FROM UNIVERSAL MACHINE TOOLS TO AUTOMATIC TRANSFER MACHINES

by

J. FLEISCHER, Mech. Engineer

The Csepel Machine Tool Works (the former Machine Tool Factory of the Manfred Weiss Works) have been building Milling Machines and Radial Drills in batches for over thirty years. These types have undergone constant development, a milestone in which was the marketing of the Type UF 22 Universal Milling Machines and of the Type RF 5 Radial Drills. The output of the Works was unable to meet the increasing demands for these machines — acknowledged as up-to-date the world over — whose almost entire number was contracted for exports several years in advance.

Nevertheless, the management of the Works, with wise forethought, envisaged the building of single-purpose machines in the mid-fifties and have obtained excellent results in this line since.

The present trend of industrial production may be characterized by the slogan: automation where-ever possible. Ever-increasing demands can no more be satisfied by the former methods of production; automated machines, plants and entire factories had to be created for the purpose. The foundations of this development were laid in America mainly by the automotive industry — as the most characteristic of batch production — and it gained ground in Europe as well after the second world war. Next to the automotive industry, such equipment has principally been required by the manufacture of electric motors, but single-purpose equipment, including transfer machines, are also put to use in the production of typewriters, printing machinery, machine tools etc. Transfer machines usually consist of prefabricated units which, utilized as component parts, are assembled by the so-called building block method. Drilling, milling, feed, frame, circular table etc. units are available, each in various sizes. Preceding assembly, they are subjected to careful testing (ensuring trouble-free operation), are batch-produced (securing relatively low cost) and are available from stock which permits their quick assembly into the required equipment.

Another advantageous feature of this kind of machinery is that any such machine can be disassembled into its component units should their use for the given purpose come to an end, and the units, then, can be assembled into equipment serving a different purpose.

The Csepel Machine Tool Works has followed the same road by developing its standard units.

The series of *Drilling Units*, developed at first, consists of four sizes, each unit being constituted of a motor and driving gear, the face of the latter taking a single or multi-spindle tool-holder attachment.

The drilling units are designed primarily for drilling and tapping operations, but can be used for reaming and boring as well. Their overall dimensions are shown in Fig. 4.

The speed of the spindle nose can be altered by means of change gears or by change gears and shift lever. The latter is recommended mainly for the production of small batches when e.g. drilling is followed by tapping or reaming after having replaced the tools, of course. The most frequently used element of

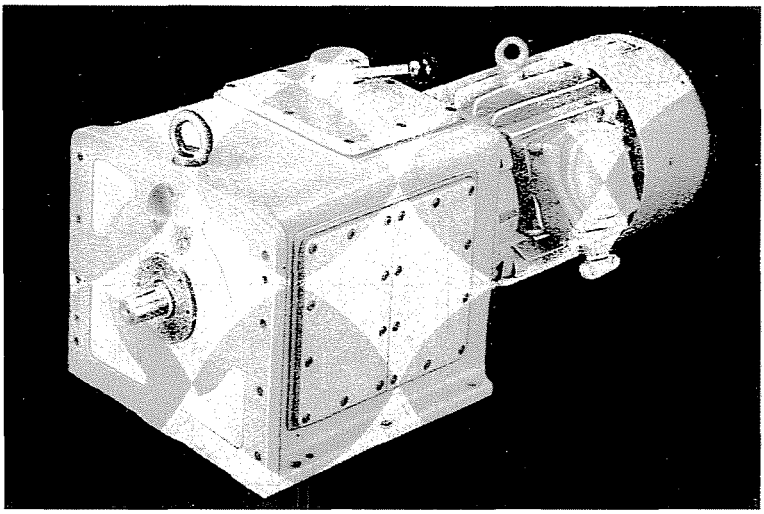


Fig. 1. Type FE Drilling Unit

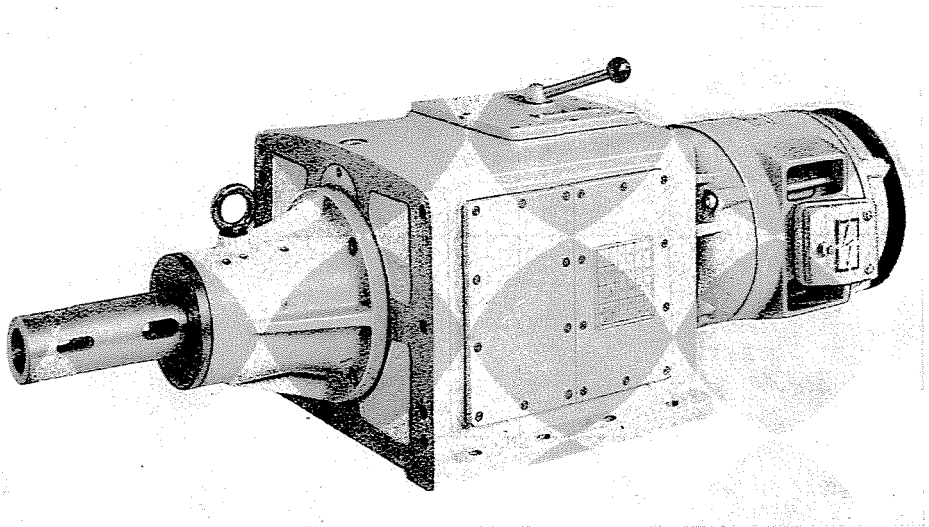


Fig. 2. Type FE 40 Drilling Unit with single-spindle attachment

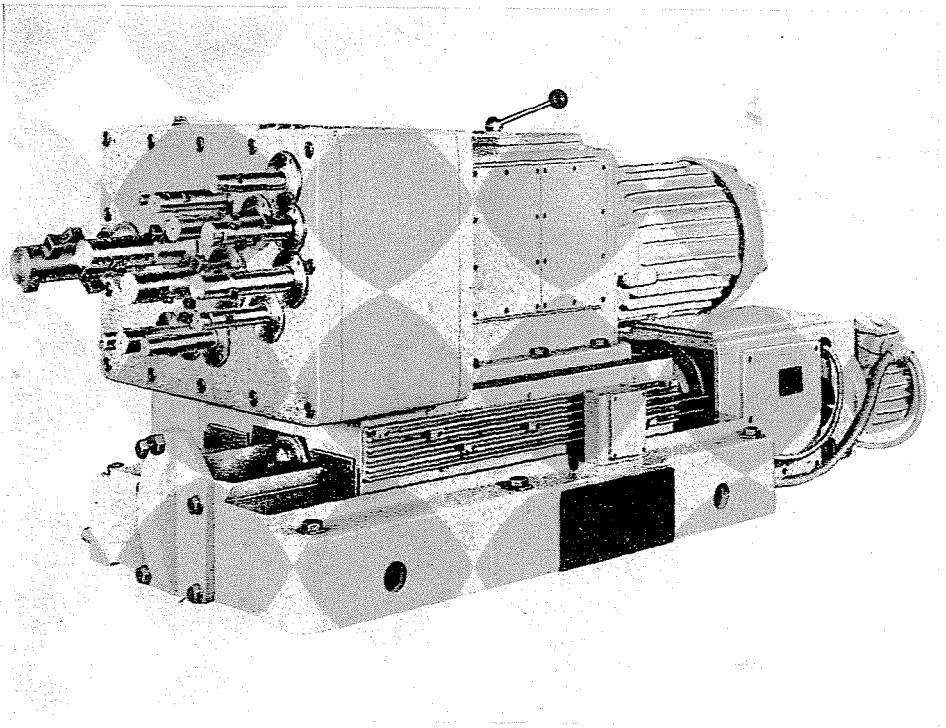
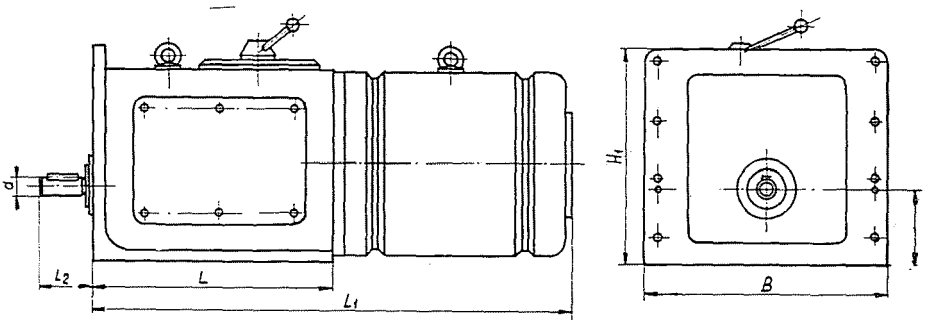


Fig. 3. Type FE 63 Drilling Unit with multi-spindle attachment



Type	B	d	H_1	h	h	L_1	L_2	Motor rating kW	Torque, kg-cm	Drilling capacity, dia.	Range of speeds
FE-25	320	⌀ 30	300	100	360	765	53,5	1.7—2.8	1 000	25	125—2800
FE-40	400	⌀ 35	360	125	404	887	90	2.2—4.5	2 300	40	32—2000
FE-63	470	⌀ 50	415	190	505	1085	95	7—10	6 300	63	22—1400
FE-100	585	⌀ 70	715	270	570	1150	104	8.5—14	16 000	100	16—1000

Fig. 4. Principal dimensions of the Type FE series of Drilling Units. Data in mm

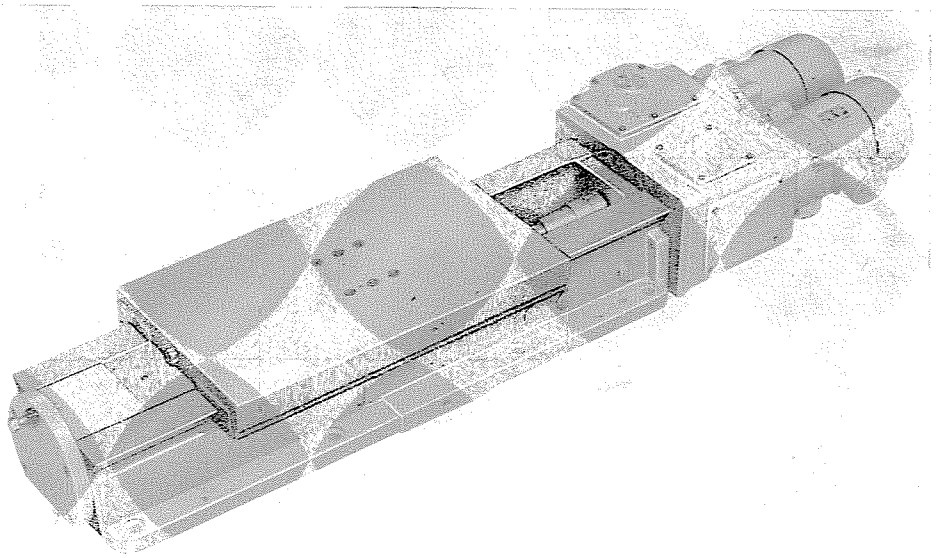


Fig. 5. Type Te 2000 Feed Unit

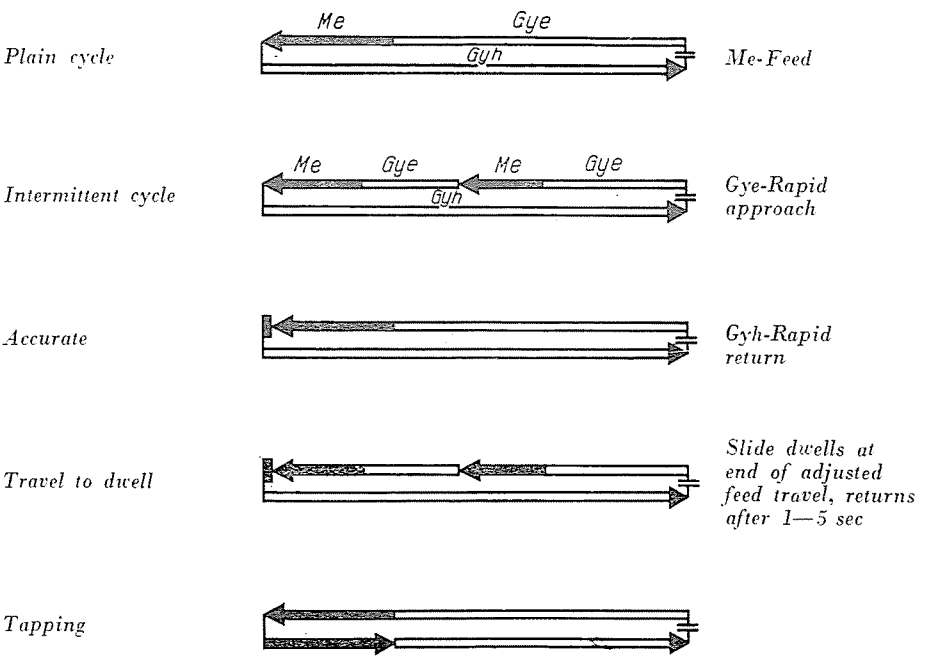
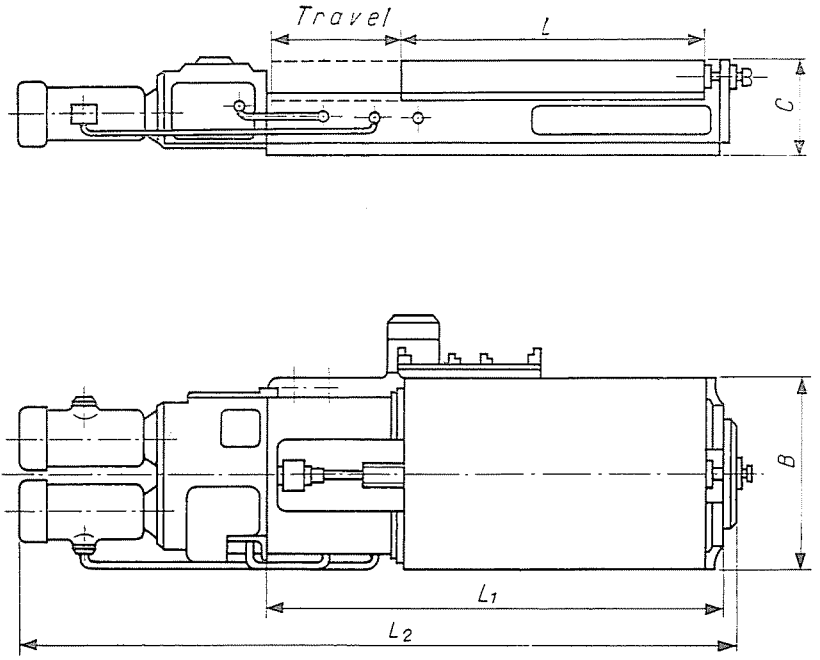


Fig. 6. Cycles provided by the feed unit



Type	Feed force, kg	Feed travel, mm/min.	L	Travel, mm	L_1 mm	L_2 mm	B mm	C mm
TE-1000	1000	5—250	650	250	850	1350	320	170
				355	955	1455		
				500	1100	1600		
TE-2000	2000	5—250	750	315	1035	1542	420	200
				450	1170	1677		
				630	1350	1857		
TE-3000	3000	5—250	850	400	1300	2016	470	255
				560	1418	2174		
				800	1700	2416		
TE-5000	5000	5—250	1000	250	1300	2026	580	260
				400	1460	2186		
				650	1700	2426		

Fig. 7. Principal data of Type TE Feed Units

assembly is the Feed Unit (Fig. 5) consisting of a stationary bed and a slide. The top of the bed is designed for flat ways, the slide travelling along the hardened and ground surfaces of the latter.

The slide is traversed by a driving gear attached to the bed. Power is derived from two motors through threaded spindle and nut.

The diversity of movements provided by the driving gear is shown in Fig. 6. The length of each section of travel is limited by stops.

The feed units are also provided in four sizes characterized by the width of the slide (*B*) and by the max. feed force (*kp*). A less frequently used element is the Milling Unit suited to the machining of steel, cast iron as well as aluminium work. Milling units are available in 3 sizes and a number of styles (left-hand, right-hand, horizontal arrangements; ranges of speed etc.). They can be supplied also with tool-lifting attachment which removes the tool off the machined surface after the milling operation thereby ensuring freeness from tool marks during return. Principal data of the milling units are listed in Fig. 8.

