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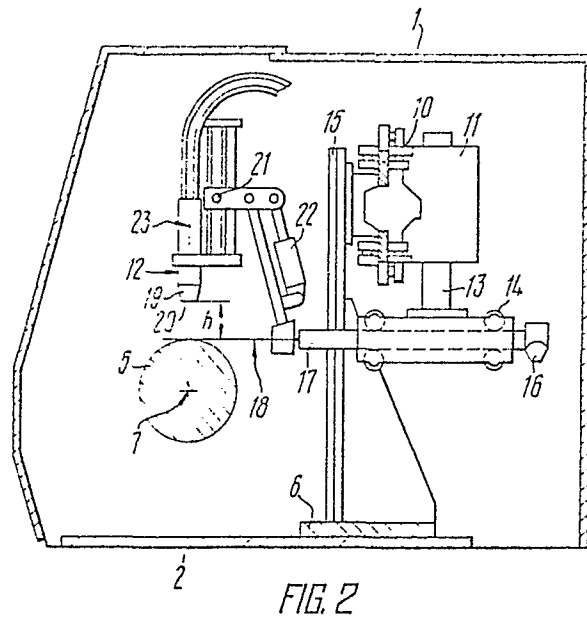
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⑤⁴ **DEVICE FOR GASOTHERMIC APPLICATION OF COATINGS ON ARTICLES SHAPED WITH A BODY OF
REVOLUTION.**

⑤7 A device for the gasothermic application of coatings on articles shaped with a body of revolution comprises a spindle (4) for fixing the article (5), a pulverizer (12) provided with a nozzle (19) with an end face (20), a mechanism (11) for longitudinal movement of the pulverizer (12) in relation to the axis (7) of the spindle (4), a mechanism (13) for transversal movement of the pulverizer (12) in relation to the axis (7) of the spindle (4) and a mechanism (16) for rotation of the pulverizer (12), provided with a hinge (17) which is mounted between the axis (7) of the spindle (4) and the end face (20) of the nozzle (19) so that its axis (18) is situated in relation to the end face (20) of the nozzle (19) at a distance equal to the distance of pulverization.



APPARATUS FOR HOT GAS SPRAY DEPOSITION OF COATINGS ON PRODUCTS IN THE FORM OF BODIES OF REVOLUTION

Technical Field

5 The invention relates to the equipment to be used for the deposition of coatings on surfaces of products, and, in particular, it deals with apparatuses for hot gas spray deposition of coatings on products in the form of bodies of revolution.

10 Background of the Invention

Known in the art is an apparatus for hot gas spray deposition of coatings on products in the form of bodies of revolution (US, A, 4099481), comprising a spindle for carrying a product, a spray gun having a nozzle with an end face, means for moving the spray gun axially along, and transversely with respect to the spindle. The product is installed in the spindle, a desired distance is adjusted from the end face of the nozzle and the product surface, and the product is caused to rotate. A hot spray gas material to be deposited is supplied to the spray gun, and the spray gun is caused to move in an equidistant relation to the generant of the product by the means for moving the spray gun axially along, and transversely with respect to the spindle. The hot gas spray coating is deposited on the product surface during single or repeated reciprocations of the spray gun. The longitudinal axis of the spray gun in the above-described apparatus remains perpendicular with respect to the axis of the spindle, i.e. to the axis of rotation of the product. Therefore, with any inclined position of the generant of the body of revolution with respect to the axis of rotation, the angle between the longitudinal axis of the spray gun and the generant of the body of revolution will deviate from the right angle so as to result in a change in the range of deposition. As the

position of the longitudinal axis of the spray gun at right angles with respect to the surface being coated is the most preferred in the hot gas spray deposition of coatings, any deviation of the axis of the spray gun from such position results in impaired quality of coating.

Known in the art is an apparatus for hot gas spray deposition of coatings on products in the form of bodies of revolution manufactured by METCO SUISSE SA.

