United States Patent [19]

Barber et al.

[11] **3,820,605**

[45] **June 28, 1974**

[54] **APPARATUS AND METHOD FOR THERMALLY INSULATING AN OIL WELL**

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[22] Filed: **Dec. 29, 1972**

[21] Appl. No.: **319,689**

Related U.S. Application Data

[63] Continuation of Ser. No. 115,240, Feb. 16, 1971, abandoned.

[52] **U.S. Cl.** **166/315,** 166/57, 166/DIG. 1

[51] **Int. Cl.** **E21b 43/00**

[58] **Field of Search** .... 166/57, 157, 227, 242, 166/302, 303, 304, 315, DIG. 1; 138/110, 149; 285/47

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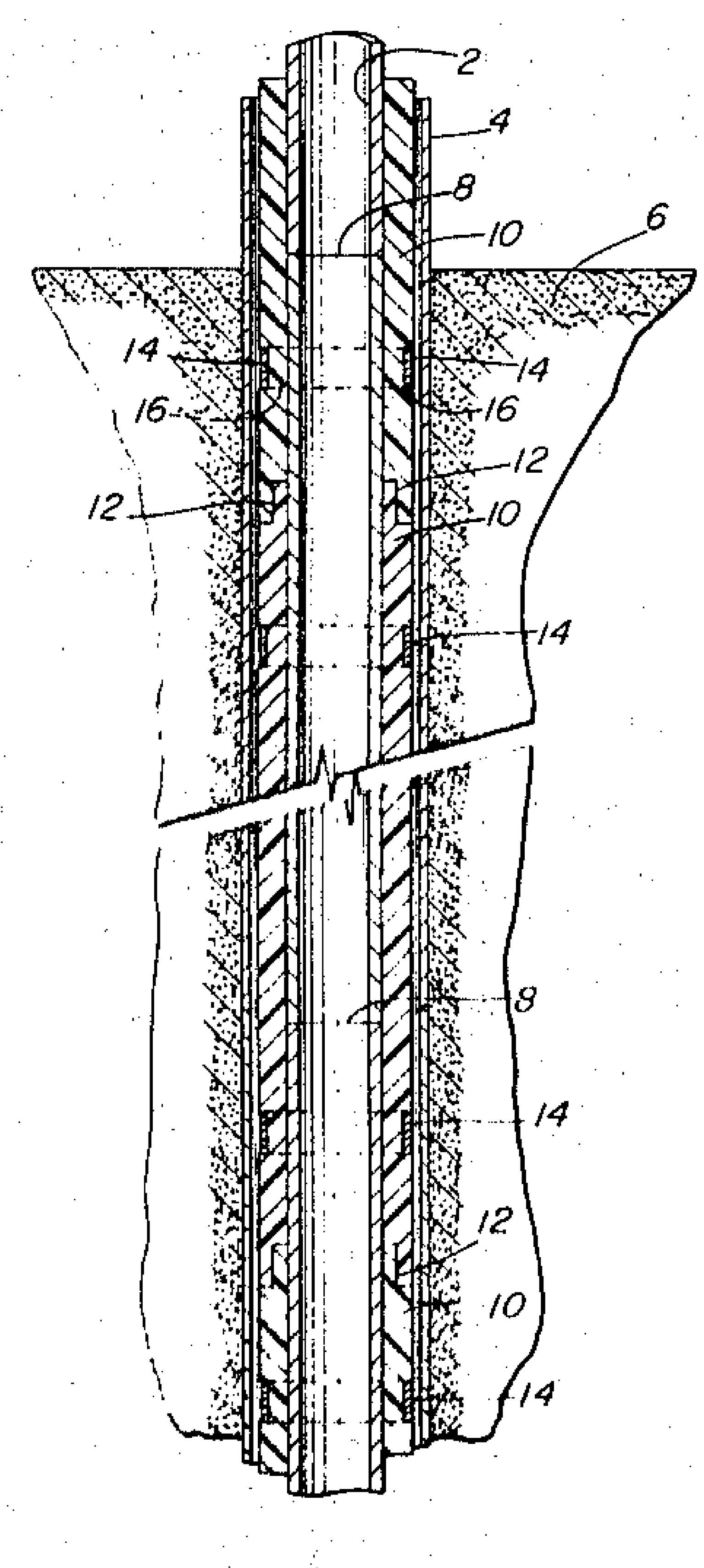
[57] **ABSTRACT**

An oil well is thermally insulated to prevent exchange of heat between the flowing oil and the strata surrounding the well. Sections of rigid polymer foam (preferably polyurethane or polyisocyanurate foam) are assembled in sealed relationship on the outside of the pipe through which the oil and like liquids flow, thereby forming a continuous barrier of insulation between said pipe and the well casing. The insulation is installed on the pipe as the latter is being assembled in accordance with normal practice, before being lowered into the well casing. The foam insulating sections preferably have a density of 2 pcf to about 40 pcf and have an outer surface and configuration which permits sliding engagement of the insulated pipe with the inner surface of the well casing.

The insulation of the oil well in the above manner permits the satisfactory operation of oil-producing, or oil and gas producing, or gas producing wells drilled through permafrost and like frozen strata which would otherwise be subject to excessive thawing and irreversible structural change due to contact with heat transmitted from the oil or other fluids being pumped through the well. The insulation is also effective in overcoming problems encountered in oil and like wells drilled in the ocean floor. The oil being passed in such wells through the top section in contact with the ocean is frequently cooled to the point at which serious viscosity increases occur with resulting flow problems. This invention obviates these difficulties.

