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JP-A-62 266 178
US-A- 4 419 163

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(73) Proprietor: **MITSUI PETROCHEMICAL INDUSTRIES, LTD.**
2-5, Kasumigaseki 3-chome
Chiyoda-ku
Tokyo (JP)

(72) Inventor: **Tomoyasu, Takaharu, c/o MITSUI PETROCHEMICAL INDUSTRIES, LTD.,**
3 Chigusa Kaigan
Ichihara-shi,
Chiba-ken (JP)
Inventor: **Miyamoto, Kanji, c/o MITSUI PETROCHEMICAL INDUSTRIES, LTD.,**
3 Chigusa Kaigan
Ichihara-shi,
Chiba-ken (JP)

(74) Representative: **Lehn, Werner, Dipl.-Ing. et al**
Hoffmann, Eitle & Partner,
Patentanwälte,
Postfach 81 04 20
D-81904 München (DE)

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PATENT ABSTRACTS OF JAPAN vol. 11, no. 133 (C-418) 25 April 1987 & JP-A-61 271 070 (NIPPON GIJUTSU KAIHATSU CENTER) 1 December 1986	

Description

BACKGROUND OF THE INVENTION

The present invention relates to an improvement in a method for lining internal surfaces of pipelines for various pipings such as water pipes and gas pipes in which a plurality of branched pipelines branched from a main pipeline, and particularly to a shaping method for lining surfaces.

In the past, a method for blowing a coating into a pipeline with the aid of an air current to effect lining has been widely used for renewal of water pipes and gas pipes, as disclosed, for example, in Japanese Patent Laid-open Publication No.2(1990)-68177.

According to the aforesaid technique, if viscosity of coating and air speed are properly selected and a coating having an excellent run characteristics is used, excellent lining can be carried out.

However, this method involves a problem which is difficult to solve in that a film thickness of lining on the back surface of an elbow tends to become thin.

This problem occurs due to the fact that when an air current impinges upon the back of an elbow and then changes its direction, the action for forcibly spreading a film is so strong that it is difficult to secure a film thickness practically required in the range of flow velocity of air required for an air flow method.

This method sometimes involves a further problem in that if coating conditions such as flow velocity are mistaken, the coated film becomes thick or thin more than as needed.

As methods for solving these problems, a method has been carried out to smooth a coated film and correct its thickness through a shaping pig before a coating is cured after being coated in the air current method (For example, Japanese Patent Laid-open Publication Nos. 62(1987)-266178 and 63(1988)-274474).

However, a pig used in the conventional method is so high in density that when it is strongly compressed, a force for pressing the inner wall of a pipe becomes excessively strong to scrape off the coated film. Therefore, a ball-like pig, which is somewhat smaller than or one-size smaller than the inside diameter of a pipe has been used. Accordingly, in this method, the pig is of the size adjusted to a minimum size of pipes used in a piping as an object. Therefore, where sizes of pipes are different, there gives rise to a problem in that a sufficient effect cannot be obtained for a portion whose size is large. Moreover, since the pig is moved from the side of a main pipeline whose size is large to the side of a branched pipeline whose size is small, in branched portions, the pig does not enter a branched pipeline but tends to move straight ahead along a main pipeline portion.

As measures for solving this problem, Japanese Patent Laid-open Publication No. 1(1989)-304086 proposes a method in which a pig is introduced into a branched pipeline with the aid of air also from the side opposite to a main pipeline (See Fig.4, numeral 1 denotes a main pipe, and 1A denotes a branched pipe).

However, also in this case, the pig is moved from a main pipeline toward a branched pipeline. At the branched portion, even if a pig is pushed by an air current from the side opposite to the main pipeline, the pig as well as coatings accumulated in front of the pig do not enter the branched pipeline but tend to be transferred to the main pipeline on the opposite side. Since the pig is pushed by the air current from the side opposite to the main pipeline, the pig transferred to the opposite side is pushed back after all and moves to the branched pipeline. However, the coating having been pushed by the pig remains thick hardened within the main pipeline, and the object of shaping inner surfaces is not attained.

Furthermore, Japanese Patent Laid-open Publication No. 1(1989)-304086 discloses, instead of shaping a coated film subjected to lining by an air current method, a method for lining in which a coating is placed frontwardly of a pig, and the coating is pushed by air rearwardly of the pig. In this method, where the size of a branched pipeline is smaller than that of a main pipeline, the outside diameter of the pig is contracted due to compression.

However, the characteristics of the pig is not further defined, and therefore, there remains a question if necessary thickness of a coating is formed by a pig reduced in diameter.

GB-A-2 114 255 discloses a pipe comprising a lining layer formed from a liquid resin composition which may be applied to the inner surface of the pipe with the use of a pig comprising one or two members which are interconnected by a flexible linear member. The pig may be moved by the use of fluid pressure.

