(12) UK Patent Application (19) GB (11) 2 273 142 (13) A

(43) Date of A Publication 08.06.1994

(21) Application No 9225544.7

(22) Date of Filing 07.12.1992

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(51) INT CL[5]
F16L 55/165 , B08B 9/02 , F16L 55/18

(52) UK CL (Edition M)
F2P PG2 PL2 PTBL
F2N N1A6A

(56) Documents Cited

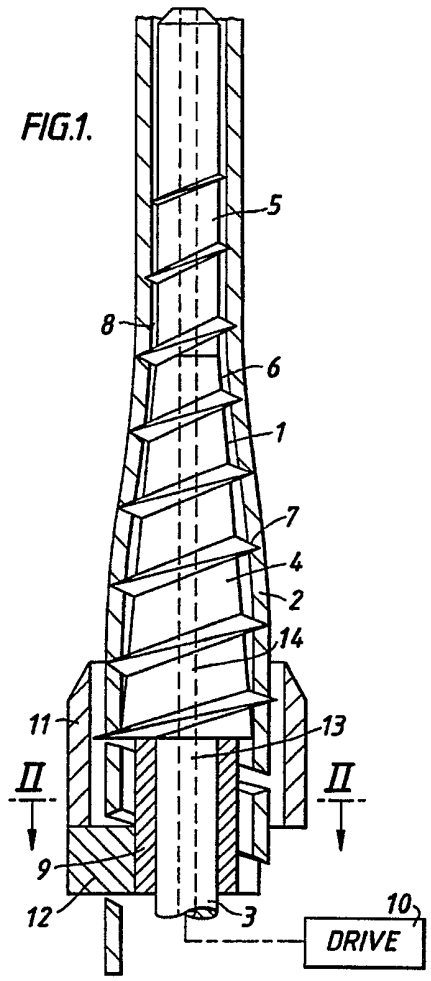
EP 0159573 A1	**US 5098225 A**	**US 5078546 A**
US 5076731 A	**US 4925344 A**	**US 3181302 A**

(58) Field of Search
UK CL (Edition K) **F2P PG2 PL2 PL9**
INT CL[5] **F16L 1/028 55/165**

(54) Renewing underground pipes

(57) A method for removing a ground embedded piped 2 from the passageway it forms in the ground comprises cutting the wall of the pipe 2 outwardly from its internal surface while the pipe is still in the ground and withdrawing the cut pipe 2 along the passageway. The pipe 2 may be cut helically. A new pipe may be fed in at the end the cut pipe is removed. The cutter 1 may pull a new pipe behind it and may just remove deposit from a pipe.

FIG.1.



GB 2 273 142 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG.1.

