

APPENDIX 7B

ANALYSIS OF FAILURES FOR FACET INDEX IN

W. R. U. TEST

QUESTION (6) "We are having a high incidence of porosity in iron castings. Chemical analysis gives satisfactory results. What might be the cause and the remedy ?"

TITLE (1240) Practical observations on mould stability as a factor in controlling the soundness of grey iron castings. British Foundryman, Vol. 54, 1961, Feb., pp 45-53.

INDEXING

Concept Analysis

Grey Iron Castings
Defects, Porosity, Soundness
Mould stability/Rigidity effects
Foundry Sand

Class Number Elements

(1) Nfecp (2) Vg (3) Vgs (4) Mce (5) Vgb (6) Pn (7) Pec (8) Teh
i. e. (1) Grey Cast Iron. (2) Castings. (3) Mould-making. (4) Foundry Sand.
(5) Sand Castings. (6) Defects. (7) Porosity. (8) Stability.

Permutations

2:6:1	3:1:8
2:7:1	3:4:1
1:3:4	3:8:1
2:1:3	7:2:1
2:1:6	5:1:3
2:1:7	4:3:8

Assessment Concept analysis and class number elements adequate. Failure due to poor choice of permuted entries 1:7 1:6 6:1 7:1 required.

SEARCHING

1. POROSITY Pec (A)	A:B
IRON CASTINGS Nfec+ (B)	B:A
2. IRON CASTINGS Nfec+ (A)	A:B
DEFECTS Pn (B)	B:A

Assessment Could have tried further programmes, e.g.

3. POROSITY Pec (A)	A:B
CASTINGS Vg (B)	B:A
4. DEFECTS Pn (A)	A:B
CASTINGS Vg (B)	B:A

Document 1240 would have been found at
3. A:B B:A and at 4. B:A

RE-INDEXING

Add permutations:	Nfecp	Pec	Grey Iron Castings. Porosity
	Nfecp	Pn	Grey Iron Castings. Defects

REASON FOR FAILURE

Lack of permutation mainly the cause of failure, but insufficient searching contributed.

QUESTION (23) "What method can be used to identify the micro-constituents in alloy steels ?"

TITLE (1183) Intergranular precipitation of intermetal in compounds in austenitic alloys. A.I.M.E. Metallurgical Soc. Trans., Vol. 221, Feb. 1961, pp 28-34.

ASSESSMENT OF QUESTION

The question is too specific for this particular document. The paper is more concerned with the phenomena investigated than the method of investigation, which is dealt with in one paragraph only.

INDEXING

Concept Analysis

Austenitic alloys
Intergranular Precipitation
Ageing
Phase solubility limits
Microstructures

Class Number Elements

(1) N.1 (2) Ns.1 (3) Odj (4) Oev (5) Pgcb
i. e. (1) Austenitic alloys. (2) Steel. (3) Intergranular Precipitation
(4) Phases, Transformations. (5) Ageing.

Permutations

1:3	4:1
1:4	4:2
2:3	1:5
2:	2:5
3:1	5:1
3:2	5:2

Assessment Omitted to translate the concept 'Microstructures' into the class number. If this had been done the document would have been found at the sixth search.

<u>SEARCHING</u>	1. Microscopic Analysis	A:B
	Trace Analysis Xj. m	B:A
	Steel Alloys (B)	
	2. Microscopic Analysis, Metallography.	
	Xulm+ (A)	A:B
	Steel Alloys Ns. g+ (B)	B:A
	3. Metallography Xuz+ (A)	A:B
	Steel Ns+ (B)	B:A
	4. Analysis Xj+ (A)	A:B
	Steel Ns+ (B)	B:A
	5. Impurities Od1 (A)	A:B
	Steel Ns+ (B)	B:A
	6. Microstructure Od/e (A)	A:B
	Steel Ns+ (B)	B:A

RE-INDEXING

Translate concept Microstructures to class number Od/e.

REASON FOR FAILURE

Failure due to careless omission to translate concept into class number.
Also the question too specific and misleading.

QUESTION (30) "Is it possible to approach the close tolerance of metal diecasting by any sand-type process for alloys of aluminium".

TITLE (1391) The permeable plaster casting process. Light Metals, Jan. 1961, pp 7-10.

