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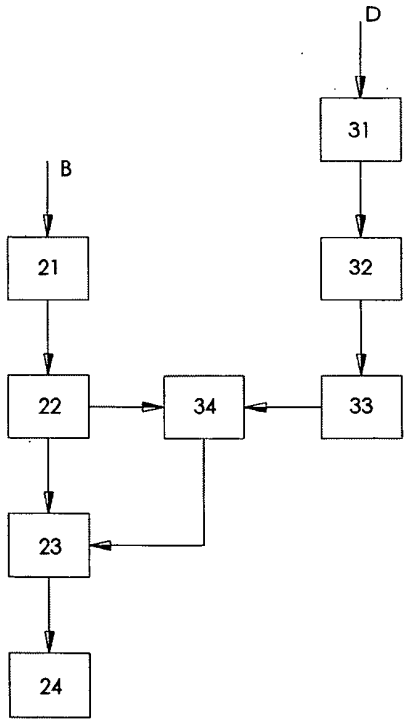
(54) **Drill-cut-saw-machine.**

(57) The present invention relates to a method for the manufacturing of a metal construction according to a design by means of a machining device for machining of beam elements in particular a drill-cut-saw-machine and a storage of beam elements, comprising the steps of converting the design of the metal construction into separate beam element specifications; saving the beam element specifications in a computer file or memory; assigning machining instructions according to the beam element specifications and saving said machining instructions in relation to the beam element specifications.
The method is improved in that the method further comprises the steps of generating by software a plan for the machining of beam elements by comparing the beam elements out of the storage with said saved beam element specifications and selecting beam elements out of the storage which fits with the beam element specifications.



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Title: Drill-cut-saw-machine

The present invention relates to a method for the manufacturing of a metal construction according to a design by means of a machining device for machining of beam elements in particular a drill-cut-saw-machine and a storage of beam elements, comprising the steps of:

- converting the design of the metal construction into separate beam element specifications, like kind of material, length, width, volume and positions of holes etc.;
- saving the beam element specifications in a computer file or memory;
- assigning machining instructions according to the beam element specifications and saving said machining instructions in relation to the beam element specifications,

Such a method is known and often indicated as CAD/CAM, which means Computer Aided Design / Computer Aided Manufacturing. Firstly, a computer may be used to design a metal construction. The metal construction is for example a trailer or a more civil structure like a frame for a building, a bridge, a gate or fence. Often the design of the metal construction comprises a lot of beam elements. The CAD/CAM software can be used to analyse the design and to generate a database of beam elements which are used in the design. The technical specifications of the beam elements, like the dimensions or kind of materials can be saved in a computer file. The computer file can subsequently be used in a computer program to add machining instructions. This may be done in a second computer file which is linked to the computer file including the beam element specifications, but the machining instructions may also be integrated in the already existing computer file.

After the generation of the computer files including technical beam element specifications and machining instructions, the machining of the beam element may be started. Normally, a beam element out of a storage for beam elements is clamped into the machining device and the operator uploads the computer file to start the machining. The beam element out of the storage is most of the times a steel profile having standardized dimensions. The clamped in beam element has to be machined according to the machining instructions. In the machining device the beam elements may be provided with all kind of operations like drilling, painting, milling, cutting etc. to obtain holes, recesses, paintures, cuttings etc. and to comply in the end with the beam element specifications.

A drawback of this known CAD/CAM method is that often a lot of waste material remains after machining. Many times the beam elements out of the storage are much larger

than the finally machined beam element. The beam elements out of the storage have to be shortened, and the length of waste material depends on the difference between the original length of the beam element out of the storage and the length of the beam element according to the specifications. It may be clear that by increasing costs of materials, it is not desirable to have a lot of remaining parts of beam elements.

It is an object of the invention to eliminate at least partially the above-mentioned drawbacks and/or provide at least one usable alternative. In particular, it is an object of the invention to provide a method, wherein the waste of materials may be reduced, the time of passage through the machining device may be reduced and wherein the manufacturing of beam elements may be further automated.

This object is achieved by the method according to the invention as defined in claim 1.

The method according to the invention is improved in that the method further comprises the steps of generating by software a plan for the machining of beam elements by comparing the beam elements out of the storage with said saved beam element specifications and selecting beam elements out of the storage which fits with the beam element specifications. A selected beam element may fit with more than one beam element specification. Machining instructions are assigned to the selected beam elements. The selected beam elements out of the storage may be all kind of bar materials, like H- or I-profiles, pipe or rod elements etc. Subsequently said beam elements out of the storage are machined by the machining device according to machining instructions from the generated plan. Finally, the metal construction is manufactured out of the machined beam elements. The metal construction is normally a steel construction, but it may also be a construction including aluminium parts.