US-A-4 419 163 discloses a method of applying a sealant onto the inside surface of a pipe to repair any defective portions likely to cause a leak and therefore in need of repair. An injection means may be used for supplying the sealant in a cylindrical shape so that every portion of the inner surface of the pipe is coated. After formation of a bonding agent layer, a thin and sufficiently resilient cylindrical film may be inserted inside the cylindrical layer according to an inversion method. For insertion of the cylindrical film, a pig method may also be used. The film is then secured with the end of a guiding thread member previously inserted

into the pipe. By subsequently pulling this guiding thread member, the film is inserted into the pipe.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a method for lining internal surfaces of pipelines in which even in lining of particularly an elbow portion of multi-branched pipings different in size, it can be shaped into a substantially uniform thin film, while solving the problems noted as with respect to the prior art.

The afore-said object can be achieved by a method for lining an internal surface of a pipeline comprised of a multi-branched piping in which a plurality of branched pipelines are branched from a main pipeline, wherein a coating is poured into the pipeline from one end of the main pipeline or each of the branched pipelines,

characterized by the following steps:

(a) feeding air therein to thereby line the internal surface of the pipeline;

(b) after said lining step, inserting a sponge as a pig, consisting of an elastic foam body having a larger diameter than the inside of the pipe constituting the pipeline, said elastic foam body being made from a synthetic resin and having a continuous foam and being capable of being impregnated with a coating; and

(c) pushing said sponge with the aid of air pressure to shape the lining surface.

As specific examples of the sponge made of synthetic resin used in the method according to this invention, there can be mentioned polyurethane foam, polyvinly chloride foam, latex foam, silicone rubber foam, etc. Among these sponges, preferable sponges are those satisfied with characteristics conditions in which in load-flexure characteristics, a load at flexure of 70% is 60 kg (daN) or less, preferably 10 to 60 kg (daN) more preferably 20 to 40 kg (daN) and a load at 70% of compression rate is 6.0 times of a load at 10% of compression rate or less, preferably 1.0 to 6.0 times, more preferably 1.0 to 3.0 times; and those satisfied with conditions in which let D be the diameter of sponge, d_1 be the minimum inside diameter of pipe and d_2 be the maximum inside diameter of pipe, in dimensions (and shapes) , preferred is a column in which D is 1.0 x d_2 or more, preferably 1.0 x d_2 to 3.0 x d_1, more preferably 1.1 x d_2 to 2.0 x d_1, and length is 0.5 x D to 3.0 x D, or a sphere in which D is 1.1 x d_2 to 2.0 x d_1.

When these conditions are fulfilled, shaping of lining surfaces of internal surfaces of pipes different in diameter can be better carried out while the sponge is suitably deformed.

If the outside diameter of the sponge is columnar, molding of the sponge is also easy, and the sponge can be produced at less cost.

The synthetic resin foam constituting the afore-said sponge is preferably of 10 to 70 kg/m^3 or so in density in displaying the effect of the present invention.

When the sponge is satisfied with the condition in which in the load-flexure characteristics, a load at 70% of flexure is 60 kg (daN) or less, stress produced in a radial direction of the sponge is further small. When a load at 70% of compression rate is equal to or less than 6 times of a load at 10% of compression rate, a change of load resulting from deformation in said range is further less.

Thus, when the sponge is fulfilled with the aforementioned conditions, in shaping of lining surface in case where the diameter of a pipe is varied, pipes including large-diameter and small-diameter pipes can be deformed while being adjusted to the diameter of these pipes. In addition, since stress with respect to the pipe wall is not rapidly increased even the diameter of pipe is reduced,, the lining surface of the entire pipe can be shaped more uniformly.

The load-flexure characteristics are measured in accordance with ASTM D3574 at a compression speed of 50 mm/min. using a 200 mmØ - compressed plate and a sample of 50 mm x 300 mm x 300 mm in size.

According to the present invention, when a sponge is pressed by air pressure from an end of each branched pipeline, said air pressure may be varied according to diameters of pipes, dimensions and shapes of sponges, states of films, etc. Normally, the air pressure is 0.1 to 0.5 atmospheric pressure or so.

If this step is carried out in the procedure in which an inlet of a main pipeline is opened, and a small amount of backflow preventive air is fed from an end of the other branched pipeline to thereby guide a sponge to the inlet of the main pipeline, better results are obtained.

Accordingly, when the method of the present invention is carried out in accordance with said procedure using a sponge satisfied with the aforementioned characteristics and dimensional conditions, best results are obtained.

Coatings used in the method according to the present invention may be those used in the conventional lining method for internal surfaces of pipes. For example, epoxy resin coating is used.

