MINING MACHINE CUTTER BITS AND MOUNTING SLEEVES

Abstract  A mining machine cutter bit (1, 40, 60) is provided of generally circular cylindrical shape with a locating flange (3) intermediate its ends. The flange provides a first annular abutment face (4a, 23, 32) on the side thereof remote from an associated first hard wearing tip (Ha, 46) the use of which is associated with the use of said first abutment face. The cutter bit has a circumferentially extending first locating groove (5a, 22, 43, 57) and a mounting tail (9b, 61) on the side of the locating flange remote from the first hard wearing tip. The locating groove is positioned with its nearer edge axially at a distance from said first abutment face that is less than 25 percent of the reach of the cutter bit, and typically of the order of 10 percent. The cutter bit may be reversible and in that instance has, in axial mirror image relative to the locating flange, a second hard wearing tip (11b), a second annular abutment face (4b) on the opposite side of the locating flange and a second locating groove (6b) on the side of the locating flange opposite the first locating groove. A co-operant mounting sleeve is also provided.
— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:
— with international search report (Art. 21(3))
FIELD OF THE INVENTION

This invention relates to mining machine cutter bits or, as they are quite often referred to, picks, that are attached to a mining machine by way of a mounting sleeve into which a shank or tail of the cutter bit extends in the operative condition. Such cutter bits are particularly widely, although not exclusively, used in the coal mining industry.

BACKGROUND TO THE INVENTION

Cutter bits of the type under consideration and a typical example of which is illustrated in Figure 14 of the accompanying drawings, generally comprise a hard wearing tip (a) (typically of tungsten carbide) of generally squat conical shape mounted axially at one end of a generally cylindrical body (b). The other end of the body is formed into a tail (c) of generally right circular cylindrical shape that is releasably accommodated in the bore (d) of a cooperating sleeve (e) that itself is operatively attached to a mining machine.

The tail is typically retained in the bore of the sleeve by means of a generally cylindrical spring clip (f) located in a circumferential groove (g) in either the outer surface of the tail or the inner surface of the bore and whereof projections or undulations (h) in the spring clip engage in a cooperating circumferential groove (i) in the other of the inner surface of the bore or outer surface of the tail. The spring clip is usually located towards the end of the tail remote from the hard wearing tip, as illustrated in the drawing.

The fit of the tail in the bore, and the characteristics of the spring clip are particularly arranged so that, during use, impacts of the hard wearing tip on
the mineral being mined, cause the cutter bit to rotate about its own axis relative to the sleeve. This rotation avoids a lopsided shape developing on the outer surface of the hard wearing tip and, indeed, it creates a self sharpening effect of the abrasion inflicted on the hard wearing tip.

Clearly the cutter bits need to be replaced regularly and even once, or more often, during a single mining shift. A significant number of spare cutter bits therefore need to be transported to the mining site on a regular basis with accompanying inconvenience occasioned by their weight.

Whilst not being directed at sleeve mounted cutter bits, there has been suggested in United States patents Nos 3,493,268 and 5,810,102, reversible cutter bits that enable a first hard wearing tip to be firstly exposed to a workface followed by axially reversing the orientation of the bits relative to their mountings to expose a second hard wearing tip on the opposite end of the cutter bit.

In the case of the former prior patent the cutter bit is retained in a bore in a mounting block by means of a tangentially extending pin that cooperates with a groove in the otherwise continuous right circular cylindrical surface communicating between the tip formation and a central locating flange that has a flared surface cooperating with a flared entrance to the bore. Indeed the groove is rather deep and located more towards the cutting tip than the flange in keeping with the apparent philosophy that the retaining means should be located towards the inner end of the bore. The result is that the exposed groove that is available for use in locking the reversible bit in its reversed (other) orientation forms a significantly weakened zone of the bit near the cutting tip that is presently in operation at any one time. Applicant is, in addition, of the view that the arrangement described in that patent does not lend itself to efficient rotation of the cutter bit relative to the mounting block.
The latter of the two patents mentioned above attempts to address the shortcomings of the former by providing an enlarged central region to the cutter bit with a single central groove serving to locate it in its cooperating bore in a mounting block in both of the two possible positions of the reversible bit. The result of this is that a substantial outer surface area of the bit is in substantial contact with the inner surface of the bore. This, in applicant's view, must inhibit rotation of the bit, in use. This arrangement would also adversely affect the reach of the cutter bit (being basically the distance that the hard wearing tip projects forwardly of the mounting) and necessitate a longer and more costly cutter bit in order to achieve a longer reach.