The following illustrations show a Feed Unit with a Drilling Unit (Fig. 9) and a Milling Unit (Fig. 10) mounted.

Such assembled units are mostly installed on a *horizontal frame* (Fig. 11) which, due to reasons of economy, are available only in two sizes (a size each for two feed units) (Fig. 12).

Operations on single-purpose machines frequently involve the machining of vertical bores as well. In such instances, the feed unit must be attached to a *vertical frame* (Fig. 13).

The vertical frame units, available in three sizes, are suited to single-purpose machines as well as to transfer machines. A counterweight inside the frame aids in traversing the attached feed units (Fig. 14).

Some other units that can be utilized for purposes of assembly are the following:

a) special single-spindle boring unit in 3 sizes (Fig. 15),

b) face-machining unit,

c) cam-controlled drilling and tapping unit in 2 sizes, feed-sleeve design,

d) hydraulic indexing circular table, 1600 mm dia,

e) series of hydraulic elements (gear pumps, electro-hydraulic valves etc.).

The assembly of single-purpose machines was taken up almost simultaneously with the production of standard elements. The first of the former was a Type CD 1 dual head, Horizontal Single-Purpose Machine (Fig. 16), built by the order of the DINAMO Works in Budapest, which — in fact — is a component of the Type CD 2 Automatic Transfer Machine. It machines such surfaces at either end of motor casings which serve as bases for clamping on transfer machines (Fig. 17).

The task of the designers was a difficult one since thin-walled motor casings of 11 various sizes must be held on the machine without their suffering deformation.

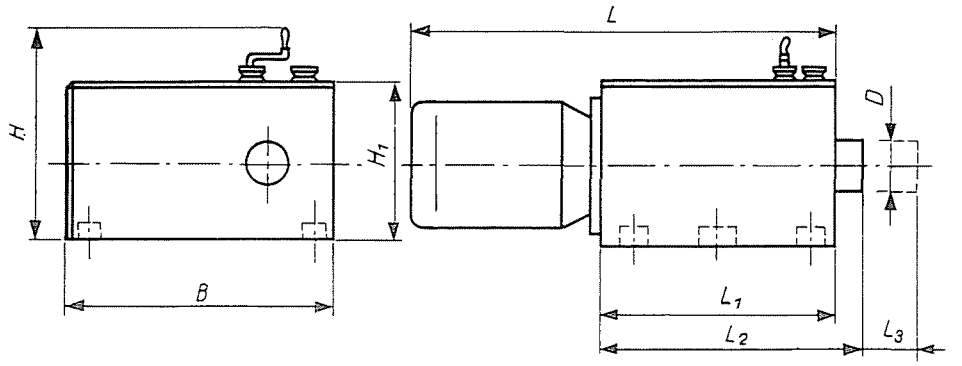
Some characteristic data of the Type CD 1 single-purpose machine are as follows:

Weight	8000 kg
Electrical output	22 kW
Capacity	1.5—2.2. min. per work

The advance-machined motor casings are transferred to the Type CD 2 transfer machine whose diagram is shown in Fig. 18. This transfer machine, consisting of 6 stations and 12 machining units, completely finishes the casings of motors rated from 0.6 kW to 10 kW.

Would the conventional design be employed for the machining of motor casings, a transfer machine with 12 stations and a turning-over unit would be required.

Due to the condensed arrangement of the Type CD 2 transfer machine, all machining operations are performed at six stations. This is achieved by the use of a double chucking unit (Fig. 20) and by passing every motor casing twice along the line. The advance-machined casings first are held at the right-hand side of the chucking unit (*A*) and pass along the line for the first time. Next, they are turned over and slightly rotated to be held at the left-hand side of the chucking unit (*B*) and, after passing for the second time along the line, are unloaded in a completely finished state.



Type	n	M max	N mot	Dimensions in mm							
				L	L_1	L_2	L_3	D	B	H	H_1
ME63	40—2000	63 mkp	4.5—10	1132	645	705	125	⌀ 88.87	660	565	408
ME160	25—1250	160 mkp	7,5—13	1250	665	735	150	⌀ 128.57	740	625	463
ME260	20—1000	250 mkp	13—22	1367	720	800	160	⌀ 128.57	900	745	583

Fig. 8. Overall dimensions of Type ME Milling Units

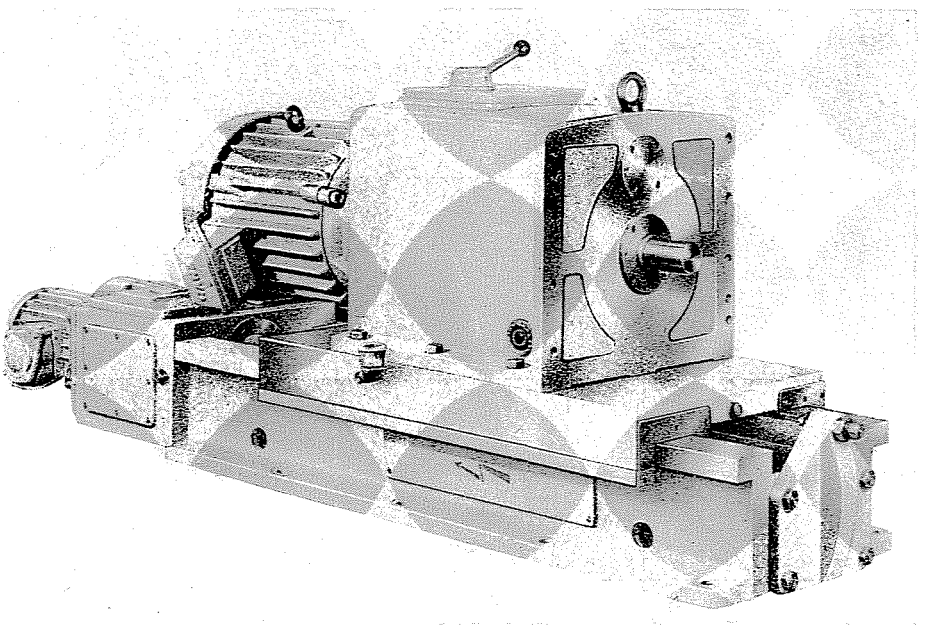


Fig. 9

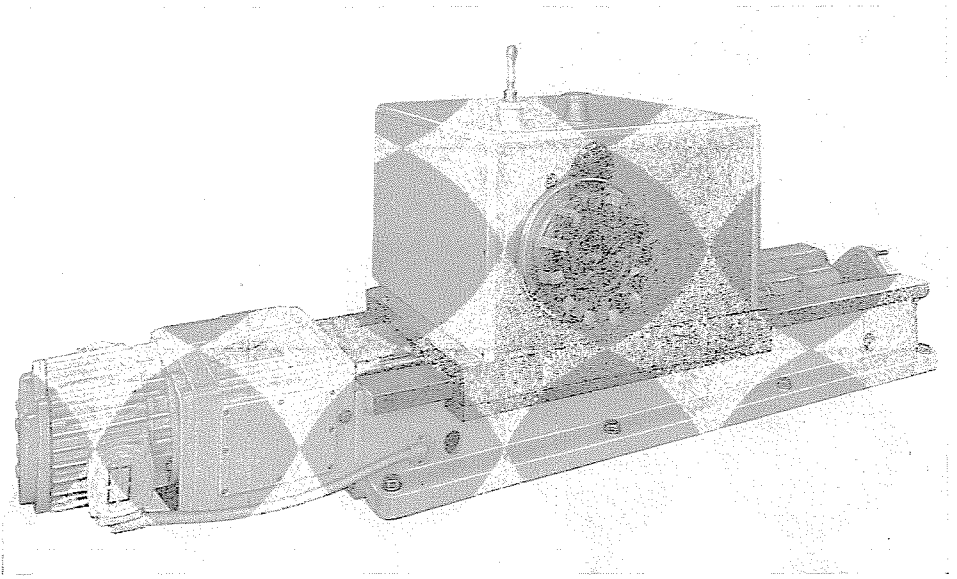


Fig. 10. Type ME 63 Milling Unit mounted on Type TE 3000 Feed Unit

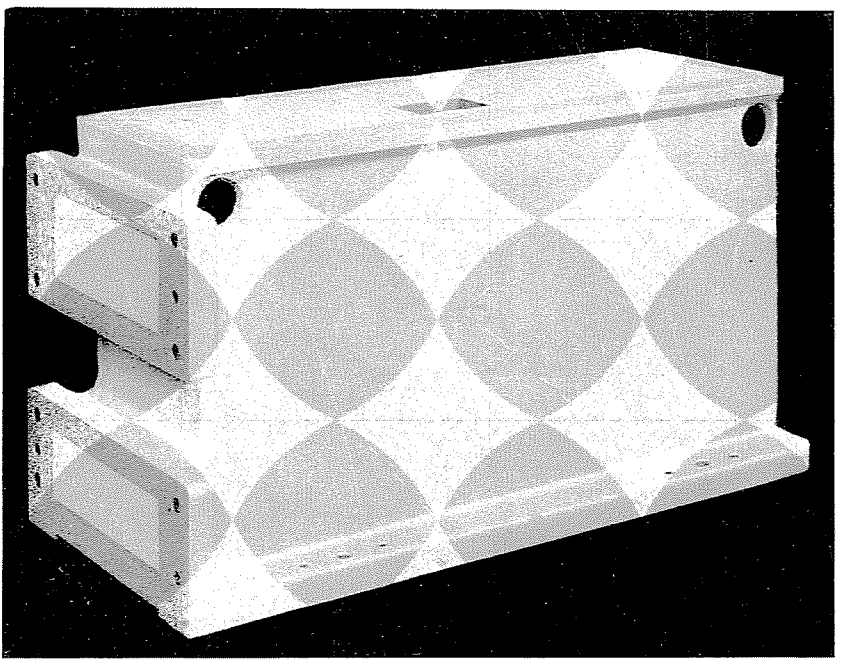
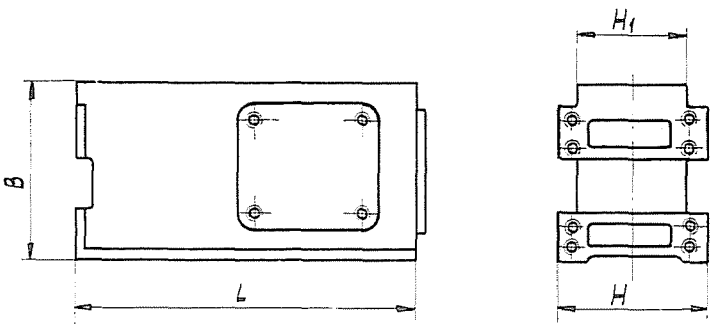


Fig. 11



Mark	Type	
	AAV-12	AAV-22
L	1360	1860
B	580	580
H	560	800
H_1	440	650

Fig. 12. Dimensions of Horizontal Frames

This method of condensation permitted reduction of the number of machining units, shortened the line to be passed and considerably reduced the floor space required by the machine.

The following operations are performed at the individual stations of the transfer machine:

Station 1

Clamping and unclamping, exchange of the motor casings

Station 2

"A" Roughing of main bore (2 A)

"B" Milling of base (1) (2 B)

Station 3

Hor. „A" Facing of cable box surface (3 A)

"B" Drilling for lug (3 B)

Vert. "A" and "B" Drilling for endshield fastening screws (3 AB)

Station 4

"A" Drilling for attachment of cable box (4 A)

"B" Finishing of main bore (4 B)

Station 5

Vert. "A" and "B" Gauging of drilled holes (5 AB)

Hor. "B" Drilling of base (5 B)

Station 6

Vert. "A" and "B" Tapping for endshield fastening screws (6 AB)

Hor. "A" Tapping for cable box fastening and earthing screws (6 A)

"B" Tapping for lug (6 B)

Some data on machining are tabulated below.

Shown in the illustration are Station 2 of the transfer machine with the double chucking unit and with the units for roughing the main bore and milling the base.

After passing Station 6, the double chucking unit is raised by an inclined conveyor and is returned to its point of starting by an overhead horizontal conveyor.

The operator can check the entire operation of the machine on a panel of pilot lights.

The finished motor casings are carried by an overhead chain conveyor to the assembling plant.

Some principal data of the transfer machine:

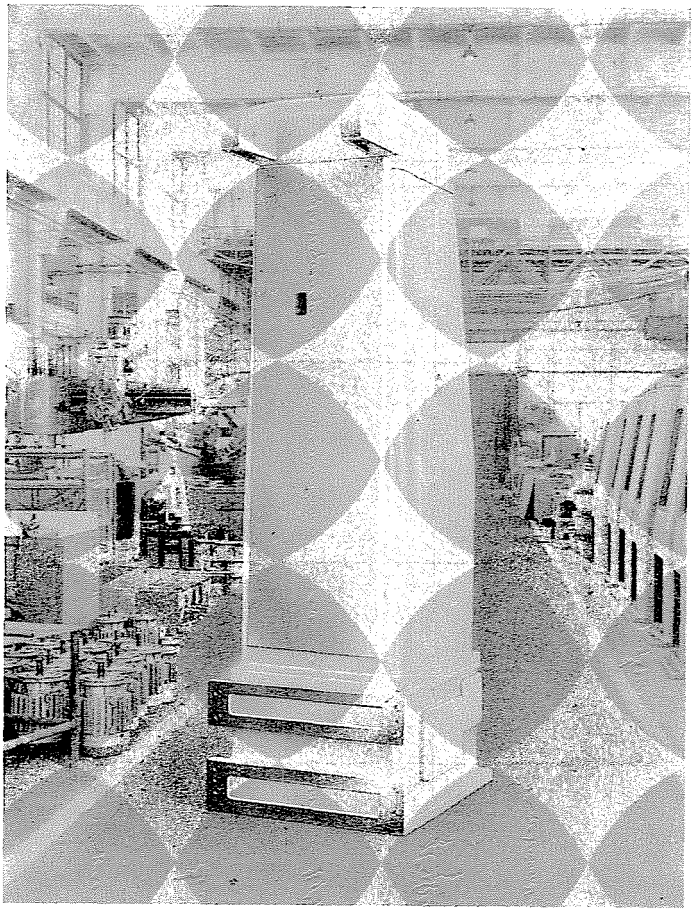


Fig. 13. Vertical Frame (Type AAF 2)

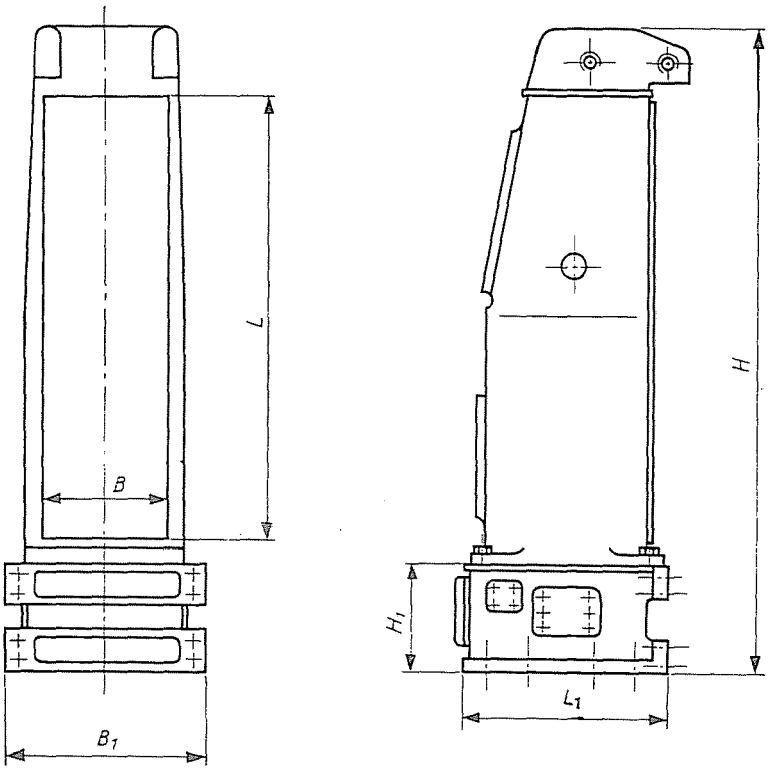
Weight	55 000 kg
Length	12 000 mm
Width	5 000 mm
Height	3 300 mm
Total power rating	70 kW
Number of stations	6
Number of units	12
of which	
drilling units	3 with 17 spindles
tapping units	2 with 14 spindles
boring units	2 with 2 spindles
milling unit	1 with 2 spindles
facing unit	1 with 1 spindle
gauging units	2 with 15 mandrels
clamping unit	1 with 2 spindles
Capacity	1.6—2.8 min. per work
Guaranteed output	75%
Number of attendants	1

Produced as well for the DINAMO Works was the Type CD 3 Single-Purpose Machine with circular table designed for the machining of *motor endshields* for electric motors of 0.6 kW to 10 kW power rating.

