PLATFORM IDENTIFICATION OF GROUPS OF MOBILE WORKING MACHINES

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Abstract:
The contribution deals with the verification of modularity ratio considered as the usage measure of unified building modules in creation of building sequence of products – telescopic manipulators. This methodology also enables objectification of a platform and consequently determining of common basic building modules.
Key words:
mobile working machine, modularity, platform

1. MOBILE WORKING MACHINES

Determination of a platform, consisting of common basic building modules, from which a group of machines can be assembled, was realized on a group of mobile working machines, which establishes an offer of domestic (Slovakia) production base. For real conditions of users on the domestic market a new group of mobile machines was developed recently, determined for realization of a broad range of working technologies. These mobile working machines are known under the type markings UPS 112, UPR 112, UPM 112 and UTM 11.34. Their common feature is maximal effort of designers to create a group of working machines on a single basis – platform of basic building modules (2), (3). In this way an effective solution of a machine group was created, noted mainly for high flexibility in the design of new types of machines, according to apriori defined requirements of users (1). New machine designs can be readily created, that fulfill various requirements of users in civil engineering, agriculture, wood processing and forest industry, as well as in the communal area. Particular machine solutions differ mainly in kinematics of working machinery and also in individual differences in composition of a carrier, determined by the specifications of machine.

UPS 112 is a universal working machine equipped with multiple working tools, figure 1. It is determined for soil manipulation with the help of toothed shovel, or for handling realized via loading shovel or pallet forks. With suitable working machinery I can work even as a universal finishing machine.

UPR 112 is a universal working machine adjusted for handling and mining of soils, as well as manipulation with soil and loose materials, figure 2. By its design it is

determined for final terrain arrangement and arrangement of building site. It is equipped with an assortment of attached working machinery.
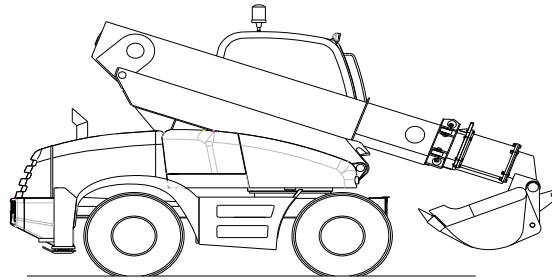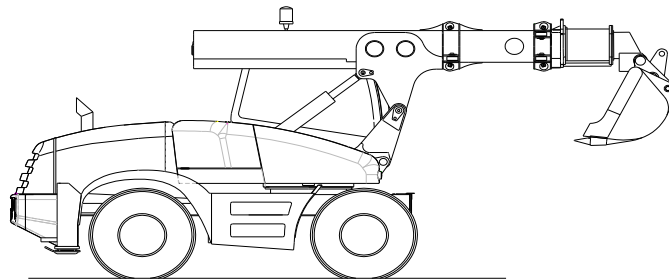
Figure 1. UPS 112

Figure 2. UPR 112

UPM 112 is a universal front telescopic manipulator, determined mainly for technologies performed with pallet forks, or with technologically similar attached working equipment, figure 3. Through its design, load ability and reach, it can be adjusted to the most frequently used technologies in the area of agriculture.
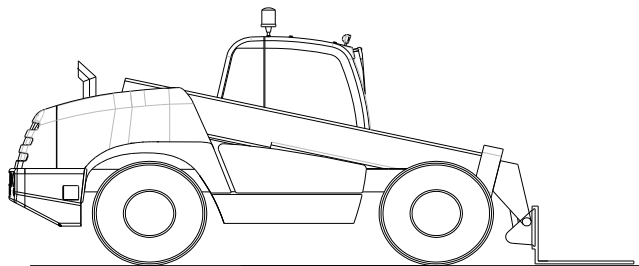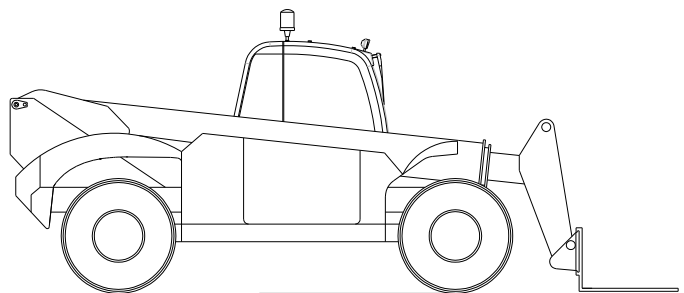
Figure 3. UPM 112

Figure 4. UTM 11.34

UTM 11.34 is a terrain telescopic manipulator, designed for manipulation with individual pieces and loose materials, figure 4. It is equipped with a quick-clamp, enabling adaptation of a broad assortment of attached equipments that predetermine it for the use in civil engineering, agriculture, communal area, wood processing and others.

2. PLATFORM

Because of objective determination of a platform, on which the above described group of machines is based, it is advantageous to use the methodology used in modularity ratio assessment of machine assemblies (1). Basic feature of this methodology is considering all parts(building modules) of all these machines and considering so called menus of particular modules (menu of motors, menu of cabins and so on…), so that these menus satisfy for the creation of all these machines. For the pursued group of mobile working machines 23 menus were created containing 33 basic building modules (4).For these menus, machine types were depicted with the help of a map of a modular problem. This map depicts illustratively usage of basic building modules in particular machines, as well as numbers of used variants of particular module. For variables defined in this way, modularity ratio of technological assemblies of telescopic manipulators was expressed by the formula (1)

$$k_M = \frac{PMa_i \quad PVMa_i}{PMa_i \quad max(PMa_{i/jl})} = 0{,}839 \qquad (1)$$

The platform of assessed technological assemblies of manipulators is created by such basic modules, which were used in all machine assemblies and at the same time for these modules holds good, that they occur in assessed machines only in one basic variant (4). Building sequence of mobile working machines UPS 112, UPR 112, UPM 112 and UTM 11.34 is then created on the platform „P" which consists of the following modules: drive motor, motor accessories, drive hydro-generator, drive hydro-motor, drive gearbox, front axle, rear axle, travel wheels, hydro-motor of working hydraulics, cabin, rear axle arresting. This choice of basic building modules can be described in the following way (4):

$$P = \{m_1, m_{p1}, p_{g1}, p_{m1}, p_{p1}, n_{p1}, n_{z1}, k_1, h_{p1}, c_1, s_{a1}\} \qquad (2)$$

3. CONCLUSION

Flexible machine assemblies created on a platform, which acquire relatively high modularity ratio, can be considered as effective and competitive solutions (5). From the point of view of an effective attitude to design of modular machine assemblies, it is necessary to establish such a set of basic modules, which enable as many solutions on a platform as possible.

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