12 Claims, 5 Drawing Figures



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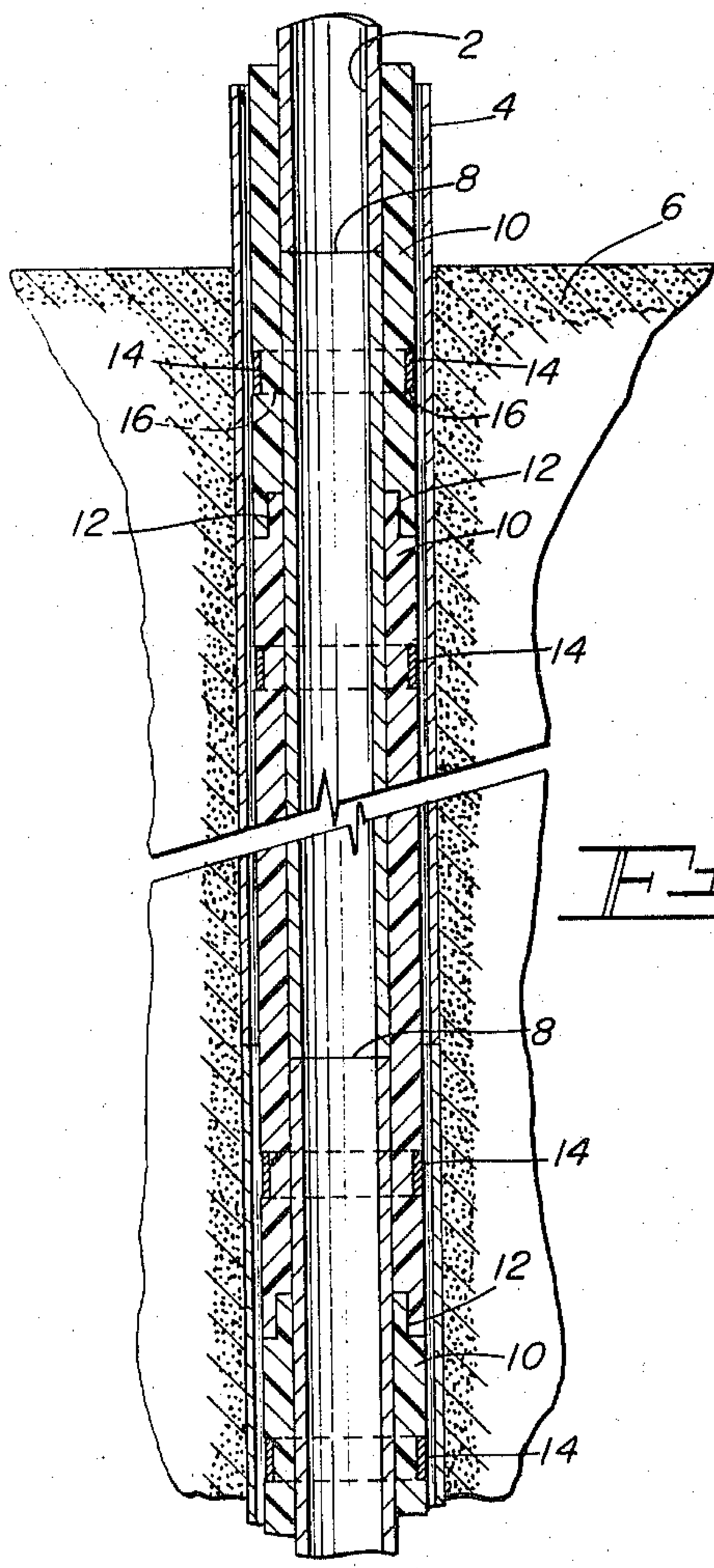