OBJECT OF THE INVENTION

It is one object of this invention to provide a cutter bit and mounting sleeve that may be configured to enable enhanced rotation of the cutter bit relative to the mounting sleeve, in use.

It is another object of this invention to provide a reversible cutter bit and cooperating mounting sleeve that operates effectively, in use.

SUMMARY OF THE INVENTION

In accordance with one aspect of this invention there is provided a mining machine cutter bit of generally circular cylindrical shape with a locating flange intermediate its ends and presenting a first annular abutment face on the side thereof remote from an associated first hard wearing tip the use of which is associated with the use of said first abutment face (the distance between such an abutment face and hard wearing tip hereinafter being referred to as the reach of the cutter bit), a circumferentially extending first locating groove in the surface of the cutter bit on the side of the locating flange remote from the first hard wearing tip, and a mounting tail extending away from the
locating flange on the side thereof opposite the first hard wearing tip, the tail
being configured to be received in a bore in a cooperant mounting sleeve, in
use, the cutter bit being characterized in that the locating groove is positioned
with its nearer edge axially at a distance from said first abutment face that is
less than 25 percent of the reach of the cutter bit.

Further features of this aspect of the invention provide for said inner edge of
the locating groove to be positioned at a distance that is less than about 15
percent, and preferably less than about 10 percent, of the reach of the cutter
bit; for the locating groove to be formed in a central portion of the cutter bit
having an enlarged diameter selected such that the diameter of the cutter bit
at the bottom of the groove is no less than the diameter of the cutter bit
extending from said central portion to the hard wearing tip; and for the cutter
bit to be reversible in which instance it has, in axial mirror image relative to
the locating flange, a second hard wearing tip at the opposite end of the
cutter bit, a second annular abutment face on the opposite side of the
locating flange and a second locating groove on the side of the locating
flange opposite the first locating groove.

In one variation of the invention in which a tangentially extending pin is to be
used to hold the cutter bit captive within a mounting sleeve, the locating
groove preferably has a width that is from about 5 to about 15 percent, and
most preferably of the order of about 10 percent of the reach of the cutter bit.
It in another variation of the invention in which a spring is to be used to hold
the cutter bit captive within a mounting sleeve, the groove may be
appreciably narrower and typically between 3 and 5 per cent of the reach of
the cutter bit.

In accordance with a second aspect of the invention there is provided a cutter
bit and mounting sleeve therefor in which the mounting sleeve has a bore for
receiving the mounting tail of a cutter bit as defined above and retaining
means including a locating groove in the outer surface of the cutter bit for
operatively retaining the cutter bit within the mounting sleeve in relatively rotatable manner, the cutter bit and mounting sleeve being characterized in that the mounting tail of the cutter bit, or the inner surface of the bore of the mounting sleeve, or both, are configured such that the cutter bit is located in the radial direction in the bore by a first surface area of the cutter bit adjacent the groove that cooperates with an adjacent surface area of the bore and a second surface area of the cutter bit towards the extremity of the mounting tail that cooperates with an adjacent surface area of the bore, the arrangement being such that a space is provided between the adjacent surfaces of the cutter bit and bore between said first surface area and said second surface area.

A further feature of the second aspect of the invention provides for the retaining means for operatively retaining the cutter bit captive within the mounting sleeve in relatively rotatable manner to be either a hole for receiving an attachment pin extending in substantially a tangential direction relative to the base of the locating groove in which instance the attachment pin is preferably of tubular shape with a slot extending longitudinally along the length thereof to render it diametrically resiliently deformable (this type of pin sometimes being referred to as a Seloc pin) or, for the retaining means to be a spring clip cooperating with the locating groove and a groove in the inner surface of the mounting sleeve.