Endshields of three different sizes, in two designs each, belong to the above range of motors.

The endshields are subjected to the following operations:

1 A = Surfacing of outside bearing nipple.



Mark	Type	
	AAF-1	AAF-2
B	480	600
B_1	480	940
L_1	950	1170
L	1900	2000
H	2965	3180
H_1	625	580

Fig. 14. Overall dimensions of Vertical Frames

2 A = Outside machining for fan cover.
3 A = Drilling on the internal and external circles.
4 A = Tapping on the internal circle after which the shield is turned over and machining continued.
1 B = Rough boring of ball-bearing nipple and of external joint flange.
2 B = Surfacing of inside bearing nipple.
3 B = Drilling of bore for draining condensating water.
4 B = Finish-boring of ball-bearing nipple and of external joint flange.

In the meantime, four threaded bores must be drilled and tapped radially for fastening the fan cover.

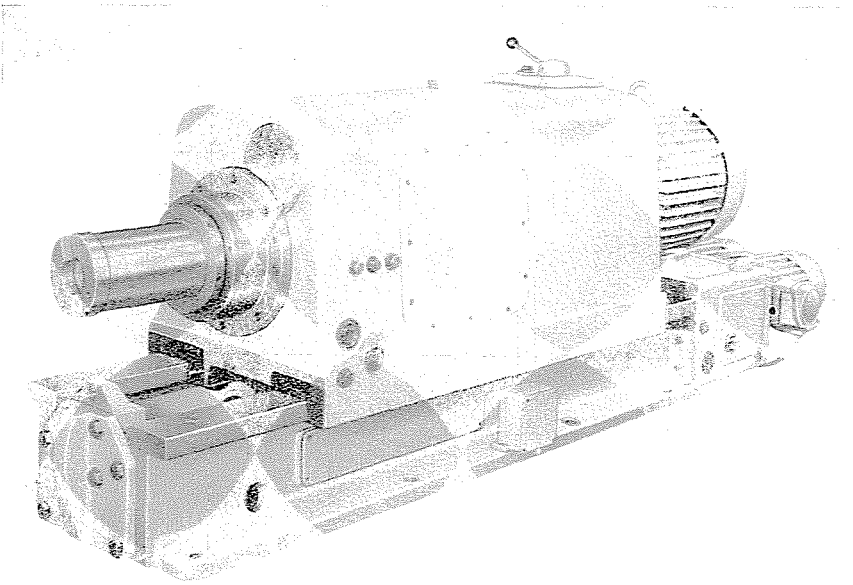


Fig. 15. Special Single-Spindle Boring Unit on Feed Unit

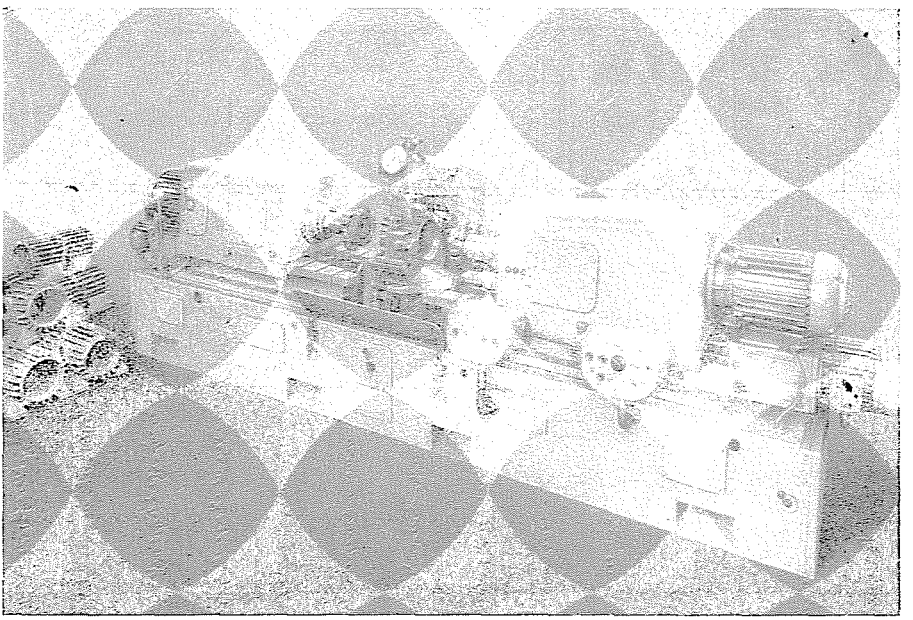


Fig. 16. Type CD 1 Single-Purpose Machine for machining of motor casings

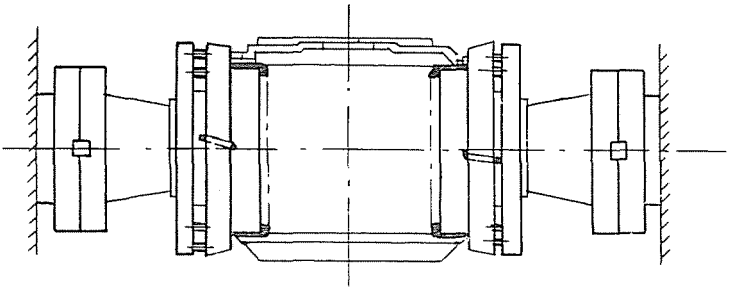


Fig. 17. Diagram of machining on Type CD 1 Single-Purpose Machine

Two machines, with five stations each, would be required to perform the above operations, however, a single, 5-station machine with circular table suffices in the present case on account of its condensed design applied in this instance as well. Two endshields are machined simultaneously at each station, one being rotated through 180 deg. in reference to the other. Here, too, each endshield passes twice around the line until finished but, all said, an endshield is unloaded at each indexing of the table.

The arrangement of the single-purpose machine is as follows: Five clamping fixtures marked "A" and five marked "B" are held on the circular table of 1600 mm diameter. The fixtures open when the operator actuates a pedal after which the endshields are hydraulically clamped. Four stations around the table (the fifth performs loading and unloading) incorporate two machining units each (Fig. 31) with four drilling and tapping units, each, on top which operate simultaneously.

The two clamping fixtures ensuring different kinds of operation are clearly visible in the figure. The raw endshield is clamped in the left-hand fixture. After passing around the machine, this workpiece is turned over and clamped in the right-hand fixture from which it is unloaded in a finished state after its second turn around the machine.

The bottom portion of the single-purpose machine with circular table is incorporating five stations and four dual machining units.

The mark 1 B machining unit roughs the ball-bearing nipple and the joint flange while two small units perform drilling for the screws fastening the fan.

Operational data on the machining of motor endshields of intermediate size.

Principal data of the single-purpose machine:

Weight	24 000 kg
No. of machining units	16
No. of tools operating simultaneously	23
Total power rating	70 kW
Floor area required	29 sq. m
Capacity (depending on work size)	0.9—1.3 min. per work
Output (at 75% exploitation)	50—35 per hr.
No. of attendants	1
Period of conversion	1—3 hr.

*

The production of casings for motors rated from 10 kW to 28 kW is performed in part on universal machine tools, however, the Type CD 4 Single-Purpose Machine with circular table can be utilized to best advantage for some of the operations. The machine incorporates four stations as follows:

Station 1 Loading and unloading.
Station 2 Milling of base.
Station 3 Drilling of base.
Station 4 Milling of cable outlet surface.

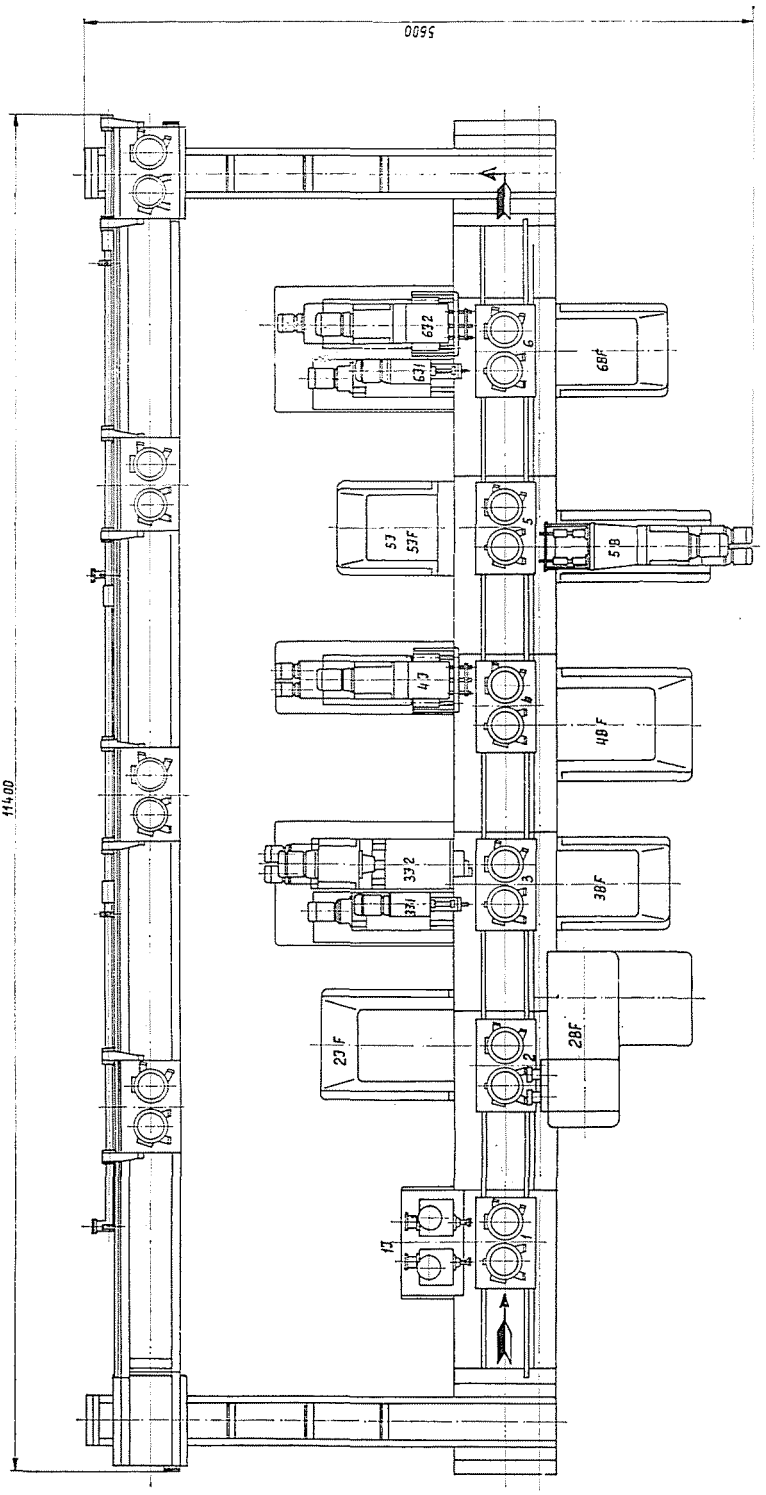


Fig. 18. Arrangement diagram of Type CD 2 Transfer Machine

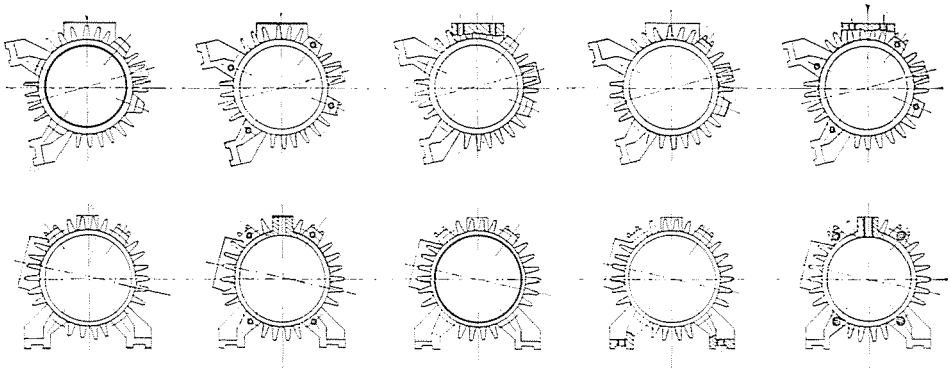


Fig. 19. Chart of machining conforming to the conventional process

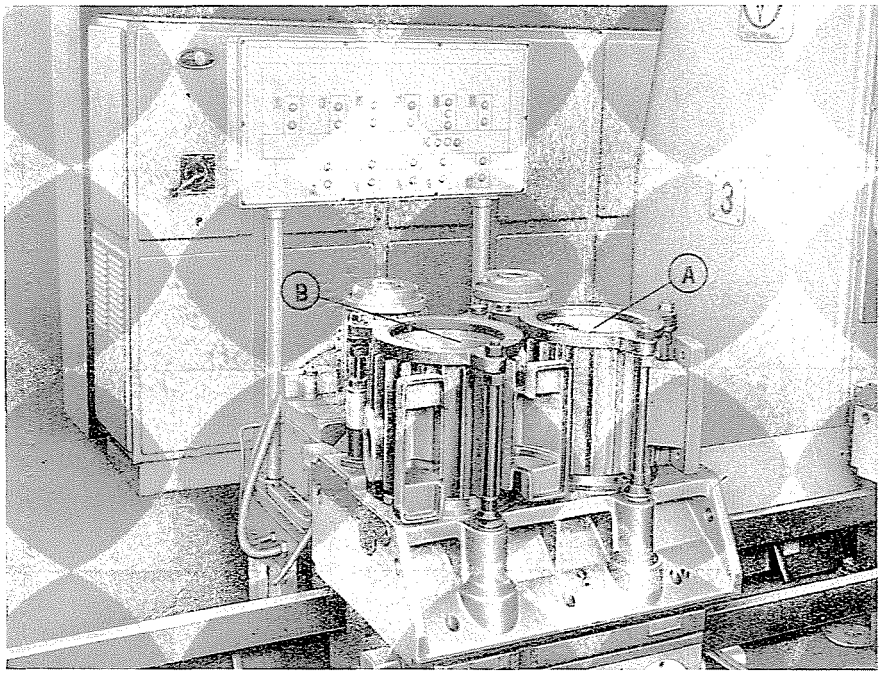


Fig. 20

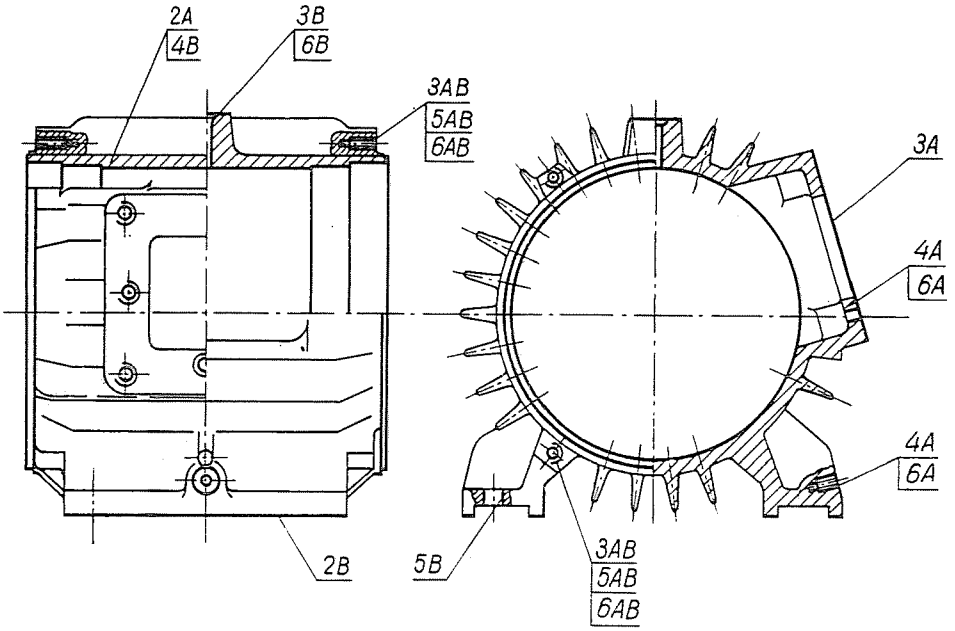


Fig. 21. Diagram of motor casing for machining on Type CD 2 Transfer Machine

Mark	Operation denomination	Cutting speed, m/min	Tool dia., mm	RPM	Feed mm/rev.	Feed mm/tool	Feed mm/min
	Roughing main bore	45	169	84.5	1.48	0.185	125
	Milling base	88	140	200	0.9	0.09	180
	Facing	55/19.6	140/50	125	0.252	0.252	31.5
	Drilling	11.8	5	750	0.06		45
	Finishing main bore	97	170	182	0.688	0.688	125
	Drilling base	13.6	12	360	0.088		31.5
	Tapping	1.81	M 6	96	1.00		96