In performing lining interior of pipes using such a coating, air is normally used as gas but inert gases such as nitrogen can be also used. In this case, the pressure of a gas may be varied according to the inside diameter of pipes, length of pipes, etc. Generally, the pressure is 1.0 to 5.0 atmo-

spheric pressure or so.

As described above, since the sponge of the present invention consists of a foam body having a continuous foam, a large amount of coatings can be contained therein. When the sponge is made to travel within the coated pipe before the coating is cured, the same state as that the interior of the pipe is coated with a so-called sponge brush results and excess amount of the coating on the pipe wall is sucked by the sponge. While an additional new coated film can be formed on a portion where a coated film is thin.

Particularly in an elbow portion, when the sponge changes its direction, it is strongly pressed against the pipe wall, and therefore, a coating contained in the sponge is further extruded to form a thick film.

In the present invention, the sponge can be impregnated in advance with a coating for shaping if necessary. Also, the sponge can be pushed in after the shaping coating is put in advance into an end of a pipeline. In either case, the suitable amount of the shaping coating is equal to or less than the saturated amount by impregnation to the sponge. When the sponge is fulfilled with the aforementioned characteristics and dimensional conditions, the force of the sponge pushing the wall surface is substantially constant.

Accordingly, a lining surface can be shaped into a substantially uniform film thickness by the sponge, and the sponge will not scrape off a part of the lining surface.

The aforementioned fact has been confirmed by experiments as follows:

That is, two sponge-like elastic bodies are prepared (one has a continuous foam and capable of being impregnated with a coating, whereas the other has a discontinuous foam and not capable of being impregnated with a coating). One contains a coating while the other contains no coating. When in that state, the sponge is slid on the coating surface after coated while pressing it with the same compressive force, a film can be held in case of the former whilst a coating was scraped off in case of the latter.

This means that the principle of shaping a film according to the present invention is entirely different from the case of a shaping pig proposed in the conventional Japanese Patent Laid-open Publication Nos. 62(1987)-266178 and 63(1988)-274474.

That is, the conventional pig has no function to absorb coating but merely adjusts a clearance between the pig and the pipe wall to thereby shape a coated film, which the same as a rubber spatula in which a coated film is pressed spread to shape it.

When the sponge of the present invention is moved with the aid of air by a compressive force in the range of substantially constant after lining by way of an air current method as described above, a film surface is smoothly shaped to have a substantially constant thickness as mentioned above. It has been also found that in an elbow portion, a thicker film than that of the original can be formed on the back surface of the elbow by the passage of the sponge.

The range of 10% to 70% of strain of the sponge covers three sizes in terms of piping sizes according to JIS, for example. Therefore, it can be applied to the case such as a normal water piping in which a piping in the range of 15A to 25A and is extremely effective.

When the sponge is put in from an end of a branched pipeline and moved toward a main pipeline, the sponge is unavoidably turned in either left of right direction since ordinarily the branched pipeline is connected to the side of the main pipeline at a branched portion with respect to the main pipeline, and a minute air flow is merely from upstream and the sponge is positively transferred toward an opening portion of the main pipeline (See Fig. 2 numeral 1 designates a main pipe, and 1A is a branched pipe). Thereafter, the sponge will suffice to move straight ahead, and therefore, the sponge is positively guided to the opening portion of the main pipeline merely by introducing a small amount of anti-backflow air into a branched pipeline halfway.

As described above, according to the present invention, in a case where lining is applied to an inner surface of a multi-branched piping having branched pipes, a particularly elbow portion of a lining surface can be shaped into a substantially uniform thickness.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view showing an example in which the present invention is embodied to a piping assembled in accordance with water pipes in apartments; Fig. 2 is a view showing a method for moving a sponge from a branched pipeline to main pipeline; Fig. 3 is a view showing a load-flexure curve of a sponge according to the present invention; and Fig. 4 is view showing a method for moving a sponges from a main pipeline to a branched pipeline.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

An embodiment of the present invention will be described hereinafter with reference to the drawings.

First, a general load-flexure curve of an elastic foam material constituting a sponge used in the

present embodiments is shown in Fig. 3. Fig. 3 shows a flexure amount by percentage obtained by compressing a plate having a diameter of 200 mmØ on a flexible polyurethane foam having a size of 300 mm (longitudinal) x 300 mm (lateral) x 50 mm (height) and applying a load thereon at a compression speed of 50 mm/min.

It is understood from Fig. 3 that the elastic foam material has characteristics that when the flexure amount is 10% or less, the load increases in proportional to the flexure amount; when the flexure amount exceeds 10%, a rate in increase of load up to 50% of flexure amount is very small; when the flexure amount exceeds 50%, a rate in increase of load up to 70% increases; when the flexure amount is about 70% or less, a rate in increase of load gradually increases; and when the flexure amount exceeds 70%, the load rapidly increases.

