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THE SEQUENCE MODULAR BLOCKS FOR THE AUTOMATISED PROCESSES COMMAND – PART 1

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Abstract: *In the paper there is presented and described an application in which the pneumatic command via the sequential modular block could be applied in case of the automatic drilling machines. The sequential cycle is about each worked probe, it being presented and described the required phases for the cycle running. Due to the algorithm, was established the pneumatic command scheme for optimization of the automatic drilling process, including cases in which the emergency STOP or adjusting mode is strictly recommended.*

Our paper presents an example about an automatic drilling gauge, which could be commanded by the sequence modular blocks. The designed solution is presented in the figure below:

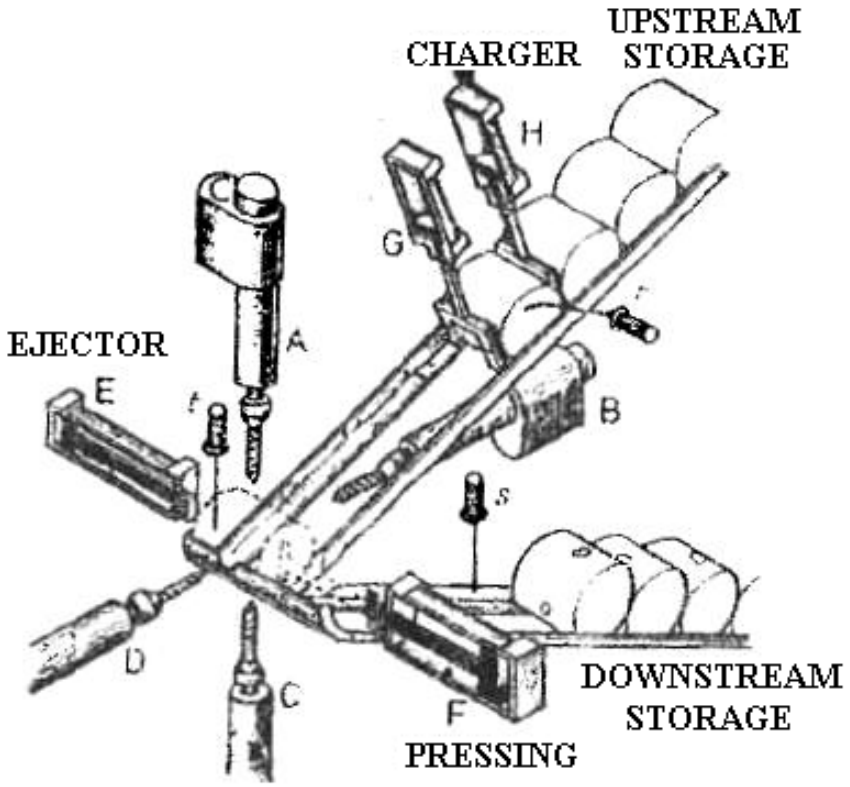

Figure 1: ***The automatic drilling gauge [1,2]***

The required operations algorithm for the drilling technological process is presented in Table 1.

Table 1: ***The operation algorithm for a drilling cycle [3]***

The operation cycle	The command symbol
1. The downstream gate opening	G -
2. The probe' s pressing and the downstream gate closing	F + G+
3. The splinter tools advancing	A + B + C + D +
4. The splinter tools retreating and the upstream gate opening	(A - B - C - D -) H -
5. The probe ' s releasing and ejecting	F - E +
6. The ejector retreating and the upstream gate closing	E - H +

For each cycle beginning, on the charger there is delivered one probe submitted to be work. At the ending of the drilling cycle, the probe is evacuated to the downstream storage, delivering the next working gauge. The proximity sensors, ***r***, ***s*** and ***t*** check up the level of the probes that deliver the upstream and down stream storages and also the presence of the manufactured probe to the drilling gauge.

The cycle is running automatically if there is no probe in the working gauge and if exists a free space in the downstream storage, for the drilled probe ejecting.

The command scheme is presented in the figure 2, being composed by:

- the drilling units A, B, C and D, delivered by the same distributor and being equipped with the lower and upper range limit proximity sensors: a_0, b_0, c_0, d_0 for the resting position and a_1, b_1, c_1, d_1 for the working position;
- the E and F pistons equipped with pressure drop relays;
- the with discharging sensors, ***r***, ***s*** and ***t***, for the detecting of the probe's presence, associated with the discharging relays;
- the cylinders of the charger, G and H, equipped with the sensors g_0 and h_0, corresponding to the resting position of the machine. When retreating, the piston G delivers a new probe into the drilling gauge, the probe being touched by the sensor ***t***. When retreating the piston H, a new probe loads the upstream storage, it being touched by the sensor ***r***.

