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(54)

Lubricating mandrel bars.

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A method of lubricating mandrel bars, plugs etc. which are used in rolling iron and steel tubes involves applying the lubricant by electrostatic deposition. The bar (10) is shown on a plurality of spaced driven support rolls (17). Spray guns (18 and 19) are used respectively to spray liquid carrier such as carbopol and lubricant such as graphite onto the bar (10). The liquid carbopol is contained in a tank (20) and supplied by means of a pump (21) to spray gun (18). The graphite is contained in a tank (22) and pumped by means of a pump (23) to spray gun (19). A high tension electrical supply (24) is connected so that the rollers (17) are earthed and the gun (19) positively charged to charge the graphite. Initially the bar is sprayed with a thin controlled layer of the liquid carrier, then graphite is sprayed onto the wet bar (10) employing the electrostatic spraying technique. In some instances it may be desirable to spray the liquid electrostatically as well but this is not essential.

Excess liquid may be removed by means of the electrically operated dryer or heater (25) which, in one arrangement is a ring shaped heater completely surrounding the bar. Alternatively, the heat retained in the shell may be sufficient to remove the liquid carrier from the bar after it has entered the shell.

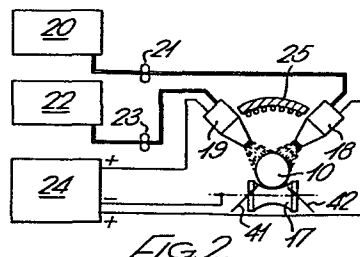


FIG. 2.

This invention is concerned with a method of lubricating mandrel bars, plugs, and the like which are used in producing hollow metal articles such as iron and steel tubes.

5 In use mandrel bars are inserted in hollow shells or tubes which are to be reduced in section in a mandrel mill. It is conventional to lubricate the mandrel bars for example by pushing the mandrel bar through a lubricating ring as it is pushed into the bore of the shell on the
10 entry table to the mandrel mill. In most instances the shell or tube which is to be reduced in diameter is preheated to a temperature which may be in the region, for example, of 900 to 1000°C and any carrier liquid used in applying the lubricant may well be vapourised and the
15 vapour produced may be in such volume that the graphite or other lubricant employed is to some extent blown away from between the bar and shell. In the course of time the surrounding equipment in the atmosphere can be covered in graphite dust which is clearly disadvantageous. There
20 is also a risk that inadequate lubrication will result if too much graphite is removed.

An object of the invention is to provide a method of accurately controlling the application of the lubricant and enabling the minimum amount of liquid to be used
25 consistant with applying the lubricant to the bar.

According to the invention a method of lubricating mandrel bars, plugs and the like comprises applying a lubricant to the bar by electrostatic deposition, preferably by electrostatic spraying.

30 If the lubricant is a solid it may be desirable to wet the bar or plug with a suitable liquid before electrostatic spraying the solid material on to the wet bar.

Alternatively the solid lunricant may be suspended
35 in the liquid and the suspension sprayed onto the bar

electrostatically.

If desired the bar may be heated after application of the suspension of lubricant in the liquid so as to remove excess liquid or even to remove the whole of the liquid so as to leave a dry layer of lubricant such as
5 graphite on the bar.

An external source of heating may be employed for this purpose. Alternatively the heat of the shell into which the lubricated mandrel is inserted may itself be
10 sufficient to dry off the liquid, or the mandrel bar itself may be preheated.

A suitable liquid which may be used is carbopol.

By using electrostatic spraying of the lubricant an optimum thickness of lubricant may be applied to the
15 bar. If graphite is used as the lubricant this is most important because graphite is expensive and so it is uneconomic to use too much graphite and at the same time it can be disastrous to use too little and provide inadequate lubrication.

20 In the accompanying drawings:-

Figure 1 is a plan view of a conventional arrangement for inserting mandrel bars into shells prior to their passage through mandrel mills modified in accordance with the present invention;

25 Figure 2 shows an electrostatic lubricant spraying apparatus in accordance with the present invention applied to the apparatus shown in Figure 1;

Figure 3 shows an alternative arrangement of electrostatic lubricant spraying apparatus;

30 Figure 4 is a plan view of an arrangement similar to Figure 1 but showing an alternative way of lubricating mandrel bars; and

Figure 4A is a section on line 4A-4A shown in Figure 4.

