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ASSEMBLY PROCESS PLANNINGS STRUCTURE DESIGN

Summary. Design of systems of mechanical & automatic assembly with computer aided process planning is intricate processing of several stages of information data. The information data concern of constructional data, conditions of assembly, decisions gauges of choice of process. The conversational, computer aided process planning system of assembly is controlled by a program, which has integrated subprograms of particle tasks.

1. Conditions of the assembly process

Conditions of the assembly process create the data input process set. These are the initial conditions of mechanical and automatic assembly with computer aided process planning. For estimating of the tasks and the gauges the systems subprogram with the twograduated model of the condition is accepted [1]. These solutions aren't always suitable, even though considering different meanings of particular conditions. Therefore is recommended to accept different gauges of quantitative estimations of conditions of assembly for the correctness realization this subprogram.

First of all technical data about a stock of assembly workpieces are imported to subprogram of assembly conditions. In the first step the production program is realized, which is estimated through auxiliary gauges. Quotient is counted from the estimation gauges of production program. That decides about further course of the subprogram. Its critical value depends on the acceptable model of the condition and on the level of the investigated conditions. The affirmative result allows to go to a next activities. They concern estimations of: the workpiece design for producibility [3], the quality and the exactitude of assembled pieces, the structure and the organization of assembly, the structures and the characterizations of manufacturing processes, the possibility of the market, the ergonomical conditions, the internal and external conditions of the factory. Each of these mentioned activities of the subprogram proceed similarly as an estimation of manufacturing program. An affirmative result of analysed gauges is memorized in working manufacturing card-index. It permits to start planning a mechanical & automatic assembly by a process engineer.

2. The structure of the manufacturing process planning

The manufacturing process planning can be realized by means of two subprograms:

- the subprogram of the manufacturing process structure
- the subprogram of the assembly order estimating

The design of the structure of the manufacturing process planning utilizes the procedure of the partition into pieces, couplings, nodes, subaggregates, aggregates. All structure of the process planning is subordinated to these partitions of a product [2]. In the particular loops the possibility of free interferences in a planned general assembly process out of a process engineer, through the arranged and supplemented activities is created. The algorithm regards possibilities, among other things, of realization in each loop of the program the parallel and arranged in row couplings assembly. It's designed so as to plan out the versatile assembly process structure for any composed product of ones choice. That means for any amount of pieces, couplings, nodes, subaggregates or aggregates.

The subprogram should be realized as conversational processing. In this subprogram the activity of the production engineer at the computer aided planning of assembly process includes: a specification of kinds of fastenings within a following coupling,

a node, a subaggregate, an aggregate or a product. The final settlement of the assembly order, initially performed in this subprogram, need to start the subprogram of estimation of assembly order.

3. The estimating of the assembly order

The starting point to realize of the subprogram of assembly order estimating is a result of a workpiece partition into assembly units. It's connected with partition into pieces, couplings, nodes, subaggregates and aggregates [3]. In next loops of the subprogram: pieces assembly in fastenings, couplings and free pieces in nodes, nodes and free pieces in subaggregates, subaggregates and free pieces in aggregates, aggregates and free pieces in a product is realized.

The estimating of assembly order planning consists on conversation of the production engineer with the computer. The task of the production engineer will consist on using of the ready solutions. They are located in the suitable subprograms or in working manufacturing card-index or in the appropriate model screens after their exact completing.

The problem of the assembly order planning resolves itself into a phase in which the order of pieces fastening in the first coupling is stated, next in following couplings one after the other, through each nodes, subaggregates, aggregates until the product. It's possible to translocate the investigated couplings for example from an assemblage, that may be realized as the parallel or as the arranged in row assembly, to other assemblages within the node, the subaggregate, the aggregate and the product. The structure of the partition is memorized in a working manufacturing card-index. It permits to compare the worked out structures by one or several production engineers and to execute the final choice of the assembly order realization for the assembled pieces. The subprograms under discussion relating to the structure process planning and the estimating of the assembly order make a whole. As the structure planning subprogram can be realized by a beginning production engineer, so the assembly order subprogram, consisting of some arbitrary decisions, requires the qualifications for assembly processes planning of a experienced production engineer.

4. The control of the particles programs for the assembly process planning

The system of the conversational processing of the computer aided planning of mechanical & automatic assembly is controlled by the program that integrates subprograms, which realize the particles tasks of a project. The algorithm of the control, the base of the program, comprises:

- the order of engendering subprograms from a catalogue of subprograms, in accordance with the sequence of steps and operations planning,
- the places where the information about the process planning should appear on a screen and it's indicatived of activities which ought to be done in co-operation with a production engineer,
- co-operation between a production engineer and a computer relating to:
 - input data i.e. the draft recording to do the assembly process planning
 - completion of input data, that is necessary to continue the planning,
 - accepting the solutions of particular steps of planning and changing some results in the generating information,
- after which steps, the results of planning should be memorized in a working manufacturing card-index.

The control of the assembly process planning consists:

- recording of the drawing that consists of: construction data, information: about the production program, about the factory equipment (about the conditions of the assembly process),
- deciding on the method and on the planning of the assembly process structure,
- operation planning of the assembly with references to the conditions of assembly
- selection of the technological means
- deciding on the methods and the control means planning
- deciding on the rational way and transportation means of pieces, subaggregates and aggregates,
- work time planning,
- preparing the production schedule for the assembly division,
- printout of the manufacturing documentation.

Information necessary for the system realisation are collected

in data bases - card-indices. There are standing card-indices created and completed independently of program activities and card-indices completed in during the process of planning. To a first group belong: technological means card-indices, normative work time card-indices. To a second group belong: card-indices of the assembly conditions, a drafts card-index, a manufacturing card-index. The methodics, the foundations and the model of the system [1] can be used for a mechanical or an automatic assembly system planning. The module structure enables adding of the modules of some assembly planning systems gradually according to the need. The form of the conversational processing limites an automatic data choice, as a result of the absence of data base in this range.

REFERENCES

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PROZEDUREN DER AUTOMATISCHEN PROJEKTIERUNG DER MONTAGETECHNOLOGIE

Zusammenfassung

Projektierung der mechanisierten und automatisierten Montage-systemen mit Berücksichtigung der Computerunterstützung ist eines kompliziertes, aus mehreren Etappen bestehendes Informations-verarbeitungsprozess. Diese Informationen betreffen der Teilekon-struktion, der Montagebedingungen und der Endscheidungskriterien der Auswahl des technologischen Prozesses. Das Konversation System der Montageprozessprojektierung ist mit einem Programm gesteuert, welcher alle Subprogrammen der fragmentarischen und projektierenden Aufgaben integriert.

PROJEKTOWANIE STRUKTURY PROCESU TECHNOLOGICZNEGO MONTAŻU

Streszczenie

Projektowanie zmechanizowanych i zautomatyzowanych systemów montażu z uwzględnieniem wspomaganie komputerowego jest wieloetapowym, złożonym procesem przetwarzania informacji. Informacje te dotyczą konstrukcji części, warunków montażu, kryteriów decyzyjnych wyboru procesu technologicznego. System dialogowego projektowania procesu montażu jest sterowany programem integrującym podprogramy realizujące cząstkowe zadania projektowe.

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