The command scheme of the automatic drilling machine is presented in the figure 3, it containing:

- a modular block composed by six modules, corresponding to each cycle phase;
- AND blocks, in series, for the regrouping of the input signals, corresponding to the simultaneous motions;
- the additional conditions ***s*** and ***t***, that are introduced re-starting loop at the cycle beginning, the additional condition ***r*** being required during the cycle running;
- automatic starting and emergency STOP, by interrupting the supplying pressure P, with the cycle reloading from the phase where the cycle stopped;
- the adjusting starting, that is obtained when the supplying pressure of the proximity sensors is interrupted. It allows a verifying of the cycle step by step, or with the intervention about some specified phases.

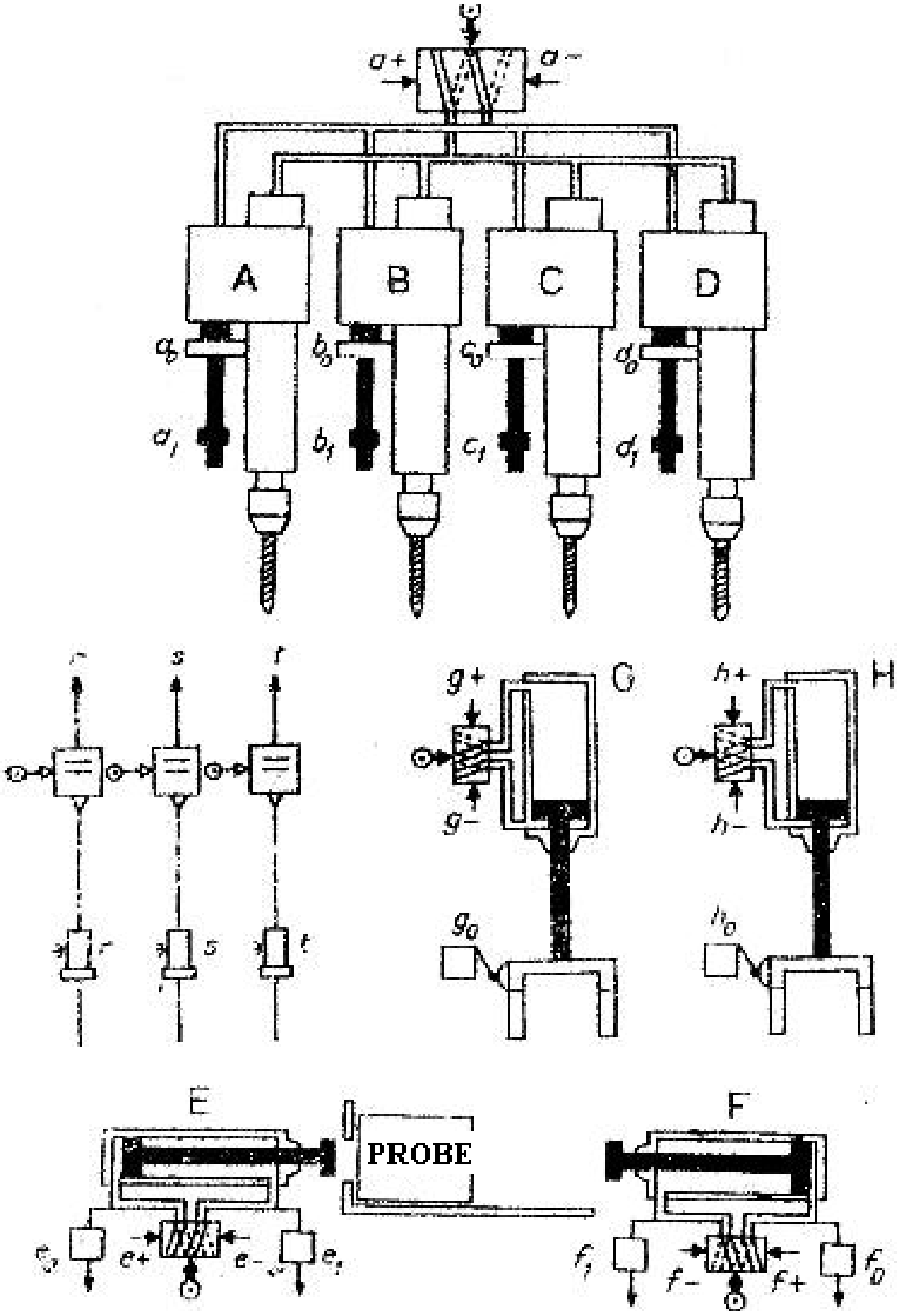

Figure 2: ***The scheme for the drilling tools and proximity sensors ordering [1,2]***