Fig. 22. Some data on machining

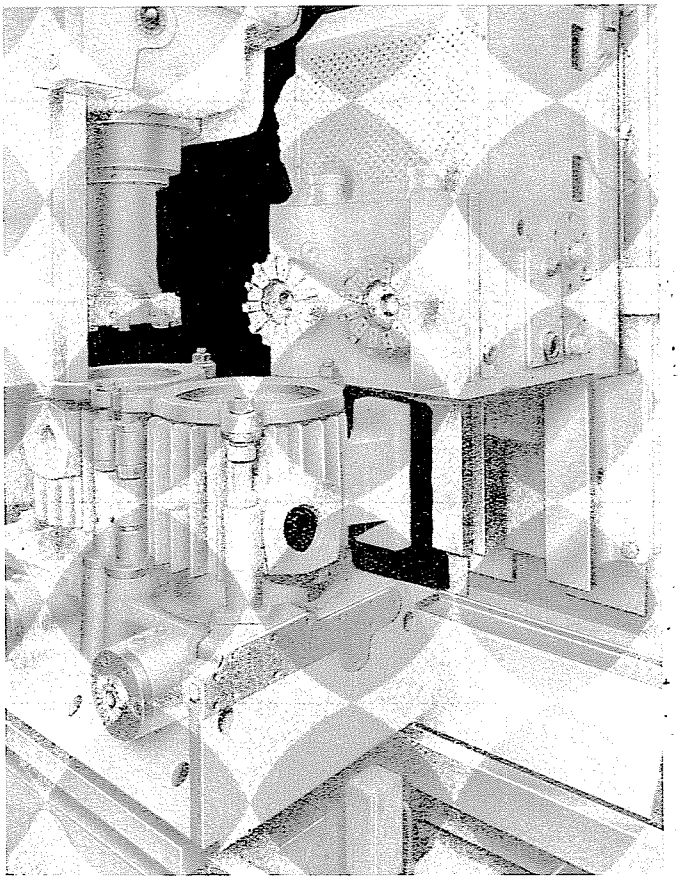


Fig. 23. Station 2 of Type CD 2 Transfer Unit

The single-purpose machine consists of a 1600 mm dia., hydraulically operated circular table with four stations and of three machining units arranged next to the table.

Mounted on the table are hydraulically operated clamping fixtures for holding 11 kinds of motor casings.

Operational data on the single-purpose machine:

Operation	Tool	Dia. D mm	Cutting speed, m/min.	Feed, mm/min.
2. Base milling	Inserted-tooth cutter	200	56	100
3. Base drilling	Twist drill	22	12.5	
4. Cable outlet milling	Inserted-tooth cutter	160	49	100

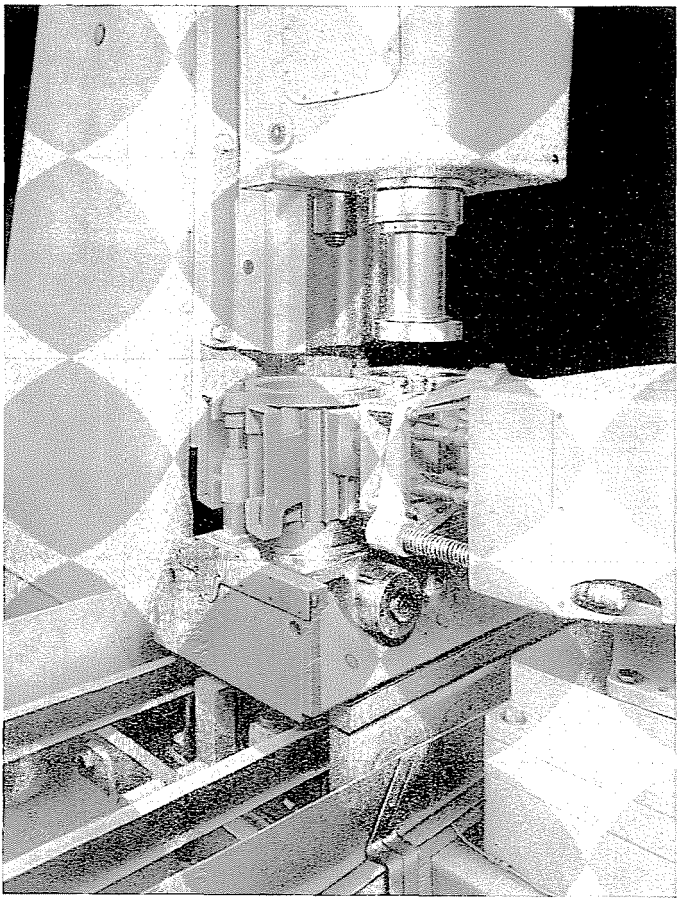


Fig. 24. Shows the units for finishing the main bore and drilling for the screws fastening the cable box

Some principal dimensions of the single-purpose machine:

Weight	26 000 kg
Total power rating	30 kW
Indexing time	4 min.
Guaranteed output at 75% exploitation	11 per hr.
Number of attendants	1
Required floor area	24 sq.m

Type CSz 2 High-Production Transfer Machine for machining of motor casings

This transfer machine has been supplied to the Soviet Union for installation at the VOLTA Electromotor Works in Tallin. It has been designed for the total machining of motor casings conforming to IEC Standard No. 72, with 112—132 mm and 160 mm high bases (Fig. 44).

The transfer machine is convertible to two lengths of casing in either of the above base heights, and is also suited to machine the casings of flange-mounted motors.

As shown in Fig. 45, the casings must be machined from 5 sides. This cannot be performed in a single clamping wherefore machining is done in two stages. Finished in the first stage are the machining of one of the flanges, drilling and tapping of its three bores, making the large bore for the cable outlet, drilling

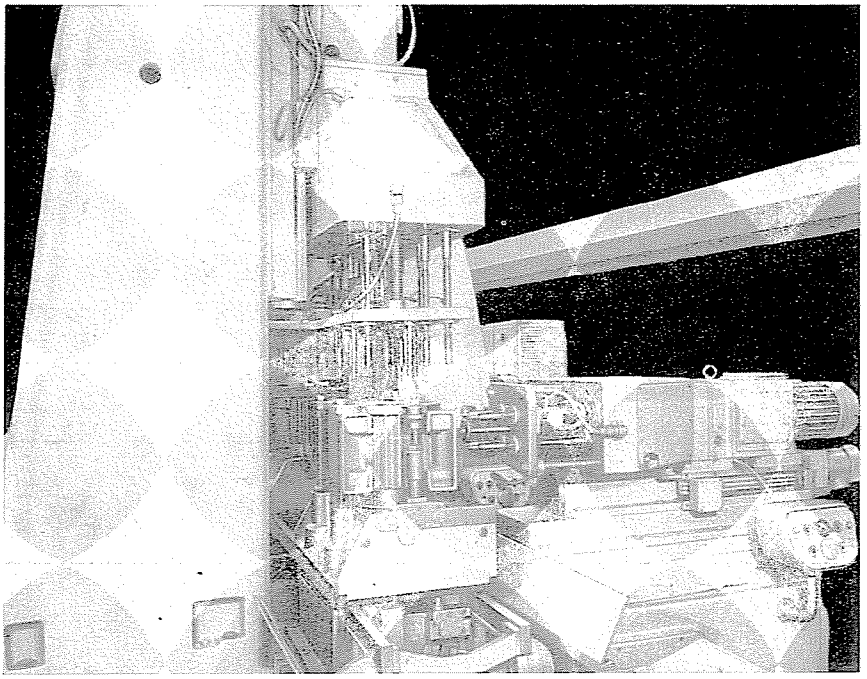


Fig. 25. The last station of the transfer machine with vertical and horizontal tapping units

