Aug. 16, 1966 M. H. F. LEBORGNE ET AL 3,266,820

ASSEMBLY DEVICE FOR WELDED METAL TUBES

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FIG. 1

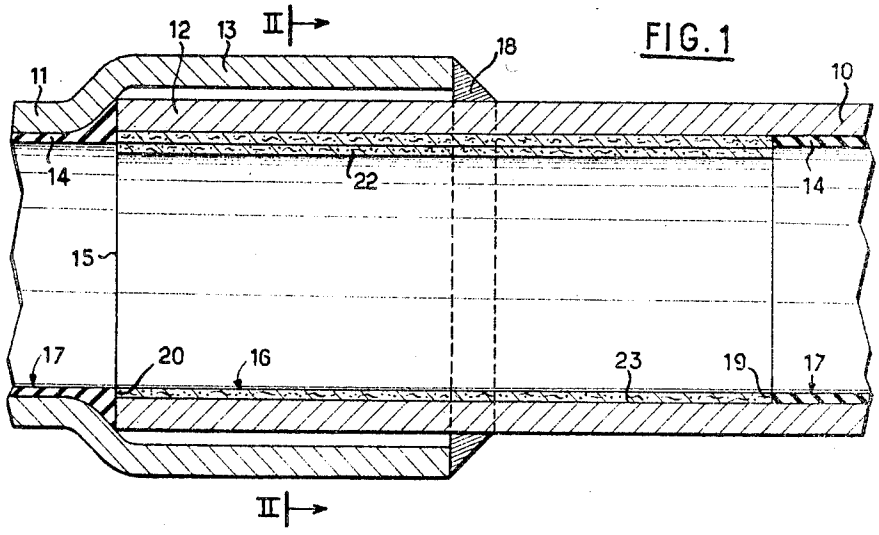


FIG. 4

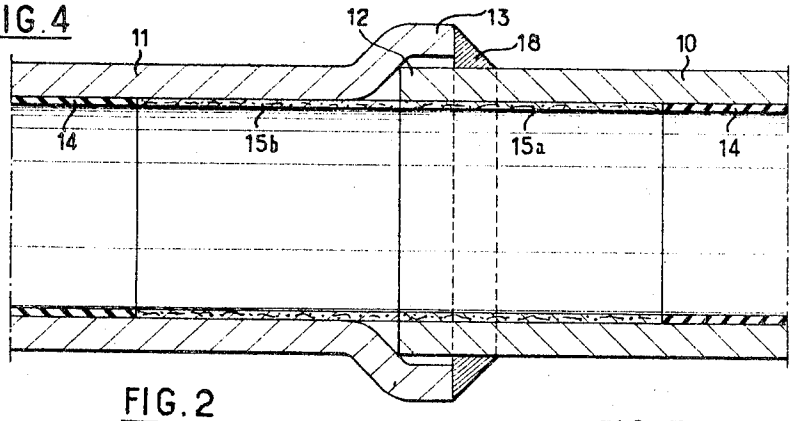


FIG. 2

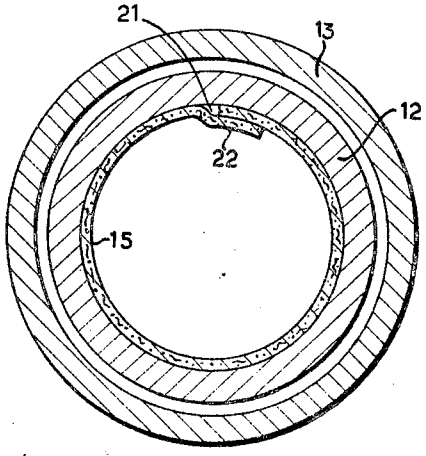
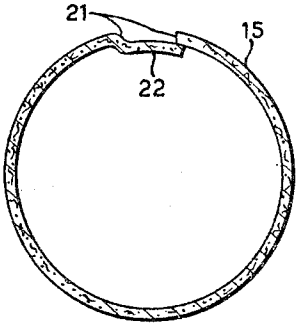


FIG. 3



INVENTORS

MICHEL H. F. LEBORGNE

PIERRE GUINVARC'H

By Irvin & Thompson

ATTY.