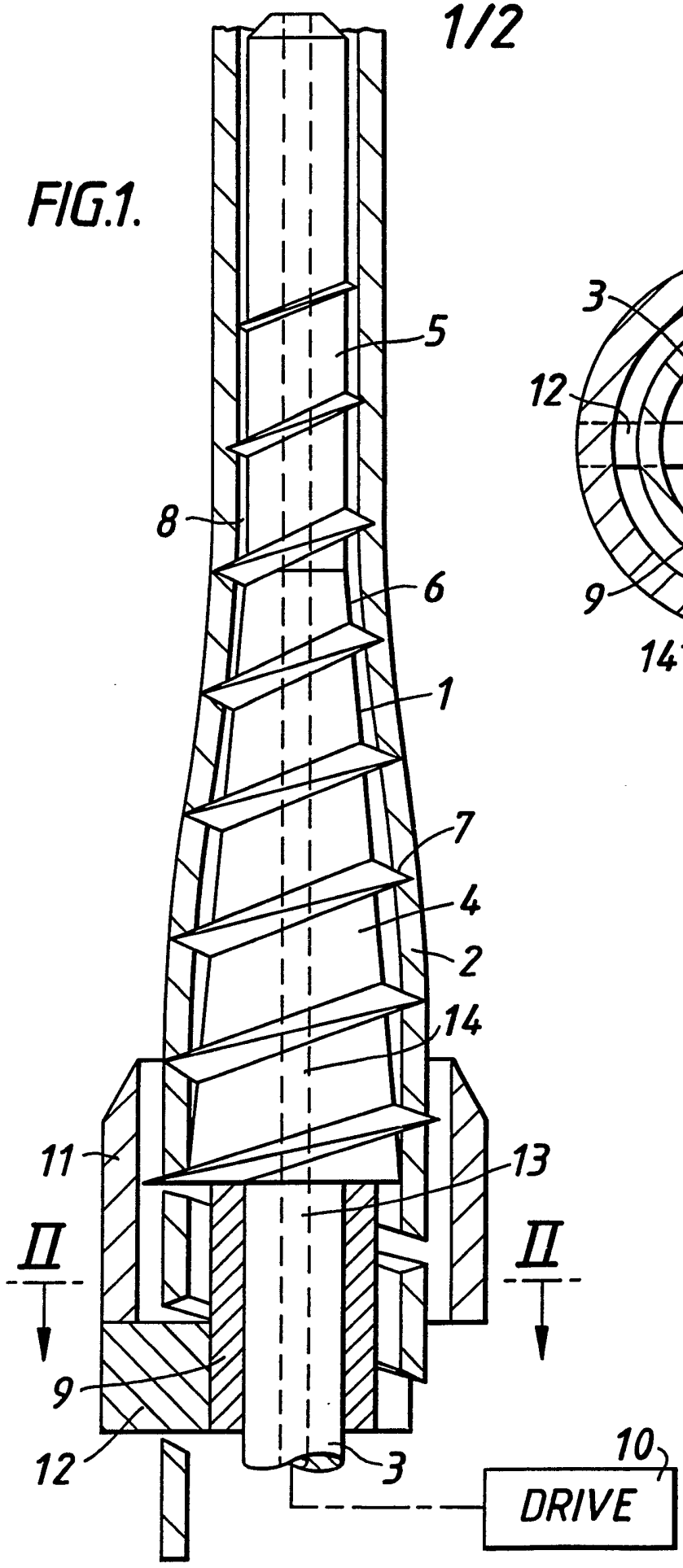


FIG.2.

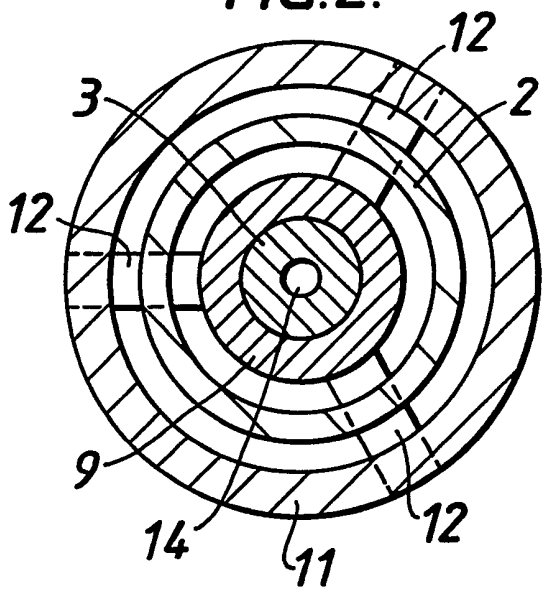
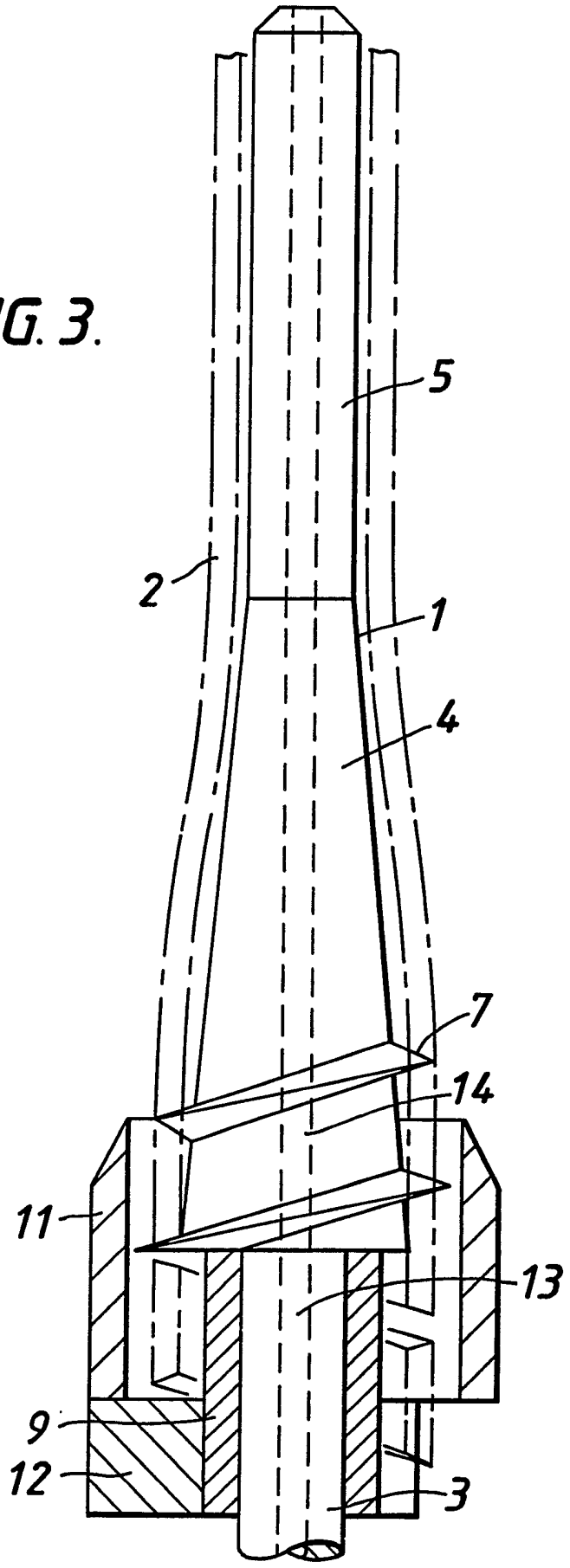