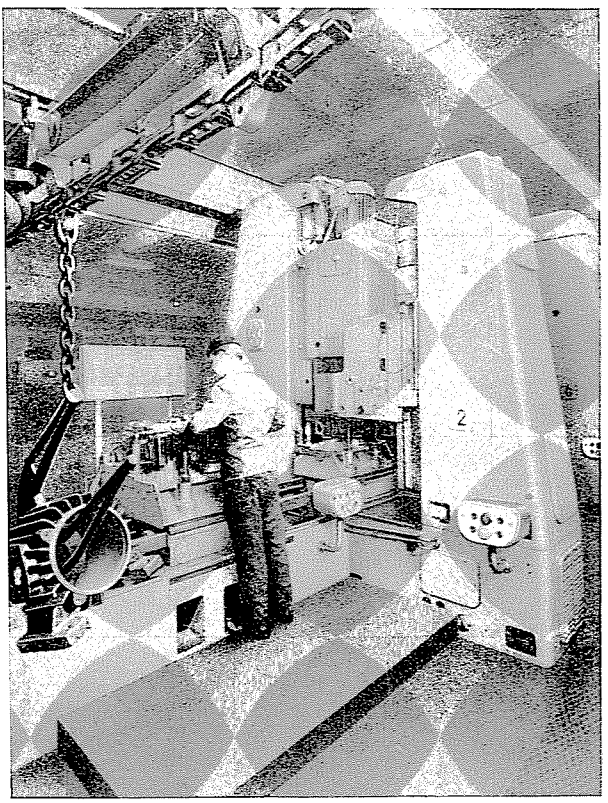


Fig. 26. Loading station with pilot-light panel

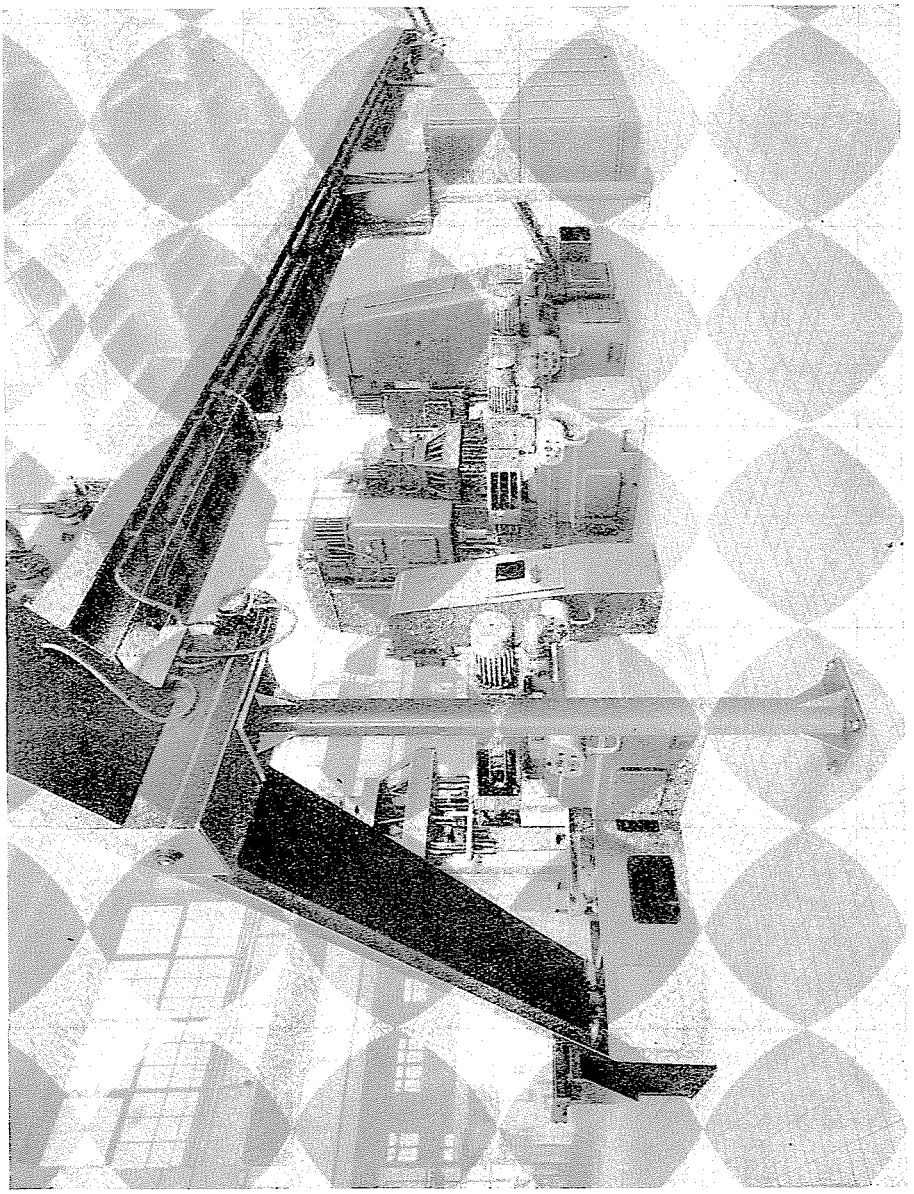


Fig. 27. Type CD 2 Transfer Machine for machining motor casings

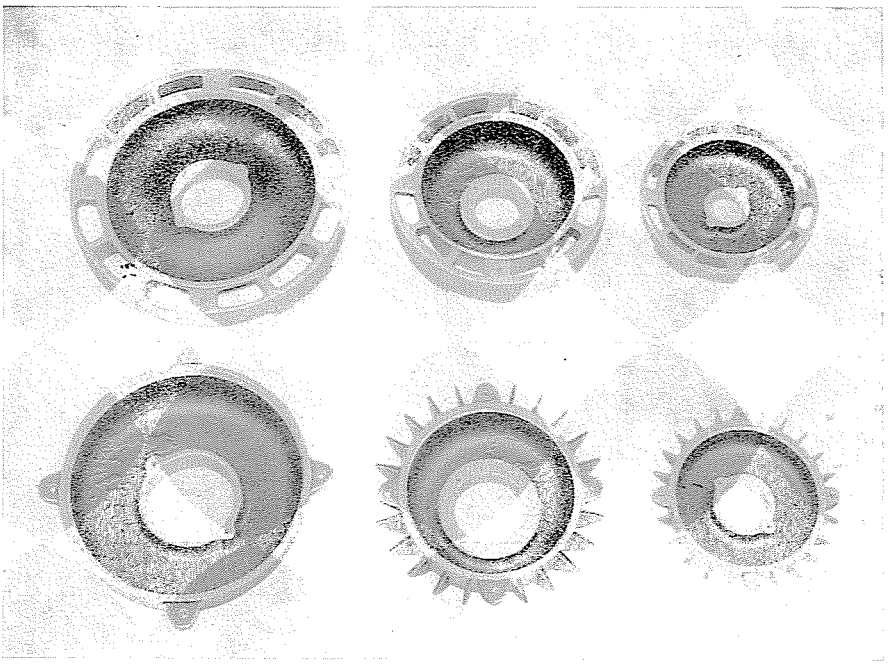


Fig 28. The six kinds of finished endshields

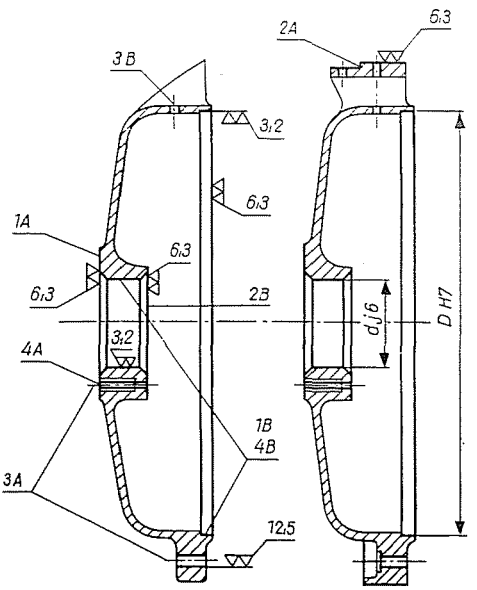


Fig. 29. Diagram of endshield machining

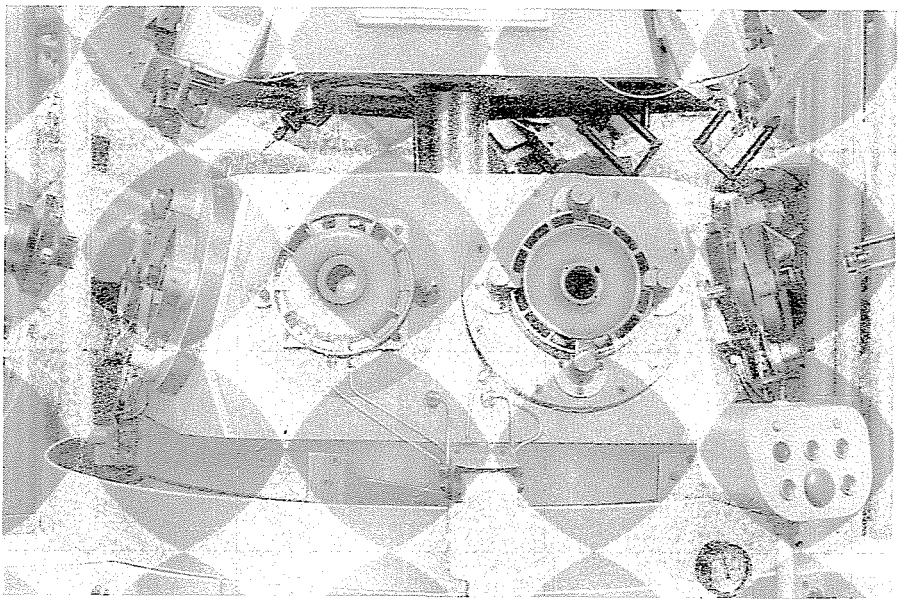


Fig. 30. Clamping fixtures on Type CD 3 Single-Purpose Machine

and tapping of bores for the screws attaching the cable outlet cover box. Then the casing is removed and, after rotating it by 180 deg., clamped in the fixture of the second stage after which further machining is performed.

Conforming to the above, the equipment actually consists of two transfer machines which, however, are linked by means of a fully automatic transfer mechanism which ensures attendance by a single operator (Fig. 46).

As required by customer, the transfer machine is automated to almost 100 per cent. The raw motor casings are supplied to the transfer machine by a belt conveyor. A loading mechanism (Fig. 47) lifts the casings off the conveyor and loads them into the clamping fixture. The only attendant, standing at this station, merely has to inspect this operation since the machine automatically holds the casing and, if all of its parts are positioned normally, transfers the fixture to the first station. Here the casing is accurately oriented and clamped, after which the machining tools are automatically advanced to the work and feed is engaged.

The first stage consists of six stations which perform the following operations:

Station 1
Loading of casing by means of the automatic mechanism shown in Fig. 47.

Station 2
Machining of flange supporting the end-shield (Op. 2 BF)

Station 3
From the left: Drilling for attachment of cable box (Op. 3 B).
From above: Drilling for attachment of cover (Op. 3 JF).

Station 4
From the left: Drilling of 35 mm dia. bore

Station 5
Tapping of bores made at Station 3. Cable outlet (Op. 4 B).
From above: Blowing the chips out of the bores machined in Op. 3 JF, gauging the bores.

Station 6
Unclamping the fixture and removal of casing.

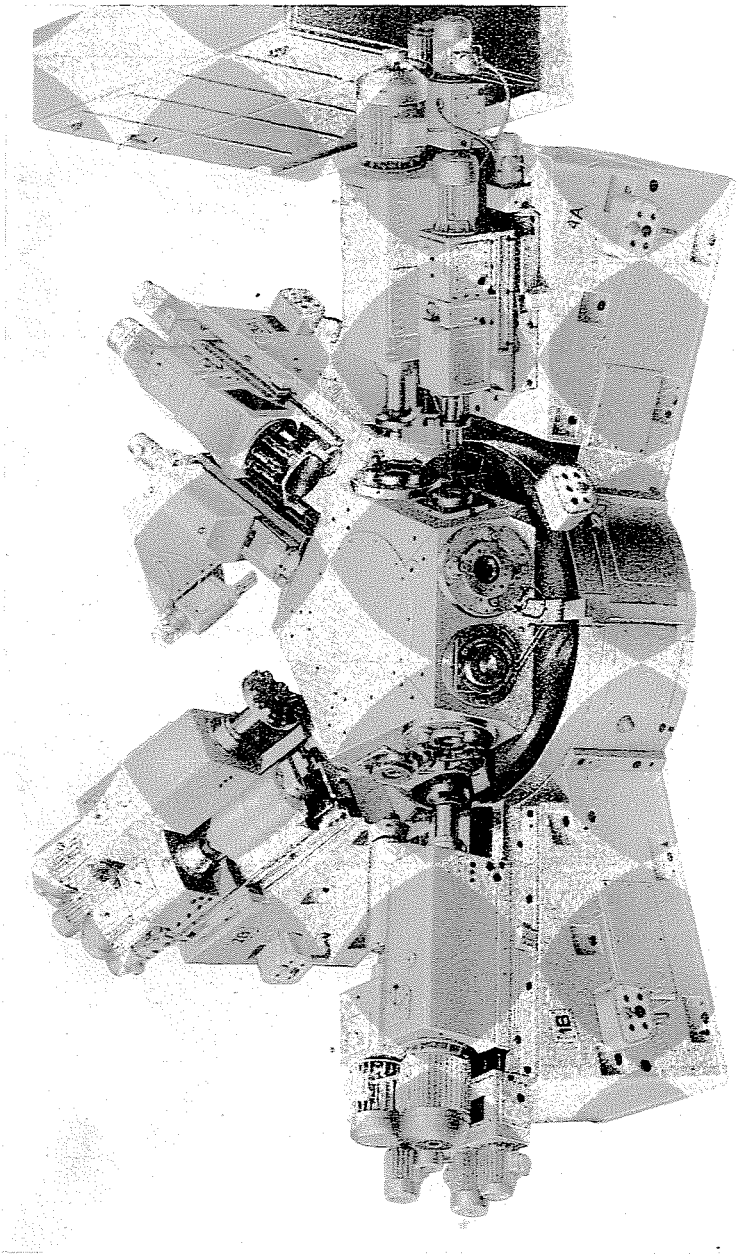


Fig. 31

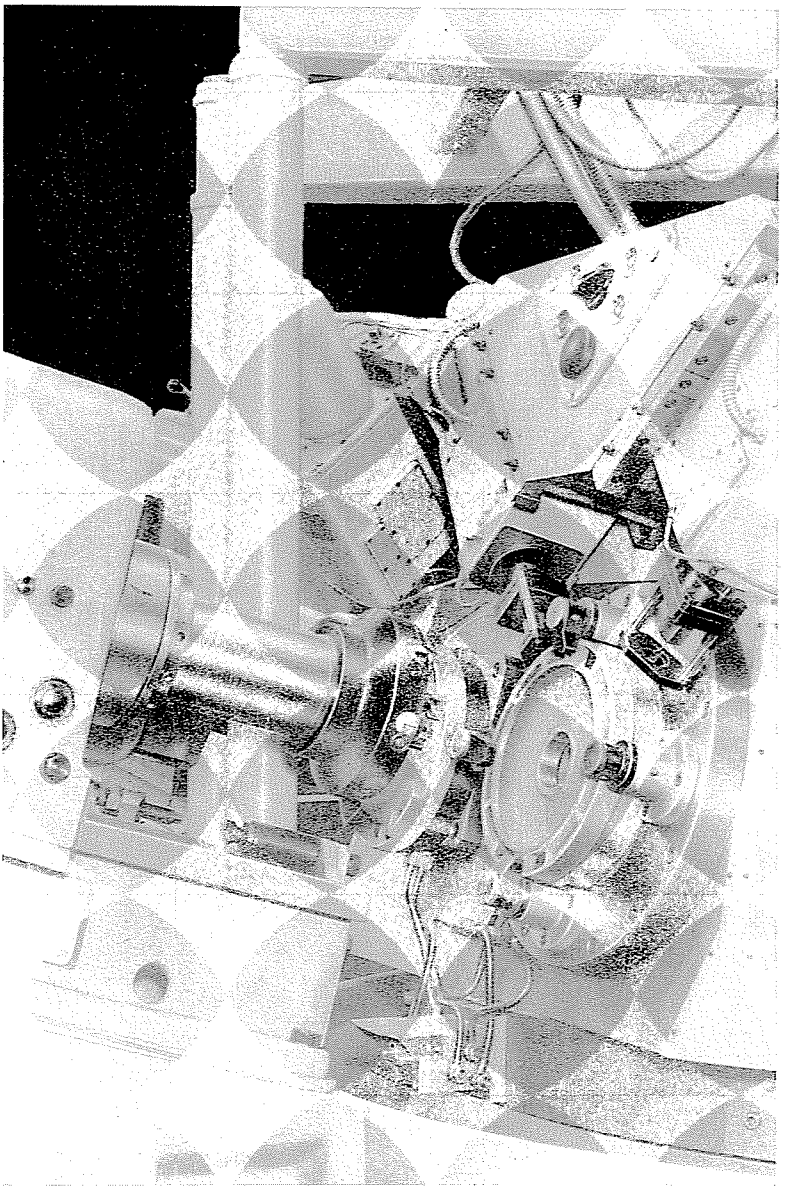


Fig. 32

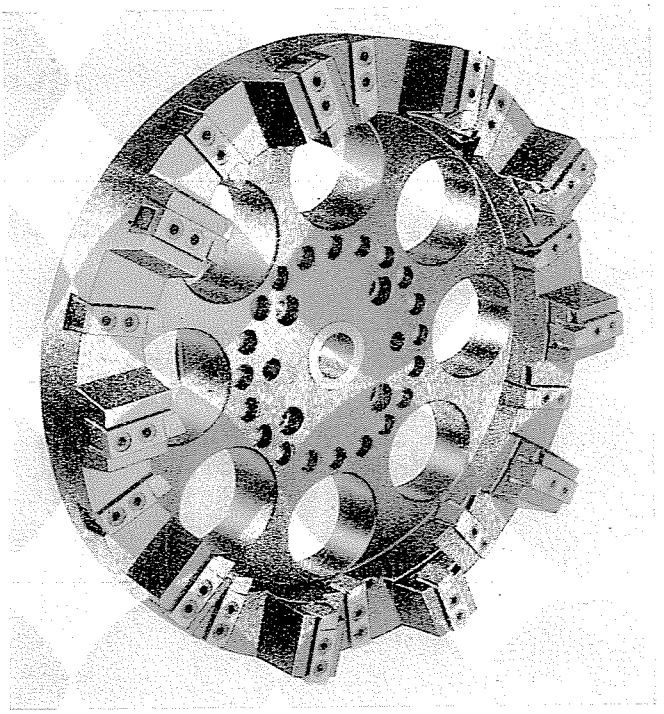


Fig. 33. Special tool for machining the surface supporting the fan cover

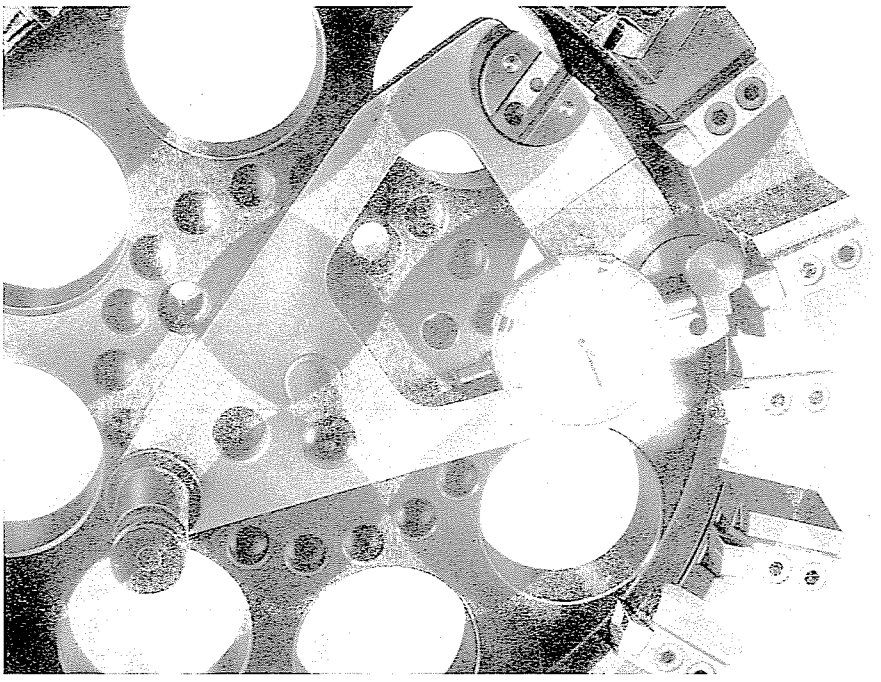


Fig. 34. Adjustment gauge for the special tool shown in Fig. 33

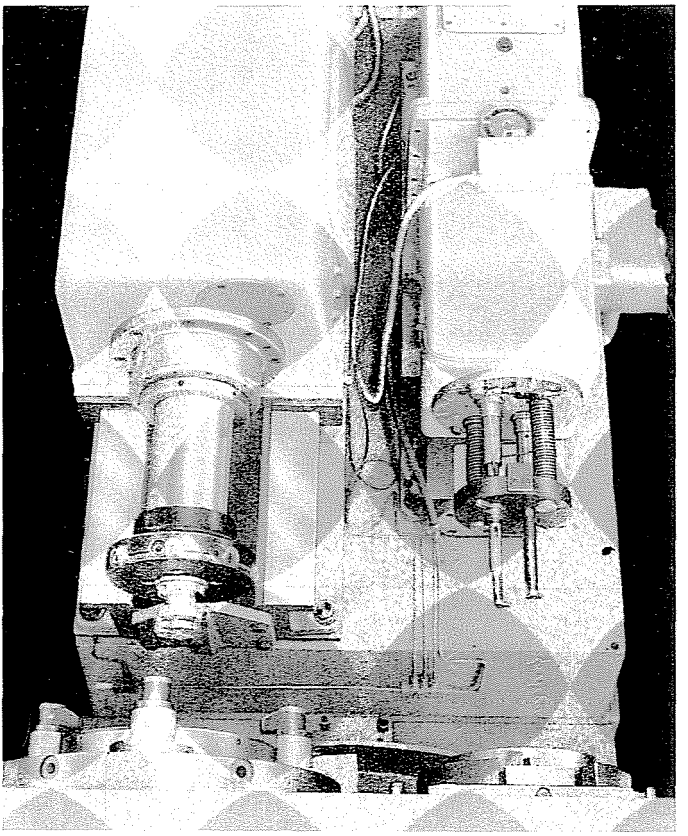


Fig. 35. At Station 4, the unit at the left-hand side performs finishing of the bearing nipple and of the joint flange (Operation 4B), the unit at the right-hand side carrying out tapping (Operation 4A)