Next, an embodiment of the method according to the present invention using the sponge as described above will be explained. Fig. 1 is an explanatory view of an embodiment in which the present invention is embodied to a piping assembled in accordance with a water pipe in apartment.

In Fig. 1, a main pipeline 1 for water pipes is provided at an end with a pipeline 5, and branched pipelines 10A, 10B, 10C and 10D are connected between the pipeline 5 and the other end 2 of the main pipeline 1.

In preparation for execution of lining, a water meter is removed from the other end 2 of the main pipeline 1; faucets are removed from one end 6 of the pipeline 5 and ends 11A to 11D of the branched pipelines 10A to 10D; connection pipes whose openings are directed upward are additionally connected to the one end 6 and the ends 11A to 11D; said opening is formed so that an air hose can be mounted to and removed therefrom; a pressure gage 24 and a valve 23 are connected to an air hose 25 connected to the one end 6 of the pipeline 5; pressure gages 24A to 24D and valves 23A to 23D are connected to air hoses 25A to 25D connected to the ends 11A to 11D of the branched pipelines 10A to 10D; and the valves 23, 23A to 23D are connected to an air compressor 20 through a flow meter 22 and a dehumidifier 21.

As for sizes of pipes, 2 to 12A of the main pipeline use 25A in nominal diameter of JIS; the branched pipelines 5 and 10A - 10D use JIS 20A; and elbows different in diameter of JIS 15A are mounted at portions leading to the faucets.

In execution of lining, a necessary quantity of epoxy resin coating is poured into the ends of the pipeline 5 and 10A - 10D using a measuring cup and applied toward the main pipeline. This coating method is in accordance with a method described in Japanese Patent Laid-open No.2(1990)-68177.

Immediately after coating the whole pipeline, a columnar sponge of 30 mm in diameter and 50 mm in length made of flexible polyurethane foam of 20 kg/m^3 in density is inserted into a connection pipe which was used when the coating is poured into the end of the pipeline 5, and the hose 25 is connected.

In the sponge used, the load at 70% of flexure in the load-flexure characteristics was 25 kg (daN), and the load at 70% of compression rate was 5 times of the load at 10% of compression rate.

The other end 2 of the main pipeline is opened, and a small amount of anti-backflow air (0.1 atmospheric pressure) is introduced into other branched pipelines 10A - 10D by opening the valves 23A - 23D. Then, when the valve 23 is slightly opened to feed air of 0.3 atmospheric pressure to the pipe 5, the sponge moves forward through the pipe and is discharged from the other end 2 of the main pipeline.

Subsequently, a sponge similar to the above is inserted into the connection pipe at the end 11A of the branched pipeline 10 and an anti-backflow air is introduced into other branched pipeline to feed the sponge in the same manner as above, which is then recovered from the other end 2 of the main pipeline.

Thereafter, the sponge is passed through all branched pipelines.

As the result, only by the air current method, there was a portion where a film thickness of the back surface of the elbow was less than 0.3 mm. On the other hand, by the use of the sponge, there can be secured 0.3 mm to 1.0 mm of a thickness of the back surface thereof of all elbows. It is to be noted that the film-thickness other than the elbows was 0.3 mm to 2.0 mm.

Furthermore, the movement of the sponge to the open portion 2 of the main pipeline was extremely smooth, feeling no uneasy at all.

An operation similar to the former was carried out by using s spherical sponge having a diameter of 30 mm (a load at 70% of flexure is 25kg (daN), and a load at 70% of compression rate is 5 times of a load at 10% of compression rate) made from flexible polyurethane foam in place of the columnar sponge. Good results similar to those of the present embodiment were obtained.

Claims

1. A method for lining an internal surface of a pipeline comprised of a multi-branched piping in which a plurality of branched pipelines are branched from a main pipeline, wherein a coating is poured into the pipeline from one end of the main pipeline or each of the branched pipelines,

characterized by the following steps:

(a) feeding air therein to thereby line the internal surface of the pipeline;

(b) after said lining step, inserting a sponge as a pig, consisting of an elastic foam body having a larger diameter than the inside of the pipe constituting the pipeline, said elastic foam body being made from a synthetic resin and having a continuous foam and being capable of being impregnated with a coating; and

(c) pushing said sponge with the aid of air pressure to shape the lining surface.

2. A method according to Claim 1, wherein said synthetic resin-made sponge is constituted such that in a load-flexure characteristics, a load at 70% of flexure is 60 kg (daN) or less and a load at 70% of compression rate is 6 times or less of a load at 10% of compression rate, and has a columnar shape having dimensions that D is 1.0 x d_2 or more and length is 0.5 x D to 3.0 x D or a spherical shape having a dimension that D is 1.1 x d_2 to 2.0 x d_1 wherein D is a diameter of sponge, d_1 is a minimum inside diameter of pipe and d_2 is a maximum inside diameter of pipe.