10 The apparatus comprises a spindle for carrying a product, a spray gun having a nozzle with an end face, a means for axially moving the spray gun with respect to the spindle, a means for moving the spray gun transversely with respect to the spindle axis, and a means
15 for rotating the spray gun having a pivot joint. The end face of the spray gun nozzle is positioned between the axis of the spindle and the pivot pin of the pivot joint of the means for rotating the spray gun so that the distance from the pivot pin of the pivot joint to
20 the surface of the product is greater than the coating deposition range, i.e. the distance from the surface of the product to the end face of the nozzle. The product is installed in the spindle, a desired coating deposition range is adjusted, and the product is caused to rotate. Components for hot gas spray deposition of coating
25 are supplied to the spray gun, and the means for axially and transversely moving the spray gun cause it move equidistantly with respect to the generant of the product. During the movement of the spray gun the means
30 for rotating the spray gun rotates the spray gun upon every bent of the generant of the body of revolution in such a manner that its longitudinal axis always remain perpendicular with respect to the generant. As the distance from the pivot pin of the pivot joint of the rotation means to the surface of the product is greater than
35 the coating deposition range, the pivot pin of the pivot joint is offset through a small distance at all portions of the product surface upon every bent of the

generant to ensure a constant coating deposition range.
 Therefore, the path of movement of the pivot pin is
 more complicated than the generant of the body of revolution.
 This path of movement makes operation of a program
 5 control device more complicated. In addition, upon
 every rotation of the spray gun it applies a surplus
 layer of coating to a small patch lengthwise of the product
 in the bending zone of the generant. The larger
 the number of reciprocations of the spray gun along the
 10 product surface, the greater is the difference between
 thickness of coatings in such patches and over the rest
 of the product surface. It will be apparent that the
 kinematic system of the spray gun movement in the prior
 art apparatus does not allow uniform coating to be pro-
 15 duced.

Summary of the Invention

The invention is based on the problem of providing
 an apparatus for hot gas spray deposition of coatings
 on products in the form of bodies of revolution which
 20 can ensure uniform coating owing to a modified kinematic
 system.

The above problem is solved by that in an apparatus
 for hot gas spray deposition of coatings on products
 in the form of bodies of revolution, comprising a
 25 spindle for carrying a product, a spray gun having a
 nozzle with an end face, a means for moving the spray
 gun axially along the spindle, a means for moving the
 spray gun transversely with respect to the axis of the
 spindle, and a means for rotating the spray gun having
 30 a pivot joint, according to the invention, the pivot
 joint of the means for rotating the spray gun is provided
 between the axis of the spindle and the end face of
 the nozzle in such a manner that the pivot pin of
 the pivot joint is spaced from the end face of the
 35 nozzle at a distance equal to the coating deposition
 range.

This construction of the apparatus for hot gas

spray deposition of coatings to products in the form of bodies of revolution ensures the movement of the pivot pin of the pivot joint of the means for rotating the spray gun along a line following the configuration of the generant of the body of revolution so as to facilitate programming of the path of movement of the spray gun. In addition, no surplus layer of coating is applied to portions of the product surface contiguous to the bending points of the generant, and uniformity of the coating layer over the entire surface of the product is ensured.

Brief Description of the Drawings

The invention will now be described in detail with reference to specific embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a general view of an apparatus for hot gas spray coating deposition on products in the form of bodies of revolution, according to the invention;

Fig. 2 is ditto, a cross-sectional view taken along line II-II in Fig. 1, according to the invention;

Fig. 3 shows a diagram of movement of a spray gun along the generant of a body of revolution, according to the invention.

Best Mode for Carrying Out the Invention

An apparatus for hot gas spray coating deposition on products in the form of bodies of revolution comprises a chamber 1 (Fig. 1) attached to a bed 2. The bed 2 also supports a headstock 3 with a spindle 4 for carrying a product 5 in the form of a body of revolution, and a guide member 6 supports a tailstock 8 movable axially along the axis 7 of the spindle 4 and having a journal 9 coaxial with the axis 7. A guide member 10 in the chamber 1 supports a means 11 for axially moving a spray gun 12 with respect to the axis 7 of the spindle 4, and a means 13 (Fig. 2) for transversely moving the spray gun 12 with respect to the axis 7 is

mounted on the means for axially moving the spray gun, a mechanism 14 being provided on this means for bringing the spray gun 12 from a rear 15 of the chamber 1 to the working position. The mechanism 14 for bringing the
 5 spray gun 12 to the working position carries a means 16 for rotating the spray gun 12 to rotate its with respect to the planes of axial and transverse movement drawn through the axis 7 of the spindle 4. The means 16 for rotating the spray gun 12 has a pivot joint 17 with
 10 a pivot pin 18. The spray gun 12 having a nozzle 19 with an end face 20 is mounted on the pivot joint 17 by means of mechanism 21 for linear displacement and a device 22 for emergency rotation of the spray gun 12 away from the surface of the product 5. The means 16 for ro-
 15 tating the spray gun 12 about an axis 23 is designed for adjusting the range h of coating deposition, i.e. the distance from the surface of the product 5 to the end face 20 of the nozzle 19.