FIG. 3.



TITLE: Removal and Replacement of Ground Embedded Pipes

This invention relates to the removal and replacement of ground embedded pipes.

Service pipes carry gas and water from a feeder main to premises such as a domestic dwelling, commercial and industrial premises.

Such pipes are over most if not all of their length laid underground. Those which were laid several decades ago are in many cases becoming partially blocked with deposits and scale or are beginning to leak due to corrosion especially if they are of lead or steel. Consequently they are increasingly being replaced by pipes which are usually of polyethylene. In addition, due to the danger of their contaminating drinking water, there is a general policy of removing lead water service pipes.

A common technique of replacement involves digging up the existing service pipe to remove it and then laying a new one in its place. This is extremely labour intensive and is therefore expensive.

Another method involves inserting a replacement pipe into the existing pipe so that the replacement pipe takes over from the existing pipe. While this obviates the need to dig up the entire existing service pipe, necessarily the internal bore

diameter of the replacement pipe is smaller than that of the existing pipe so that the rate of flow of fluid or gas through the replacement pipe is less than that of the existing pipe.

It is therefore an object of the present invention to permit removal of the existing service pipe without digging it up and to permit the replacement of such pipes without digging the pipe up or providing a replacement with a reduced internal bore diameter.

According to one aspect of the present invention, we provide a method for removing a ground embedded pipe from the passageway it forms in the ground, the method comprising cutting the wall of the pipe while the pipe is still in the ground and withdrawing the cut pipe along the passageway.

Preferably the pipe is cut outwardly from its internal surface.

Suitably the pipe is cut helically.

Conveniently during the cutting process the pipe is expanded outwardly radially.

According to a second aspect of the present invention we provide a method for replacing an existing ground embedded pipe with a replacement pipe, the method comprising withdrawing the existing pipe along and out of one end of the

passageway occupied by the existing pipe and moving the replacement pipe into the passageway by way of that one end.

Preferably the replacement pipe is moved into the passageway after the existing pipe has been withdrawn therefrom.

According to a third aspect of the present invention we provide a method for replacing an existing ground embedded pipe with a replacement pipe, the method comprising cutting the wall of the pipe, withdrawing the cut pipe along the passageway it once occupied and moving the replacement pipe into the passageway.

Preferably the pipe is cut outwardly from its internal surface.

Suitably during the cutting process the pipe is expanded radially outwardly.

Conveniently the pipe is cut helically and the replacement pipe may be moved into the passageway after the existing pipe has been withdrawn therefrom.

Preferably the pipe is withdrawn from one end of the passageway and the replacement pipe is moved into the passageway by way of that end.

The existing pipe may be of lead or a lead alloy, ductile

steel, copper, pvc or polyethylene.

According to a fourth aspect of the present invention we provide apparatus for removing a ground embedded pipe from a passageway occupied by the pipe, the apparatus comprising a shank for insertion into one end of the pipe and means to engage the shank to cause it to rotate about its longitudinal axis, the shank having a surface at least part of which in use engages the internal surface of the pipe in such a manner that on rotation of the pipe is cut into at least one portion.