3. A method according to Claim 2, wherein, in said characteristics of the sponge, a load at 70% of flexure is 10 to 60 kg (daN) and a load at 70% of compression rate is 1.0 to 6.0 times of a load at 10% of compression rate; and in case where the sponge is columnar, D is 1.0 x d_2 to 3.0 x d_1.

4. A method according to Claim 1, wherein the density of the sponge is approximately 10 to 70 kg/m^3.

5. A method according to Claim 1 to 4, wherein the sponge is formed of flexible polyurethane foam, polyvinyl chloride foam, latex foam or silicone rubber foam.

6. A method according to Claim 1, wherein when the sponge is pushed by air pressure from the end of the branched pipeline, an inlet of the main pipeline is opened to feed a small amount of anti-backflow air from the end of the other branched pipeline thereby introducing the sponge to the inlet of the main pipeline.

7. A method according to claim 1, wherein the sponge to be inserted into the end of the branched pipeline is impregnated in advance with a shaping coating.

8. A method according to Claim 1, wherein when the sponge is inserted into the end of the branched pipeline, a shaping coating is poured into the end of said pipeline.

Patentansprüche

1. Verfahren zur Beschichtung einer inneren Oberfläche einer Rohrleitung umfassend ein vielverzweigtes Rohrleitungssystem, in dem eine Vielzahl abgezweigter Rohrleitungen von einer Hauptrohrleitung abzweigen, worin ein Beschichtungsmaterial in die Rohrleitung von einem Ende der Hauptrohrleitung oder jeder der abgezweigten Rohrleitungen gegossen wird,

gekennzeichnet durch die folgenden Schritte:

(a) Zufuhr von Luft in die Rohrleitung zur Beschichtung der inneren Oberfläche der Rohrleitung;

(b) Einführen eines Schwammes als ein Rohrmolch nach dem Beschichtungsschritt, der aus einem elastischen Schaumkörper besteht, der einem größeren Durchmesser als das Innere der Röhre besitzt, aus der die Rohrleitung zusammengesetzt ist, wobei der elastische Schaumkörper aus einem Kunstharz hergestellt ist und einen durchgängigen Schaum besitzt und mit einer Beschichtung durchtränkt werden kann; und

(c) Durchdrücken des Schwammes mit Hilfe von Druckluft zur Formung der Beschichtungsoberfläche.

2. Verfahren gemäß Anspruch 1, worin der synthetische, aus Harz hergestellte Schwamm so zusammengesetzt ist, daß in der Belastungs-Biegungs-Charakteristik eine Belastung bei einer Biegung von 70% 60kg(daN) oder weniger entspricht und eine Belastung bei einer Kompressionsrate von 70% sechsmal oder weniger der Belastung bei einer Kompressionsrate von 10% entspricht, und
eine zylinderförmige Form mit Abmessungen besitzt, daß D 1,0 x d_2 oder mehr ist und die Länge 0,5 x D bis 3,0 x D ist oder
eine kugelförmige Gestalt, die eine Abmessung besitzt, daß D 1,1 x d_2 bis 2,0 x d_1 ist, wobei D der Durchmesser des Schwammes, d_1 der minimale Innendurchmesser der Röhre und d_2 der maximale Innendurchmesser der Röhre ist.

3. Verfahren gemäß Anspruch 2 worin in der Charakteristik des Schwammes eine Belastung bei einer Biegung von 70% 10 bis 60 kg(daN) entspricht und eine Belastung bei einer Kompressionsrate von 70% 1,0 bis 6,0-mal der

Belastung bei einer Kompressionsrate von 10% entspricht; und im Fall, in dem der Schwamm zylinderförmig ist, D von 1,0 x d_2 bis 3,0 x d_1 ist.

4. Verfahren gemäß Anspruch 1, worin die Dichte des Schwammes ungefähr 10 bis 70 kg/m^3 beträgt.

5. Verfahren gemäß Anspruch 1 bis 4, worin der Schwamm aus einem flexiblen Polyurethanschaum, Polyvinylchloridschaum, Latexschaum oder Silikongummischaum gebildet ist.

6. Verfahren gemäß Anspruch 1, worin, wenn der Schwamm vom Ende der abgezweigten Rohrleitung durch Druckluft gedrückt wird, ein Einlaß der Hauptrohrleitung geöffnet ist, um eine geringe Menge an Anti-Rückstromluft vom Ende der anderen abgezweigten Rohrleitung einzuspeisen, um damit den Schwamm dem Einlaß der Hauptrohrleitung zuzuführen.

