamping"
- 4.02: Solenoid valve "indexing"
- 4.03: Solenoid valve "index return"
- HR Start impulse control relay

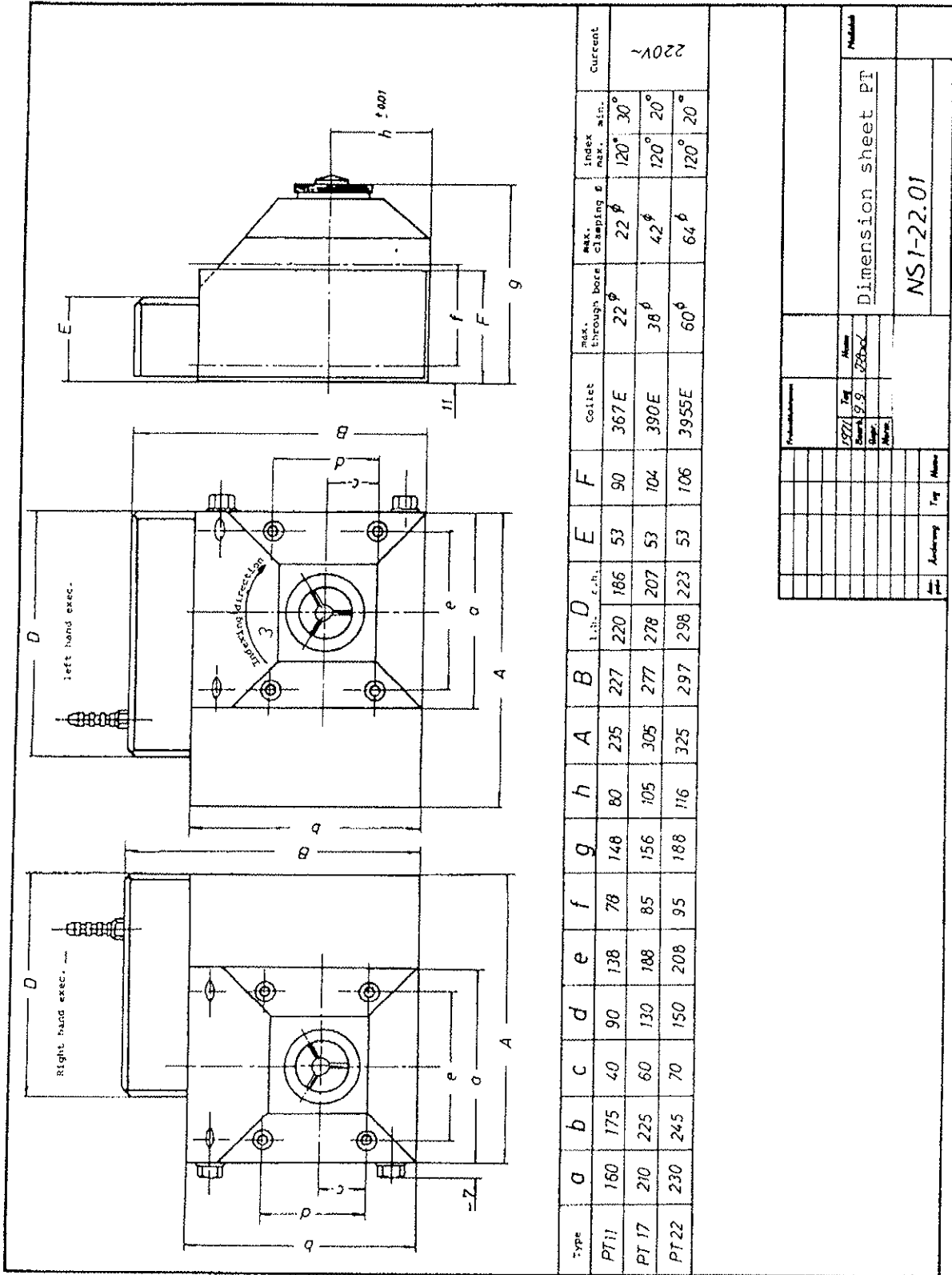
6.5: Circuit diagram for automatic cycle control with automatic double indexing (page 20)

As described under paragraph 2.2.3, with the assistance of additional electrical controls, double indexing can be effected. This is necessary if the indexing angle between two machining stations requires to be in excess of 120°.