INDEXING

Concept Analysis

Permeable plaster. Precision casting

Class Number Elements

Vgh Permeable plaster casting

Assessment Omitted concepts Aluminium

Sand casting

Plaster of Paris

Moulds

Permeable

Tolerances

SEARCHING

- | | |
|-----------------------------|-----|
| 1. (Aluminium Nal | |
| (Aluminium alloys Nal.d (A) | A:B |
| Sand casting Vgb (B) | B:A |
| 2. (Aluminium alloys Nal.d | |
| (Aluminium Nal (A) | A:B |
| Diecasting Vgc (B) | B:A |
| 3. (Aluminium Nal | |
| (Aluminium alloys Nal.d (A) | A:B |
| Casting Vg+ (B) | B:A |
| 4. Tolerances Xft (A) | A:B |
| Castings Vg (B) | B:A |

RE-INDEXING

Add concepts as listed above with necessary permutations.

REASON FOR FAILURE

Failure due to inadequate indexing. Important concepts in the document not recorded.

QUESTION (37) To what extent do stress concentrations affect the structural tensile strength of aircraft and space vehicles.

TITLE (1376) Structural significance of ductility. Jnl. of Metals, Vol. 13, March 1961, pp 201-203.

INDEXING

Concept Analysis

Missiles, Rockets
Space Vehicles
Pressure vessels
Ductility
Stress Concentration
Strength-to-weight
Titanium alloys

Class Number Elements

(1) Kct Pressure vessels. (2) Ed Missiles, Rockets. (3) Eg Space Vehicles. (4) Pb Mechanical properties, Strength. (5) Teb Weight. (6) Pbd Ductility. (7) Px Stress concentrations (8) Pjb Brittle fracture. (9) Nti.d Titanium alloys.

Permutations

1:2:6	1:5:3	1:9:3	7:1
1:3:6	1:6:3	9:1:6	8:1
2:1:6	1:7:3	5:1	6:9:1
3:1:6	1:8:3	6:1	9:6:1
1:4:3			

Assessment

(1) Omitted concepts Tensile strength and Aircraft structures. Also Aircraft.
(2) Should have made permutations for 2 and 3 with 5, 6, 7, 8 and 9.

SEARCHING

1. Aircraft structures	Eb Fc (A)	B:A:C C:B:A
Stress Concentrations	Px (B)	B:C:A A:B:C
Tensile properties	Pbb (C)	C:A:B A:C:B
2. Aircraft structures	Eb Fc (A)	
Stress concentrations	Px (B)	B:A
3. Aircraft structures	Eb Fc (A)	A:B
Tensile properties	Pbb (B)	B:A
4. Stress concentrations	Px (A)	A:B
Tensile properties	Pbb (B)	B:A

Further searching of no avail even if extended search to missiles and space vehicles. Could not have broadened search to Px generally where document would have been found.

RE-INDEXING

Add concepts 1. Tensile properties Pbb
2. Aircraft Eb
3. Aircraft structures Eb Fc
Add permutations 2. Missiles Rockets and 3. Eg Spacecraft with phenomena at 5, 6, 7, 8 and 9.

REASON FOR FAILURE

Cause of failure equally due to omissions in indexing and lack of permutation.

QUESTION (45) "To what extent is calcium fluoride applied to iron and steel-making processes".

TITLE (1341) The kinetics of sulphur transfer from iron slag.
Iron and Steel Institute Journal, Vol.196, Dec.1960, pp 393-405.

INDEXING

Concept Analysis

Steel-making, iron-making
Sulphur removal to slag from iron carbon saturated
Transfer rate

Class Number Elements

(1) Vc Metal production. (2) Vcd Physical methods. (3) Nfe Iron. (4) Ns Steel.
(5) Nsf Sulphur. (6) N.wh Ores.

Permutations

4:1:5:1	5:2:3	1:2:5:2
4:2:5	5:3:2	2:5:3
3:2:5	6:3:5	2:3:5
3:1:5:2	3:6:5	

Assessment Omitted concept Calcium fluoride.

SEARCHING (1) Steel-making Ns Vc (A) B:A
Calcium fluoride MwCaF (B)

Assessment (2) Calcium fluoride MwCaF
Should have extended search to
(3) Steel-making Ns Vc
where document would have been found.

RE-INDEXING

Add concept Calcium fluoride MwCaF
Add Permutation Calcium Fluoride. Steelmaking.

REASON FOR FAILURE

Failure due to inadequate concept indexing and failure to search far enough.