Fig. 1

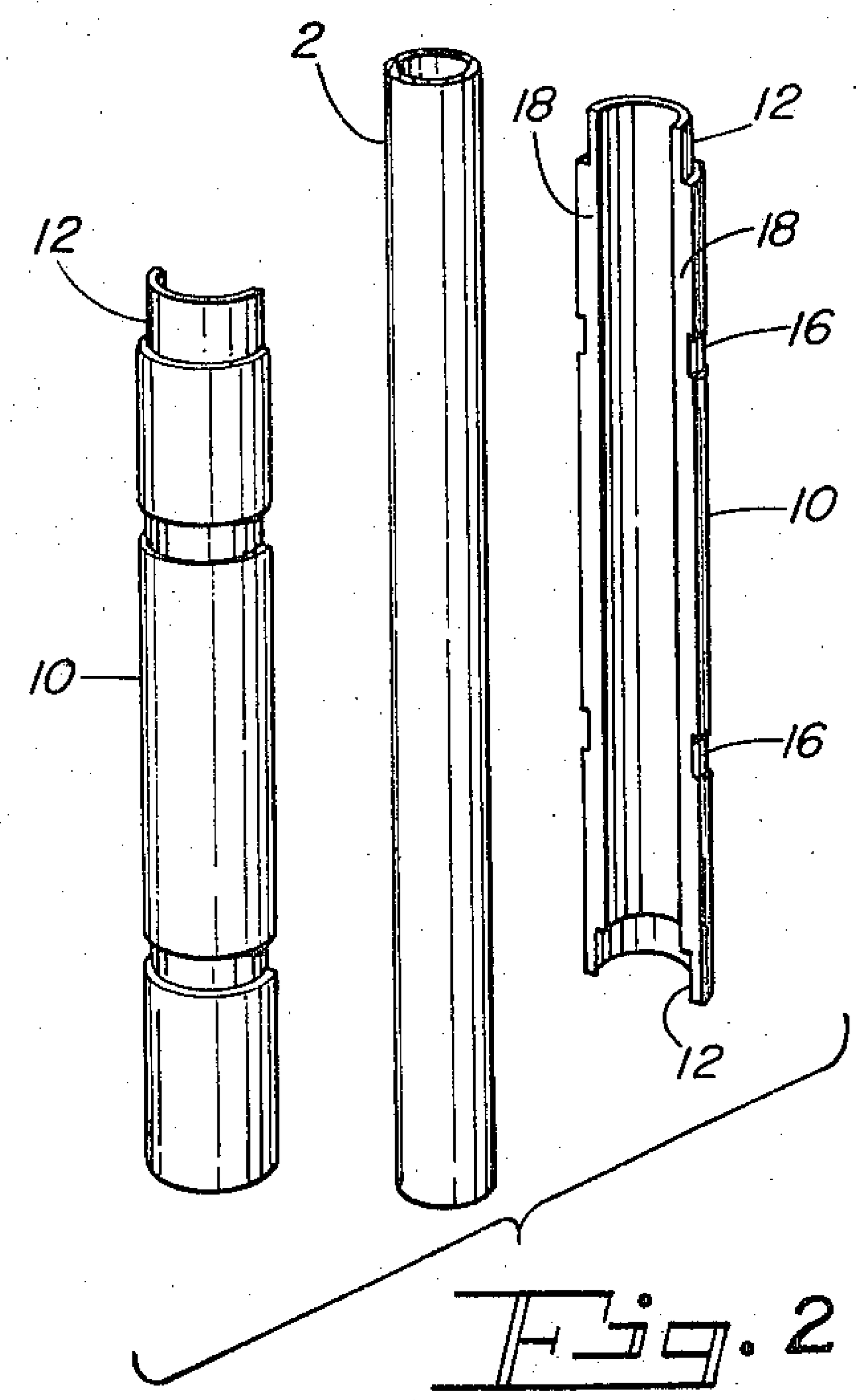

Fig. 2

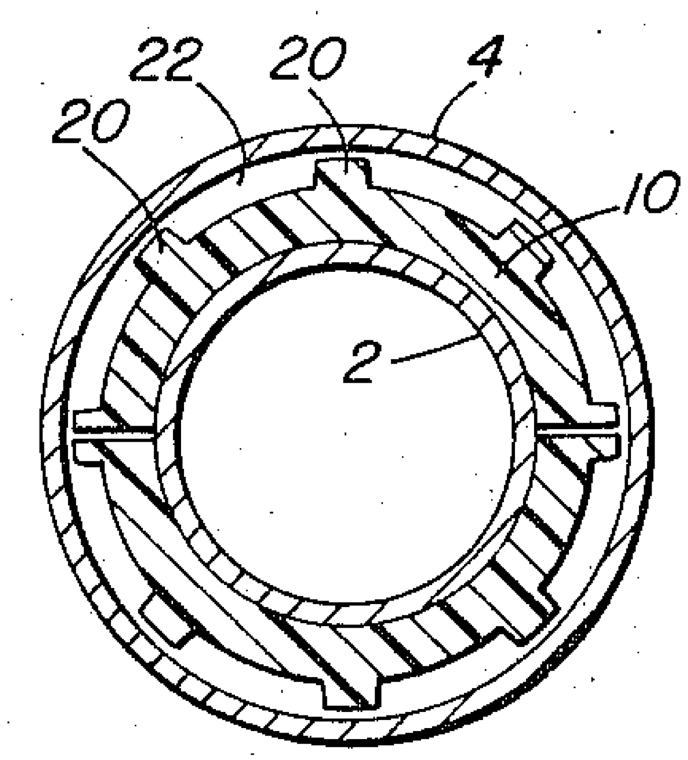

Fig. 3

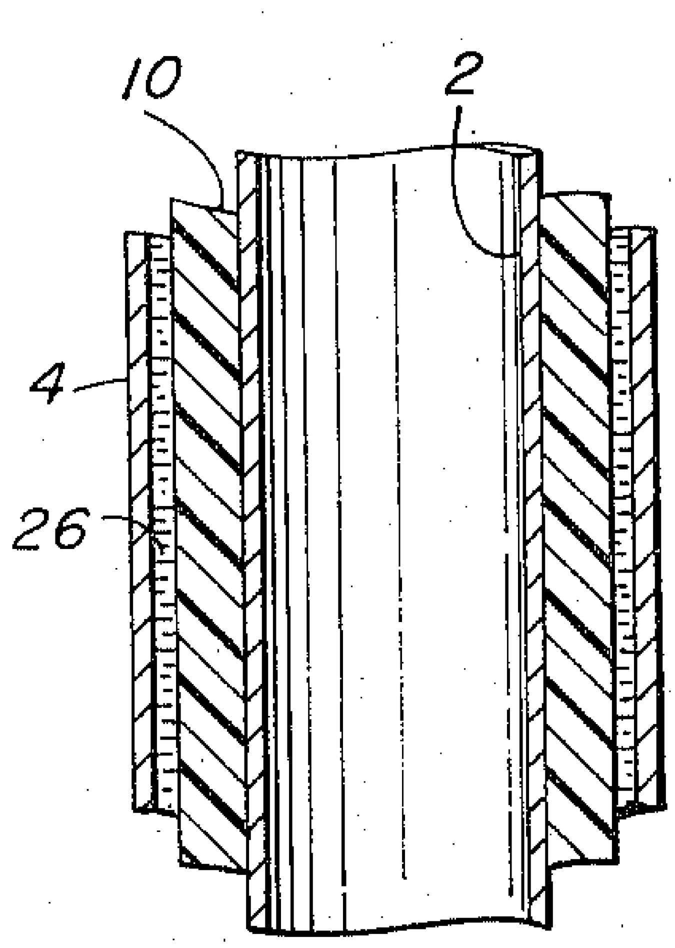

Fig. 5

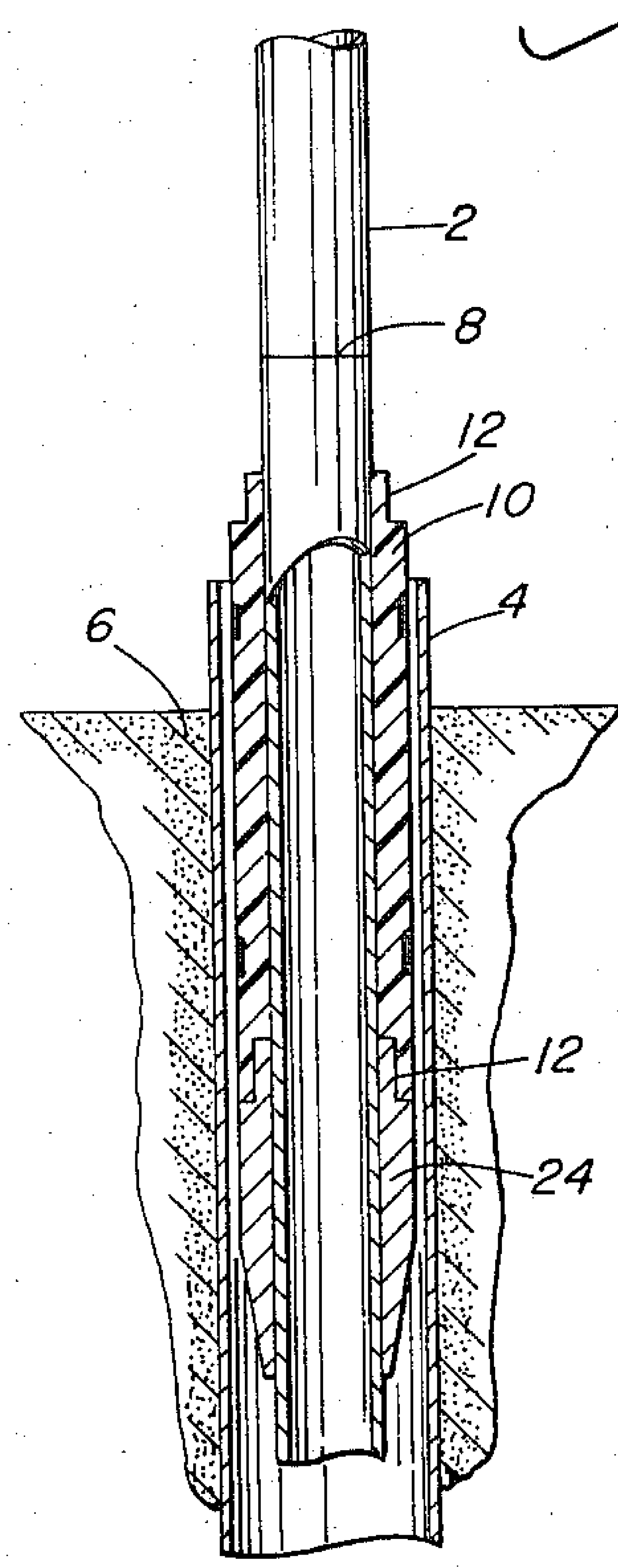

Fig. 4

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APPARATUS AND METHOD FOR THERMALLY INSULATING AN OIL WELL

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of our copending application Ser. No. 115,240 filed Feb. 16, 1971, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the thermal insulation of conduits and is more particularly concerned with the thermal insulation of oil, oil and gas, and gas producing wells and the like.

2. Description of the Prior Art

The recent discovery of oil in the northern portion of Alaska has posed a problem not previously encountered in the assembly and operation of oil wells. In order to recover the oil from the Alaskan field, it is necessary to drill the well through permafrost which can extend to depths of two thousand feet or more. The oil which is recovered from such wells is at a temperature substantially above freezing point as it passes upwards through the well. Conduction of this heat through the outer casing of the well and into the permafrost would cause gradual thawing of the latter with ultimate degradation of the strata in which the well is installed. Similar problems arise when the well is being used to recover a mixture of oil and natural gas or natural gas alone, and whenever water or other heated fluids are to be passed down the well during construction or operation of the well in accordance with procedures well-known in the art. Accordingly, it is necessary to provide insulation means to prevent transmission of thermal energy from the well to the surrounding strata.

Various methods of thermally insulating oil wells for other purposes have been described in the literature; none of these prior methods represents a satisfactory answer to the above problem. Thus, prior art methods of insulation have been concerned with thermal insulation of conduits which are employed to transport heat transfer fluids such as steam, hot water, refrigerants and the like, down into the well; see, for example, U.S. Pat. Nos. 3,213,889; 3,397,745; 3,444,279; and 3,451,479. In none of these prior art methods is the insulation designed to prevent heat transfer from the oil or other fluids to the exterior of the well casing; nor is it important in any of said prior art methods to ensure that the insulation should withstand exposure to relatively high levels of hydrostatic pressure.

The latter consideration is of prime importance in the case of oil wells drilled through permafrost. Any leakage of fluid through the insulation to the exterior well casing could result in transfer of heat to the permafrost with consequent thawing. If the leak remained undetected for any length of time, the deterioration of the surrounding strata due to thawing could cause irreparable damage to the well.