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FIG. 5

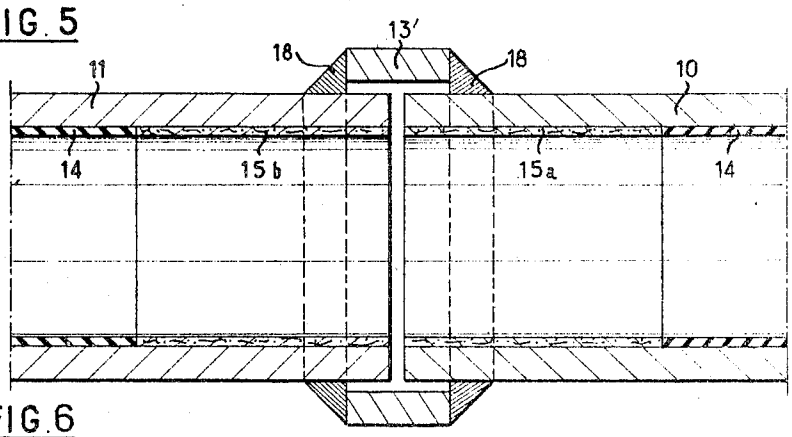


FIG. 6

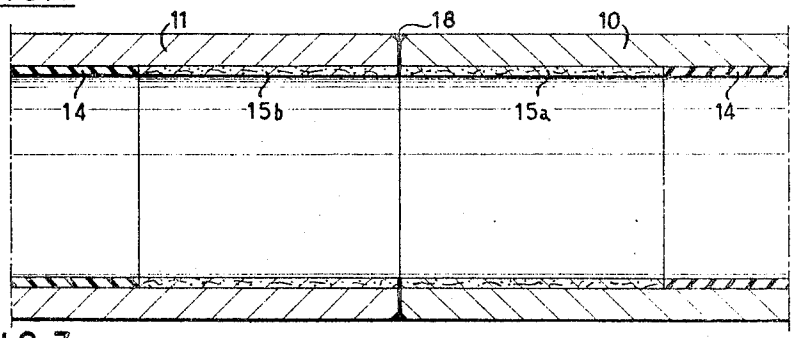
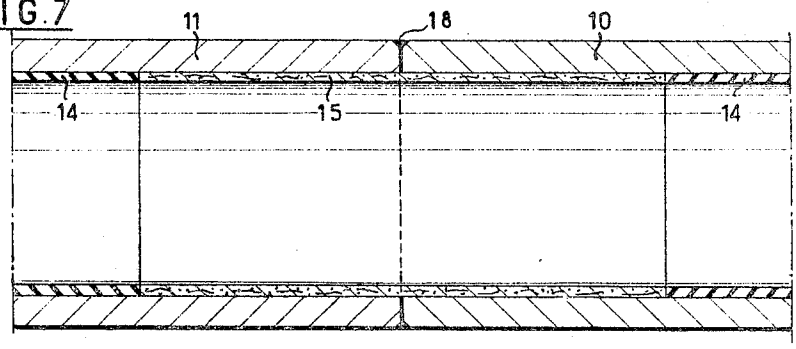


FIG. 7



INVENTORS
MICHEL H. F. LEBORGNE
PIERRE GUINVARC'H
By Irwin S. Thompson
ATTY.