QUESTION (54) "Are there any automatic installations producing laminations in the United Kingdom".

TITLE (1403) Quality production of laminations for transformer cores. Machinery, Vol. 98, Feb. 1961, pp 150-252.

INDEXING

Concept Analysis

Transformers
Cores
Laminations
Production
Cold rolled grain oriented steel
Strip
Slitting machines
Presswork

Class Number Elements

(1) He Transformers. (2) Hw Cores. (3) Mail Laminations. (4) Vhz Slitting. (6) Ns.hv Electric Steel - low alloy. (7) Kwh Strip. (8) Vj Presswork. (9) Vhp Slitting.

Permutations

1:2:3	2:6:4	9:7:6
1:2:4	6:7	6:1:2
1:2:6	7:6	8:2
2:4:6	8:7:6	9:2

Assessment

Careless permutation. Laminates and Laminations 3 and 4 are not brought to the front at all.

SEARCHING

- (1) Laminations Mail
- (2) Laminating Vhz

RE-INDEXING

Add permutations 4:2:1 Laminating: Cores: Transformers
3:2:1 Laminates: Cores: Transformers

REASON FOR FAILURE

Failure due to careless permutation.

QUESTION (59) "If the oxide film is removed from the steel strip by liquid fluxes, is the flow of liquid tin over the surface more satisfactory".

TITLE (1354) The spread of molten tin on mild steel reduced in hydrogen or treated with molten fluxes. Iron and Steel Institute Jnl. Vol.197, March 1961, pp 233.

INDEXING

Concept Analysis

Strips. Mild steel
Tinning. Surface preparation and treatment
Oxide film removal
Reduction in hydrogen, Hydrogen-argon
Zinc chloride- stannous chloride flux, molten.

Class Number Indexing

(1) Ns.d Mild steel. (2) Kwh Strip. (3) Vty Tinning, soldering.
(4) Vv Cleaning. (5) Nh Hydrogen. (6) MwZnClO Zinc chloride.
(7) MwSnClO Stannous chloride.

Permutations

2:3:1	3:4:5	4:3:1
1:2:3	2:1:3	5:3:1
1:3:4	3:6:1	6:3:1
3:1:2	3:7:1	7:3:1
3:2:1		

Assessment

Should have used notation for tin plating and not tinning: soldering.
Omitted permutations 2:1 Strip Cleaning
4:2:1 Cleaning steel strip
which would have retrieved the document.

SEARCHING

(1) (Tin plated Ldm Nsn	
(Tin plating Vwm Nsn (A)	
Steel Ns (B)	A:C:B:D
Strip Kwh (C)	C:B:A:D
Cleaning Vv+ (D)	D:C:B:A
(2) Cleaning Vv+ (A)	D:A:B:C
Steel Ns (B)	A:C:B
Strip Kwh (C)	A:B:C
	C:B:A
	C:A:B
(3) Strip Kwh (A)	
Steel Ns (B)	A:B:C
(Tin plating Vwm Nsn	A:C:B
(Tin plated Ldm Nsn (C)	C:A:B
	C:B:A
(4) Strip Kwh (A)	A:B
(Tin plating Vwm Nsn	B:A
(Tin plated Ldm Nsn (B)	
(5) Strip Kwh (A)	A:B
Cleaning Vv+ (B)	B:A

RE-INDEXING

- (1) Use Vwm Nsn for Vty (Tinplating instead of Tinning (soldering))
- (2) Add permutations 2:4 Kwh Vv Strip. Cleaning
 4:2:1 Vv Kwh Ns.d Cleaning. Strip. Mild Steel.

REASON FOR FAILURE

Failure due to incorrect indexing and lack of permutation.

QUESTION (81) "Do stainless steels have any advantage over Al and Ti alloys as structural materials for rockets using liquid oxygen and hydrogen propellants".

TITLE (1450) Selection of metals for use at cryogenic temperatures. Metal Progress, Vol.79, April 1961, pp 65-72.

INDEXING

Concept Analysis

Missiles, Rockets
Liquid propellants, Hydrogen, Nitrogen
Low temperatures, Cryogenic tests
Tensile, impact, hardness, fatigue, notch tensile, and charpy v tests.
Aluminium alloys, aluminium magnesium, aluminium copper alloys
Titanium alloys, titanium aluminium alloys
Stainless steels, cold rolled austenitic nickel alloys, cobalt alloys, sheet
Alloys by name.