Advantageously the generate plan may provide an opportunity to keep the amount of waste material after machining of the beam elements as low as possible. In general the beam elements out of the storage comply to technical standardisations of suppliers, but the storage of beam elements may also comprise remaining parts of beam elements of earlier machined beam elements. The relevant technical data of the beam elements out of the storage is uploaded to the software for generating the plan. The plan is based on a comparison between the uploaded data of the beam elements out of the storage and the technical specifications of the beam element which have to be machined. After the comparison a selection is made of beam elements out of the storage which fits with the beam elements specifications. The selection results in the plan indicating for each beam element out of the storage the corresponding machining instructions. The selection may be optimised by taking a minimal waste of remaining material as main criteria. The selection may also be based on a minimum of sawing operations. It is for example advantageous to

combine a pair of two beam element specifications including for example 45° saw cuttings to eliminate one of the saw operations. The beam elements may be planned in such a way that the saw cuttings coincide, wherein the beam elements including the saw cuttings are positioned beside each other in a supplied beam element out of the storage.

Advantageously, since sawing is generally a time consuming operation, this may strongly reduce the time of passage of the beam element through the machining device. The machining instructions from the plan serve as an input for the machining device to execute the machining operations. By executing the machining operations according to the plan a minimal amount of remaining parts may be obtained.

Advantageously, the generated plan may make it further very easy to produce beam elements according to the specifications from the design. By integrating the generated plan in the machining device the production of beam elements may be further automated. It is even possible to produce the beam elements according to the specifications without any interruption by an operator. In an embodiment according to the invention the beam elements out of the storage may be supplied automatically to the machining device. The beam element may be automatically recognised and machining instructions according to the plan may be automatically generated. The machining device may subsequently start directly the machining operations and finally a beam element according to the specifications is produced.

Advantageously, the machining device may operate completely automatically without any further programming or other interaction by an operator from the moment of supplying an arbitrary beam element out of the storage. An operator or an automatic supply unit may supply a beam element out of the storage to the machining device and the machining device provided with the generated plan may automatically recognize the supplied beam element.

In an embodiment according to the invention a machining device may be used which include a measurement station to recognise the supplied beam elements. The measurement station may be arranged to decode data from a supplied beam element which is coded with a bar code or transponder chip. The decoded data may provide an input to the measurement station to recognise the supplied beam element from a database.

The code on the supplied beam elements may also be used in the method according to the invention after the recognition of a supplied beam element. An unique code for every supplied beam element may be used e.g. for identifying a machined beam element before it is implemented in the metal construction. For this the measurement station may generate a database including codes of supplied beam elements together with assigned machining instructions which are related to beam element specifications for each code. Based on this database it is possible to identify machined beam elements before mounting them in the metal construction. Advantageously, the complete processing of the beam

elements from the storage until the mounting of the beam elements into the metal construction may be further automated.

In an alternative embodiment the measurement station is arranged to measure certain dimensions from the supplied beam element. Based on the dimensions the supplied beam element out of the storage may be recognised as a standardised beam element or remaining part of a previously machined beam element. The measurement station generates output-data relating to the recognised beam element. This output-data is subsequently used to determine the machining instructions according to the plan. Subsequently, the supplied beam element is machined according to the machining instructions to obtain a specified beam element which fit in a metal construction.

In an embodiment according to the invention an intermediate step is introduced between the determination of the machining instructions according to the plan and the actual starting of the machining operations. The intermediate step provides an opportunity for the operator to make a choice between alternative machining operations which all fit within the plan. During the intermediate step the operator may give priority to one of the possible machining instructions. Advantageously, the method according to the invention including said intermediate step is more flexible for the logistics to anticipate on other relevant facts than only the amount of waste material. It is for example possible to choose during the intermediate step for a greatest reduction of saw cuttings, or an alternative machining operation e.g. a cutting in stead of a sawing operation.

According to the invention the execution of the machining operations is based on the machining instructions from the plan. In an embodiment according to the invention the machining instructions are given in a particular order. Preferably, the order of machining instructions is determined by a criteria of minimal amount of displacements of the supplied beam element in the machining device. A minimal amount of displacements of the beam element in the machining device for beam elements is taken as a basis for the execution of the machining instructions. Herewith, the amount of movements of the beam elements may be minimal, which may be advantageously for heavy beam elements of e.g. 1000kg. A minimal displacement of the beam element in the machining device is further advantageous because it may provide a reduction of the time of passage of beam elements through the machining device.

In an embodiment of the method according to the invention the beam element is machined during a displacement of the beam element with respect to the machining device. Advantageously, several machining operations may be synchronically executed in the machining device which may further minimise the time of passage of beam elements through the machining device.

In an embodiment of the method according to the invention the beam elements are sawed, drilled and/or cut in the machine device. Preferably, the machining operations are performed in one cycle without interruption of an operator. To shorten the time of passage of the beamelements through the machining device the sawing may be executed simultaneously with an other operation or operation in the machining device. Often the sawing operation has a long duration which forms a main part of the overall time of passage. Therefore, it is advantageous to saw simultaneously with other machining operations.

In a preferred embodiment of the method according to the invention a robot of the machining device is used to execute a machining operation, like drilling or cutting on a beam element. The use of a robot in the machining device provides a lot of flexibility to anticipate on the diversity of beam element specifications to be machined. The use of a robot further provides the opportunity to manufacture complex 3D-shapes in the beam elements, like double angled edges.

In a preferred embodiment the same robot is used for different machining operations. The same robot may be used for both drilling, milling, cutting etc.