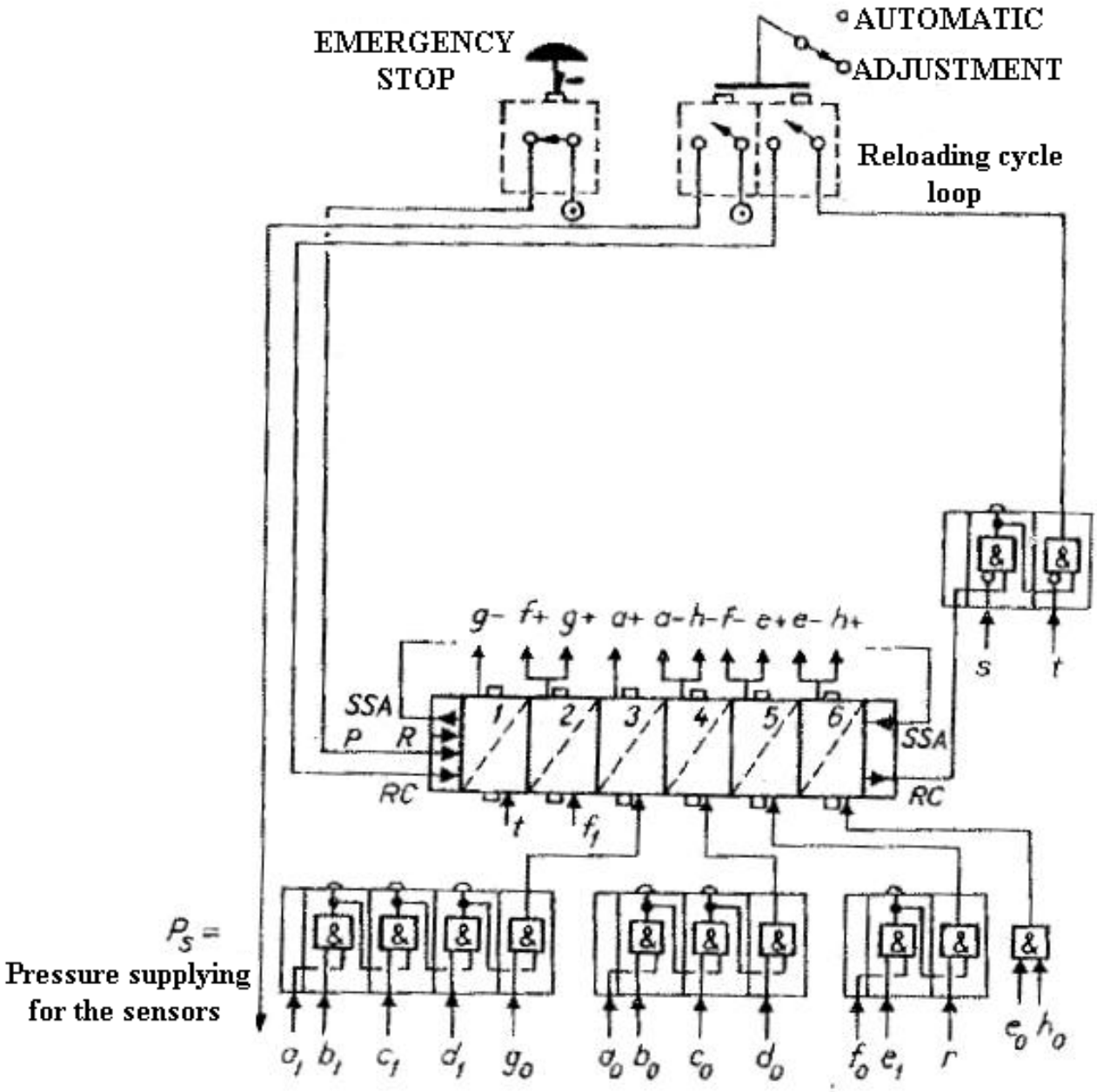

Figure 3: ***The pneumatic command scheme of the drilling machine [1,2]***

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