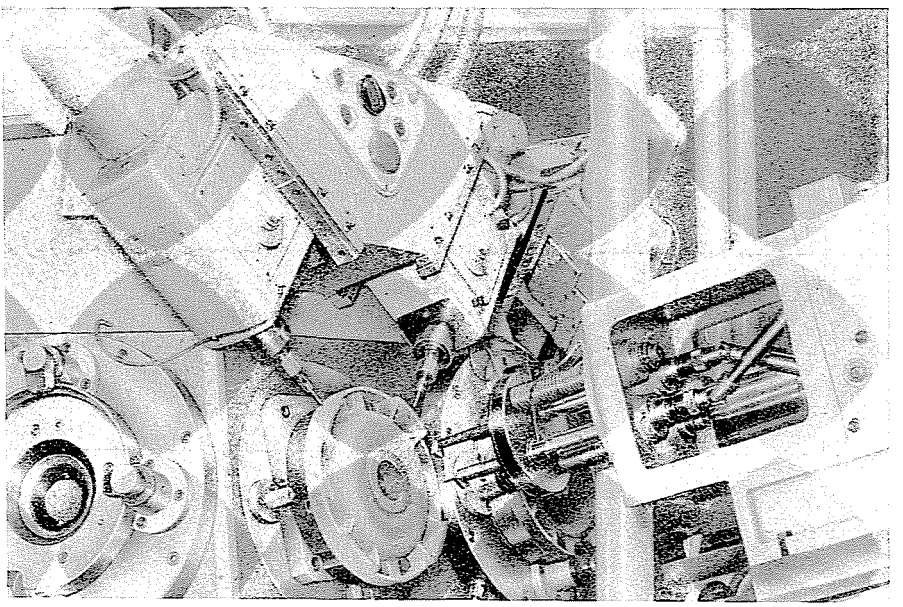


Fig. 36. The closeup shows a tapping attachment and two of the overhead tapping units

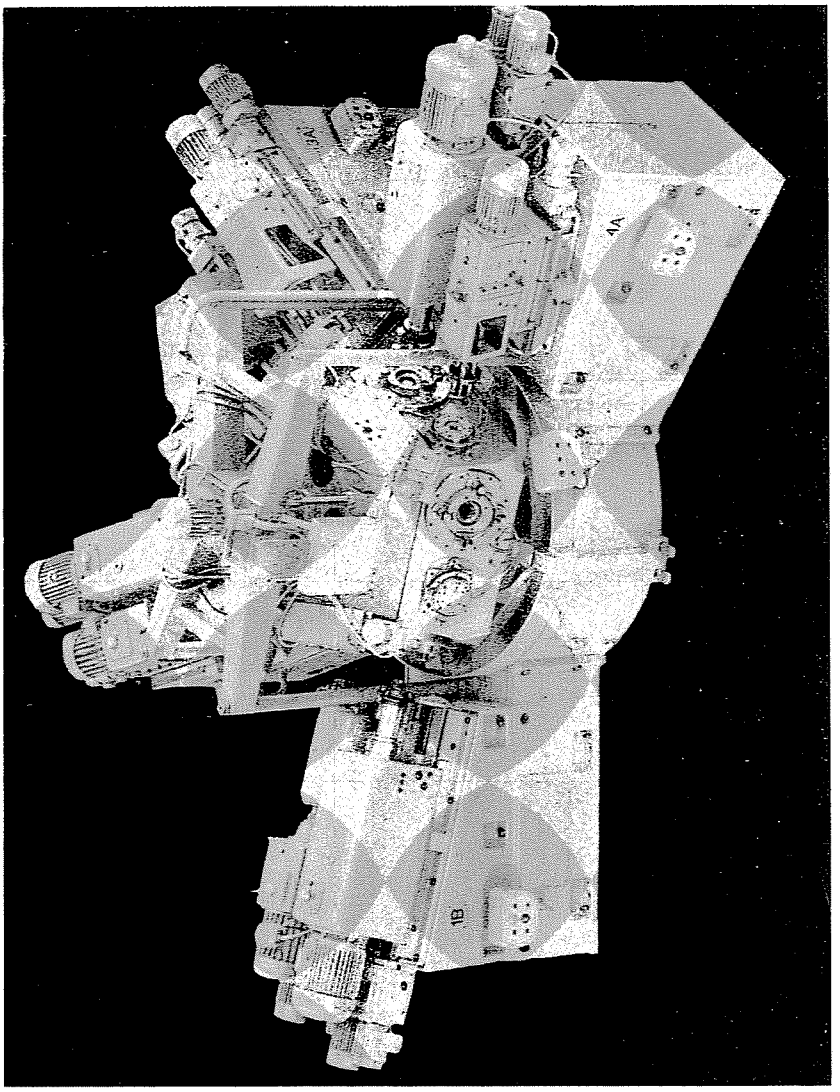


Fig. 37. Type CD 3 Single-Purpose Machine with circular table for machining of motor endshields

Operational data on the machining of VZ 22 HEO endshields, first chucking

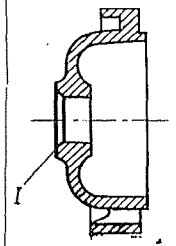
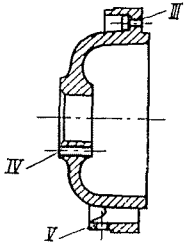
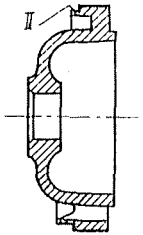
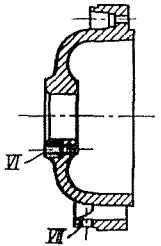
Station		1 A	2 A	3 A			4 A	
Loading and unloading								
Operation, mark		I.	II.	III.	IV.	V.	VI.	VII.
Mach. dia., mm		44—85	226/232	7/14	4,9	3,3	M 6	M 4
Mach. length, mm		16	41	21	32	8	20	8
Approach and overrun, m/m		5	9	7	10	10	6	10
Total length, mm		21	50	28	42	18	26	18
Return, mm							26	18
Rap. trav. mm	Advance	200	250	272	258	32	274	32
	Total	421	550	572	558	82	574	82
Cutting speed m/min		24,9—48	44.7/45.9	15.6/31.2	15,4	10.35	3.4	4.46
RPM		180	63	710	1000	1000	180	355
No. of cutters		1	9/9					
Feed mm	per cutter	0.175	0.159					
	per rev.	0.175	1.43	0.127	0.09	0.09	1	07
	per min.	31.5	90		90	90	180	248.5
Time, min.	Feed	0.667	0.553	0.312	0.467	0.2	0.29	0.145
	Rap. trav. adv. ret.	0.14	0.183	0.19	0.186	0.03	0.19	0.03
	Uncl. further clamp	0.2	0.2		0.2	0.2	0.2	0.2
	Total	1.007	0.936	0.702	0.853	0.43	0.68	0.375

Fig. 38

Operational data on the machining of VZ 22 HEO endshields, second chucking

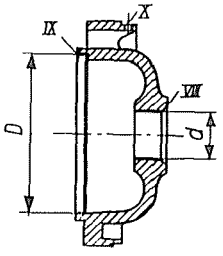
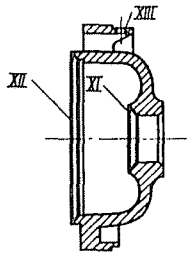
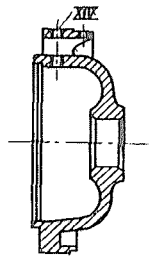
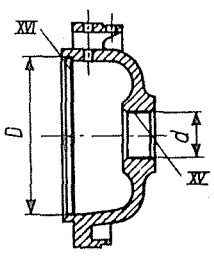
Station		1 B	2 B	3 B	4 B
Loading and unloading					
Mach. dia. mm d		51.6	44—185	3.3	52
Mach. length, mm d		35	15	8	26
Approach and overrun, mm		10	5	10	19
Total length, mm		45	20	18	45
Cutting speed, m/min. d		29.2	24.9—72.6	10.35	42.5
RPM d		180	125	1000	260
No. of cutters d		6	1		4
Mach. dia., mm D		169			170
Cutting speed, m/min. D		47.8			69.4
RPM D		90			130
No of cutters, D		4			4
Rap. trav. mm	Advance	255	220	12	255
	Total	555	420	62	555
Feed, mm	per cutter d	0.08	0.252		0.06
	per rev. d	0.5	0.252	0.09	0.242
	per cutter D	0.25			0.12
	per rev. D	1.00			0.484
	per min.	90	31.5	90	63
Time, mm	Feed	0.5	0.635	0.422	0.714
	Rap. trav. adv. ret.	0.185	0.14	0.02	0.185
	Uncl. further clamp.	0.2	0.2	0.2	0.2
	Total	0.885	0.975	0.642	1.10

Fig. 39

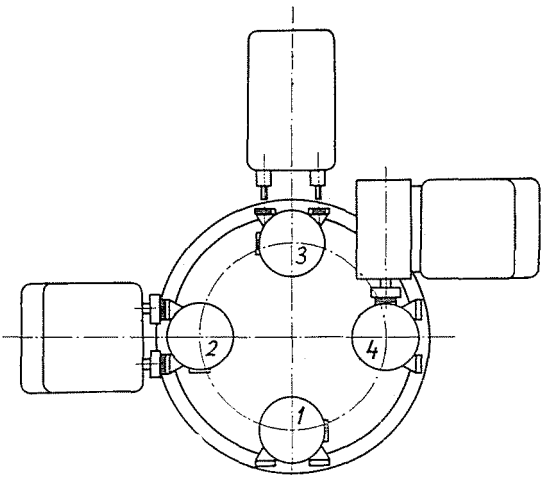


Fig. 40. Arrangement diagram of Type CD 4 Single-Purpose Machine

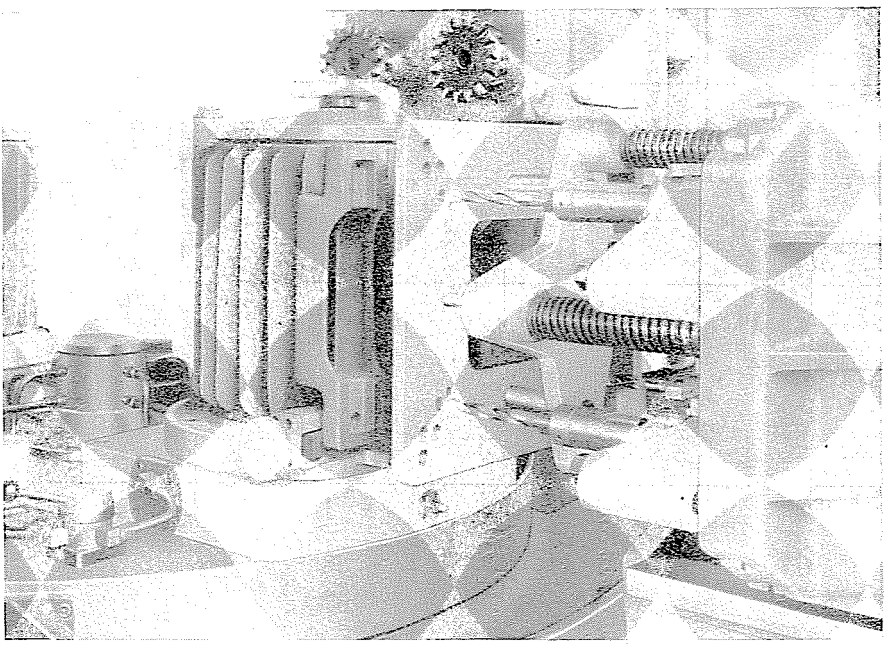


Fig. 41. Base-drilling unit with jig plate suited to various sizes of motor casings

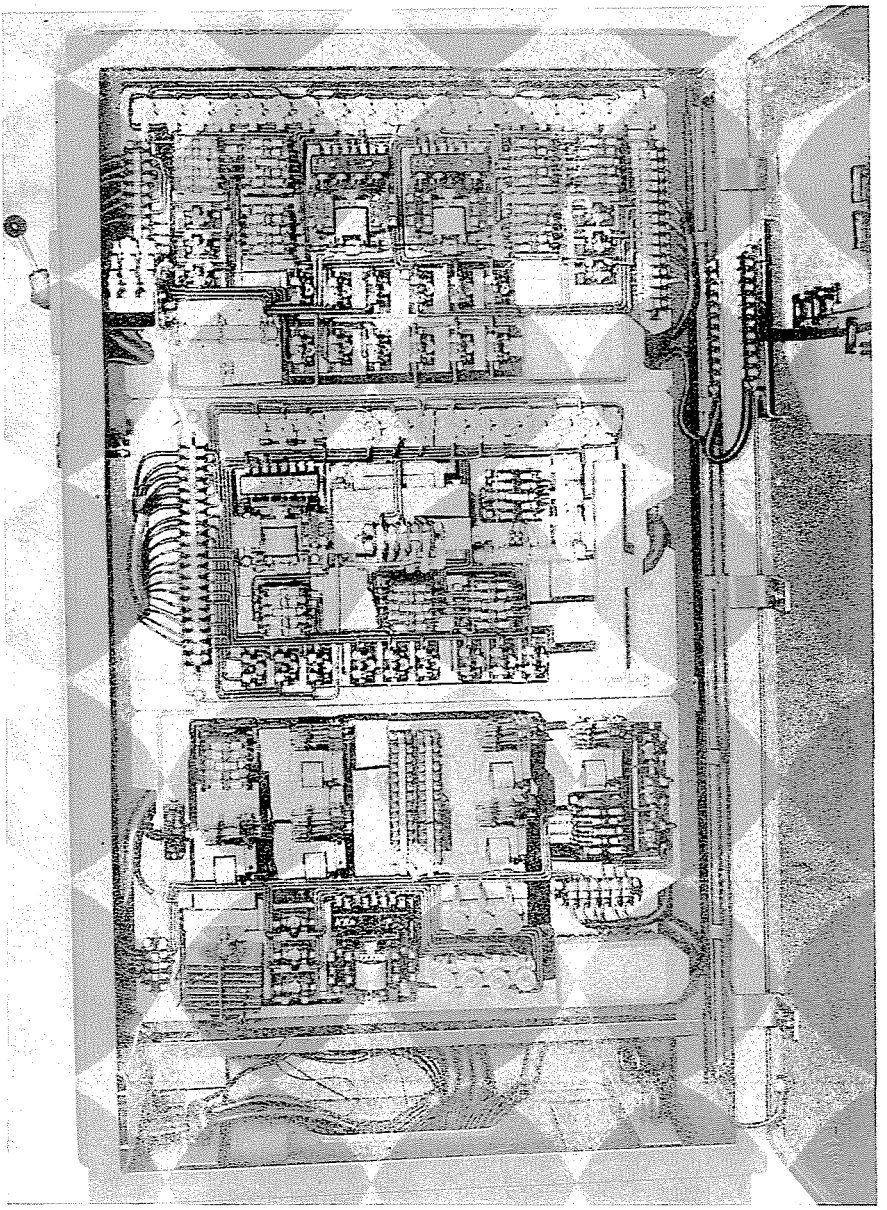


Fig. 42. Electrical control equipment in separate cabinet for the single-purpose machine with circular table