In an embodiment of the method according to the invention a resistance measurement is executed during drilling. The resistance measurement may be used to control the feeding and / or rotation speed of the drill head of the drill head if it appears from the measurement that a certain threshold limit value is exceeded or not achieved. Advantageously, the risk for a broken drill may be reduced. In addition, the impulse on the robot when the drill goes through the material may be reduced too.

Further the invention relates to a method for programming a machining device comprising the steps of converting a design of a metal construction into separate beam element specifications, like kind of material, length, width, volume and positions of holes etc.; saving the beam element specifications in a computer file or memory; assigning machining instructions according to the beam element specifications and saving these machining instructions in relation to the saved beam element specifications. This method is improved in that the method further comprises the steps of generating by software a plan for machining of beam elements by comparing the beam elements out of the storage with the saved beam element specifications and selecting beam elements out of the storage which fits with the beam element specifications and programming the machining device with the plan.

The data of the beam elements out of the storage may be collected in a database. The database may comprise standardised beam elements which can be ordered by suppliers. The database may also comprise imported data relating to remaining parts of already machined beam elements. The method may be stored in a computer file on a data-carrier,

like a memory stick or CD-rom as an upgrade package, such that the computer file can be used to upgrade an existing control system of a machining device.

Further the invention relates to a machining device for beam elements for the manufacturing of beam elements of a metal construction according to the method according to the invention. In particular the invention relates to a drill-cut-saw-machine. In particular to a drill-cut-saw machine for beam elements, in particular for heavy beam elements of at least 100 till 3000kg.The machining device comprises a supply device for the supplying of beam elements; a measurement station for recognising the supplied beam element and the generation of measurement data; a comparison-unit for comparison of the measurement data with a plan including machining instructions for a beam element out of a storage; and a machining unit for machining the supplied beam elements. The supply device may be arranged as a roller conveyor to transfer the beam elements to the machining unit. The measurement station may be integrated in the machining unit. Preferably, the measurement station may comprise an decoder to decode a code on a supplied beam element.

In an embodiment of the machining device according to the invention a code station is provided to code beam elements. The beam elements may be coded before or after supplying the beam elements to the machining device. The coded beam elements can be recognised at the measurement station and/or identified before mounting them in the metal construction.

In a preferred embodiment of the machining device according to the invention the machining unit comprises a robot for the execution of a operation, like drilling or cutting on a beam element. The robot is in particular preferred for the manufacturing of a wide diversity of beam elements. Advantageously, the robot provides freedom to operate the tool in all directions and angels. Herewith, complex shapes can be made. Holes can be drilled under an angle. Preferably, the robot is provided with a tool changer for the coupling of different toolings, like a cutting tool or a drill tool. Advantageously, a drill tool can easily be changed with a cutting tool. According to the invention the order of machining instructions may be based on a minimal displacement of the beam element with respect to the machining device. This results in more changing's in total of a tool. The tool changer makes it more simple to switch from a drill tool to a cut tool which complies to method according to the invention.

Preferably, the robot is provided with a resistance measurement unit for the control of the machining operation, in particular a drilling operation. Advantageously, the drilling process may be optimised by reducing or increasing the feeding and/or the rotation speed of a drillhead when a predetermined threshold limit value is exceeded or not achieved. Herewith the robot may be optimally used for drilling or cutting operations.

In an embodiment of the machining device according to the invention a six-axes machine, like a robot for cutting and/or drilling beam elements and a transfer mechanism for

transferring beam elements is provided. The robot may transfer synchronically with a beam element in the transfer mechanism. The cutting or drilling operation may continue while the beam element is transferred through the machining device. Since some operations have sometimes a long duration, the synchronically operating robot allows a shorter time of passage of beam elements through the machining device. Herewith, the robot contributes to a reduction of time of passage of the beam elements through the machining device.

In an embodiment of the machining device according to the invention a storage for beam elements is connected to the supply device for an automatically supply of beam elements to the machining device. Herewith, the machining device is further automated and may even be operated without an operator.

Further embodiments are defined in the dependent claims.

The invention will be explained in more detail with reference to the accompanying drawings, which illustrate a practical embodiment of the invention, but should not be regarded as limiting and in which:

Fig. 1 shows a flow-chart of an embodiment of the method according to the invention;

Fig. 2 shows a machining device according to the invention arranged as a drill-cut-saw machine;