As indicated on the circuit diagram page 20, the unit can be set to automatically index twice before transmitting the starting impulse for the machining cycle. This additional control is an extension to the circuit described under paragraph 6.4 This unit complete with additional control relays can be supplied as control panel VPT 05.

- 7. Unit drawing: page 21**
spare parts drawing: page 22

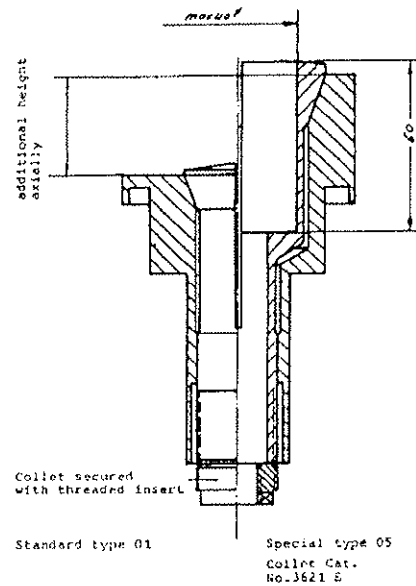
In the spare parts list, the parts subject to wear are marked*. When ordering spare parts the serial No. of the indexing unit which is indicated on the name plate must be quoted.



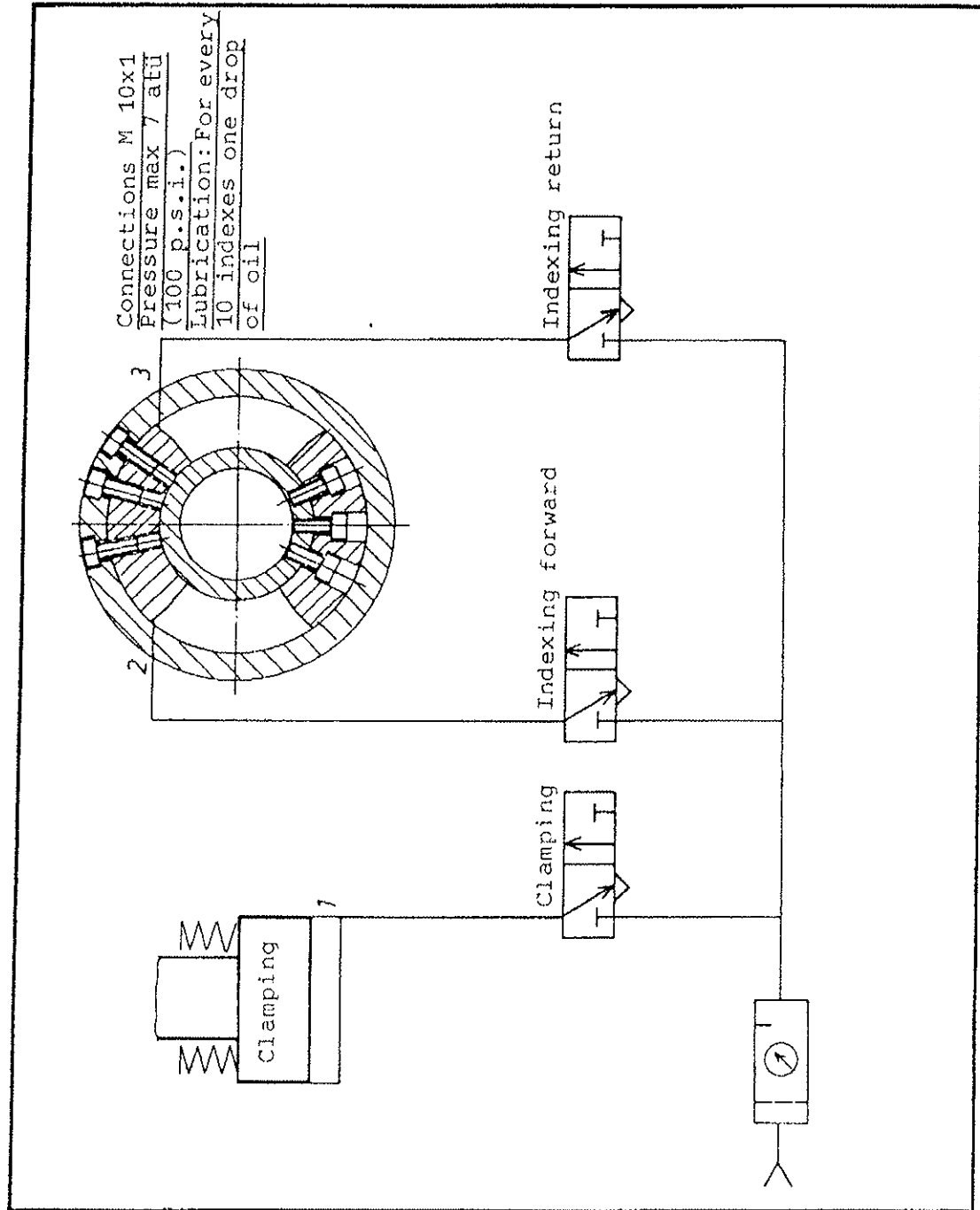
Increased clamping capacities

The indexing units PT can be considerably increased in capacity by using special pressure sleeves and stepped collets.