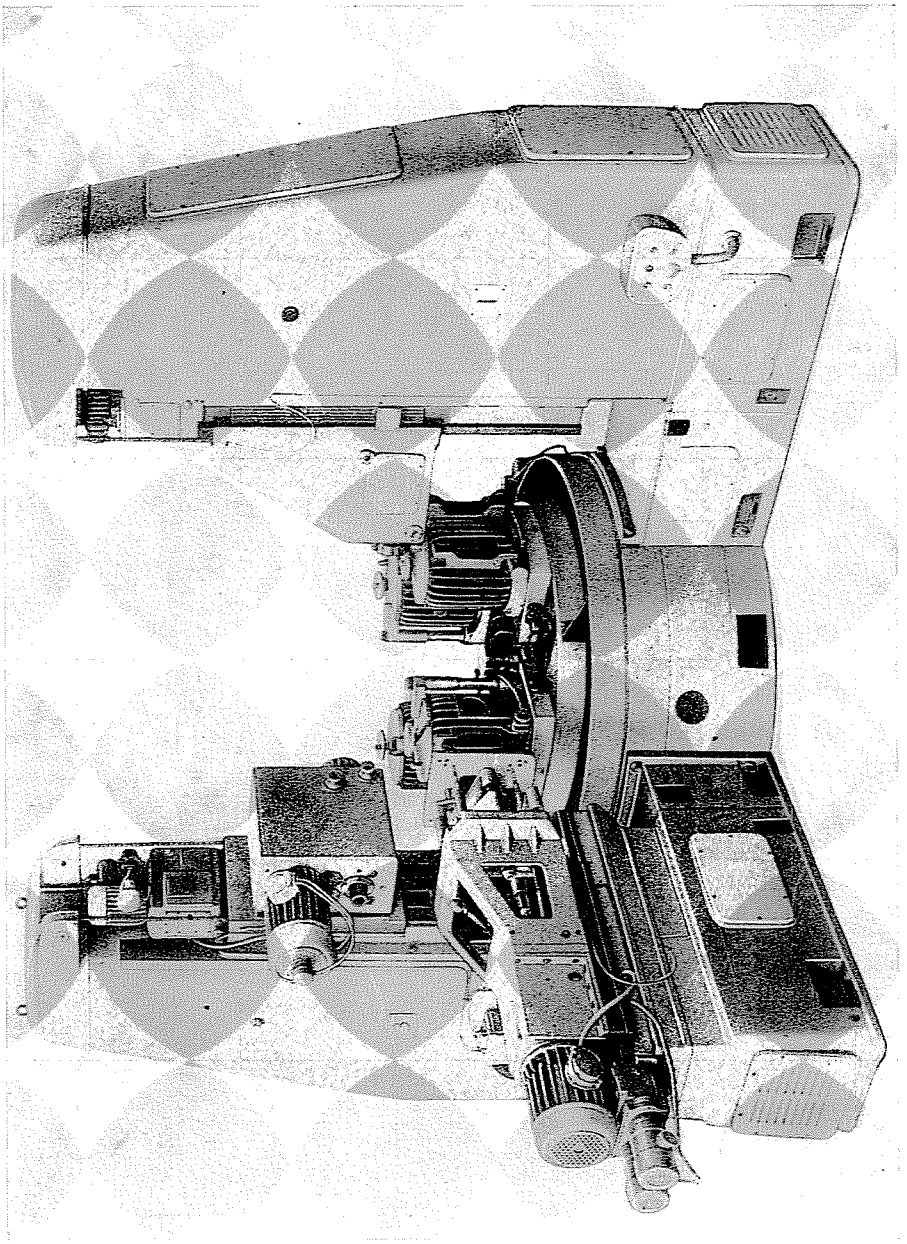


Fig. 43. Type CD 4 Single-Purpose Machine with circular table

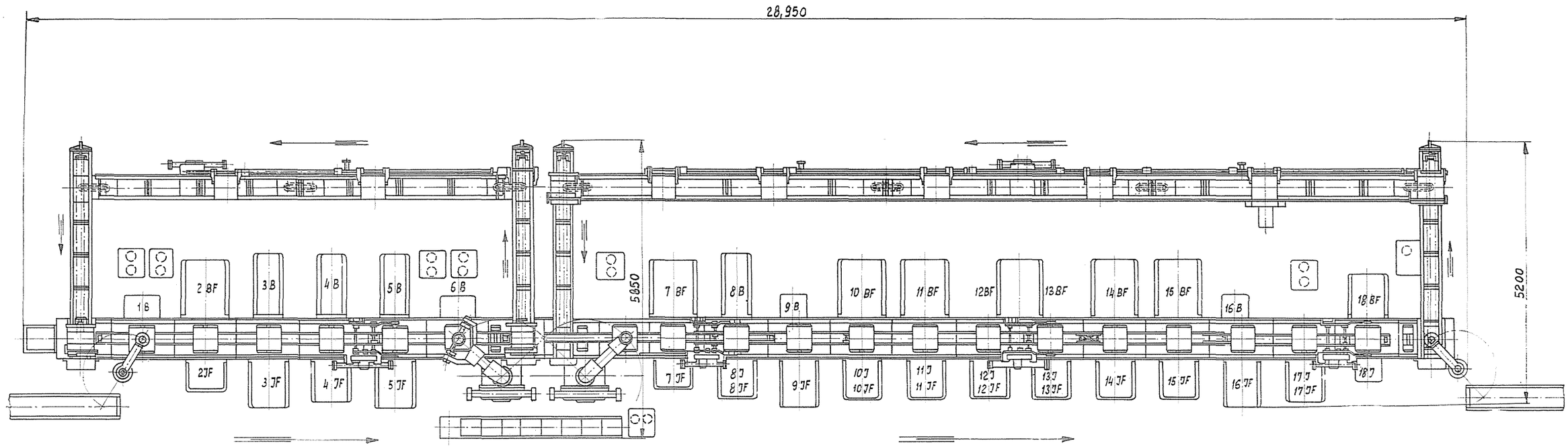


Fig. 46. Arrangement diagram of the Type CSz 2 Transfer Machine

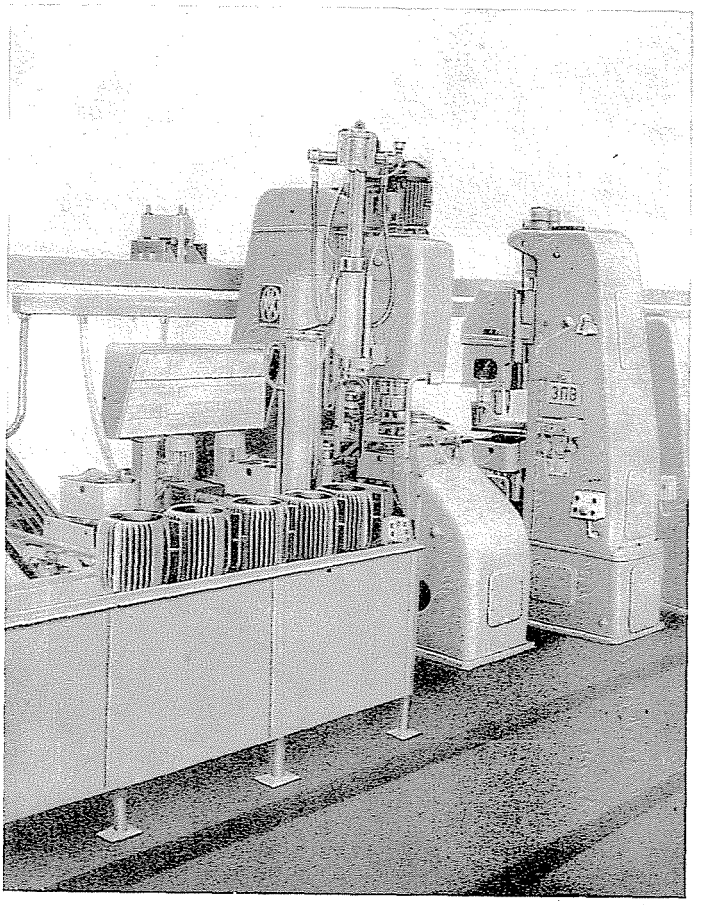


Fig. 47. Loading mechanism. Operations and operational data for the first stage of machining on the transfer machine

After removal of the casing, the clamping fixture is returned to Station 1 by means of an overhead conveyor.

At Station 6, the motor casings are removed by means of a fully automatic transfer mechanism with two arms (Fig. 49), whose first arm rotates the unloaded casings through 180 deg. about their vertical axis and passes then to the second arm which, in turn, either loads the casings into the clamping fixture of the second stage or places them in storage.

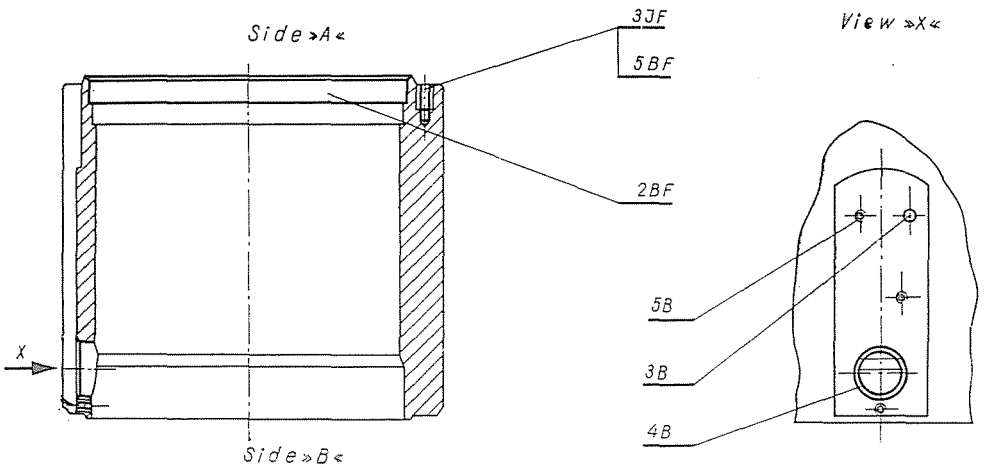
The transfer mechanism is capable of operating in the following three ways:

(1) In normal operation, transfer is effected from the first stage of the transfer machine to the second.

(2) Should a minor breakdown occur in the second stage of the transfer machine (e.g. breakage of a twist drill), the mechanism supplies the casings for storage.

(3) Should a minor disturbance occur in the first stage of the machine, the transfer mechanism removes the casings from storage for machining in the second stage of the machine.

The storage has a capacity of 15 casings which permits the bridging of standstills lasting 10—15 minutes.



Operation, mark		2 BF	3 JF	3 B	4 B	5 B	5 JF
Tool dia., mm		252	10.2	5	35	3 × M 6	3 × M12
Cutting speed, m/min.		56.5	19.2	12.3	37	4.6	4.96
RPM		71.5	600	783	340	244	132
Feed,	mm/cutter	0.077	—	—	—	—	—
	mm/rev.	0.924	0.2	0.108	0.352	1	1.75
	mm/min.	66	120	85	120	244	231
Time, rapid traverse, min.		0.069	0.08	0.074	0.08	0.067	0.08
Time feed, min.		0.378	0.383	0.306	0.3	0.156	0.147
Time total, min.		0.447	0.463	0.38	0.38	0.38	0.374
Inching, indexing, min.				0.2			
Cycle time, min.			0.663				

Fig. 48. Operations and operational data for the first stage of machining on the transfer machine (data refer to motor casings of 160 mm base height)

The second stage of the transfer machine consists of 13 stations at which the following operations are performed:

Station 6a

Here, the casings are loaded into the clamping fixtures by the transfer mechanism.

Station 7

Machining of supporting flange for endshield (Op. 7 BF).

Station 8

From the left: Machining 4 bores in the base for motor attachment bolts, one bore for earthing screw (Op. 8 B).

From the right: Machining a bore for lug (Op. 8 J).

Station 9

From the left: Tapping for earthing screw (Op. 9 B).

From above: 3 bores for endshield screws (Op. 9 JF).

Station 10—11

From the left: Roughing of main bore (Op. 10 BF—11 BF).

From the right: Surfacing and countersinking for lug (Op. 10 J—11 J).

Station 12—13 Milling of bases with 400

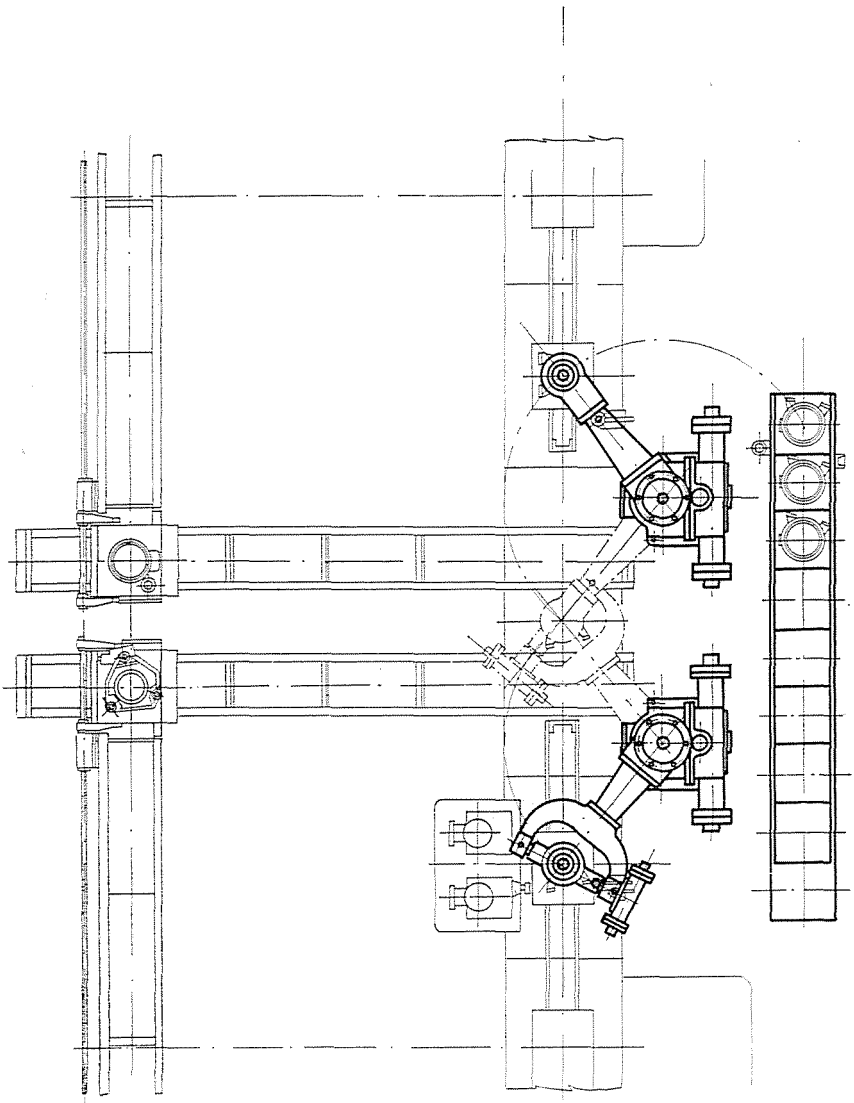


Fig. 49. Diagram of transfer mechanism

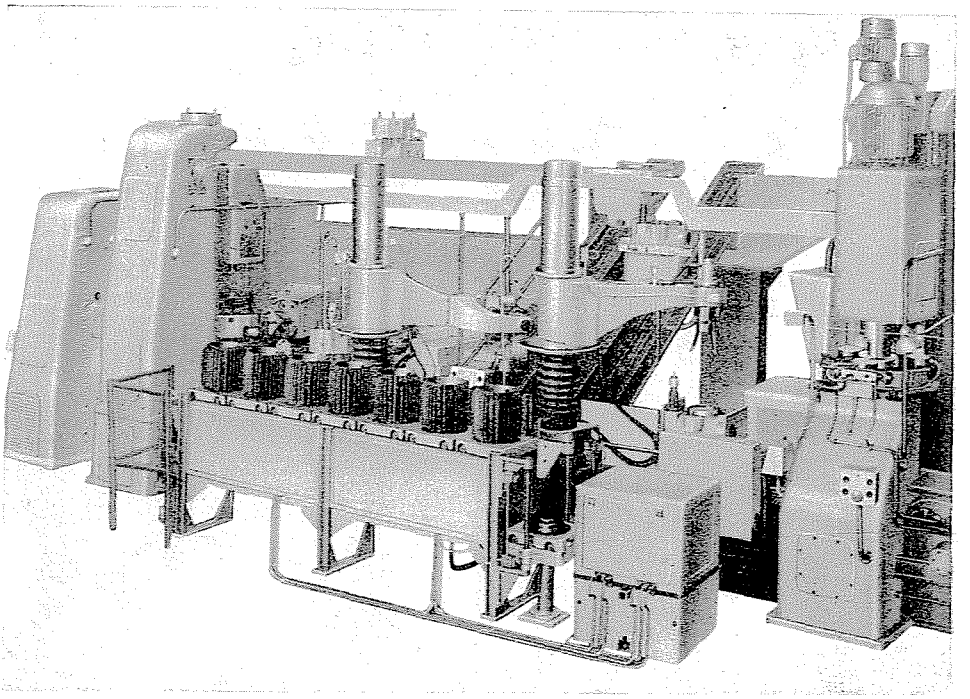


Fig. 50. The transfer and storage equipment

mm dia. cutters (Op. 12 BF-13 BF).

From the right: Drilling four bores with 3.5 mm dia. drills for fastening the data plate (Op. 12 J—13 J).