Fig. 1 shows a flow-chart including successive steps of an embodiment of the method according to the invention. In a first step a beam element B from a storage is supplied to a machining device by a supply unit 21. The supplied beam element is subsequently recognised by a measurement station 22. The measurement station 22 may comprise a decoder or may have measurement instruments to determine specific dimensions or other technical specifications. In the measurement station 22 measurement data is generated, which serves as an input for a comparison unit 34. A second input for the comparison unit 34 is deducted from at least one design D of a metal construction. The second input comprises a database including machining instructions and technical specifications of beam elements which need to be machined to be manufactured to mount the metal construction. To obtain the database the design D of the metal construction is converted by a converter 31 into separate beam element specifications, like kind of material, length, width, volume and positions of holes etc. The specifications indicate the positions of holes, recesses etc. for each beam element. The specifications are saved in a computer file 32 for each beam element. To complete the database machining instructions according to the beam element specifications are assigned in step 33. Specified small holes are recognised for which drilling operations are assigned and cutting operations are assigned for the bigger holes in the machining instructions. The supplied beam element has to be

machined according to one of these machining instructions out of the database to get a beam element according to the specifications. The comparison unit 34 generates a plan which is optimised to reduce the amount of waste materials after machining the supplied beam element. The plan is programmed to a machining device 23 and the machining of the beam elements is started according to the plan. In the end the supplied beam element is machined conform one or more of the specified beam elements and can be mounted in one of the metal constructions. The metal construction is completed after mounting all necessary beam elements in step 24.

Fig 2 shows in a perspective view a drill-cut-saw machine according to the invention. The drill-cut-saw machine comprises a supply unit 1. The supply unit 1 includes a roller conveyor 12 to convey a beam element 7 to the machining device 13. The machining device 13 comprises a saw machine 6 and a robot 3. A tool storage 4 is arranged in the neighbourhood of the robot 3. The robot 3 is provided with a tool changer to perform different kind of machining operations. The beam element 7 is transferred along the robot 3 through a machining unit by a transferring mechanism. The transfer mechanism has movable clamping units 11, which may clamp a beam element 7 and move the beam element along the robot 3. Here, the transfer mechanism has three clamping units 11. The machining device further comprises a measurement station 8. The measurement station 8 is positioned in front of the machining unit and is arranged to measure several dimensions of a supplied beam element, in particular the length, height and width of a supplied beam element. According to the invention the measurement station generates measurement data, which is used in a comparison unit for a comparison with a plan which includes machining instructions for a beam element out of a storage. After passing the measurement station 8 the beam element 7 is transferred to the robot 3 to be machined according to the machining instructions following from the plan. In the end the beam element 7 leaves the drill-cut-saw machine, wherein the beam element is fully automatically operated by the machining device according to the invention.

In addition to the illustrated embodiments in the figures, many different variants are possible which all fall within the scope of protection as defined in the claims. In a variant on the drill-cut-saw machine, it is possible to arrange alternative machining operations, like milling, grinding or painting. All kind of machining operations may be done by a robot, but also by a bridge-arrangement or other kind of frame-construction which allows machining operations with movable tooling.

Thus, according to the invention a method is provided which may reduce the amount of waste materials and further automate the manufacturing of a metal construction out of beam elements.

Clauses

1. Method for the manufacturing of a metal construction according to a design by means of a machining device for machining of beam elements in particular a drill-cut-saw-machine and a storage of beam elements, comprising the steps of:

- converting the design of the metal construction into separate beam element specifications, like kind of material, length, width, volume and positions of holes etc.;
- saving the beam element specifications in a computer file or memory;
- assigning machining instructions according to the beam element specifications and saving these machining instructions in relation to the beam element specifications,

characterized in that the method further comprises the steps of:

- generating by software a plan for the machining of beam elements by comparing the beam elements out of the storage with said saved beam element specifications and selecting beam elements out of the storage which fits with the beam element specifications;
- machining of said beam elements out of the storage according to the generated plan;
- manufacturing the metal construction from the machined beam elements.

2. Method according to clause 1 further comprising the steps of:

- supplying a beam element to the machining device for beam elements;
- recognising of the supplied beam element;
- reading out of machining instructions out of a plan corresponding with the supplied beam element; and
- machining the beam element based on the machining instructions from the plan.

3. Method according to clause 1 or 2, wherein a minimal amount of displacements of the beam element through the machining device for beam elements is taken as a basis for the execution of the order of the machining instructions.

4. Method according to one of the preceding clauses, wherein the beam element is machined during the displacement of the beam element with respect to the machining device.

5. Method according to one of the preceding clauses, wherein the beam element is coded

6. Method according to one of the preceding clauses, wherein the beam elements are sawed, drilled and/or cut in one cycle in the machine device.

7. Method according to one of the preceding clauses, wherein several operations are executed simultaneously in the machining device.

8. Method according to one of the preceding clauses, wherein a six-axes operation station like a robot of the machining device is used to execute different operations, like drilling and cutting on a beam element.

9. Method according to one of the preceding clauses, wherein a resistance measurement is executed during drilling operations.

10. Method according to clause 9, wherein the feeding and/or rotation speed of a drill head is controlled if it appears from the measurement of resistance that a certain threshold limit value is exceeded or not achieved.

11. Method for programming a machining device comprising the steps of:

- converting a design of a metal construction into separate beam element specifications, like kind of material, length, width, volume and positions of holes etc.;
- saving the beam element specifications in a computer file or memory;
- assigning machining instructions according to the beam element specifications and saving these machining instructions in relation to the saved beam element specifications,

characterized in that the method further comprises the steps of:

- generating by software a plan for machining of beam elements by comparing the beam elements out of the storage with at least one saved beam element specification and selecting beam elements out of the storage which fits with the beam element specifications;
- programming the machining device with the plan.