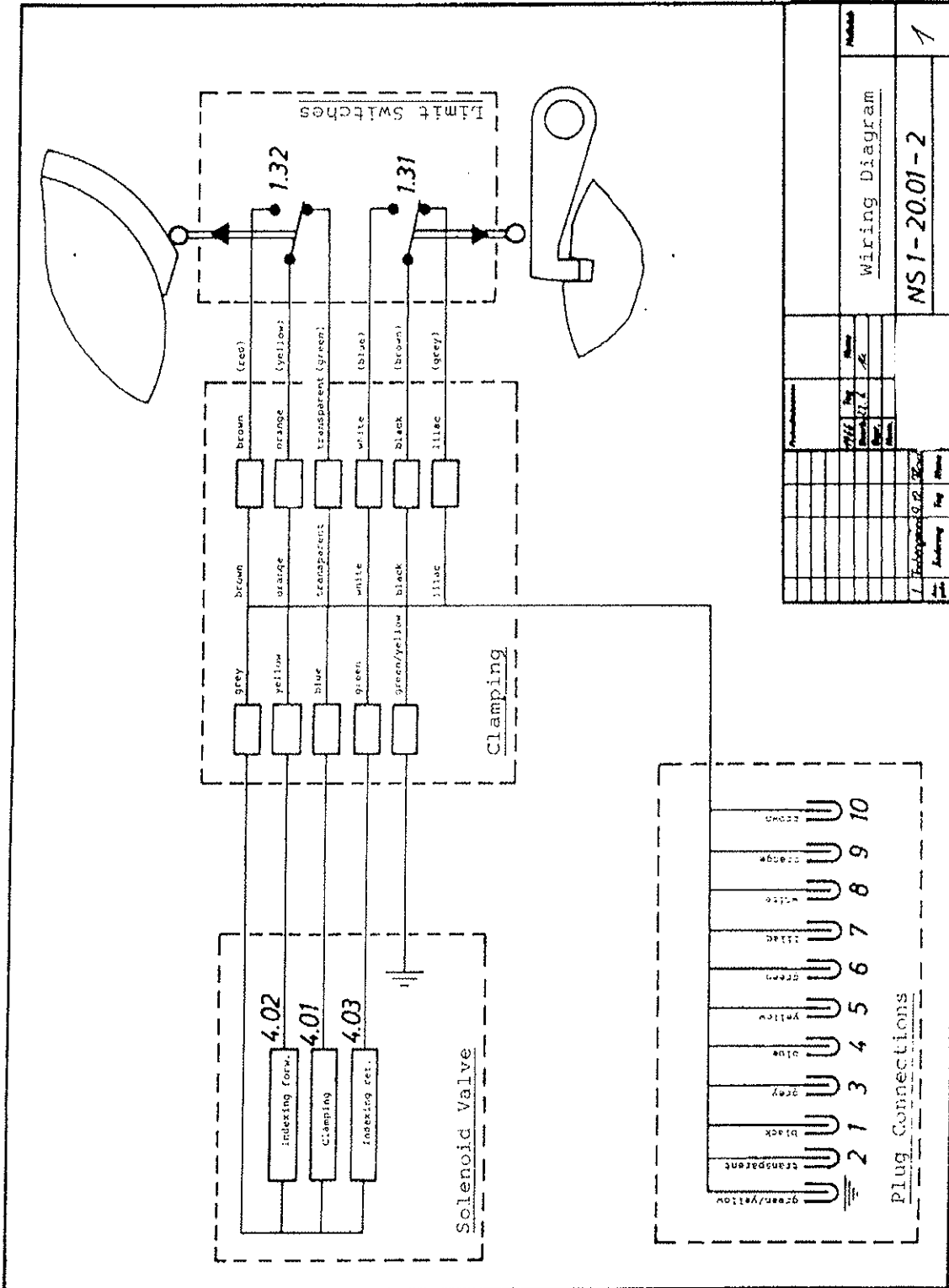
With these it is possible to clamp short components with diameters larger than the standard capacity of the unit in question. Conversion is effected simply by exchanging the pressure sleeves. On executions 04 the collet is not extended, and its larger head diameter is embedded in the front portion of the pressure sleeve. On all other executions the pressure sleeve is extended and enlarged but in such a way that it still presses the collet cone on its largest diameter. This ensures strong and save clamping.