The invention also provides, as independent items of commerce, cutter bits and mounting sleeves that are particularly configured to be used together in a manner envisaged in the definition given above.

In order that the above and other features of the invention may be more fully understood different embodiments thereof will now be described with reference to the accompanying drawings.
BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 is an elevation of one embodiment of cutter bit and mounting sleeve according to the invention;

Figure 2 is the same as Figure 1 with the mounting sleeve shown in section;

Figure 3 is a plan view of the assembly illustrated in Figure 1;

Figure 4 is a cross-section taken along line IV - IV in Figure 3;

Figure 5 is an elevation of a cutter bit showing a variation in the position of the locating groove;

Figure 6 is an elevation similar to Figure 5 but showing a cutter bit having a substantially longer reach and a different position of the locating groove;

Figure 7 is a view similar to Figure 2 of a somewhat different embodiment of the invention;

Figure 8 is a view similar to Figure 7 of an embodiment of the invention utilising a spring clip as the retaining means;

Figures 9, 10 and 11 illustrate three different forms of spring clip that can be used in the embodiment of the invention illustrated in Figure 8;
Figure 12 is a view similar to Figure 8 but showing an arrangement in which two spring clips are used to retain the cutter bit captive relative to the mounting sleeve;

Figure 13 is a view similar to Figure 7 but showing an embodiment of the invention in which a cutter bit has a single cutting tip and a more conventional tail; and,

Figure 14 is a similar partly sectioned elevation showing a typical prior art cutter bit and mounting sleeve.

DETAILED DESCRIPTION WITH REFERENCE TO THE DRAWINGS

Referring firstly to Figures 1 to 4 of the drawings, there is illustrated a first embodiment of the invention in which a reversible cutter bit (1) is operatively received in a cooperating mounting sleeve (2) configured to be held in a mining machine, in well-known manner. Indeed, the outer configuration of the sleeve will generally be tailored for the sleeve to be compatible with one of a wide range of different proprietary mining machines. As a result, different mounting sleeves may need to be made according to the particular type of mining machine on which it is to be used. On the other hand, the cutter bits of the invention may be made more universal and, in particular, simply varied only according to the required reach (indicated by the letter "A" in Figures 1 and 2) and the service to be performed, rather than the type of mining machine on which it is to be used.

The cutter bit (1) is of basically right circular cylindrical shape with a central outwardly directed locating flange (3) having annular first and second abutment faces (4a, 4b) in planes at right angles to the axis of the cutter bit. On each side of the locating flange is an enlarged diameter zone of cutter bit body in which there is respectively formed a first and second circumferentially extending locating groove (5a, 5b). The locating grooves are located
symmetrically about the centre of the length of the cutter bit and are, in each case, spaced from the associated abutment face (4a, 4b) by a distance that is only sufficient to provide a relatively narrow ridge (6a, 6b) between the nearer edge of the groove and the associated abutment face.

Simply by way of example, in an instance in which the reach of the cutter bit is about 80 millimetres the width of the ridge may be about 2 to 4 millimetres thus representing about 2 to 5% of the reach of the cutter bit. The other edge of each locating groove is defined by a similar ridge (7a, 7b).

The cross-sectional shape of the grooves is, in this instance, generally arcuate and may be semicircular although this shape may have a significant bearing on the freedom with which the cutter bit can rotate in use relative to the mounting sleeve. The width of the grooves is, in this embodiment of the invention, substantially greater than in the case of prior art locating pins and grooves. In this particular embodiment of the invention the groove is dimensioned to accommodate approximately one half of the diameter of a cooperator tubular pin (8) that is more fully described below and that has, in the case of the specific example given above, a diameter of about 10 millimetres that represents 12.5% of the reach of the cutter bit.