12. Upgrade package for upgrading a machining device comprising a data-carrier which comprises the method according to clause 11.

13. Machining device for beam elements for the manufacturing of beam elements of a metal construction according to the method according to one of the clauses 1-10 comprising:
- a supply device for the supplying of beam elements;
- a measurement station for recognising the supplied beam element and the generation of measurement data;
- a comparison-unit for comparison of the measurement data with a database including machining instructions for a specified beam element and for generating a plan for machining beam elements out of a storage; and
- a machining unit for machining the supplied beam elements according to the plan.

14. Machining device according to clause 13, wherein the machining unit comprises a robot for the execution of a operation, like drilling or cutting on a beam element.

15. Machining device according to clause 14, wherein the robot is provided with a tool changer for the coupling of a cutting tool or a drill tool.

16. Machining device according to clause 14 or 15, wherein the robot is provided with a resistance measurement unit for the control of the operation.

17. Machining device according to one of the clauses 13-16, wherein the machining device is provided with a six-axes operation station for operating beam elements and a transfer mechanism transferring beam elements, wherein the six-axes operating station transfers synchronically with a beam element in the transfer mechanism.

18. Machining device according to one of the clauses 13-17, wherein a code station is provided for the coding of beam elements.

19. Machining device according to one of the clauses 13-18, wherein a storage for beam elements is connected to the supply device for an automatical supply of beam elements to the machining device.

CONCLUSIES

1. Werkwijze voor het met behulp van een bewerkingsinrichting voor balkelementen in het bijzonder een boor-snij-zaagstraat en een magazijn met balkelementen vervaardigen van een metaalconstructie volgens een ontwerp omvattende de stappen van:

- het vanaf het ontwerp ontleden van de metaalconstructie naar afzonderlijke balkelementspecificaties, zoals materiaalsoort, lengte, breedte, grootte en posities van gaten etc;
- het opslaan van de balkelementspecificaties in een computerbestand of geheugen;
- het volgens de balkelementspecificaties toekennen van bewerkingsinstructies en het opslaan van deze bewerkingsinstructies in relatie tot de balkelement specificaties, **met het kenmerk**, dat de werkwijze verder de stap omvat van:
- het softwarematig door een vergelijk van de balkelementen uit het magazijn en ten minste één computerbestand met balkelementspecificaties genereren van een planning voor bewerking van balkelementen uit het magazijn in de bewerkingsinrichting;
- het bewerken van de balk elementen uit het magazijn volgens het gegenereerde plan;
- het vervaardigen van de metaal constructie uit de bewerkte balk elementen.

2. Werkwijze volgens conclusie 1 verder omvattende de stappen van:

- het toevoeren van een balkelement aan de balkelementenbewerkingsinrichting;
- het herkennen van het toegevoerde balkelement;
- het uitlezen van bewerkingsinstructies uit de bij het toegevoerde balkelement passende planning;
- het bewerken van het balkelement op basis van de bewerkingsinstructies uit de planning.

3. Werkwijze volgens conclusie 1 of 2, waarbij een minimale aantal verplaatsingen van het balkelement in de bewerkingsinrichting als uitgangspunt wordt genomen voor het uitvoeren van de volgorde van de bewerkingsinstructies.

4. Werkwijze volgens één van de voorgaande conclusies, waarbij bewerkingen op het balkelement worden uitgevoerd gedurende het verplaatsen van het balkelement ten opzichte van de bewerkingsinrichting.

5. Werkwijze volgens één van de voorgaande conclusies, waarbij het balkelement wordt gecodeerd.

6. Werkwijze volgens één van de voorgaande conclusies, waarbij de balkelementen in de balkelementenbewerkingsinrichting in één cyclus gezaagd, geboord en/of gesneden worden.

7. Werkwijze volgens één van de voorgaande conclusies, waarbij een aantal bewerkingen in de bewerkingsinrichting gelijktijdig worden uitgevoerd.

8. Werkwijze volgens één van de voorgaande conclusies, waarbij met een zes-assige bewerkingsmachine zoals een robot van de bewerkingsinrichting verschillende bewerkingen, zoals boren en snijden op een balkelement worden uitgevoerd.

9. Werkwijze volgens één van de voorgaande conclusies, waarbij tijdens het boren een weerstandmeting wordt uitgevoerd.

10. Werkwijze volgens conclusie 9, waarbij de aanzet en/of de rotatiesnelheid van de boorkop wordt geregeld indien uit de weerstandsmeting blijkt dat een bepaalde weerstandsgrens overschreden of niet bereikt wordt.

11. Werkwijze voor het programmeren van een bewerkingsinrichting omvattende de stappen van:

- het vanaf het ontwerp ontleden van de metaalconstructie naar afzonderlijke balkelementspecificaties, zoals materiaalsoort, lengte, breedte, grootte en posities van gaten, uisparingen etc;
- het opslaan van de balkelementspecificaties in een computerbestand of geheugen;
- het volgens de balkelementspecificaties toekennen van bewerkingsinstructies en het opslaan van deze bewerkingsinstructies in relatie tot de balkelement specificaties, **met het kenmerk**, dat de werkwijze verder de stappen omvat:
- het softwarematig door een vergelijk van de balkelementen uit het magazijn en ten minste één computerbestand met balkelementspecificaties genereren van een planning voor bewerking van balkelementen uit het magazijn in de bewerkingsinrichting; en
- het programmeren van de bewerkingsinrichting met het plan.