The apparatus for hot gas spray deposition of coat-
 20 ings on products in the form of bodies of revolution functions in the following manner.

When the spray gun 12 is retracted to the rear wall 15 (Figs 1, 2), the product 5 is installed in the spindle 4 and pressed by the revolving journal 9 of the
 25 tailstock 8. The pivot joint 17 is moved by the means 13 for transversely moving the spray gun 12 and stopped in a position in which the pivot pin 18 of the pivot joint 17 is aligned with a tangent line to the circumference of the product 5 (Fig. 2) drawn through the
 30 extreme point of the surface of the product 5 being coated. The spray gun 12 is moved to the working position by the mechanism 14 for bringing the spray gun from the rear wall 15 to the working position and is stopped in this working position in such a manner that the axis
 35 23 of the spray gun 12 be aligned with a plane drawn through the axis 7 of the spindle 4. The spray gun 12 is then displaced by the linear displacement mechanism 21 along the axis 23 to adjust the desired coating

deposition range h . Then using a programming device well known to those skilled in the art, a program for moving the spray gun 12 with respect to the generant of the product 5 is set up, the generant being shown in

5 Fig. 3 at 1. The program sets forth the movement of the pivot pin 18 of the pivot joint 17 along a path following the configuration of the generant 1 and rotations of the spray gun 12 about the pivot pin 18 at bending points of the generant 1 in such a manner that the axis

10 23 of the spray gun 12 remain always perpendicular with respect to the generant 1. A drive of the spindle 4 (not shown) is switched on, components of the hot gas spray coating are supplied to the spray gun 12, and drives of the means 11 for longitudinal movement, means

15 13 for transverse movement and rotation means 16 are switched on to move and rotate the spray gun 12 in accordance with a pre-set program. During the movement of the spray gun 12 over the cylindrical portion of the product 5, the pivot pin 18 of the pivot joint 17 moves

20 in parallel with the axis 7 (Fig. 3) so as to ensure the constant range h of coating deposition. The spray gun 12 moves from the position a into a position b, and the pivot pin 18 of the pivot joint 17 moves between points O_1 and O_2 , i.e. to the bending point of the generant 1 at an angle α . The means 16 for rotating the

25 spray gun 12 rotates the spray gun 12 from the position b to a position c, and the axis 23 of the spray gun 12 is rotated about the point O_2 also through the angle α . The spray gun 12 is then moved at the angle α with respect to the axis 7, i.e. in parallel with the next position of the generant 1 from the position c to a position d. The pivot pin 18 of the pivot joint 17 moves

30 from the point O_2 to a point O_3 so as to maintain the range h . At the point O_3 , i.e. at the next bending point of the generant 1 at an angle β the means 16 for rotating the spray gun rotates the spray gun 12 through the angle β from the position d to a position e. The axis 23 of the spray gun 12 is rotated about the point

0₃. The spray gun 12 then moves in parallel with the
 next portion of the generant 1 from the position e to a
 position f. The spray gun 12 is then moved and rotated
 in the similar manner. During the return movement of
 5 the spray gun 12 along the generant 1, its motions are
 repeated in the reversed order. The number of reciprocations of the spray gun 12 along the generant 1 depend
 on the desired thickness of the coating layer on the
 product 5. As it can be seen from Fig. 3, the path of
 10 movement of the pivot pin 18 of the pivot joint 17 of
 the spray gun 12 follows the configuration of the generant 1, and all rotations of the spray gun 12 occur
 about bending points of the generant 1 so as to rule
 out application of any surplus layer of coating to the
 15 surface of the product 5 in the zones of bending points
 of its generant 1.

Upon a sudden stoppage of the spindle 4 or one of
 the means 11, 13, 16, the emergency rotation device 22
 automatically retracts the spray gun 12 to an inclined
 20 position so as to avoid application of a surplus coating
 to a local portion of the surface of the product 5.