Also, the enlarged diameter zone of the cutter body, and the depth of the grooves, are selected so that the diameter of the cutter bit through the bottom of the groove is no smaller than the diameter of the balance of the cutter bit body, that is indicated by numeral (9a, 9b) and extends between the enlarged portion and tapering end portion (10a, 10b) that carries the actual hard wearing tip (11a, 11b).

It will be understood that in the above as well as the following description of the various embodiments of the invention, and wherever the cutter bit is reversible, like first and second parts of the cutter bit will be referred to using the same reference numeral with the postscript "a" applying to the first part
that is functional with the cutter bit in a first operating orientation and the
postscript "b" applying in the case of the equivalent second part that is
functional with the cutter bit in the second (reversed and not "as illustrated")
operative orientation.

Turning now to the mounting sleeve, it has an outer surface and terminal
flange (12) at the end receiving the cutter bit that are configured, as indicated
above, for a particular type of mining machine. Whatever the shape, at the
appropriate axial position, the sleeve is provided with a transverse hole (13)
that extends tangentially relative to the circular configuration of the sleeve
and cutter bit and is positioned so that the pin (8) substantially contacts the
base of the associated groove when the pin is in position and the abutment
face of the flange engages the end of the sleeve.

The pin is, in this instance, not of a conventional type but is made to the
configuration of a tubular pin made of spring steel with a slot (14) extending
longitudinally along the length thereof so that the pin is radially resilient.
Such a pin can be introduced into the hole whilst simultaneously causing it to
contract radially somewhat and, to facilitate this, the entrances to the hole
(13) can be provided with lead-in tapers.

The bore through the sleeve has a first right circular cylindrical section (15)
that accommodates, and radially locates, the peripheries of the two spaced
ridges defining the edges to the associated groove and the outer surfaces of
which define said first surface area being that of the enlarged diameter zone
of the cutter bit body.

The bore also has a second right circular cylindrical section (16) that
accommodates and radially locates a part of the right circular cylindrical body
(9b) of the cutter bit that serves, for the time being, as the tail and provides
said second surface area. Between these two sections (15, 16) of the bore is
a section (17) along which the outer surface of the cutter bit and the inner surface of the bore are spaced apart.

It has been found that this particular configuration enables a reversible cutter bit constructed as described, to be employed effectively and to be easily reversible, as and when necessary, in order to present the second of the hard wearing tips to the working face.

The exact position of the grooves could be changed reasonably extensively within the parameters defined above, and thus, for example, as illustrated in Figure 5, the grooves could be spaced somewhat further from the associated abutment face. In this case, with an 80 millimetre reach, as indicated by numeral (20), the adjacent edge (21) of the groove (22) is spaced from the associated abutment face (23) by about 8 millimetres which represents 10 percent of the reach.

In the variation of the invention illustrated in Figure 6, there is illustrated a similar bit having a substantially longer reach, as indicated by numeral (30), of about 100 millimetres. In this case the distance from the adjacent edge (31) to the associated abutment face (32) is about 15 millimetres which represents 15 percent of the reach.

Figure 7 illustrates a variation in which the mounting sleeve is somewhat different and the cutter bit (40) has a tapered section (41) communicating between the enlarged diameter region (42) containing the grooves (43) and a right circular cylindrical section (44) that terminates in a tapering end portion (45) and hard wearing tip (46). In this case the bore in the sleeve (47) provides a space (48) over substantially the entire length of the tapering section (41) received within the bore.

Figure 8 illustrates a variation similar to that of Figure 7 wherein the groove (50) is substantially narrower and adapted to cooperate with a retainer in the
form of a more conventional circlip type of generally circumferentially extending spring clip (51). Simply by way of example, in the instance that the reach is about 80 millimetres, the distance between the abutment face and the edge of the groove is about 8 millimetres thus representing about 10 percent of the reach. In this instance, the groove (52) in the mounting sleeve (53) is sufficiently deep to accommodate substantially the entire diameter of the spring clip whilst the cutter bit is installed and removed in substantially conventional manner simply by forcing it in or out of the mounting sleeve. It has been found that, at least in certain circumstances, improved rotation of the cutter bit is achieved.