12. Upgrade-pakket voor het upgraden van een bewerkingsmachine omvattende een gegevensdrager met de werkwijze volgens conclusie 11.

13. Balkelementenbewerkingsinrichting voor het vervaardigen van balkelementen voor een metaalconstructie volgens de werkwijze volgens één van de conclusies 1-10 omvattende:
- een aanvoerinrichting voor het aanvoeren van balkelementen;
- een meetstation voor het herkennen van een aangevoerd balkelement en het genereren van meetgegevens;
- een vergelijkeenheid voor het vergelijken van de meetgegevens met een plan dat bewerkingsinstructies omvat voor balkelementen uit een magazijn;
-een bewerkingseenheid voor het bewerken van de aangevoerde balkelementen.

14. Balkelementenbewerkingsinrichting volgens conclusie 13, waarbij de bewerkingseenheid voorzien is van een robot voor het uitvoeren van een bewerking, zoals boren of snijden aan een balkelement.

15. Balkelementenbewerkingsinrichting volgens conclusie 14, waarbij de robot is voorzien van een gereedschapwisselkop voor het koppelen van een snijgereedschap of een boorgereedschap.

16. Balkelementenbewerkingsinrichting volgens conclusie 14 of 15, waarbij de balkelementenbewerkingsinrichting voorzien is van een weerstandsmeeteenheid voor het regelen van de bewerking.

17. Balkelementenbewerkingsinrichting volgens één van de conclusies 13 – 16, waarbij de balkelementenbewerkingsinrichting voorzien is van een zes-assig bewerkingsstation voor het bewerken van balkelementen en een verplaatsmechanisme omvat voor het verplaatsen van balkelementen, waarbij het zes-assig bewerkingsstation synchroon met een balkelement in het verplaatsmechanisme verplaatsbaar is.

18. Balkelementenbewerkingsinrichting volgens één van de conclusies 13 – 17, waarbij een codeerstation voor het coderen van balkelementen is voorzien.

19. Balkelementenbewerkingsinrichting volgens één van de conclusies 13 – 18, waarbij een magazijn met balkelementen is gekoppeld aan de aanvoerinrichting voor een automatische aanvoer van balkelementen aan de bewerkingsinrichting.