When application of the coating layer to the surface of the product 5 is over as prescribed by process
 shart, the spindle 4 is topped, the means 11, 13 and
 25 16 are switched off so as to stop the spray gun 12 in
 the initial position, and the mechanism 14 for bringing
 the spray gun to the working position retracts the
 spray gun 12 to the rear wall 15 of the chamber 1. The
 product 5 is discharged. The cycle can be repeated.

30 Therefore, the kinematic system for moving the
 spray gun 12 with respect to the pivot pin 18 of the pivot joint 17 by means of the apparatus for hot gas
 spray coating deposition on products in the form of bodies of revolution along a path following the configuration
 35 ation of the generant 1 of the body of revolution facilitates programming of movement of the spray gun 12 in
 carrying out deposition of hot gas spray coatings. In
 addition, as the pivot pin of rotation of the spray gun

12 is aligned with the bending points of the generant 1 during rotations of the spray gun 12, deposition of surplus coating layers in the zones of the surface of the product 5 contiguous to the bending points is avoided. This ensure uniformity of the layer of a hot gas spray coating applied to the surface of the product and enhances product quality.

Industrial Applicability

10 An apparatus for hot gas spray deposition of coatings on products in the form of bodies of revolution may be used for the deposition of coatings on bodies of revolution of simple and intricate configuration in the metallurgical, machine tool engineering and chemical industries.

CLAIMS:

An apparatus for hot gas spray deposition of coatings on products in the form of bodies of revolution, comprising a spindle (4) for carrying a product (5) a
 5 spray gun (12) having a nozzle (19) with an end face (20), a means (11) for axially moving the spray gun with respect to the axis (7) of the spindle (4), a means (13) for moving the spray gun (12) transversely with respect to the axis (7) of the spindle (4), and a
 10 means (16) for rotating the spray gun (12) having a pivot joint (17), c h a r a c t e r i z e d in that the pivot joint (17) of the means (16) for rotating the spray gun (12) is provided between the axis (7) of the spindle (4) and the end face (20) of the nozzle (19) in
 15 such a manner that a pivot pin (18) thereof is spaced from the end face (20) of the nozzle (19) at a distance equal to the range of coating deposition.