7. Verfahren gemäß Anspruch 1, worin der Schwamm, der in das Ende der abgezweigten Rohrleitung eingeführt werden soll, im voraus mit einem formgebenden Beschichtungsmaterial getränkt wird.

8. Verfahren gemäß Anspruch 1 worin, wenn der Schwamm in das Ende der abgezweigten Rohrleitung eingeführt wird, ein formgebendes Beschichtungsmittel in das Ende der Rohrleitung geschüttet wird.

Revendications

1. Procédé pour le revêtement d'une paroi intérieure d'une conduite constituée de tuyaux ramifiés multiples dans lesquels une pluralité de conduites ramifiées sont ramifiées à partir d'une conduite principale, dans lequel un revêtement est versé dans la conduite depuis une première extrémité de la conduite principale ou de chacune des conduites ramifiées,
caractérisé par les étapes suivantes consistant à :
(a) envoyer de l'air dans celle-ci pour ainsi revêtir la paroi intérieure de la conduite,
(b) après ladite étape de revêtement, insérer une éponge, en tant que furet, constituée d'un corps de mousse élastique possédant un diamètre plus grand que l'intérieur du tuyau constituant la conduite, ledit corps de mousse élastique étant réalisé à partir d'une résine synthétique et comportant une mousse continue et étant apte à être imprégné d'un revêtement, et
(c) pousser ladite éponge à l'aide d'une pression d'air pour former la surface du revêtement.

2. Procédé selon la revendication 1, dans lequel ladite éponge réalisée en résine synthétique est constituée d'une manière telle en caractéristiques charge/flexion qu'une charge à 70 % de flexion est de 60 kg (daN) ou moins et qu'une charge à 70 % de taux de compression est 6 fois ou moins une charge à un taux de compression de 10 % et possède une forme de colonne possédant des dimensions telles que D soit 1,0 x d_2 ou plus et que la longueur soit 0,5 x D à 3,0 x D ou une forme sphérique comportant une dimension telle que D soit 1,1 x d_2 à 2,0 x d_1, dans lequel D est un diamètre de l'éponge, d_1 est un diamètre intérieur minimal du tuyau et d_2 est un diamètre intérieur maximal du tuyau.

3. Procédé selon la revendication 2, dans lequel, dans lesdites caractéristiques de l'éponge, une charge à 70 % de flexion est comprise entre 10 et 60 kg (daN) et une charge à un taux de compression de 70 % est de 1,0 à 6,0 fois une charge à un taux de compression de 10 % et, dans le cas où l'éponge est en colonne, D est de 1,0 x d_2 à 3,0 x d_1.

4. Procédé selon la revendication 1, dans lequel la densité de l'éponge est approximativement comprise entre 10 et 70 kg/m^3.

5. Procédé selon les revendications 1 à 4, dans lequel l'éponge est formée d'une mousse de polyuréthane souple, d'une mousse de chlorure de polyvinyle, d'une mousse de latex ou d'une mousse de caoutchouc de silicone.