35 In Figure 1 there is shown a conventional arrangement in which a mandrel bar 10, shown at position A is ready

for insertion into a shell or tube 13. The end of the mandrel bar 10 will be gripped by the mandrel restraint equipment 11 and the bar 10 will then be passed through a lubricating ring 12 as it is pushed into the bore of the
5 shell 13 on the entry table 14 to the mandrel mill 15.

The mandrel restraint equipment 11 positions mandrel bar 10 correctly in relation to the mill 15. The mandrel bar 10 and shell 13 (or tube) are then pushed together into the mandrel 15 in known manner. The shell 13 is
10 rolled in the mandrel mill 15 and leaves on the exit side of the mill but the mandrel restraining gear 11 extracts the mandrel bar 10 and pulls it back to position A again.

The mandrel restraining gear 11 then lets go of the bar and the bar is moved out to position B where it traverses
15 to position C and is then moved to position D and to cooling spray 16. The bar 10 traverses again from position D to position E where it is in a waiting position ready to be moved into position A again for use in the mill. Several bars will be circulating in positions A, B, C, D
20 and E at any one time.

Figure 2 shows diagrammatically one method of electrostatically spraying the lubricant onto the bar 10. The bar 10 is shown on a plurality of spaced driven support rolls 17. Spray guns 18 and 19, are used respectively
25 to spray liquid carrier such as carbopol and lubricant such as graphite onto the bar 10. The liquid carbopol is contained in a tank 20 and supplied by means of a pump 21 to spray gun 18. The graphite is contained in a tank 22 and pumped by means of a pump 23 to spray gun 19. A
30 high tension electrical supply 24 is connected so that the rollers 17 are earthed and the gun 19 positively charged to charge the graphite. Initially the bar is sprayed with a thin controlled layer of the liquid carrier. Then graphite is sprayed onto the wet bar 10 employing
35 the electrostatic spraying technique. In some instances

it may be desirable to spray the liquid electrostatically as well but this is not essential.

Excess liquid may be removed by means of the overhead electrically operated dryer or heater 25.

- 5 Alternatively, the heat retained in the shell may be sufficient to remove the liquid carrier from the bar after it has entered the shell. By first coating the bar 10 with a small amount of liquid and then electrostatically spraying the graphite lubricant onto the bar and
- 10 subsequently drying the strip, the graphite is found to adhere to the bar 10 thus ensuring that an optimum predetermined coating thickness is achieved.

In Figure 3 is shown an alternative in which a single tank 28 contains the lubricant suspended in a

15 carrier e.g. graphite in carbopol. The graphite in the liquid may be applied via spray guns 29 and 30 to a bar 10 supported on a plurality of spaced driven bar support rolls 17, the guns being supplied with high tension voltage from the source 32 and the rolls being earthed. The spray

20 guns 29,30 enable the quantity of graphite to be carefully metered and uniformly applied.

The way in which the electrostatic coating is achieved may be any of the known ways such as charging the particles of graphite and allowing them to descend upon

25 an oppositely charged bar 10, or charging the bar 10 and earthing the guns so that the bar 10 attracts the graphite. Conventional spray guns may be used and if desired the electrode by which the charge is applied to the graphite may be located in front of the gun so that the spray of

30 graphite passes through the charged electrode.

In Figures 2 and 3, only two spray guns are illustrated. It is preferred, in the embodiment of Figure 2, that spray guns (or the like) are provided both above and below the bar 10, the position of the lower guns being illustrated

35 by the arrows 41,42. These guns would obviously be

situated between two adjacent support rolls 17, with the guns 18,19 above them. It is also preferred that two sets of spray guns be provided (not illustrated), the first set being upstream (relative to direction of movement of the
5 bar 10) of the second set. In this way, the first set of spray guns is used to spray the liquid onto the bar 10, and the second set then sprays the graphite lubricant onto the bar.

It is also preferred that at least one further spray
10 gun (represented by the arrow 43) be provided, between two spaced rolls 17, below the bar 10, in the embodiment of Figure 3. By surrounding the bar with spray guns, a more even lubrication of the surface is achieved.

It will be appreciated that the number of spray guns
15 could be altered and if desired, they could be replaced by an equivalent device, such as a perforated spray ring surrounding the bar. Obviously, whatever devices are used, they will be supplied with high tension voltage in the same way as the guns 18,19,29,30.