Type	max. through bore	max. clamping capacity	additional height +	Collet E. No.
11.02	20	40Ø x 30	35	3613 E
11.04	21	32Ø x 25	0	3615 E
11.05	20	40Ø x 60	35	3621 E
17.02	38	80Ø x 30	40	3873 E
17.03	38	120Ø x 20	35	3876 E
17.04	40	54Ø x 25	0	3867 E
22.02	60	100Ø x 60	70	3957 E
22.03	60	125Ø x 60	70	3958 E
22.04	60	80Ø x 35	8	3956 E



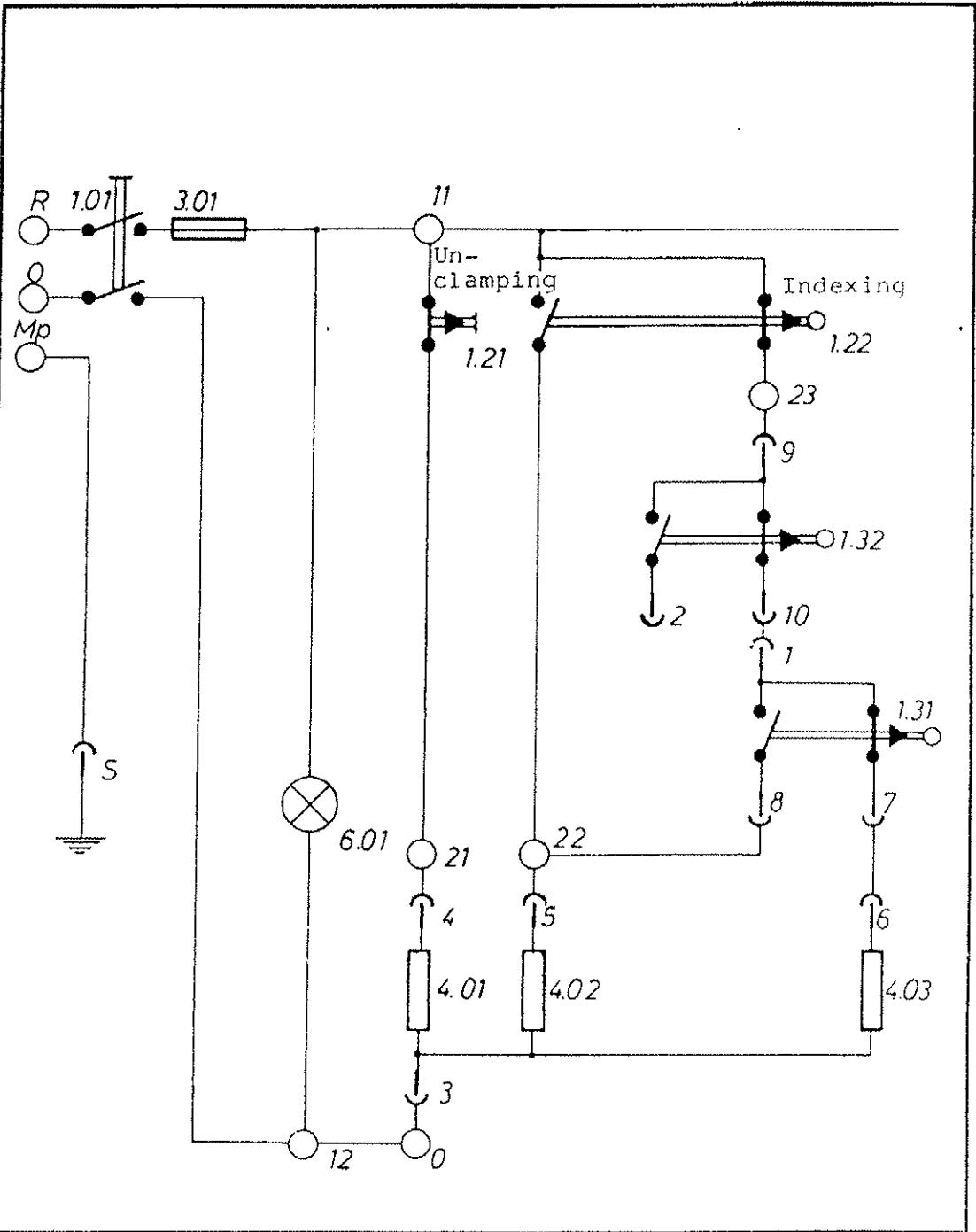
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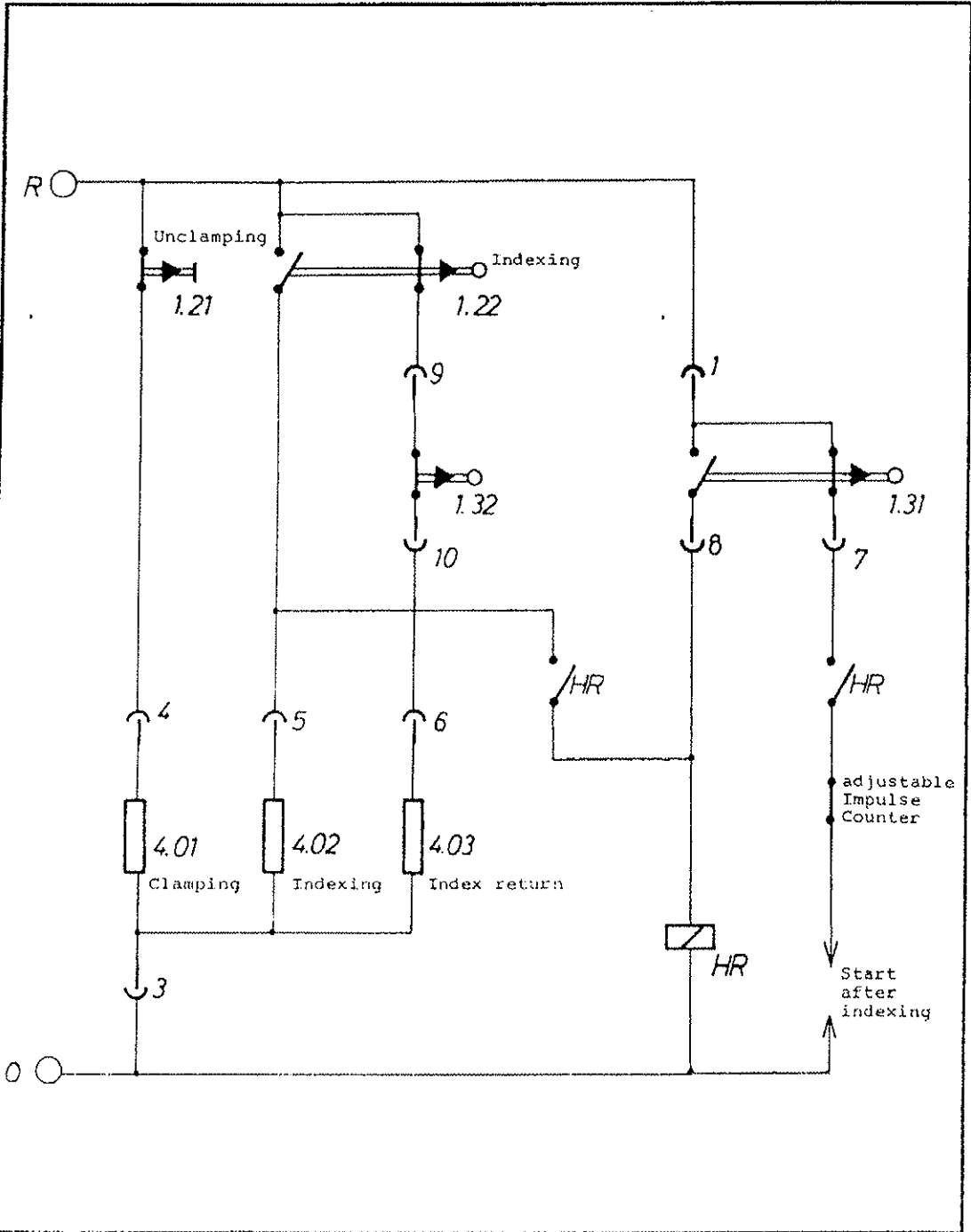
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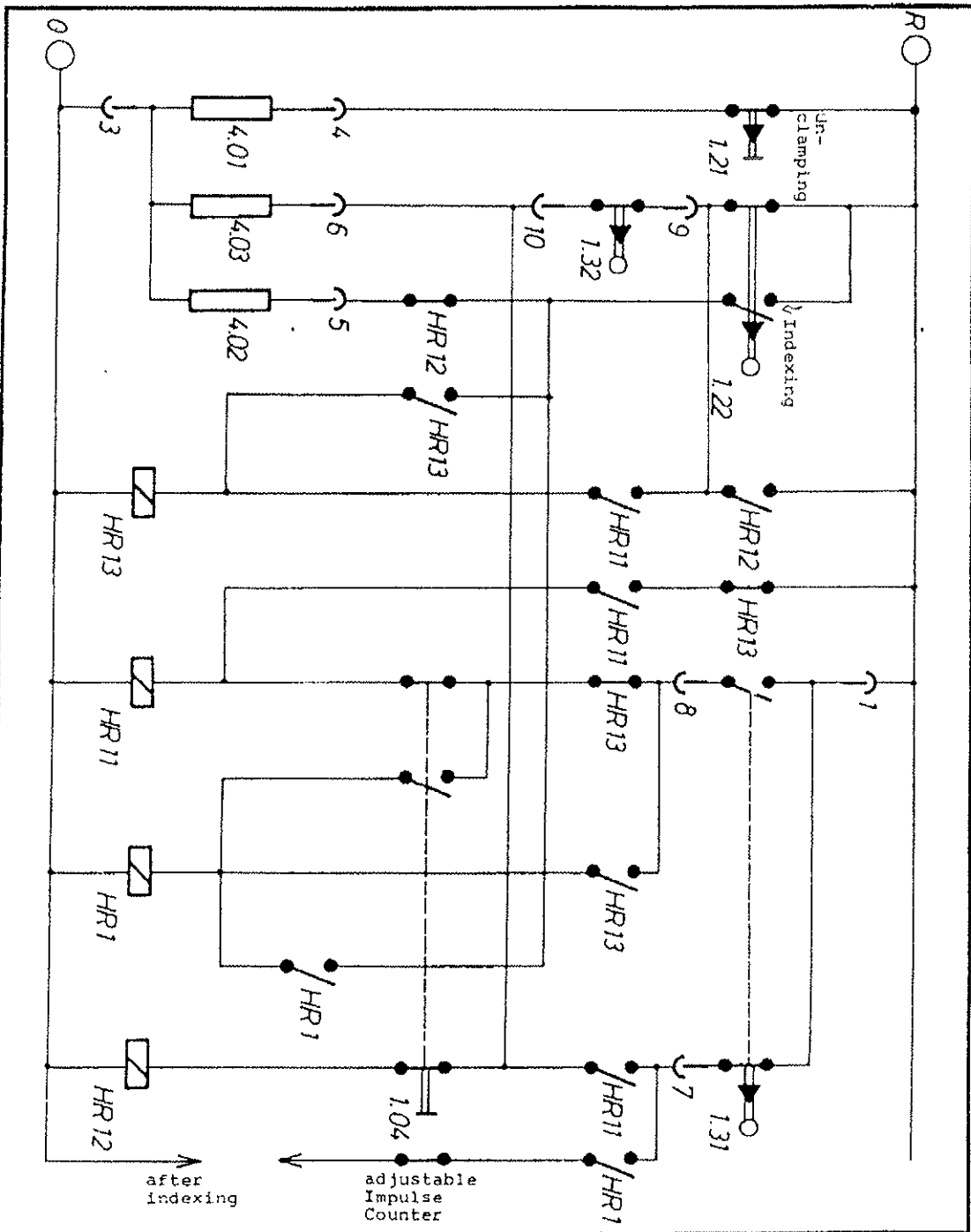