Class Number Elements

(1) Ed Missiles, Rockets. (2) Pb Prd Low Temp. Mechanical properties.
(3) N.tb Low Temperature Metals. (4) Lkf Liquid fuel. (5) Nh Hydrogen.
(6) Nn Nitrogen. (7) Nti.d Titanium alloys. (8) Nal.d Aluminium alloys.
(9) Nni.d Nickel alloys. (10) Pk Xh Fatigue testing. (11) Xtbb Tensile testing.
(12) Xtbm Impact testing. (13) Xtbp Hardness testing. (14) Xtbb.n Notch tensile testing.
(15) Nco.d Cobalt alloys. (16) Vhm Cold rolling.
(17) Ns.l Austenitic steel.

Permutations

7:2:1	2:7:5	10:2:4	15:2:4
8:2:1	2:8:5	11:2:4	1:2
9:2:1	2:9:5	12:2:4	5:4:1
4:2:1	2:17:5	13:2:4	6:4:1
17:2:1	4:2:1	14:2:4	

Assessment

Should have indexed Liquid fuel rocket engines Djt, and have added permutations Missiles 1 with Metals at 7, 8, 9, 15, 17.

SEARCHING

(1) Liquid fuelled rocket engines Djt (A)	
Stainless steels Ns.j+ (B)	A:B
	B:A
(2) Liquid fuelled rocket engines Djt (A)	A:B
Aluminium alloys Nal.d (B)	B:A
(3) Liquid fuelled rocket engines Djt (A)	A:B
Titanium alloys Nti.d (A)	B:A
(4) Liquid fuelled rocket engines Djh/t (A)	A:B
Metals N (B)	B:A
(5) Rocket engines Djh/t (A)	A:B
Stainless steels Ns.j+ (B)	B:A
(6) Rocket engines Djh/t (A)	

(7) Missiles Ed (A)	A:B
Stainless steels (B)	B:A
(8) Missiles (A)	A:B
Aluminium alloys Nal.d (B)	B:A
(9) Missiles (A)	A:B
Titanium alloys Nti.d (B)	B:A
(10) Missiles Ed (A)	A:B
Metals (B)	B:A

RE-INDEXING

(1) Add permutations Missiles 1 with Metals at 7, 8, 9, 15, 17.

(2) Add concept Djt Liquid fuelled rocket engines.

REASON FOR FAILURE

Failure due to lack of permutation.

QUESTION (82) "What is the best type of copper alloy to use in electrical appliances where high conductivity and good resistance to softening on heating is required".

TITLE (1452) Zirconium copper alloy ... high strength and conductivity.
Metal Progress, Vol.74, April 1961, pp 75-77.

INDEXING

Concept Analysis

Zirconium copper alloys (copper zirconium)

Applications: Electrical equipment, windings, motor commutators, risers.

Properties: High temp. tensile. Electrical conductivity. Strength, hardness.

Class Number Elements

(1) Zrcu Zirconium copper alloys. (2) Pb Prb High temperature mechanical properties. (3) Pcb Hardness. (4) Rvc Electrical conductivity.
(5) Ht Windings. (6) Hq Commutators. (7) H Electric machines.

Permutations

1:2	4:1
1:3	5:1
1:4	6:1
2:1	7:1
3:1	

Assessment

Indexer forgot to make entry COPPER. Zirconium copper alloys, in the alphabetical index. Also, although the title of the paper was zirconium copper alloy the alloy concerned was copper xirconium as was stated in the concept indexing. The indexer should have indexed the content of the document rather than the title when the concept was translated into the class number.

SEARCHING

(1) (Copper Ncu	
(Copper alloys Ncu.d (A)	A:B
Electrical conductivity Rvc (B)	B:A
(2) (Copper Ncu	
(Copper alloys Ncu.d (A)	A:B
Electrical properties Rv (B)	B:A
(3) (Copper Ncu (A)	A:B
(Copper alloys Ncu.d	B:A
High temperature mechanical properties Pb Prb (B)	
(4) (Copper Ncu (A)	
(Copper alloys Ncu.d	A:B
Mechanical properties Pb (B)	B:A
(5) (Copper Ncu (A)	A:B
(Copper alloys Ncu.d	
Deformation Pg+ (B)	B:A

SYSTEM

In classifying alloys the system allows only one direction synthesis. The major alloying element is given first followed by the other alloys in order of quantity. For example, zirconium copper alloys has the class number Nzrcu, where zirconium is the larger element. The minor elements are located by the index, i.e. Copper. Zirconium copper alloys. Nzrcu.