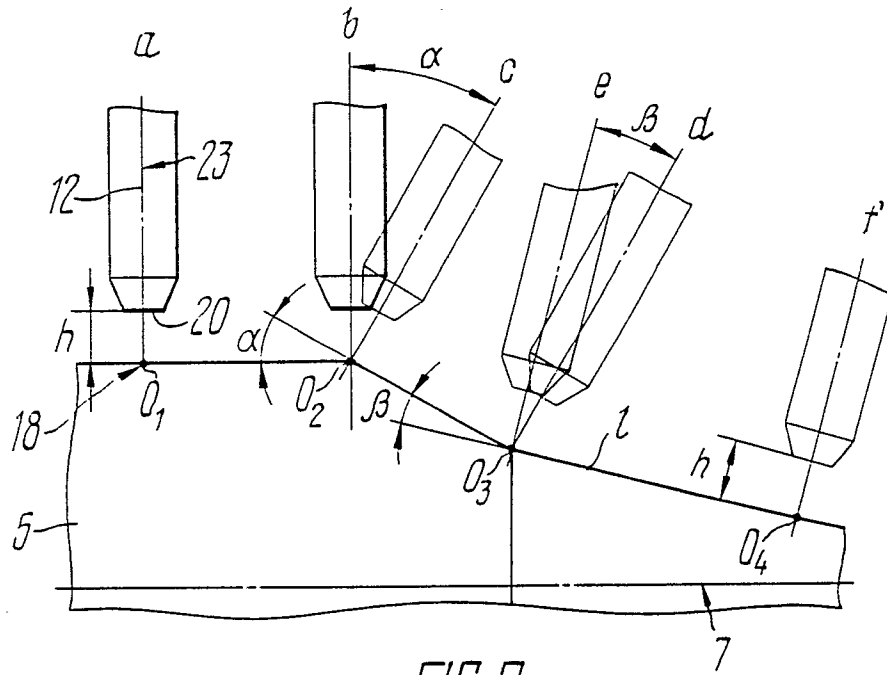


FIG. 3

II

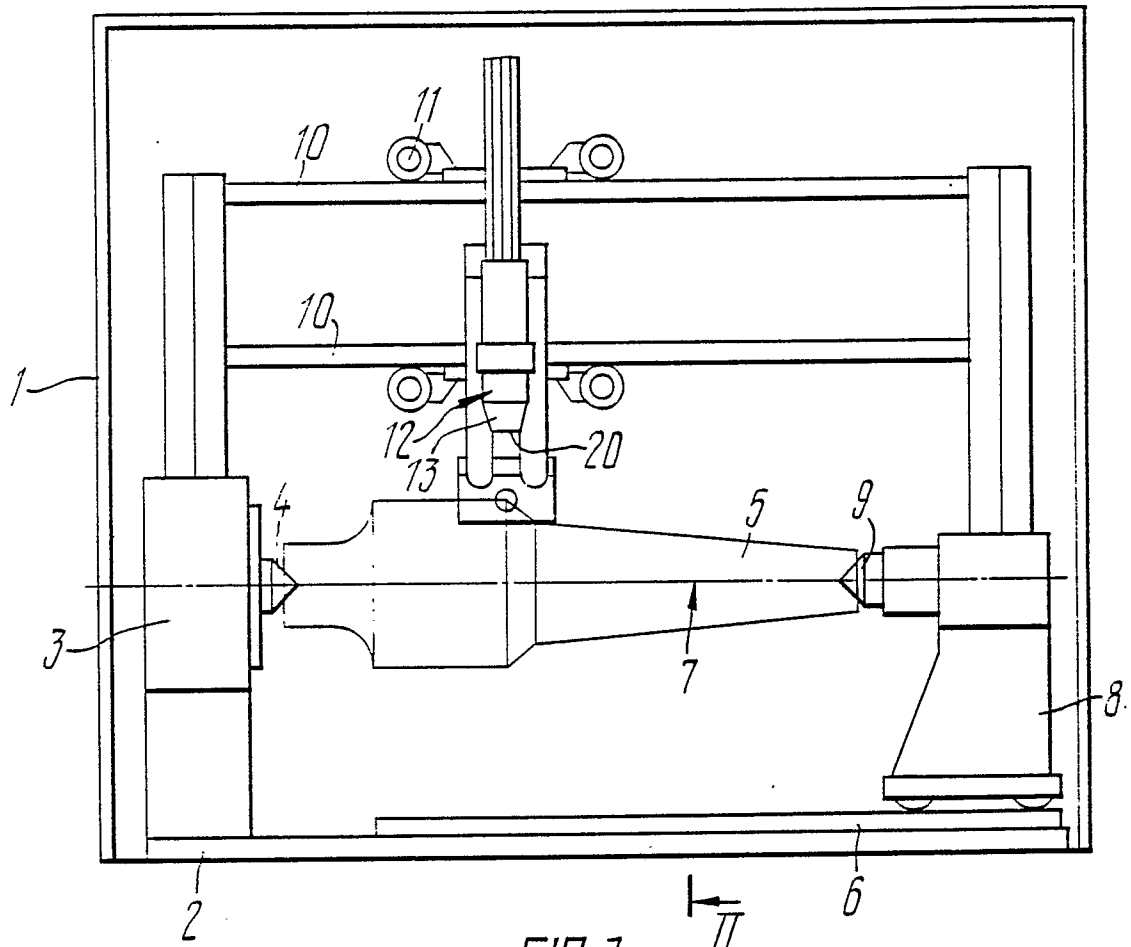


FIG. 1

II

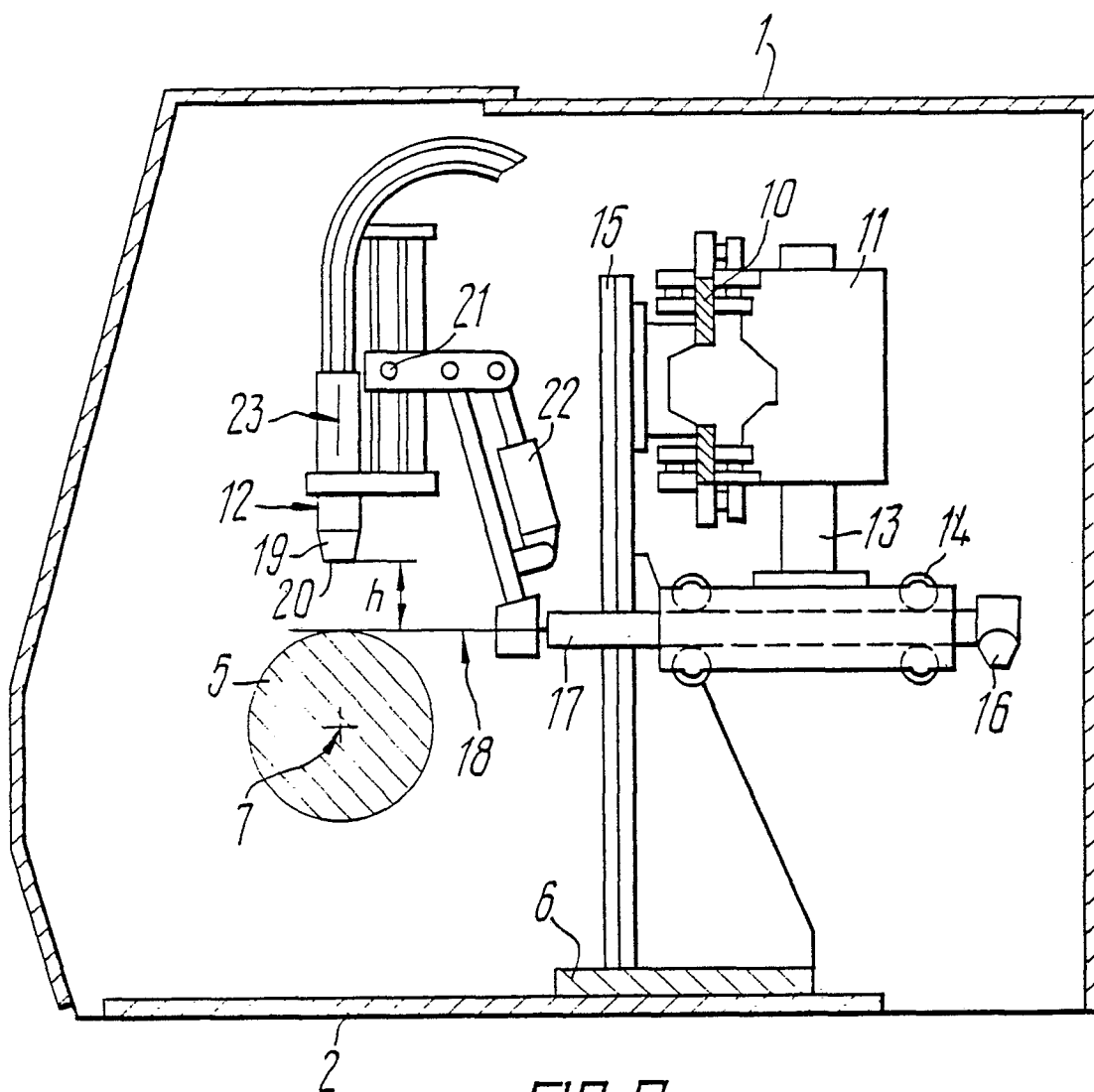
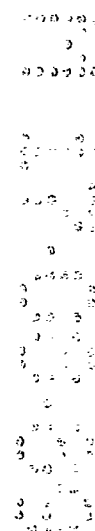


FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/SU 87/00146

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *	
According to International Patent Classification (IPC) or to both National Classification and IPC	
IPC ⁴ : B05B 13/02	
II. FIELDS SEARCHED	
Minimum Documentation Searched ⁷	
Classification System ¹	Classification Symbols
IPC ⁴ B05B 7/20, 13/02, 13/04, 13/06	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched *	
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹	
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² Relevant to Claim No. ¹³
A	US, A, 4099481, (Eutectic Corporation), 11 July 1978 (11.07.78) see column 2, lines 5-15, 20-35, figure 1 1
A	US, A, 4704985, (Nordson Corporation), 10 November 1987 (10.11.87) , see column 3, lines 49-64, figures 1,2 1
A	US, A, 3561398, (Programmed & Remote Systems Corporation), 09 February 1971 (09.02.71), see column 3, lines 65-75, figure 1 1
: : : : :	
* Special categories of cited documents: ¹⁰	
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier document but published on or after the international filing date	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step	
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.	
"&" document member of the same patent family	
IV. CERTIFICATION	
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
07 July 1988 (07.07.88)	01 September 1988 (01.09.88)
International Searching Authority	Signature of Authorized Officer
ISA/SU	