The present invention serves to provide a means of insulating oil and like wells which have been drilled through permafrost and like strata subject to deterioration when exposed to heat. The mode of insulation not only meets the requirement of preventing the undesirable exchange of heat between the well casing and the surrounding strata, but also meets the requirement of withstanding permeation of fluids therethrough and of being installed in a relatively simple and economical manner.

The mode of insulation discussed herein can also be applied to a related problem which exists in respect of wells drilled in the floor of the ocean. Oil and like fluids being passed through such wells are exposed to the cooling action of the ocean on that portion of the well immersed in the latter. Such cooling can cause highly undesirable effects. For example, in the case of oil, such cooling can cause increases in viscosity, and, in some cases, the deposition of solids in the oil, and thereby lead to obvious difficulties in maintaining reasonable production of oil from the well. The mode of insulation herein described can be applied to at least that portion of the well which is exposed to contact with the ocean. Other applications of the mode of insulation of this invention will be discussed hereafter

SUMMARY OF THE INVENTION

This invention comprises a thermally insulated oil well drilled through strata such that thermal exchange between the strata and the fluids passing through the well is deleterious. Said thermally insulated oil well comprises in combination:

a. a well casing;

b. a conduit disposed within the well casing through which fluid is passed;

c. a continuous layer of polymer foam insulation disposed between the inner surface of said well casing and the outer surface of said conduit and extending to a depth within said well casing below that at which thermal exchange between the fluid and the surrounding strata is deleterious;

d. said continuous layer of polymer foam comprising a series of rigid sections shaped to conform to the outer configuration of said conduit, each section being joined to its neighbors in sealing engagement therewith.

The invention also comprises a method of fabricating a thermally insulated oil well having the characteristics defined above.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial vertical cross-sectional schematic representation of an oil well insulated in accordance with the invention.

FIG. 2 is an exploded perspective representation of a section of the fluid conduit and insulating layer of the insulated oil well shown in FIG. 1.

FIG. 3 is a horizontal cross-section of an oil well insulated in accordance with the invention.

FIG. 4 is a vertical partial cross-sectional view of a stringer, with insulation attached, being lowered into a well casing in accordance with the invention.

FIG. 5 is a partial cross-sectional view of a preferred embodiment of an insulated conduit installed in a well casing in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

In assembling an insulated oil well installed in permafrost in accordance with the invention, the standard procedures employed in the art for drilling and assembling an oil well are followed up until the point at which the fluid conduit (or well string), or a series of such conduits generally arranged concentrically is being lowered into the well casing. Thus, the well is drilled through the permafrost to the oil bearing strata and a well casing is installed. The upper end of the well casing projects above the surface and is generally secured in the base of the well head assembly. The fluid conduit, or well string, is fabricated in situ from precut sections of pipe. The various embodiments of the invention shown and described below will, for the sake of simplicity, show only a single fluid conduit disposed in the well casing. It is to be understood that the invention can be practiced in the same manner as described herein when the fluid conduit comprises a plurality of conduits as is frequently the case with oil wells. Thus, generally speaking, a plurality of conduits is disposed within the well casing, said conduits being either in parallel relationship within a single outer conduit or more generally disposed concentrically one within another. In such an event the thermal insulation applied in accordance with the invention will be assembled on the outermost of the said conduits thus serving to prevent or reduce the amount of thermal energy passing from any of said fluid-carrying conduits to the outer well casing. It is to be clearly understood that all the above types of arrangement of fluid-carrying conduits are to be construed as falling within the scope of the present invention.

In assembling the said fluid carrying conduit, a first section is lowered into the well casing to a point at which its upper end still projects from the casing. A second section is held vertically above the first section and joined end to end therewith either by welding or using a threaded coupler or like means. These sections so joined are lowered into the well casing until the upper end of the joined sections is again almost level with the drill platform. The process is then repeated with another section of pipe and is continued until such time as the lower end of the conduit finally is located at any predetermined point in the well casing.

In assembling an insulated oil well in accordance with the invention, each section of the fluid carrying conduit is insulated on its outer surface after it has been joined to the preceding section and before it is lowered into the well casing. The insulation is applied in the form of elongated rigid pieces which, when fitted together, form a continuous layer of polymer foam surrounding the outer surface of the fluid carrying conduit.

Generally, the fluid carrying conduit has a circular cross-section and accordingly the polymer foam is applied in sections which, when assembled have a cylindrical configuration on the inner surface, said configuration closely approximating that of the outer surface of the fluid carrying conduit. The individual sections of insulation preferably take the form of sections of a cylinder. Most preferably each section is semi-cylindrical in configuration, i.e., two such sections when brought together form a completed cylinder of foam insulation. However, the individual sections can be smaller segments of a complete cylinder such that three, four or more such sections are required to be brought together to make a complete cylinder.

The longitudinal edges of the individual section of foam insulation are of a configuration such that when the required number of sections are brought together to form a complete cylindrical section said edges meet in abutting or overlapping relationship. Further, each end of the pipe-encircling cylinder of polymer foam so produced is adapted to meet and join in close sealing arrangement with the end of the corresponding foam cylinders disposed above and below it on said pipe. To achieve this result the abutting surfaces of both the longitudinal edges and the terminal edges of each of the rigid semi-cylindrical sections are provided with smooth flanges or are tongue-and-grooved or otherwise shaped in such a way that the abutting edges of two such sections come together in tightly sealed relationship.

The rigid polymer foam sections advantageously have a thickness which corresponds substantially to the space normally present between the exterior of the fluid carrying conduit and the interior of the well casing without impeding the lowering of the fluid carrying conduit, with insulation attached, into the well casing.