Preferably means is provided for driving the shank along the existing pipe from one end to the other end. Alternatively the shank may merely be rotated in use and pull itself through as it cuts the pipe.

Preferably the surface of the shank is formed with at least one continuous helical thread adapted to engage the internal surface of the pipe and on rotation of the shank cut the pipe wall outwardly into a strip or strips of helical form.

Suitably a sleeve is provided to surround the rear end of the shank.

Conveniently the shank has an axial bore extending therealong for connection to a source of compressed air.

Embodiments of the invention will now be particularly

described with reference to the drawings in which :-

Figure 1 is a longitudinal view partly in section of one form of an apparatus for removing an existing ground embedded pipe, the apparatus shown in use removing such a pipe,

Figure 2 is a section along lines II-II of Figure 1 and

Figure 3 is another form of the apparatus shown in Figure 1.

Referring to Figures 1 and 2, the apparatus comprises an externally threaded shank 1 for insertion into one end of the existing ground embedded pipe 2 to be removed and means in the form of a drive shaft 3 engaging the rear end of the shank 1 to cause it to rotate about its longitudinal axis and if desired be driven forwardly.

The shank 1 has a rearward portion 4 which tapers conically forward to meet a forward portion 5 which is cylindrical in form. Projecting from the surface 6 of the shank 1 is a continuous helical cutting or slitting thread 7 for engaging the internal surface 8 of the pipe 2. The thread 7 may be machined out from the shank 1. The shank can be used to ream out any corrosion deposits tending to narrow the bore of the pipe so as to widen the pipe bore. Subsequently a liner pipe can be moved into the widened bore of the pipe.

The shaft 3 is mounted within a bearing collar 9 and is

rotated by means of a motor (not shown). The shaft 3 can also be driven forwardly by a DRIVE 10 which can be any convenient drive motor but it is not essential to provide a forward drive.

A sleeve or shield 11 is provided to guard or protect the lowermost end of the shank 1 and in effect trap any pipe strip produced by the thread portion adjoining the sleeve 11. The sleeve 11 is mounted on three stays 12 extending radially outwardly from the collar 9 and arranged at 120° to each other.

The drive shaft 3 and the shank 1 are each provided with axially extending aligned bores 13 and 14, bore 14 being connected a source of compressed air.

Figure 3 shows a version of the apparatus similar to that in Figures 1 and 2 except that the thread 7 comprises two turns located at the rear end of shank portion 4 as we have found that this is normally sufficient to form a helical strip.

In use of the apparatus a launch pit is dug at one end of the pipe and a receiving pit is dug at the other end of the pipe. The shank 1 is then inserted into the pipe 2 at the launch pit end to the extent necessary for a leading thread portion to engage the internal surface 8 of the pipe 2 to be removed. The shank 1 is then rotated in an anti-clockwise direction as viewed in Figure 2 and is driven forwardly if required. In

Figure 1 the internal wall is engaged by all the turns of the thread and in Figure 3 by two turns. By continued rotation and with or without forward drive of the shank 1 the pipe 2 is cut into the form of a helical strip which is trapped between the sleeve 11 and surface 4 of the shank 1 and discharged from the back end of the apparatus where it can be removed. During the operation, compressed air may be blown up the bore 14 so that on emerging from the tip 15 of the shank 1 is blows any dirt away which may have fallen in from the passageway occupied by the pipe to block the passageway.

Where the external diameter of the shank is greater than the diameter of the passageway, the bore diameter of the passageway will be greater after the existing pipe has been removed. The existing pipe can therefore be replaced by a replacement pipe of larger internal diameter than the existing pipe.

When the shank 1 has emerged into the receiving pit it may be uncoupled from the drive shaft 3 which may be withdrawn through the passageway left behind by removal of the pipe.

If the earth forming the passageway is capable of retaining the shape of the passageway a new replacement pipe may now be moved into the passageway by pushing the new pipe into a passageway or by winching it into the passageway.

However, if the earth forming the passageway is not capable of

retaining the shape of the passageway the apparatus can be modified to draw in behind the shank a replacement pipe while the existing pipe is being cut. In this case the apparatus would be modified for coupling to it the new pipe.

While only a single start thread has been shown and described the shank could be provided with two or more independent threads which in use would produce a corresponding number of helical strips.