20 In the alternative arrangement illustrated in Figure 4 the mandrel bars are sprayed and pass through a heater during their movement along the conveyor marked E. The bars pass through a lubricant spray apparatus 12A, which may be any of the arrangements described above, so as to
25 spray lubricant onto the mandrel bar and to electrostatically spray graphite. The sprays preferably entirely surround the bar as described with reference to Figure 2.

The bar then passes through a heater 25A which is preferably formed as a ring entirely surrounding the
30 mandrel bar. This is diagrammatically shown in Figure 4A where E' is one roller of conveyor E supporting mandrel bar 10 and a ring-like heater 25A surrounds the mandrel bar 10.

Claims:

1. A method of lubricating mandrel bars, plugs and the like, which are used in producing hollow metal articles such as iron and steel tubes, comprising applying a lubricant to the bar by electrostatic deposition, preferably
5 by electrostatic spraying.
2. A method according to claim 1 in which the lubricant is a solid and the bar or plug is wetted with a suitable liquid before electrostatically spraying the solid material onto the wet bar.
- 10 3. A method according to claim 1 and in which solid lubricant is suspended in a liquid and the suspension sprayed onto the bar electrostatically.
4. A method according to claim 3 in which the bar is heated after application of the suspension of lubricant
15 in the liquid so as to remove excess liquid, or to remove the whole of the liquid so as to leave a dry layer of lubricant on the bar.
5. A method according to claim 4 and in which an external source of heating is employed.
- 20 6. A method according to claim 5 and in which the external heating is applied by means of a ring shaped heater which surrounds the bar.
7. A method according to claim 4 and in which the heat of a shell into which the lubricated mandrel is
25 inserted is itself employed to dry off the liquid.
8. A method according to any of claims 2 to 6 and in which the liquid used is carbopol.
9. A method according to any preceding claim and in which the lubricant used is graphite.
- 30 10. A method according to any preceding claim and in which the electrostatic deposition is applied to the bar whilst the bar is resting on rollers, the rollers being connected to earth and the electrostatic deposition being charged positively.

11. A method according to any preceding claim and in which the lubricant is applied to the bar and/or the heating is applied whilst the bar is in a waiting position.

12. A method of lubricating mandrel bars, plugs and the
5 like substantially as hereinbefore particularly described and as illustrated in the accompanying drawings.