The individual sections of rigid polymer foam can be secured to the inner conduit by various means which can be employed individually or in combination. For example, the sections can be secured by use of appropriate adhesives such as quick-drying mastics, epoxy resins and the like. Alternatively or additionally, the foam sections can be secured in place by means of straps or tapes placed around the exterior thereof at appropriate points along their length. Adjustable metal straps, corrosion resistant adhesive tape and the like can be used for this purpose. Appropriate indentations at spaced intervals on the exterior of the semicylindrical foam sections can be provided to accommodate such straps or tapes, if desired.

The seal between the abutting edges of the semicylindrical sections of rigid foam can also be improved by applying a layer of adhesive or mastic to such edges at the time of assembly.

After the sections of rigid polymer foam have been assembled on the conduit, a layer of material, either in the form of a liquid coating or of sheet material can be applied to the exterior of the insulation, if desired, to improve the resistance of the surface of the insulation to abrasive forces or other stresses involved in lowering the insulated stringer into the well casing.

The assembly of the fluid carrying conduit and the insulation thereof, followed by the lowering of the conduit, section by section, into the well casing, is continued until the lower end of the conduit has reached the desired depth in the well. The whole of the conduit lowered into the well in this manner can be so insulated if desired. Alternatively, insulation is placed on the conduit only to a depth corresponding to that below the level of the strata which is subject to deterioration on exposure to heat or which will withdraw heat from the fluid passing through the conduit.

In a preferred embodiment of the invention, the initial section of pipe which forms the lower end of the fluid carrying conduit can be provided with a cuff of hard rubber or similar elastomeric material which is highly abrasion resistant. This is particularly valuable in those instances in which there are any minor obstructions remaining in the well casing at the time the fluid carrying conduit is lowered into same.

The rigid sections of foam insulation can be made from any polymer foam normally employed in the art for insulation purposes. Such foams include polyurethane, polyamide, polyisocyanurate and the like. Preferably the sections of rigid foam are prepared from polyurethane, since this has outstanding thermal insulating capacity as well as resistance to degradation on exposure to oil, water, lubricants and the like fluids likely to be encountered in the particular use hereindescribed.

The polyurethane foams which are used in preparing the rigid sections employed in insulating the oil wells of the invention are rigid, closed celled foams prepared in accordance with methods well-known in the art; see, for example, Saunders and Frisch, Polyurethanes, Vol. 2, 1964, page 193 et seq; see also U.S. Pat. Nos. 3,501,559; 3,252,922; 3,252,925; 3,245,922; 3,240,730; 3,235,518; 3,087,901; 3,085,983; 3,080,329; 3,075,928; 3,075,926; 3,073,788; 3,072,582; 3,061,556; 3,060,137; 3,053,778; 3,050,477; 3,039,976; 3,037,946; and 3,036,022. Such foams can be made in a variety of densities by adjusting the amounts and nature of the blowing agents employed. The lower densities generally have the higher insulating capacity but lower strength. In employing polymer foams of this nature in the invention herein described, it has been found advantageous to use foams having a density within the range of about 2 pcf to about 40 pcf; preferably the foams employed have a density within the range of about 15 pcf to about 35 pcf. Foams of this nature have particularly outstanding structural strength properties and can resist the mechanical stresses imposed upon them during the lowering of the insulated stringer into the well casing as well as the continuous mechanical stresses to which the completed assembly is subjected in use.

The sections of foam can be prepared by any of the methods known in the art. For example, said sections can be cut using appropriate cutting tools from preformed blocks of polyurethane foam.

In a preferred embodiment of the invention, the semicylindrical sections of foam are cast in appropriately shaped molds using techniques well-known in the art. Further, by using techniques such as that shown in British Specification No. 1,160,041, the foam sections can be formed with integrally formed skins which are extremely tough, resistant to abrasion and like forces, and substantially impermeable to oil, lubricants, water and like materials.

A typical procedure for the molding of said rigid foam sections in the form of integrally skinned polyurethane foam is as follows:

An aluminum mold is used having an interior configuration corresponding to a semi-cylindrical section having internal diameter of 7 inches, external diameter of 9.5 inches and length of 9 feet, 8 inches. The mold is preheated to 90°F prior to use. A polyurethane foam is prepared from the following ingredients and proportions (all parts by weight).

Polymethylene polyphenyl isocyanate (PAPI) (equivalent weight=133.5)	48.5
Polyol of equivalent weight 151 [[blend of (i) adduct of propylene oxide and mixture of polymethylene polyphenyl polyamines and (ii) adduct of propylene oxide and glycerol]	38
Polyether polyol (CP-700) (polyoxypropylated glycerol equivalent weight=233)	11.4
Organosilicone surfactant	0.38
Trichlorofluoromethane	1.5
Catalyst (DABCO R-8020; mixture of triethylene diamine and N,N-dimethylethanolamine)	0.38

The polyols, surfactant, catalyst, and blowing agent are preblended to form one component. The polyisocyanate is the second component. The two components are machine mixed and dispensed to the mold using conventional foam mixing and dispensing apparatus. A total charge of 33 lbs. of foam mix is dispensed into the preheated mold, the mold is closed and foaming is allowed to go to completion. The semi-cylindrical section of integrally skinned foam so obtained has an overall density of 30 pcf. The section is cured at circa 25°C for 3 days before being used in accordance with the invention.