The searcher may forget to search the index or the indexer may be wrong about the priorities of the elements. Therefore inverted entries are recommended, e.g. NcuZR Copper - zirconium alloys as well as Nzrcu Zirconium copper alloys.

RE-INDEXING

Index alloy as NcuZR Copper zirconium alloys with index entry Zirconium. Copper zirconium alloys. NcuZR.

REASON FOR FAILURE

This search failed due to a careless indexing error - failure to make an index entry in the Alphabetical index. Also a cause of failure, indexing by the wording of the title although the subject matter was known to be otherwise. The failure also points to a weakness in the system - the construction of alloys without allowance for inverted entries.

QUESTION (85) "What kind of pretreatment should be applied to a steel base which is to receive a heavy vinyl plastisol coating (as a replacement for vitreous enamel)".

TITLE (1457) Phosphating in cold solutions. Metal Progress, Vol. 79, April 1961, pp 100-102.

INDEXING

Concept Analysis

Phosphating, cold
Cleaning, Coating
Steel
Spray coating.

Class Number Elements

(1) Vwec Phosphating. (2) Ns Steel. (3) Vvw Spray coating.

Permutations

1:2 2:1 1:3 3:1

Assessment

Concept indexing omitted concept 'paints' and 'plastic coatings'.
Class number elements omitted concept 'cleaning', included in concept analysis.

SEARCHING

- (1) Plastic Coatings Ldkp, Vwkp (A) A:B:C
Steel Ns (B) A:C:D
Cleaning Vv+ (C) C:A:B
C:B:A
- (2) Plastisol
- (3) Plastic Coatings Ldkp, Vwkp (A) A:B
Steel Ns+ (B)
- (4) Plastic coatings Ldkp, Vwkp (A) A:B
Cleaning for Vv+ (B) B:A
- (5) Plastic Coatings Ldkp, Vwkp (A) A:B
- (6) Steel Ns+ (A) A:B
Cleaning Vv+ (B) B:A
- (7) Vitreous enamel coatings Vwk
Ldk (A)
Steel Ns+ (B) A:B

RE-INDEXING

Add concepts Paints, plastic coatings
Add class number elements (4) Vv Cleaning
 (5) Ldkp Plastic coatings
 (6) Vwkp Plastic Coatings
 (7) Le Paints
Add permutations 4:6 4:7 6:2:4 7:2:4 1:4:2 4:2:6

REASON FOR FAILURE Failure of search due primarily to a careless indexing error. If the concept Cleaning Vv had been translated from the concept indexing and the necessary permutations made, the document would have been found at the sixth search. The indexer also failed to note the concepts Paint and Plastic Coatings. If this had been done and the necessary permutations made, the documents would have been found at the first search.

QUESTION (112) "Is there any direct evidence that preferential precipitation on the non-coherent boundaries of the annealing twins is due to the presence of dislocations".

TITLE (1957) Electron-microscopic study of recrystallisation twins in copper. Acta Metallurgica, Vol.8, Dec. 1960, pp 874-877.

INDEXING

Concept Analysis

Copper foils
Twinning, dislocations
Twins
Recrystallisation
Electron microscopy

Class Number Elements

(1) Neu Copper. (2) Kwff Foils. (3) Oevp Recrystallisation, Twins, Recrystallisation. (4) Oej Twinning. (5) Xulme Electron microscopy. (6) Oevv Grain growth.

Permutations

1:2:3	2:1:6	5:3:1
1:2:4	4:1:5	5:4:1
1:6:5	3:1:5	5:6:1
1:3:5	6:1:5	1:5:6
1:4:5	5:1:3	1:3:6

Assessment

Failed to translate concept 'dislocations' into class number. Failed to include the concept Precipitation boundaries.