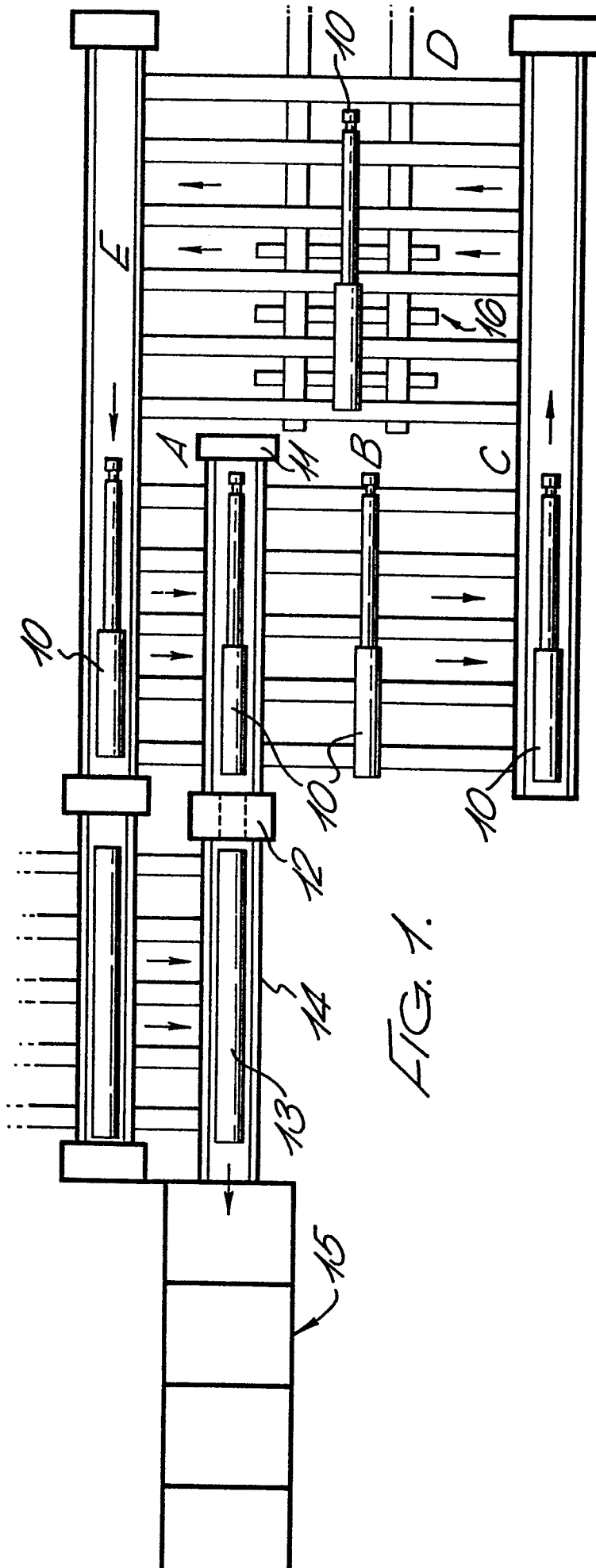
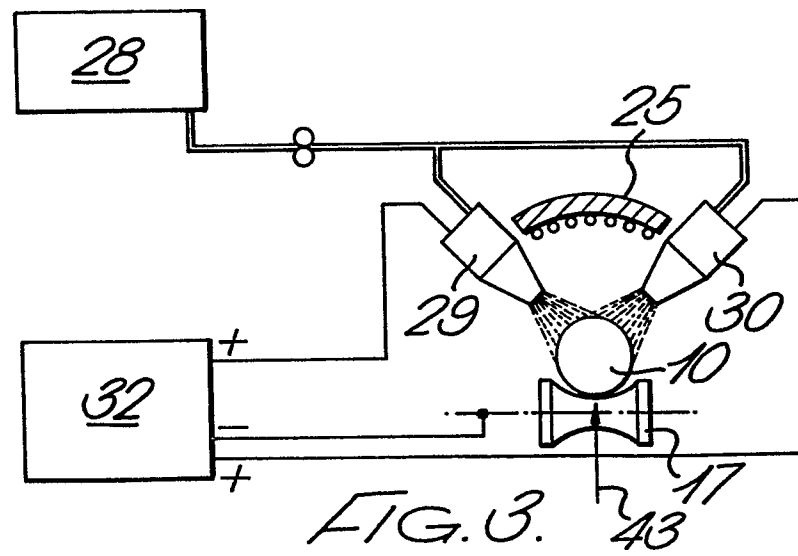
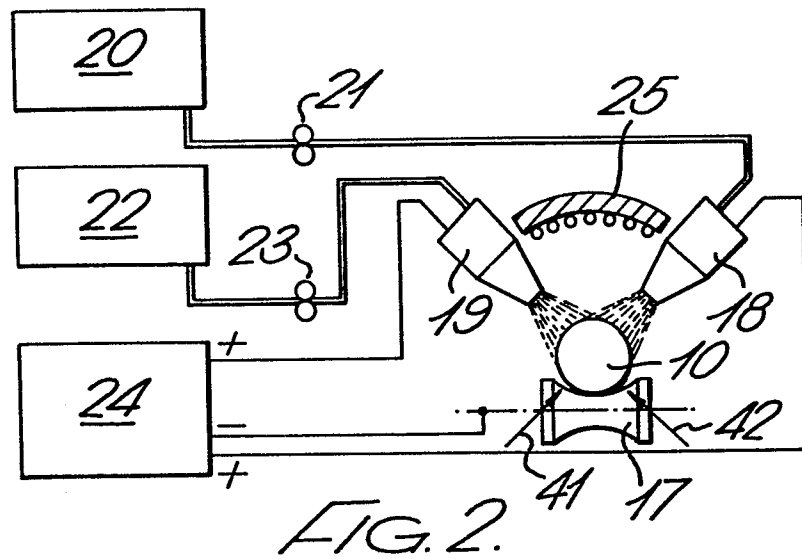


FIG. 1.