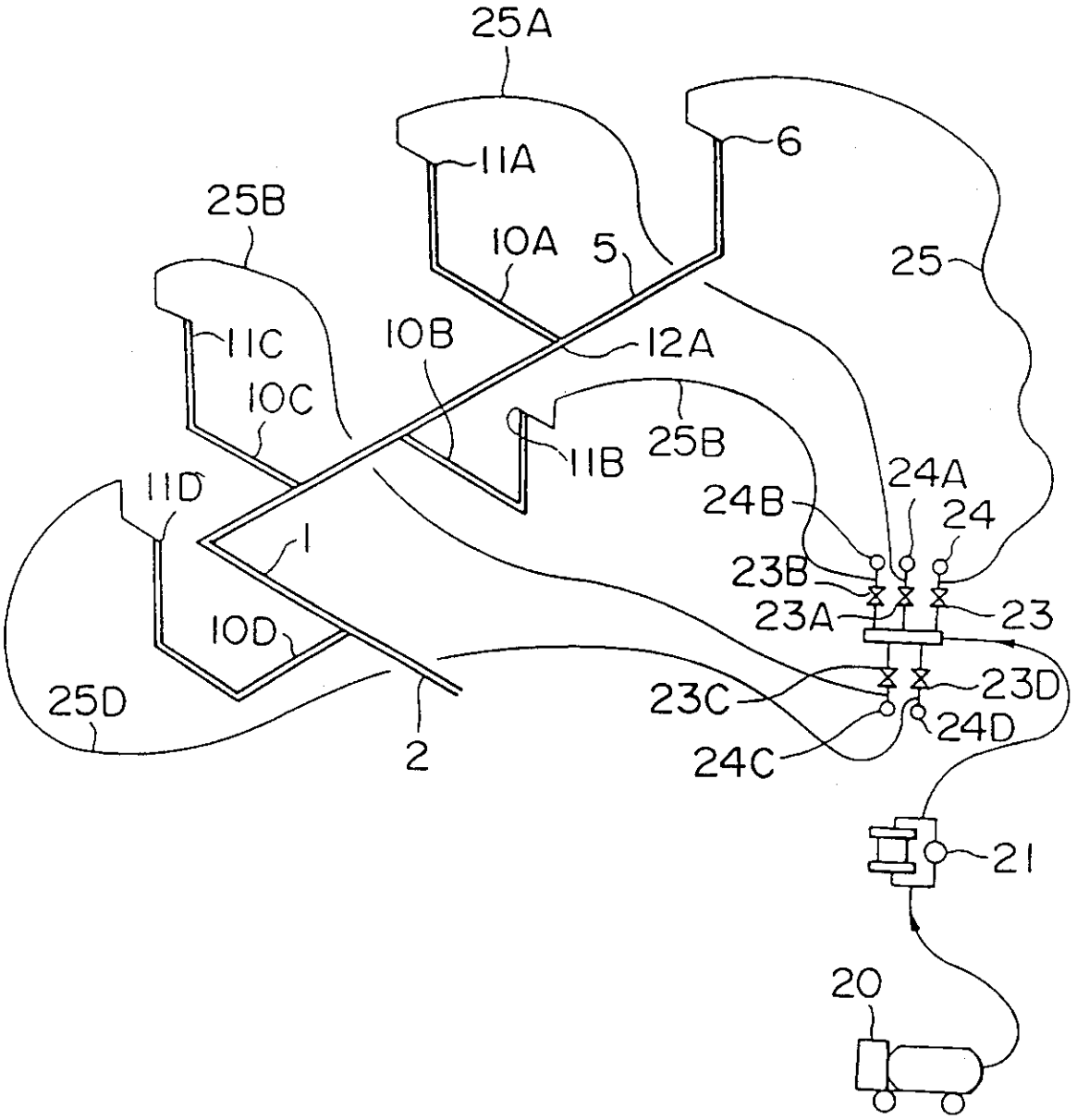
6. Procédé selon la revendication 1, dans lequel lorsque l'éponge est poussée par pression d'air depuis l'extrémité de la conduite ramifiée, une ouverture d'admission de la conduite principale est ouverte pour envoyer une faible quantité d'air anti-reflux depuis l'extrémité de l'autre conduite ramifiée, ce qui permet d'introduire l'éponge dans l'orifice d'admission de la conduite principale.

7. Procédé selon la revendication 1, dans lequel l'éponge devant être insérée dans l'extrémité de la conduite ramifiée est imprégnée à l'avance du revêtement de mise en forme.

8. Procédé selon la revendication 1, dans lequel lorsque l'éponge est insérée dans l'extrémité de la conduite ramifiée, un revêtement de mise

en forme est versé dans l'extrémité de ladite conduite.

FIG.1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10B
12A
10C
25B
11B
24A
11D
24B
24
1
23B
23A
23
10D
23D
25D
23C
24D
2
24C
21
20

FIG.2

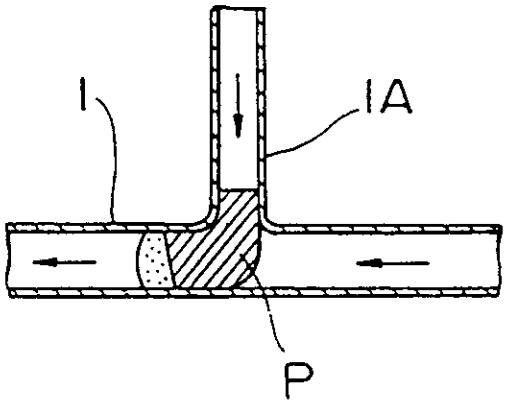


FIG.4
(PRIOR ART)