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FIG. 8

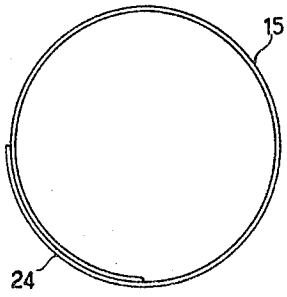


FIG. 9

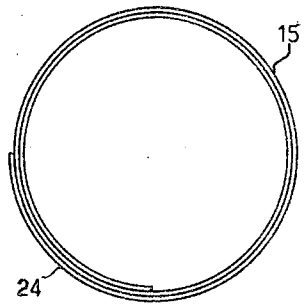


FIG. 10

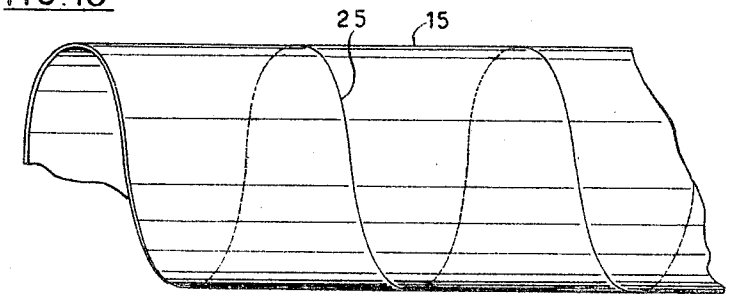
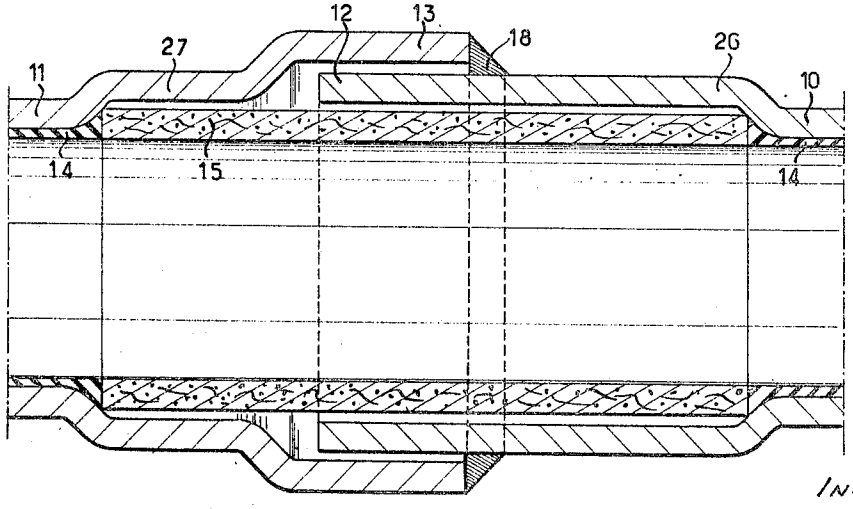


FIG. 11



INVENTORS

MICHEL H. F. LEBORGNE

PIERRE GUINVARC'H

By Irvin S. Thompson

ATTY.

United States Patent Office 3,266,820 Patented August 16, 1966

3,266,820

ASSEMBLY DEVICE FOR WELDED METAL TUBES

Michel Henri Fernand Leborgne, Enghein-les-Bains, and Pierre Guinvarc'h, Saint-Cloud, France, assignors to Societe Anonyme Franciase du Ferodo and Societe Technique et Commerciale des Canalisations Souterraines, en Tubes d'Acier S.T.E.C.T.A., both corporations of France

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Claims priority, application France, June 20, 1963, 938,727
12 Claims. (Cl. 285—21)

Metal pipes, and especially steel pipes, generally have their internal wall covered with a protective coating of bitumen or other similar material, intended to assure waterproofness and to protect the interior of the pipe against corrosion. When the pipes are welded together for assembly, the heat developed by the welding is liable to damage the protective coating, the melting point of which is low.

In order to avoid this risk, it has already been proposed to provide at the point of welding, an internal sleeve, generally of steel, which, in co-operation with heat insulation or an empty space, forms a screen between the weld and the protective coating which covers both the interior of the sleeve and the lengthwise extent of the pipes. However, this arrangement makes it necessary to provide a flare at each of the extremities of the pipes, which constitutes an expensive operation and may involve complications in the execution of the work on site.

It has also been proposed to apply a coating of vitrifiable mineral enamel on the inner wall of the sleeve, generally of steel, or of the extremities of the pipes themselves, but this enamelling is costly when it is carried out in such manner that it is not damaged by the welding.

The present invention has for its object the provision of a welded-pipe joint assembly covered internally with a protective coating having a low melting point, and comprising an internal sleeve arranged at the welding point, adapted to resist the heat developed during welding, this assembly being free from the drawbacks indicated above and permitting perfect protection to be obtained with a simple and convenient assembly.