As previously stated, the inner surface of the foam section when cut, molded, or prepared in any other fashion generally is made to conform substantially to the configuration of the outer surface of the fluid carrying conduit. The exterior surface of the foam section can be made to conform substantially to the configuration of the inside of the well casing. Alternatively and preferably, the outer surface of the foam section can be provided with a series of longitudinal channels which permits the passage upward of air, liquid mud and the like which is forced upwards and outwards when the insulated conduit is lowered into the well. Other configurations may be employed if desired, the essential requirement being only that the thickness of the foam section, i.e., the depth of foam which separates the conduit from the outside well casing is sufficient to impart the required thermal insulation. In general, it is found that thicknesses of at least about 1 inch are necessary to achieve the appropriate insulation. This minimum thickness of foam provides insulation adequate to prevent any significant amount of heat being transmitted from the well casing to the surrounding permafrost even when the temperature of the fluids passing through the insulated conduit reaches levels as high as 160°F.

The invention will now be described in more detail with reference to specific embodiments thereof.

FIG. 1 shows a partial view of a vertical cross-section taken through an oil well prepared in accordance with the invention. The inner conduit or well stringer (**2**) is disposed substantially concentrically in the well casing (**4**) which is installed through a strata of permafrost (**6**). The conduit or well stringer (**2**) is fabricated from individual sections of pipe which are united at joints (**8**). The conduit (**2**) is encased in a series of sections (**10**) of polymer foam insulation. The foam sections (**10**) are of such thickness that they substantially fill the space which would otherwise be present between the exterior of the conduit (**2**) and the interior of the well casing (**4**). Each of said polymer foam sections (**10**) is provided with a lap joint (**12**) at its ends in order to ensure continuity of insulation and provide for ready sealing of the insulation layer. The abutting surfaces of foam at lap joints (**12**) and the abutting surfaces on the longitudinal edges (not shown) of the sections are united with adhesives, sealing compositions and the like. Each of the foam sections (**10**) is held in place on the well stringer by means of straps (**14**). The straps (**14**) are located in indentations (**16**) which are provided in the foam sections (**10**) for this purpose. The depth of the indentation (**16**) is such that it does not detract from the required depth of thermal insulation placed between the exterior wall of conduit (**2**) and the interior wall of well casing (**4**).

The exploded view of a section of the conduit (**2**) which is shown in FIG. **2** serves to illustrate in more detail the mode of assembling the polymer foam sections (**10**) in accordance with the invention. In FIG. **2** a portion of the conduit (**2**) is shown with two foam sections (**10**) about to be assembled thereon. The foam sections (**10**) are aligned in such a manner that the longitudinal edges (**18**) on the two sections being brought together come into abutting relationship and form a sealed joint.

The mode of assembly of the insulated oil wells of the invention can be readily understood from the examples shown in FIGS. **1** and **2**. Thus, the individual sections of the conduit (**2**) are brought to the head of the well casing and secured by joint (**8**), which can take the form of a weld, threaded joint and the like, to the immediately preceding section of the conduit (**2**). As each section is assembled in this manner, it is insulated by applying the appropriate number of sections of polymer foam (**10**). The foam sections are brought together in the manner shown in FIG. **2** and secured together by applying straps (**14**), adhesive tape and the like around the indentation (**16**). Alternatively, the foam sections (**10**) can be affixed to the conduit (**2**) using appropriate foam-to-metal adhesives in which case it is unnecessary to provide straps (**18**) or the correspoinding indentations (**16**) in the foam sections. If desired, a combination of adhesive and of straps and the like can be used to secure the foam sections (**10**) to the conduit (**2**).

The actual length of the foam section (**10**) can be made to correspond to the length of the individual sections of the conduit (**2**) if so desired. However, in practice, the individual sections of the conduit (**2**) are found to vary markedly in length and accordingly it is more appropriate to provide the foam sections in standard lengths and to use the appropriate number as required to insulate any given section of the conduit (**2**).

Before or after each foam section (**10**) has been assembled on the conduit (**2**), said section can be coated, if desired, with an oil and solvent impermeable coating. This coating can be applied as a solution or in sheet form such as in sheets of metal, polyurethane, polyethylene, ABS elastomer and the like. As indicated previously, where the foam sections (**10**) are fabricated from high density polyurethane foam and have an integrally formed skin, the application of a sealing layer to the exterior of the foam sections (**10**) is generally unnecessary.

In a preferred embodiment of the invention, the assembled foam sections (**10**) are provided with an outer hydrostatic barrier which completely encases the insulated conduit. This barrier is such that it will withstand pressures of fluid or gas up to about 5,000 psi. The barrier can be constructed of sheet metal, polymer film, reinforced polyester and the like and can be secured in place by straps, adhesives or combinations thereof. The barrier can be applied in appropriate sections which are in sealing engagement with each other or can be wound spirally on to the insulated conduit from a roll of sheet material suitably disposed at a location adjacent to the point at which the insulated conduit enters the well casing. The hydrostatic barrier can be used in addition to the oil and solvent impermeable coating mentioned above or can itself serve the double function thus eliminating the need for the coating. The hydrostatic barrier can be employed to encase the self-skinned foamed sections of foam as well as those which have no specially formed skin thereon.

FIG. **5** shows a typical cross section of the well casing with insulated conduit installed as shown in FIG. **1** but with the additional feature of a hydrostatic barrier (**26**) installed between the outside of the foam section (**10**) and the inside of the well casing (**2**).

The oil well with insulated conduit (**2**) is assembled in the above manner and the conduit (**2**) is progressively lowered into the well casing (**4**) until the point is reached at which the lower end of the conduit (**2**) is located in the desired position for production purposes in the well. When the permafrost strata (**6**) through which the well casing (**4**) is installed does not extend to the depth to which the lower end of well casing (**4**) projects into the strata, it is unnecessary to insulate the conduit (**2**) below the point at which the permafrost exists. In such instances an appropriate length of uninsulated conduit (**2**) is lowered into the well prior to the point at which the insulation operation begins.