SEARCHING

- | | |
|-------------------------------------|-------|
| (1) Twins. Oevp, Oevv (A) | A:B:C |
| Precipitation: Boundaries Oej (B) | A:C:B |
| Dislocations Oed, Oeb (C) | B:A:C |
| | B:C:A |
| (2) Twins Oevp, Oevv (A) | A:B |
| Annealing Vme (B) | B:A |
| (3) Twins Oevp, Oevv (A) | A:B |
| Precipitation Boundaries Oej(B) | B:A |
| (4) Twins Oevp, Oevv (A) | A:B |
| Dislocations Oed, Oeb (B) | B:A |
| (5) Dislocations Oed, Oeb (A) | A:B |
| Annealing Vme (B) | B:A |
| (6) Precipitation Boundaries Oej(A) | A:B |
| Annealing Vme (B) | B:A |

Would have tried Twins Oevp, Oevv generally, but decided this would bring out too many irrelevant documents, since the place in the schedules for Twins includes all documents on recrystallisation and grain growth.

Assessment

Should have broadened the search to find document at Oevp, Oevv or tried the other number for Twinning Oej - ignored altogether by the searcher.

SYSTEM

There are too many places in the schedules for Twins, Twinning. Oej alone should have been used for twinning and recrystallisation twinning should have been expressed by the class numbers Oej, Oevp Twinning, Recrystallisation.

REASON FOR FAILURE

Failure due to careless searching. Searcher checked supplementary index to schedules for Twinning without also using the index to the schedules - consequently did not search the third possible place for Twinning. The failure also due to omitting to translate a concept into a class number. The three places in the schedules for Twinning were also partly to blame.

QUESTION (115) "What is the cross-sectional shape of extrusions formed on the surface of aluminium alloys subject to fatigue".

TITLE (2069) A study of fatigue deformation by reflection electron microscopy. Inst. of Metals Jnl. Vol. 59, March 1960/61, pp 253-254.

INDEXING

Concept Analysis

Fatigue, Deformation
Cracks. Extrusions. Electron microscopy
Deflection. Surfaces. Microstructures.

Class Number Elements

(1) Pk Fatigue. (2) Pj Cracks. (3) Xulme Electron microscopy.
(4) Pg Deformations. (5) Od/e Microstructure.

Permutations

1:3 3:2:1 3:4:2:1 4:1 5:1:3

Assessment

(1) Omitted to translate the concept Surface into class number Pej
(2) Omitted vital permutations 1:2 or 2:1
(3) Omitted concept Extrusions. (Stress raisers) from concept indexing.

SEARCHING

(1) (Aluminium Nal	A: C: B
(Aluminium alloys Nal.d (A)	A: B: C
Fatigue Pk (B)	B: A: C
Stress raisers Px (C)	C: A: B C: B: A
(2) (Aluminium Nal (A)	A: B
(Aluminium alloys Nal.d	B: A
Fatigue Pk (B)	
(3) (Aluminium Nal	
(Aluminium alloys Nal.d (A)	A: B
Stress raisers Px (B)	B: A
(4) Surface properties Pej (A)	A: B
Fatigue Pk (B)	B: A
(5) Fatigue Pk (A)	A: B
Stress raisers Px (B)	B: A

RE-INDEXING

<u>Concept Analysis</u>	Add extrusions (Stress raisers)
<u>Class Number Elements</u>	(1) Add Px Stress raisers with index entry Extrusions: Stress raisers Px (2) Translate concept Surfaces to Pej Surface Properties.
<u>Permutations</u>	Add entry 2:1 or 1:2 Cracks: Fatigue or Fatigue: Cracks

REASON FOR FAILURE

There are three causes of failure: careless permutation, omission to translate concept to class number and insufficient concept indexing.

QUESTION (131) "Is the crystal orientation of uranium affected by the previous history of the metal, and what effect does orientation have on the properties".

TITLE (1717) The recrystallisation of uranium during cold or hot forming. Jnl. of Nuclear Materials, Vol. 3, Jan. 1961, pp 115-119.

INDEXING

Concept Analysis

Uranium
Cold forging
Hot forging
Recrystallisation

Class Number Elements

(1) Nu Uranium. (2) Oevp Recrystallisation. (3) Vhc Forging.

Permutations

1:2:3 1:3:2 2:1:3 2:3:1 3:2:1

SEARCHING

(1) Orientation Oer (a) A:B
(Uranium Nu
(Uranium alloys Nu.d (B) B:A

Should have searched (Uranium alloys Nu.d
(Uranium Nu (A) A:B
Microstructure Od/e+ (B) B:A
where document would have been found.

REASON FOR FAILURE

Searching failure. Search could have been broadened to include microstructure of uranium.