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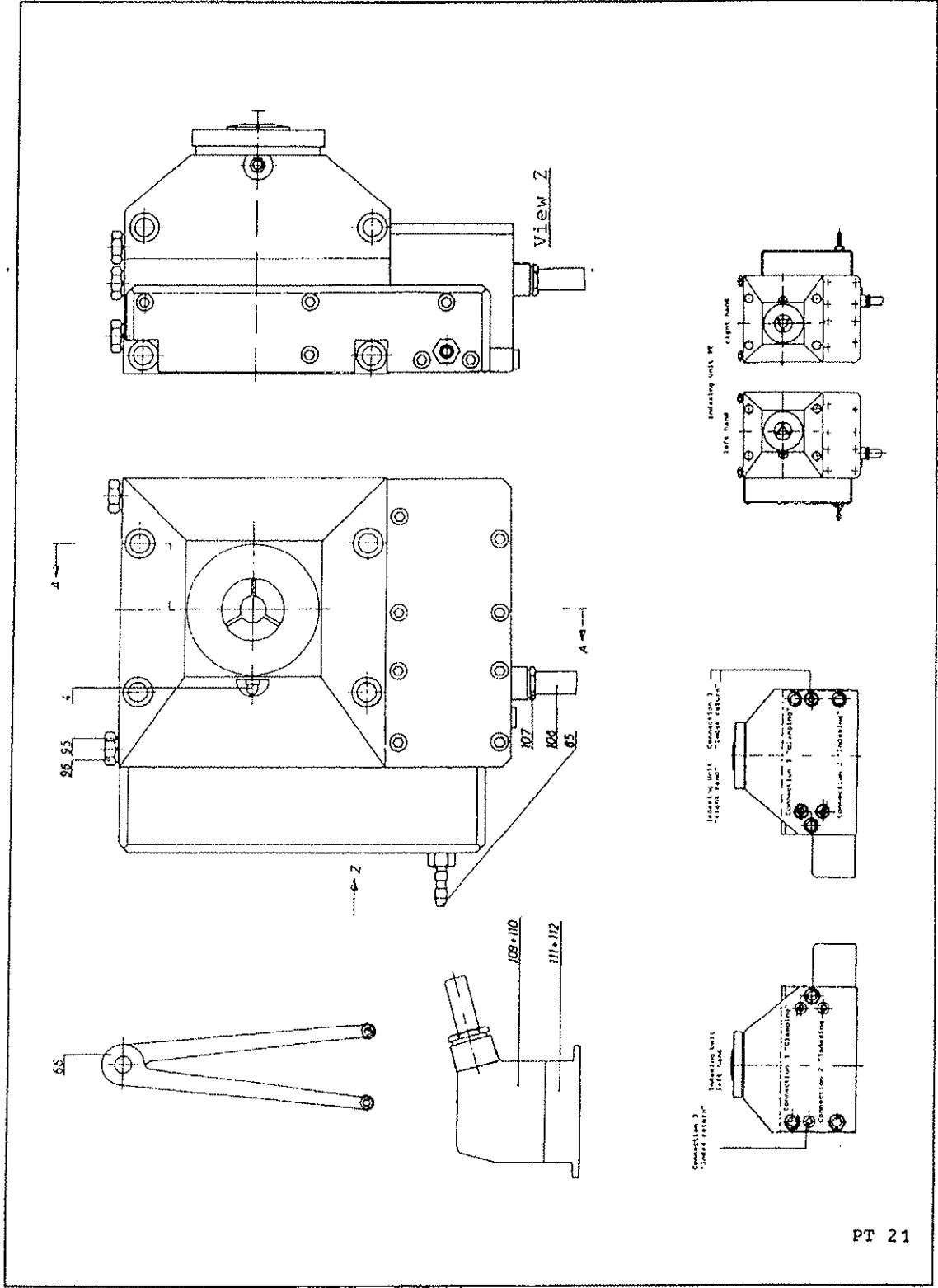
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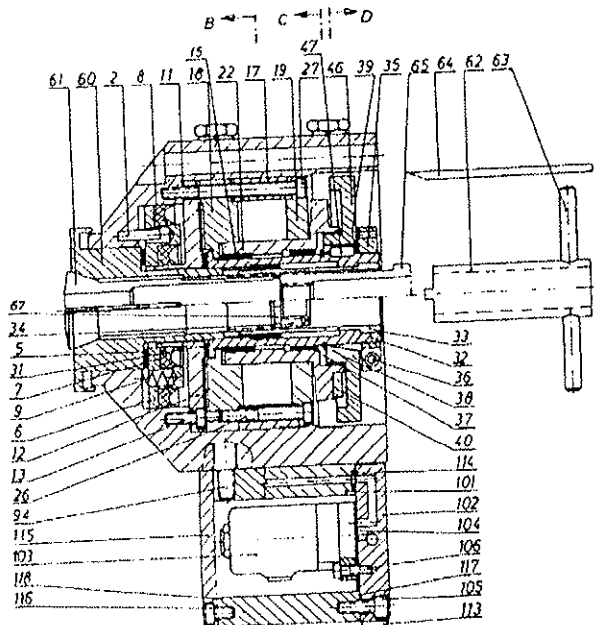
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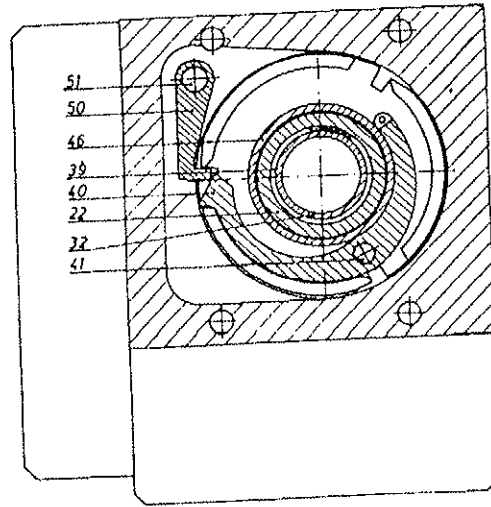