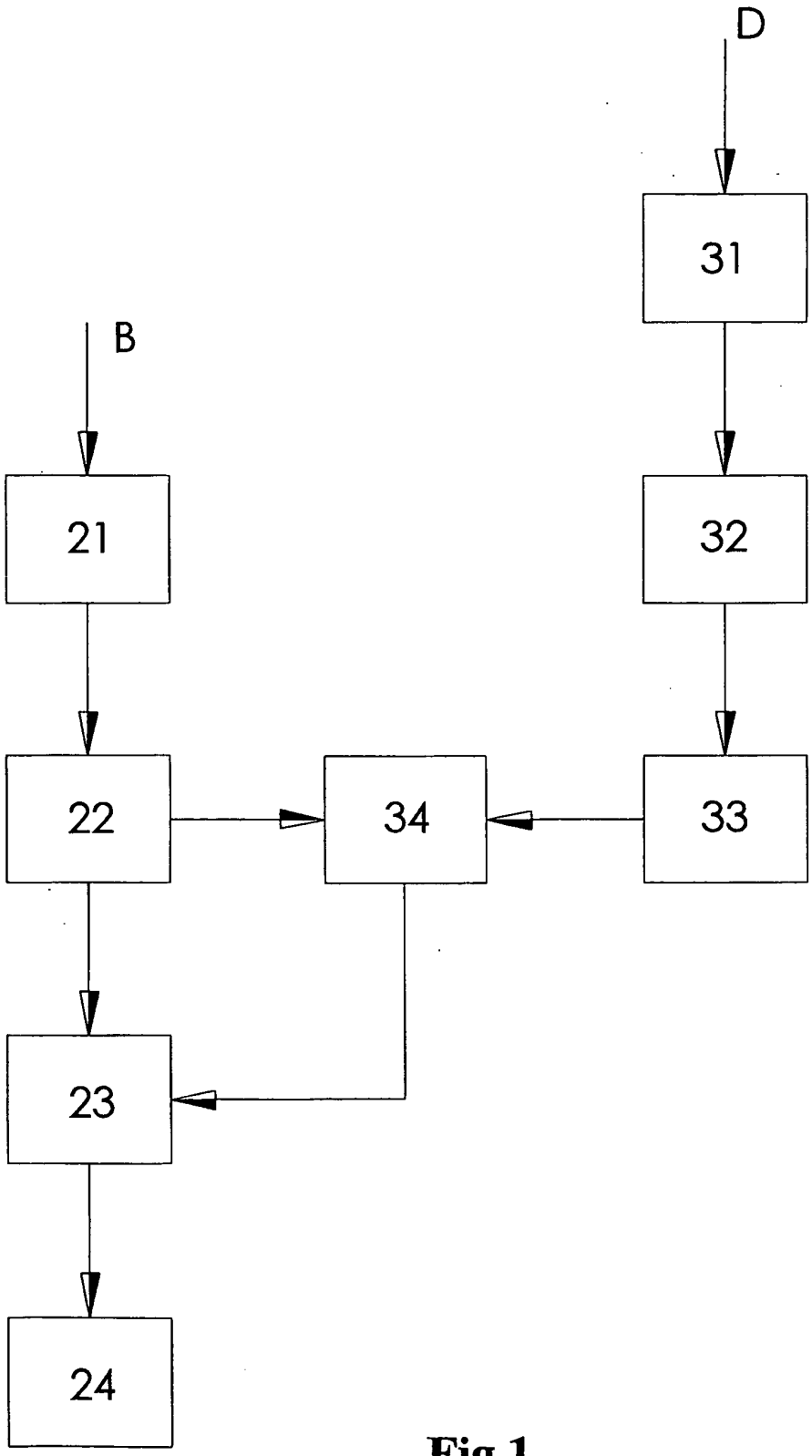

Fig.1

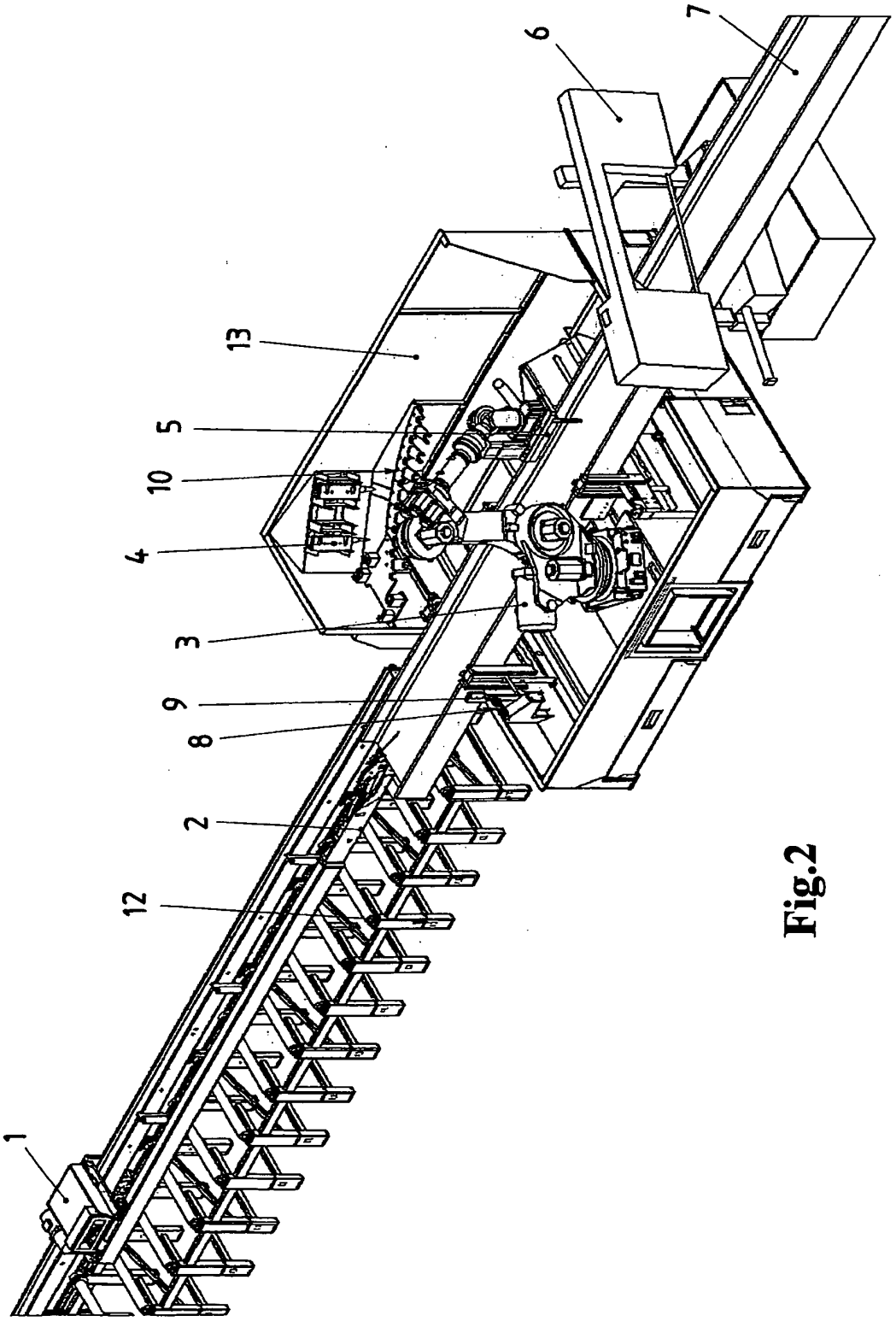

Fig.2

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	P29343NL00/KHO
Nederlands aanvraag nr. **2001800**	Indieningsdatum **14-07-2008**
	Ingeroepen voorrangsdatum

Aanvrager (Naam)

Constructiebedrijf Mous B.V.

Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
28-10-2008	**SN 51176**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

G05B19/4097

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC8	**G05B**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2001800

A. CLASSIFICATIE VAN HET ONDERWERP
INV. G05B19/4097

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
G05B

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	GB 2 332 958 A (DELCIANA INTERNATIONAL LMITED [IE] DELCIANA INTERNAT LMITED [IE]) 7 juli 1999 (1999-07-07) het gehele document	1,11-13
A	US 2005/044133 A1 (HASHIMOTO SHINICHIRO [JP] ET AL) 24 februari 2005 (2005-02-24) het gehele document	1-18
A	WO 2007/014866 A (KONSTANTINIDIS APOSTOLOS [GR]) 8 februari 2007 (2007-02-08) het gehele document	1-18
A	DE 10 2005 011268 A1 (MM4U GMBH [DE]) 14 september 2006 (2006-09-14) het gehele document	1-18

-/--

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
19 Mei 2009	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hauser, Leon

4

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2001800

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 2002/038163 A1 (HAZAMA KENSUKE [US]) 28 maart 2002 (2002-03-28) het gehele document -----	1-18

Formulier PCT/ISA/201 (vervolg tweede blad) (Januari 2004)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2001800

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
GB 2332958 A	07-07-1999	IE 970934 A2	25-02-1998
US 2005044133 A1	24-02-2005	CN 1535402 A	06-10-2004
		WO 03012562 A1	13-02-2003
		KR 20050100013 A	17-10-2005
		KR 20050099561 A	13-10-2005
		KR 20070072634 A	04-07-2007
		TW 583561 B	11-04-2004
		US 2008065252 A1	13-03-2008
WO 2007014866 A	08-02-2007	EP 1915657 A2	30-04-2008
		GR 20050100399 A	15-02-2007
DE 102005011268 A1	14-09-2006	GEEN	
US 2002038163 A1	28-03-2002	GEEN	

OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN51176	14.07.2008		NL2001800

International Patent Classification (IPC)
INV. G05B19/4097

Applicant
Constructiebedrijf Mous B.V. te Akersloot

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

	Examiner
	Hauser, Leon

WRITTEN OPINION

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	
	No:	Claims	1-18
Inventive step	Yes:	Claims	
	No:	Claims	1-18
Industrial applicability	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: GB-A-2 332 958 (DELCIANA INTERNATIONAL LMITED [IE] DELCIANA INTERNAT LMITED [IE]) 7 juli 1999 (1999-07-07)

D2: US 2005/044133 A1 (HASHIMOTO SHINICHIRO [JP] ET AL) 24 februari 2005 (2005-02-24)

D3: WO 2007/014866 A (KONSTANTINIDIS APOSTOLOS [GR]) 8 februari 2007 (2007-02-08)

D4: DE 10 2005 011268 A1 (MM4U GMBH [DE]) 14 september 2006 (2006-09-14)

D5: US 2002/038163 A1 (HAZAMA KENSUKE [US]) 28 maart 2002 (2002-03-28)

1. Lack of clarity

Claim 12 relates to an upgrade package for upgrading a machining device comprising a data carrier which comprises the method according to claim 11.
It is unclear how the method according to claim 11 is embodied in the data carrier.
The examination is carried out considering that claim 12 is a package comprising a data carrier which comprises a computer program having instructions that when run on a computer carries out the steps of method claim 11.

2 Independent claims 1, 11-13

The present application does not meet the criteria of patentability, because the subject-matter of claims 1, 11-13 is not new.

2.1 Claim 1

The document D1 discloses (the references in parentheses applying to this document):
a method for manufacturing a metal construction (page 1, lines 24-26) according to a design (page 2, line 1) by means of a machining device for machining beam elements (page 4, lines 15-17), which method comprises the following steps:

(a) converting the design into separate beam element specifications and saving these specifications in a computer file or a memory (page 2, lines 2-13);
(b) assigning machining instructions according to the beam element specifications and saving these instructions (page 2, lines 20-28);
(c) generating a plan for the machining of the beams by comparing the available beams with the saved beam element specifications and selecting the available beams which fits with he saved beam element specifications (page 2, lines 14-28);
(d) machining said available beams according to the generated plan (page 2, lines 20-28);
(e) manufacturing the metal construction with the machined beams (page 2, lines 32-35).

The subject-matter of claim 1 is therefore not new.

2.2 Claims 11-13

The subject-matter of claim 11 relates to a method for programming a machining device comprising the steps of method claim 1.
The subject-matter of claim 12 relates to an upgrade package, see point 1, which is also disclosed in D1, page 4, lines 21.
The subject-matter of claim 13 relates to a machining device adapted to carry out the steps of method claim 1.
Therefore the same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 11, 13, which therefore are also considered not new.

3. Dependent claims

Dependent claims 2-10, 14-18 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step as they relate to well-known methods for machining the beam elements, see documents D1-D5 and the corresponding passages cited in the search report.