According to the invention, the protective layer with a low melting point is eliminated at the point of welding and the sleeve is substituted for it. The inner surface of the sleeve is directly exposed to the flow of fluid in the pipe and is of substantially the same diameter as the internal surface of the protective coating so as to ensure continuity of connection in the interior of the pipe. According to an essential particular feature of the invention, the sleeve is also provided with a base of asbestos.

In addition to the heat-resisting properties which are characteristic of asbestos and which have in this case a particular advantage, this enables the sleeve to be given substantial elasticity which, according to one of the aspects of the invention, is combined with a longitudinal slot in the sleeve, so that the latter can conveniently be put into close contact with the bare inner wall of the pipe, in spite of the tolerances of manufacture of the pipes. Thus, without the disadvantage of an awkward assembly, the flared portion need be provided only at one extremity of the pipe, or the flaring may even be dispensed with entirely. The pipes may thus be provided with one straight male end of the other with a female collet or flare, or alternatively both ends straight and placed end to end.

Means are preferably provided for covering the slot in the sleeve. They consist, for example, of a small tongue.

In accordance with a further feature of the invention, the feature of providing the sleeve of a material comprising asbestos gives the sleeve qualities of absorption which are put to advantage by causing the sleeve itself to play the part of an anti-corrosion agent in a moist medium so as to protect the bare internal surface of the pipes over which the sleeve extends. To this end, the sleeve comprises, in addition to asbestos, a chemically basic material. The liquid between the sleeve and the inner surface of the pipes which is the same liquid that flows in the pipes and which is located by the actual presence of the sleeve in a position protected from the main flow in the pipe, has thus a basic pH value which prevents the corrosion of this surface in a very effective manner. An arrangement of this kind has the additional advantage of making unnecessary any extensive precautions in isolating the above-mentioned medium from the flow in the pipe in an absolutely fluid-tight manner.

In one form of construction, the sleeve is of material having a base of asbestos fiber with a silica precipitate partly converted to anhydrous silica distributed throughout the asbestos, while in an alternative form, it is of asbestos cement.

The two aspects of the invention referred to above may be adopted either separately or preferably in combination. For example, the sleeve with the base of asbestos may be slit and may not be chemically basic, or again it may not be slit and may be chemically basic. In this latter case, the sleeve may be of asbestos cement and associated with pipes provided with a flare at each extremity. It should however be observed that the sleeve is advantageously provided, according to the invention, with a slit and is chemically basic.

The objects, characteristic features and advantages of the invention will be further brought out from the description which follows below of forms of construction chosen by way of example, reference being made to the accompanying drawings, in which:

FIG. 1 is a view in longitudinal cross-section of two welded pipes comprising the internal coupling sleeve;

FIG. 2 is a corresponding view in transverse section, taken along the line II—II of FIG. 1;

FIG. 3 shows the sleeve alone in transverse section, that is to say before it is assembled in the pipe;

FIGS. 4, 5, 6 and 7 are views similar to FIG. 1, but relating to various alternative forms respectively;

FIGS. 8 and 9 are views in transverse section of two alternative forms of sleeve respectively;

FIG. 10 shows in elevation a further alternative form of sleeve; and

FIG. 11 is a view similar to that of FIG. 1, but showing still another alternative form.

Reference will first be made to FIGS. 1 to 3. Two pipes of steel 10 and 11 which are to be assembled comprise in one case a straight male end 12 and in the second case a flared portion or female collet 13, in which the end 12 is adapted to be fitted with a suitable play.

Each of the pipes 10 and 11 is provided internally over its free portion with a protective coating 14 of a material having a low melting point, for example of bitumen or the like, protecting the pipe against rust or corrosion. The end 12 and the flared portion 13 do not have any coating 14.

In the end 12 is engaged a sleeve 15 of appropriate heat-resisting and non-oxidizable material. The sleeve 15 is such that its inner wall 16 which is directly exposed to the flow in the pipe is substantially in line with the extension from the inner wall 17 of the coatings 14 which cover the pipes 10 and 11. The sleeve 15 is of such a length that its center is substantially opposite the extremity of the flared portion 13.