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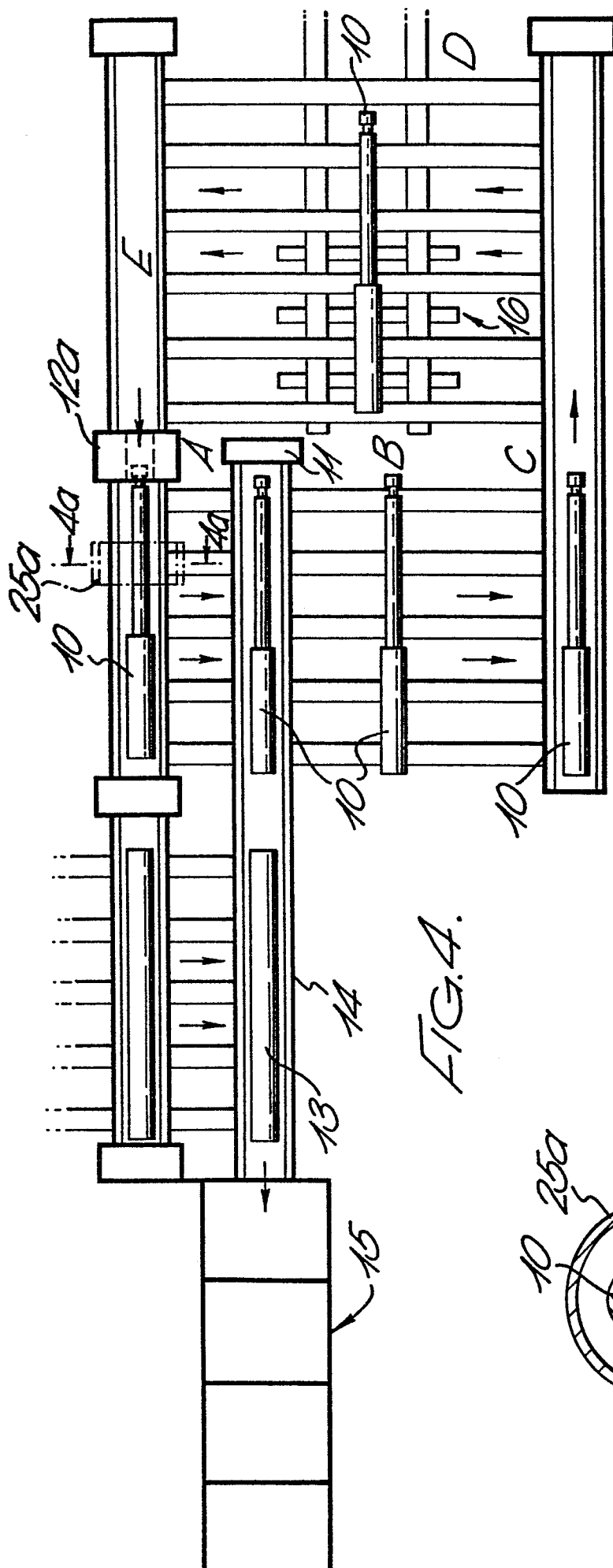


FIG. 4.

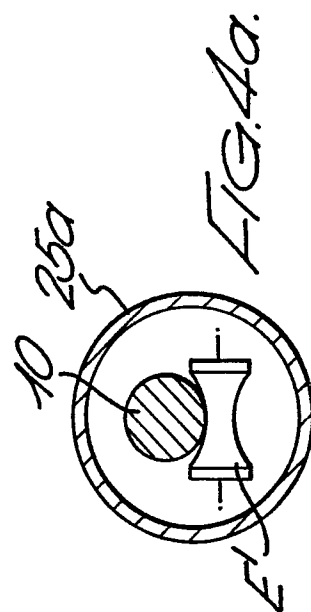


FIG. 4a.



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EUROPEAN SEARCH REPORT

0076170
Application number

EP 82 30 5197.4

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	DE - B2 - 2 732 009 (HOESCH) ---		B 21 B 25/04 B 05 B 5/08
A	US - A - 3 904 346 (SHAW et al.) ---		
A	GB - A - 2 022 471 (TI TUBE DIVISION SERVICES LTD.) ---		
A	DE - C - 725 839 (ENGELBERTZ) ----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 21 B 25/00 B 05 B 5/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
			&: member of the same patent family, corresponding document
X The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 22-11-1982	Examiner SCHLAITZ