Station 14—15

From the left: Finishing of main bore (Op. 14 BF—15 BF) and gauging of finished bore.

Station 16

Conforms entirely to Station 9.

Station 17

From above: Blowing the chips out of the 3 bores machined at Station 9 or 16, gauging of bore depth.

From the right: Gauging the results of Ops. 8 J, 10 J, 11 J, 12 J and 13 J.

Station 18

From above: Tapping of bores for end-shield screws (Op. 18 BF).

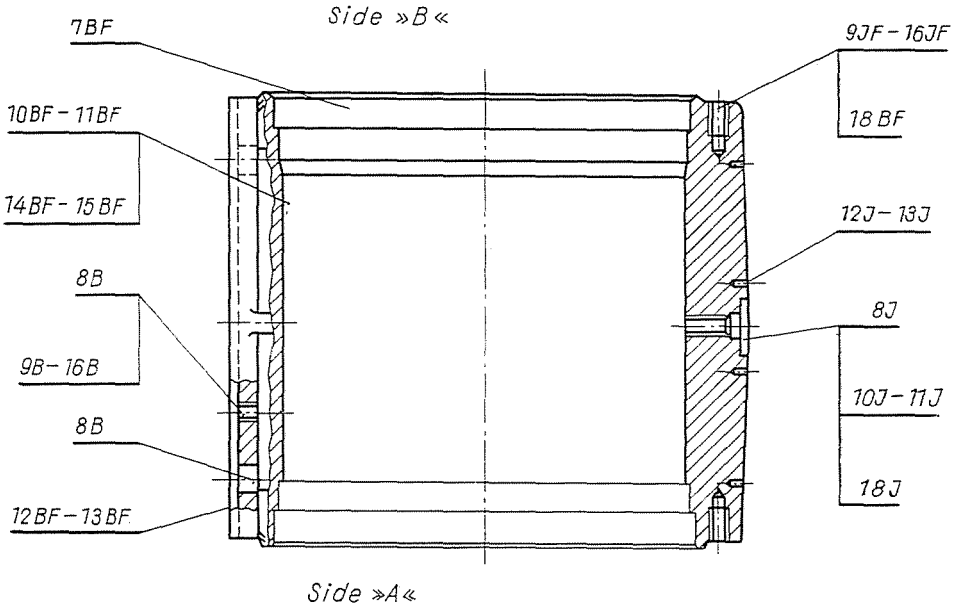
From the right: Tapping for lug (Op. 18 J).

After machining at Station 18, the unloading mechanism automatically removes the finished casings from the fixture and places them on a conveyor belt, arranged next to the transfer machine, which carries the casings to the assembly shop. The empty clamping fixtures are returned to the first station of the stage, as in the first stage of the transfer machine.

Operations and operational data for the second stage of machining on the transfer machine are shown in Fig. 51.

Each of the two stages is provided with a pilot-light panel for checking on operations. The state of each twist drill and tap operated on the transfer machine is indicated by an electronic device, giving a signal as soon as breakage occurs.

The transfer machine was supplied with four sets of tooling, two sets of which are installed in a special cabinet (Fig. 53). Included in the delivered equipment were gauges for adjustment and for checking



Operation, mark	7 BF	8 B	8 J	9 JF 16 JF	9 B 16 B	10 BF 11 BF	10 J 11 J	12 BF 13 BF	12 J 13 J	14 BF 15 BF	18 BF	18 J
Tool dia., mm	252	14	⌀ 8.5	⌀ 102	M8	⌀ 242	30	400	3.5	243	M12	M10
Cutting speed, m/min.	56,5	19.4	21	19.2	4.8	39.5	47	113	11	107	4,96	6
RPM	71.5	440	790	600	192	52	500	90	1000	140	132	192
Feed mm/cutter	0.28	—	—	—	—	0.225	—	0.098	—	0.5	—	—
Feed mm/rev.	2.8	0.18	0.19	0.2	1.25	2.7	0.104	2.96	0.035	1.00	1.75	1.5
Feed mm/min.	200	82	150	120	240	140	52	266	35	140	231	288.5
Time, rapid traverse, min.	0.09	0.076	0.083	0.08	0.08	0.12	0.07	0.12	0.2	0.12	0.08	0.08
feed, min.	0.335	0.366	0.334	0.383	0.11	1.19	0.31	1.18	0.4	1.19	0.147	0.11
total, min.	0.425	0.442	0.417	0.463	0.30	1.31	0.38	1.30	0.6	1.31	0.374	0.30
					0.2							

Fig. 51. Operations and operational data for the second stage of machining on the transfer machine (data refer to motor casings of 160 mm base height)

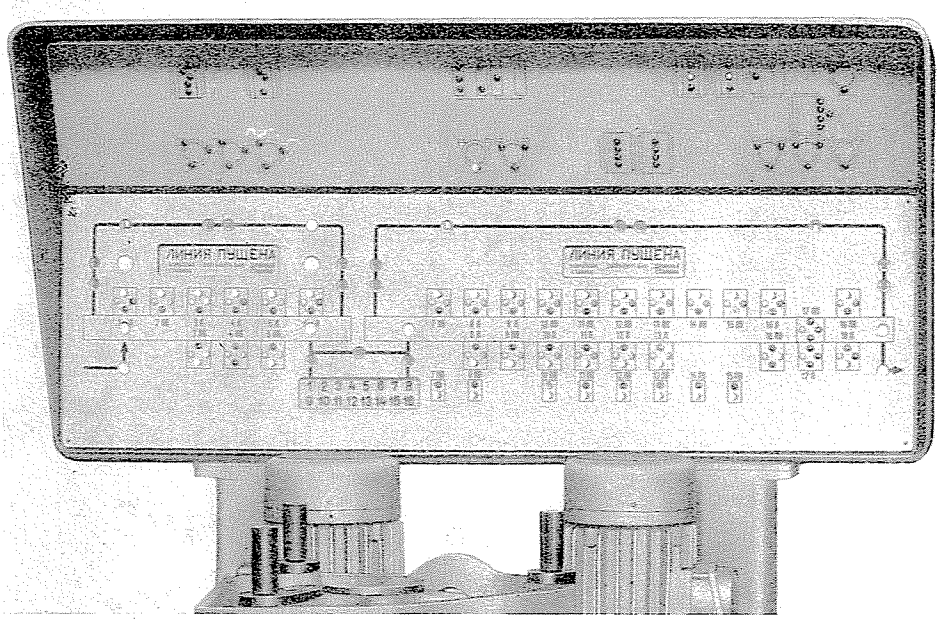


Fig. 52. All principal movements on the transfer machine are indicated on the pilot-light panel

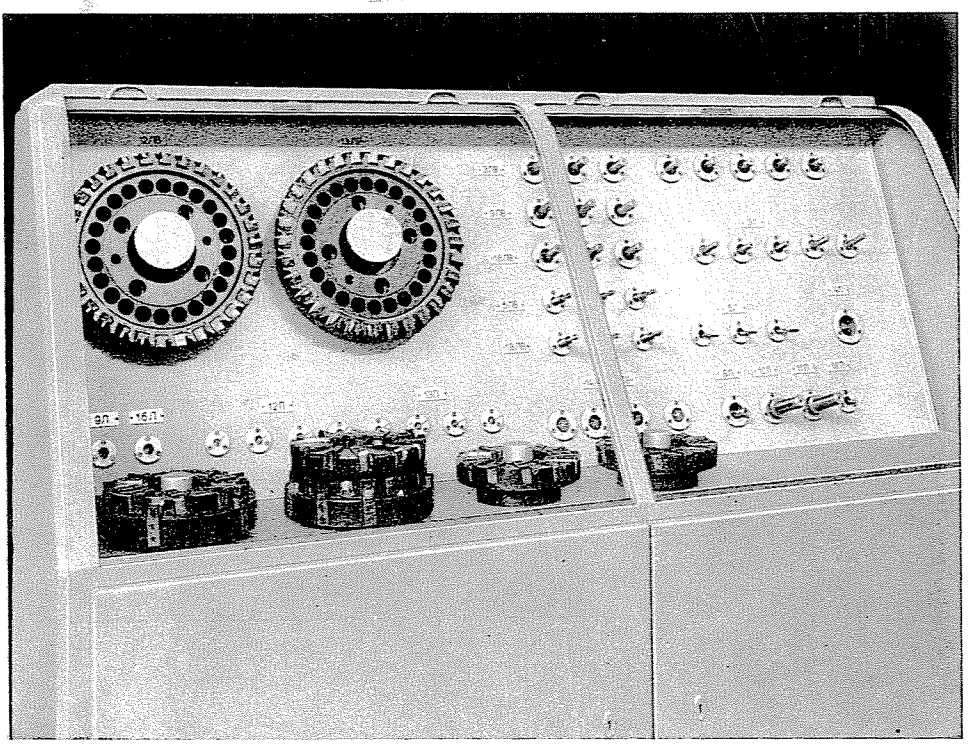


Fig. 53. Tool cabinet

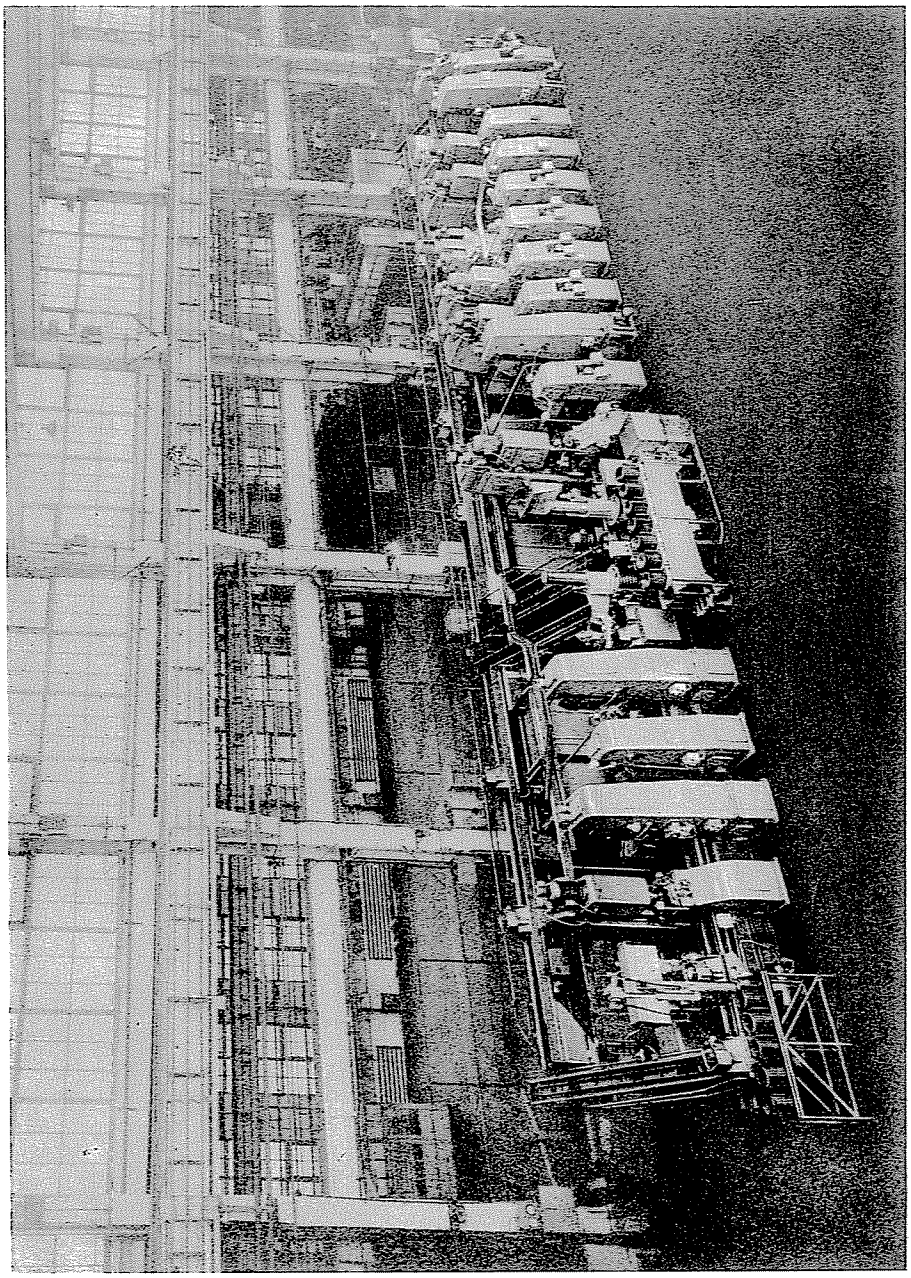


Fig. 54. Type CSz 2 Transfer Machine for machining of motor casings

dimensions as well as an adequate number of spare parts.

Several further machines of this type are being built for delivery to the Soviet Union.

Principal data of the transfer machine are the following:

Weight	160 000 kg
Overall length	29 000 mm
Overall width	5 850 mm
Overall height	3 500 mm
Total power rating	240 kW

Size Base height	Style	pcs. per hr. rated	pcs. per hr. 80%
112	short	103	82
	long	87	70
132	short	90	59
	long	73	58
160	short	79	63
	long	66	53

Number of simultaneously operating tools	52
Number of stations	19
Number of attendants	1

Type CSzP Flange Finishing Lathe

After machining, the motor casings are supplied to a hydraulic press for installation of the wound laminations in them. Factories utilizing up-to-date production methods return — after the above operation — the casing flanges supporting the endshields in order to ensure on-centre location of the air gap as well as its minimum dimensions. Orientation for this operation is taken from the bore of the laminations. The Type CSzP *Flange Lathe* has been designed for this purpose. It is fully automatic in operation and requires no attendance.

The principal parts of the horizontally arranged lathe-type machine are the following:

(*a*) the headstock which rotates the expanding mandrel with the wound motor casing,

(*b*) the tailstock supporting the mandrel,

(*c*) the two-sided tool slide with two toolholders each for machining the length of the casing and the inside joint flange,

(*d*) the automatic gauging device for checking length and diameter after turning,

(*e*) the automatic loading and unloading mechanism which removes the casings off the belt conveyor installed next to the single-purpose machine (the casings having already been fitted with the wound laminations), supplying the casings to the mandrel and, after machining and gauging, replacing them on the belt conveyor transporting them to the site of final assembly.

Type CSzP Flange Lathes are available in two sizes as follows:

CSzP 2 for motor casings with 112—132—160 mm high bases and

CSzP 3 for motor casings with 180—200 mm high bases. Either of the above machines is suited to machining motor casings of various lengths as well as of base-mounted and flange-mounted styles. The period of conversion ranges from ½ to 2 hours.

Output data are as follows:

Type	Base height, mm	Pcs. per hour rated	Pcs. per hour 80% guartd.
CSzP 2	112	52	41
	132	45	36
	160	40	32
CSzP 3	180	26	21
	200	21	16

Some other transfer machines under development or under construction at the Csepel Machine Tool Works will be described in conclusion.

Principal data of the single-purpose machine

	CSz P-2	CSz P-3
Weight, kg	8000	9000
Electrical output kW	12	14
Required floor area, sq. m.	5.5	6

The construction of a new single-purpose machine and a new transfer machine to be supplied to the DINAMO Works in Budapest is nearing conclusion. The first is for machining motor casings and the second for that of endshields. These components belong to a new Hungarian-built family of electric motors of 90—160 mm base height, conforming to IEC standards.

The building of a large transfer machine, resembling to Type CSz 2 in design, has also been started. Its task will be to machine motor casings of 180 mm and 200 mm base height.

The drafting of a transfer machine for the machining of motor endshields is being carried on. This machine will finish a front and a rear endshield during each indexing period of the Type CSz 2 Transfer Machine.

A number of other single-purpose machines and transfer machines for the automotive industry are also in the stage of preparation.

It is our sincere hope that this report will be instrumental in enhancing the international renown of the Csepel Machine Tool Works already acquired with their milling machines and radial drills.

Printed in Hungary

A kiadásért felel az Akadémiai Kiadó igazgatója Műszaki szerkesztő: Farkas Sándor

A kézirat nyomdába érkezett: 1964. XI. 9 — Terjedelem: 12,75 (A/5) ív, 119 ábra, 1 melléklet

65.59821 — Akadémiai Nyomda, Budapest — Felelős vezető: Bernát György