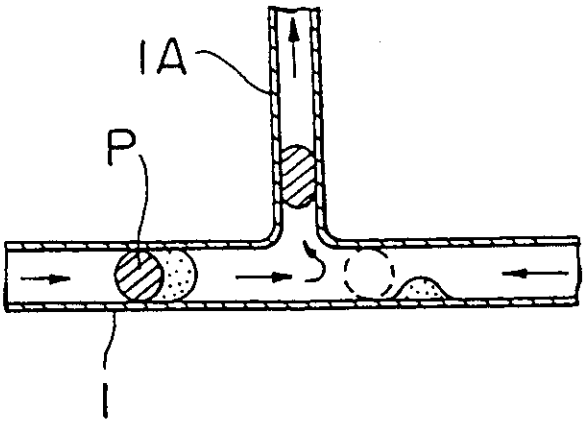
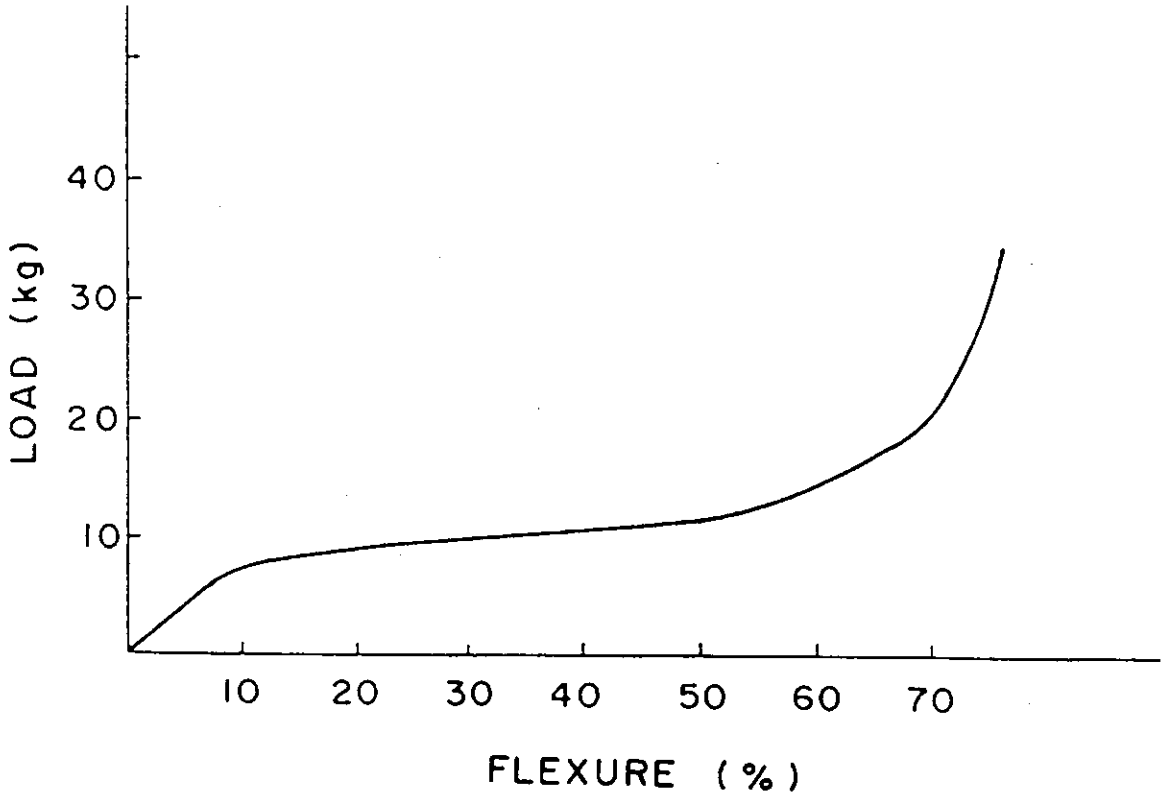


FIG.3



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Applicant/Proprietor
MITSUI PETROCHEMICAL INDUSTRIES, LTD., 2-5, Kasumigaseki 3-chome
Chiyoda-ku, Tokyo, Japan [ADP No. 50765643002]

Inventors
TAKAHARU TOMOYASU C/O MITSUI PETROCHEMICAL, INDUSTRIES, LTD., 3 Chigusa
Kaigan, Ichihara-shi, Chiba-ken, Japan [ADP No. 59471102001]

KANJI MIYAMOTO C/O MITSUI PETROCHEMICAL, INDUSTRIES, LTD., 3 Chigusa
Kaigan, Ichihara-shi, Chiba-ken, Japan [ADP No. 59471110001]

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Address for Service
HOFFMANN EITLE & PARTNER, Sardinia House, Sardinia Street, 52 Lincolns Inn
Fields, LONDON, WC2A 3LZ, United Kingdom [ADP No. 00009050001]

EPO Representative
DIPL.-ING. WERNER LEHN, Hoffmann, Eitle & Partner Patentanwälte
Arabellastrasse 4, W-8000 München 81, Federal Republic of Germany
[ADP No. 50040146001]

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Arabellastrasse 4, W-8000 München 81, Federal Republic of Germany
[ADP No. 50040146001]

to
DIPL.-ING. WERNER LEHN, Hoffmann, Eitle & Partner, Patentanwälte,
Postfach 81 04 20, D-81904 München, Federal Republic of Germany
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MITSUI PETROCHEMICAL INDUSTRIES, LTD., 2-5, Kasumigaseki 3-chome
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