It is preferred, in this variation of the invention, to use a circular cross-sectioned spring clip that may assume the form of a circular ring having a large gap (54), as illustrated in Figure 9; a smaller gap (55), as illustrated in Figure 10; and the circular ring may have two diametrically opposite straight sections (56), as illustrated in Figure 11. The width of the groove could typically be about 3.5 millimetres for cooperation with a 3 millimetre, or even made 2.5 millimetre diameter spring steel clip. This arrangement is different from the conventional situation of which applicant is aware in which a generally rectangular cross-sectioned spring clip would be used.

Figure 12 illustrates a variation of the latter embodiment of the invention in which to axially spaced locating grooves (57) are provided for cooperation with a pair of spring clips (58) retain the name correspondingly axially spaced pair of grooves (59) in the mounting sleeve. The selection of whether one or two locating grooves should be employed will depend largely on design considerations. It is to be noted that the grooves (59) in the case of the embodiment illustrated in Figure 12 are shown as being of rectangular cross-section and this is simply in order to facilitate manufacture rather than for any particular technical effect to be achieved.
Finally, Figure 13 illustrates the application of the principles of the invention to a more conventional single cutter bit (60) having a right circular cylindrical tail (61). In this case a tubular pin (62) is shown as being employed to retain the tail in position in the bore of the mounting sleeve (63). However, more importantly, in this case the diameter of the central region of the tail is reduced to provide a space (64) between two end regions (65, 66) of the tail that serve to locate the tail radially within the bore in the general manner described above. This arrangement is intended to substantially enhance the rotation of the cutter bit, in use, in the manner described above. Once more, one or two spring retaining clips could be employed instead of the tubular pin.

Numerous other variations may be made to the invention without departing from the scope hereof.
CLAIMS:

1. A mining machine cutter bit (1, 40, 60) of generally circular cylindrical shape with a locating flange (3) intermediate its ends and presenting a first annular abutment face (4a, 23, 32) on the side thereof remote from an associated first hard wearing tip (11a, 46) the use of which is associated with the use of said first abutment face, a circumferentially extending first locating groove (5a, 22, 43, 57) in the surface of the cutter bit on the side of the locating flange remote from the first hard wearing tip, and a mounting tail (9b, 61) extending away from the locating flange on the side thereof opposite the first hard wearing tip, the tail being configured to be received in a bore (16, 48, 64) in a cooperant mounting sleeve (2, 47, 53, 63), in use, the cutter bit being characterized in that the locating groove is positioned with its nearer edge axially at a distance from said first abutment face that is less than 25 percent of the reach of the cutter bit.

2. A mining machine cutter bit as claimed in claim 1 in which said inner edge of the locating groove is positioned at a distance that is less than or about 15 percent of the reach of the cutter bit.

3. A mining machine cutter bit as claimed in claim 2 in which said inner edge of the locating groove is positioned at a distance that is less than or about 10 percent of the reach of the cutter bit.

4. A mining machine cutter bit as claimed in any one of the preceding claims in which the locating groove is adapted for cooperation with a tangentially extending attachment pin (8, 62) and has a width that is from about 5 to about 15 percent of the reach of the cutter bit.

5. A mining machine cutter bit as claimed in claim 4 in which the locating groove has a width of about 10 percent of the reach of the cutter bit.
6. A mining machine cutter bit as claimed in any one of claims 1 to 3 in which the locating groove (52, 59) is adapted for cooperation with a generally circumferentially extending spring clip (51, 58) and has a width that is suitable therefor.

7. A mining machine cutter bit as claimed in any one of the preceding claims in which the locating groove is formed in a central portion of the cutter bit having an enlarged diameter selected such that the diameter of the cutter bit at the bottom of the groove is no less than the diameter of the cutter bit extending from said central portion to the hard wearing tip.

8. A mining machine cutter bit as claimed in any one of the preceding claims in which the cutter bit is reversible and has, in axial mirror image relative to the locating flange, a second hard wearing tip (11b) at the opposite end of the cutter bit, a second annular abutment face (4b) on the opposite side of the locating flange and a second locating groove (5b) on the side of the locating flange opposite the first locating groove.