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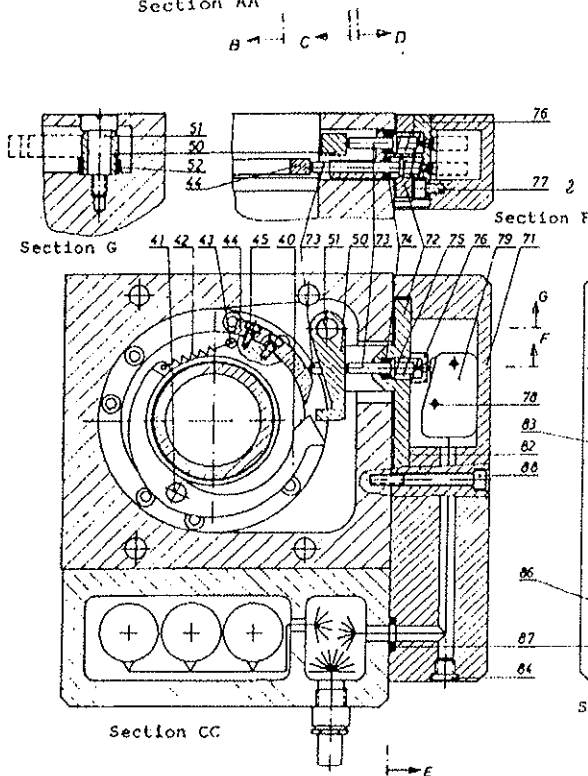
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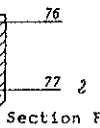
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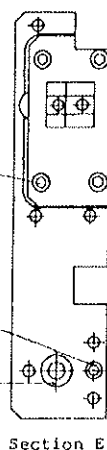
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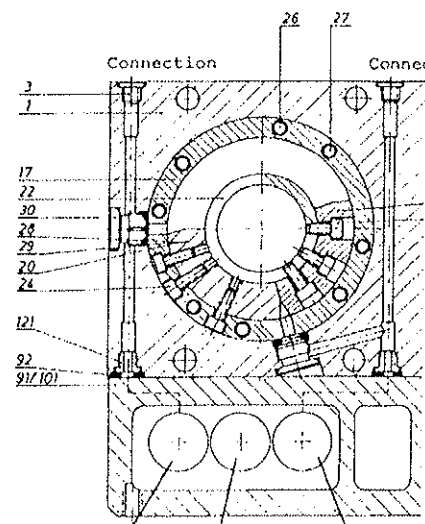
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Section F



Section E



Section BB

Index return clamping Index forward