The method is suitable for removing or replacing any existing ground embedded service pipe which is capable of being cut or slit. Thus service pipes consisting of lead of lead alloys, plastics materials e.g. pvc or polyethylene, ductile steel and copper can be removed or replaced using the method described.

It will be appreciated that the diameter of the replacement pipe can be smaller than, larger than or the same diameter as the external diameter of the existing pipe.

CLAIMS

1. A method for removing a ground embedded pipe from the passageway it forms in the ground, the method comprising cutting the wall of the pipe while the pipe is still in the ground and withdrawing the cut pipe along the passageway.

2. A method as claimed in claim 1 in which the pipe is cut outwardly from its internal surface.

3. A method as claimed in claim 1 or claim 2 in which during the cutting process the pipe is expanded radially outwardly.

4. A method as claimed in any of the preceding claims in which the pipe is cut helically.

5. A method for replacing an existing ground embedded pipe with a replacement pipe, the method comprising withdrawing the existing pipe along and out of one end of the passageway occupied by the existing pipe and moving the replacement pipe into the passageway by way of that one end.

6. A method as claimed in claim 5 in which the replacement pipe is moved into the passageway after the existing pipe has been withdrawn therefrom.

7. A method for replacing an existing ground embedded pipe with a replacement pipe, the method comprising cutting the

wall of the pipe, withdrawing the cut pipe from the passageway it once occupied and moving the replacement pipe into the passageway.

8. A method as claimed in claim 7 in which the pipe is cut outwardly from its internal surface.

9. A method as claimed in claim 7 or claim 8 in which during the cutting process the pipe is expanded radially outwardly.

10. A method as claimed in any of claims 7 to 10 in which the pipe is cut helically.

11. A method as claimed in any of claims 7 to 10 in which the replacement pipe is moved into the passageway after the existing pipe has been withdrawn therefrom.

12. A method as claimed in any of claims 7 to 11 in which the pipe is withdrawn from one end of the passageway and the replacement pipe is moved into the passageway by way of that end.

13. A method as claimed in any of the preceding claims in which the existing pipe is of lead or a lead alloy, a plastics material, ductile steel or copper.

14. Apparatus for removing a ground embedded pipe from a passageway occupied by the pipe, the apparatus comprising a

shank for insertion into one end of the pipe and means to engage the shank to cause it to rotate about its longitudinal axis, the shank having a surface at least part of which in use engages the internal surface of the pipe in such a manner that on rotation of the shank the pipe is cut into at least one portion.

15. Apparatus as claimed in claim 14 in which means is provided for driving the shank along the existing pipe from one end to the other end.

16. Apparatus as claimed in claim 14 or claim 15 in which the surface of the shank is formed with at least one continuous helical thread adapted to engage the internal surface of the pipe and on rotation of the shank cut the pipe wall outwardly into a strip of helical form.

17. Apparatus as claimed in any of claims 14 to 16 in which a sleeve is provided to surround the rear end of the shank.

18. Apparatus as claimed in any of claims 14 to 17 in which the shank has an axial bore extending therealong for connection to a source of compressed air.

19. A method substantially as hereinbefore described with reference to the drawings.

20. Apparatus substantially as hereinbefore described with

reference to any of the drawings.

Patents Act 1977
Examiner's report to the Comptroller under section 17 (The Search Report)

Application number

GB 9225544.7

Relevant Technical fields

(i) UK Cl (Edition L) F2P (PG2, PL2, PL9)

(ii) Int Cl (Edition 5) F16L 55/165; 1/028

Search Examiner

B J PROCTOR

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

18 JANUARY 1993

Documents considered relevant following a search in respect of claims 1-4, 7-20

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	US 5098225 (BROOKLYN UNION)	1-3,7-9
X	US 5078546 (CONSOLIDATED EDISON)	1-3,7-9
X	US 5076731 (DIGA DIE)	1-3,7-9
X	US 4925344 (PERES) eg Figure 3	1-4,7-11, 14-16
X	US 3181302 (LINDSAY)	1-3,7-9

		to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report) - 15 -

Application number

GB 9225544.7

Relevant Technical fields

(i) UK Cl (Edition L) F2P (PL2 PL9 PG2)

(ii) Int Cl (Edition 5) F16L

Search Examiner

T W RICHENS

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

20 MAY 1993

Documents considered relevant following a search in respect of claims 5, 6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	EP 0159573 A1 (WITTE) page 13 lines 18-25	5

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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