9. A mining machine cutter bit and mounting sleeve therefor in which the mounting sleeve has a bore for receiving the mounting tail of a cutter bit as claimed in any one of the preceding claims and retaining means including a locating groove in the outer surface of the cutter bit for operatively retaining the cutter bit within the mounting sleeve in relatively rotatable manner, the cutter bit and mounting sleeve being characterized in that the mounting tail of the cutter bit, or the inner surface of the bore of the mounting sleeve, or both, are configured such that the cutter bit is located in the radial direction in the bore by a first surface area (15) of the cutter bit adjacent the groove that cooperates with an adjacent surface area of the bore and a second surface area of the cutter bit towards the extremity of the mounting tail.
that cooperates with an adjacent surface area (16) of the bore, the arrangement being such that a space (17, 48, 64) is provided between the adjacent surfaces of the cutter bit and bore between said first surface area and said second surface area.

10. A mining machine cutter bit and mounting sleeve as claimed in claim 9 in which the retaining means for operatively retaining the cutter bit within the mounting sleeve in relatively rotatable manner is a hole in the mounting sleeve for receiving an attachment pin (8, 2) extending in substantially a tangential direction relative to the base of the locating groove.

11. A mining machine cutter bit and mounting sleeve as claimed in claim 10 in which the attachment pin is of tubular shape with a slot (13) extending longitudinally along the length thereof to render it diametrically resiliently deformable.

12. A mining machine cutter bit and mounting sleeve as claimed in claim 9 in which the retaining means for operatively retaining the cutter bit within the mounting sleeve in relatively rotatable manner is a spring clip cooperating with the locating groove and a groove in the inner surface of the mounting sleeve.

13. A mining machine cutter bit and mounting sleeve as claimed in claim 12 in which there are two axially spaced locating grooves; cooperant grooves in the mounting sleeve, and spring clips for holding the cutter bit captive relative to the mounting sleeve.

14. A mining machine mounting sleeve particularly adapted for use in combination with a mining machine cutter bit to form a mining machine cutter bit and mounting sleeve as claimed in any one of claims 9 to 13.
### A. CLASSIFICATION OF SUBJECT MATTER

**INV. E21C35/19**

According to International Patent Classification (IPC) or to both national classification and IPC

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**E21C**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical search terms used)

**EPO-Internal**

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>X</td>
<td>US 3 519 309 A (ENGLE EDGAR W ET AL) 7 July 1970 (1970-07-07) column 4, lines 53-68</td>
<td>1-5, 6-8, 14, 7, 12, 13</td>
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<td>Y</td>
<td>GB 2 029 761 A (ELFGEN APEX) 26 March 1980 (1980-03-26) figure 1</td>
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</tr>
<tr>
<td>Y</td>
<td>GB 1 117 112 A (FREDERICK EVETT; SARAH EVETT) 12 June 1968 (1968-06-12) page 2, lines 94-106 page 2, line 121 - page 3, line 10</td>
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Further documents are listed in the continuation of Box C

See patent family annex

**X** document defining the general state of the art which is not considered to be of particular relevance

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**Date of the actual completion of the international search**

28 October 2009

**Date of mailing of the international search report**

04/11/2009

Name and mailing address of the ISA/

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**Authorized officer**

Garrido García, M
**INTERNATIONAL SEARCH REPORT**

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<tr>
<td>A</td>
<td>US 4 084 856 A (EMMERICH KENNETH C ET AL)</td>
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<td>18 April 1978 (1978-04-18)</td>
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## INTERNATIONAL SEARCH REPORT

### Information on patent family members

**International application No**

PCT/IB2009/000469

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<tr>
<td>US 3519309</td>
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<tr>
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<td>28-08-2008</td>
<td>CN 101255796 A</td>
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<td>GB 1117112</td>
<td>12-06-1968</td>
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<td>US 4084856</td>
<td>18-04-1978</td>
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