In FIG. **3** there is shown in cross-sectional view an alternative mode of construction of the foam insulation sections (**10**). In this embodiment the foam sections (**10**) are provided with a series of longitudinal ribs (**20**) shown in cross-section. These ribs are raised above the general level of the exterior of the foam sections (**10**) and serve as guides in the lowering of the insulated conduit (**2**) into the well casing (**4**). The ribs (**20**) leave a gap (**22**) between the major portion of the exterior of the foam section (**10**) and the inner surface of the well casing (**4**). This gap enables fluid trapped in the well casing to escape upwardly as the insulated conduit (**2**) is lowered into the well.

FIG. **4** illustrates a cross-sectional view of the leading or lower portion of the stringer (**2**) as it is lowered into the well casing (**4**). A cuff (**24**) on the leading section of the conduit (**2**) is of tough, abrasion resistant material, such as polyurethane, ABS and like non-cellular polymers. Said cuff (**24**) serves to absorb the major abrasive forces which are encountered during the lowering of the insulated conduit (**2**) into the well. Said cuff (**24**) can be secured on the conduit (**2**) using straps and/or adhesive in the same manner as the foam sections (**10**) are secured thereto. The upper edge of the cuff (**24**) is provided with a lap joint or other means for ensuring sealing engagement between the upper edge of the cuff and the lower edge of the first of the foam sections (**10**) on conduit (**2**).

The various embodiments of the invention described and exemplified above have been shown in relation to assembling an oil well in frozen strata such as permafrost. As will be readily appreciated by one skilled in the art, the oil wells insulated in accordance with the invention can be readily adapted for use in other types of strata wherein it is desirable to prevent thermal exchange between the strata and the fluids being passed through the well. Illustratively, in the case of a well which is installed in the ocean bed, that portion of the well which extends upwardly from the ocean bed to the well rig platform can be insulated in accordance with the invention to prevent loss of heat from the well to the surrounding ocean. Similarly, the mode of insulation of the well stringer in accordance with the invention can be readily adapted to the insulation of conduits used for the transportation of liquids which have to be thermally insulated from the surrounding atmospheric temperature. Illustratively, conduits for transporting oil and like fluids above ground in arctic or sub-arctic regions or in equatorial and near equatorial regions can be insulated in the manner described for the oil well stringer in accordance with the invention. Other applications of the insulated oil well and the mode of insulating conduits in accordance with the invention will be obvious to one skilled in the art.

While the novel apparatus and mode of construction of the invention has been described above with reference to certain specific embodiments thereof, it is to be clearly understood that these embodiments have been given for purposes of illustration only and are not intended to be limiting. The scope of the invention is bounded only by the scope of the claims which are set out hereafter.

We claim:

1. In an oil well installed in strata such that thermal exchange between the strata and fluid passing through the well is deleterious, the combination comprising:

a. a well casing;

b. a conduit, disposed within the well casing, through which fluid can pass;

c. a continuous layer of polymer foam insulation disposed between the inner surface of said well casing and the outer surface of said conduit and extending to a depth within said well casing at least below the level at which thermal exchange between the said fluid and the surrounding strata is deleterious;

d. said continuous layer of polymer foam comprising a series of rigid sections shaped to conform to the outer configuration of said conduit each section being joined to its neighbors in sealing engagement therewith.

2. An oil well in accordance with claim 1 wherein the foam sections are semi-cylindrical rigid polyurethane foam sections having integrally formed skins and having an average density of about 15 pcf to about 35 pcf.

3. An oil well in accordance with claim 1 wherein the polymer foam sections are fabricated from rigid polyurethane foam having an average density of about 15 pcf to about 35 pcf and said sections have a layer of oil and water impervious material interposed between the outer surface of said foam sections and the inner surface of the well casing.

4. An oil well in accordance with claim 1 wherein an abrasion resistant cuff is installed on the outer surface of the fluid conduit below the lowest section of polymer foam.

5. An oil well in accordance with claim 1 wherein the polymer foam sections are held in sealing engagement and secured to said conduit by strap means.

6. An oil well in accordance with claim 1 wherein a hydrostatic barrier is disposed on the exterior of the continuous layer of polymer foam insulation.

7. In a method of thermally insulating an oil well installed in strata such that thermal exchange between the strata and fluid passing through the well is deleterious, the steps comprising:

progressively assembling a continuous conduit from a plurality of appropriate sections thereof;

progressively securing to the exterior of said conduit a continuous layer of polymer foam by assembling around the exterior of said conduit a series of rigid sections of polymer foam, the internal cross-sectional diameter of said foam sections being substantially the same as the outer diameter of said conduit, said assembled foam sections being in sealing engagement one with another; and

progressively lowering said conduit, with said polymer foam layer secured thereto, into an outer well casing.

8. A method according to claim 7 wherein the polymer foam sections are semi-cylindrical rigid polyurethane foam sections having integrally formed skins and having an average density of about 15 pcf to about 35 pcf.

9. A method according to claim 7 wherein the polymer foam sections are fabricated from rigid polyurethane foam having an average density of about 15 pcf to about 35 pcf and said sections have a layer of oil and water impervious material interposed between the outer surface of said foam sections and the inner surface of the well casing.

10. A method according to claim 7 wherein an abrasion resistant cuff is installed on the lower end of said continuous conduit prior to installation of the first sections of rigid polymer foam.

11. A method according to claim 7 wherein the sections of polymer foam are held in sealing engagement and secured to said continuous conduit by strap means.

12. A method according to claim 7 wherein a hydrostatic barrier is disposed on the exterior of the continuous layer of polymer foam insulation.

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