The pipes 10 and 11 are assembled together by a weld 18 applied between the extremity of the flared portion

13 and the male end 12. The weld 18 is not liable to damage the readily melted coatings 14, which are at a sufficient distance and which also are not liable to affect adversely the mechanical strength of the sleeve 15, the material of which is chosen for that purpose, as will be explained later.

The sleeve 15, the thickness of which is approximately equal to that of the internal coating 14, is such that it can easily slide inside the male extremity 12 for the purposes of assembly. The sleeve 15 is driven in until it comes against the extreme edge 19 of the coating 14 of the pipe 10 and, after the assembly of the pipes has been completed, comes into abutment at 20 against the coating 14 of the other pipe 11. The sleeve can be put in position either at the factory or on the site of emplacement of the pipes. When the sleeve 15 is put into place at the factory, the feature that it is completely engaged in the pipe 10 protects it against any damage during handling and transport.

For the purpose of facilitating the placing in position of the sleeve 15, this latter is to some extent elastic and is slit at 21 along one of its generator lines.

The sleeve 15 is provided with a tongue 22 which covers the slit 21 and ensures continuity of the protection.

There can be seen from FIG. 3 the position of the sleeve 15 in the free condition, with the slit 21 widely opened. Irrespective of the tolerances of manufacture of the pipes, the diameter of the sleeve 15 can be reduced in order to insert the latter conveniently (FIG. 2) in the end portion 12, the sleeve coming elastically into close contact with the internal wall of this end portion. Before assembly of the sleeve 15 in the end portion 12, a sealing product may be applied, if so desired, along the whole length of the tongue 22.

The sleeve 15 is preferably made of hardened asbestos cardboard of the type in which the material with a base of asbestos fiber has distributed throughout its mass a precipitate of silica, partly converted to anhydrous silica.

In consequence of its flexibility, a material of this kind can lend itself readily to all forms of pipes included within the tolerances. The sleeve 15 is preferably manufactured on forms having a larger diameter than the internal diameter of the pipe, so that by the spring effect (see FIGS. 2 and 3) it is correctly applied against the whole of the inner surface of the pipe.

In the case of the particular application considered here, the base cardboard employed is preferably an ordinary asbestos cardboard containing about 6% of organic material. It has an apparent density of the order of 1. It is employed in varying thicknesses as a function of the diameter of the sleeves to be produced. In the current diameters comprised between 100 mm. and 200 mm., a cardboard of 1.5 mm. is suitable.

A strip of cardboard having a width equal to the length of the sleeve is cut-out to a length equal to the internal circumference of the pipe increased by about 10 mm. This strip is moistened with water on the extremity at which the tongue 22 will be made and is then deformed so as to produce the tongue 22.

After drying in air, the strip is placed between two pieces of wire mesh forming a pocket. It is impregnated with a solution of sodium silicate. This solution preferably comprises 70 parts of solution at 37 or 38° Baumé of a silicate in which $SiO_3/Na_2O=3.55$, and 30 parts of water. Then the strip is left to dry in its basket of wire mesh until the surface is no longer sticky, for example for about one hour in a normal atmosphere. The sheet which has remained moist in the interior, is bent around a tube and is then fixed by its two extremities on a jacketed metal tube. A notch in the jacketing provides a housing for the tongue 22. This assembly is dried in an oven for one and a half hours at 120° C., after which the sleeve has acquired its final shape. The sleeve is removed from the former, soaked in a 10% solution of ammonium chloride and then dried at ordinary temperature and baked in a stove for one hour at 150° C.

The sleeve 15 thus formed has properties of heat resistance, non-oxidation, elasticity and absorption, and is chemically basic. By virtue of these last two properties, the liquid at 23 between the sleeve 15 and the inner surface of the extremity 12, and which is protected by the actual presence of the sleeve 15 from the main flow in the pipe, has a basic pH value which prevents the corrosion of this surface.

Reference will now be made to FIG. 4, in which the arrangement is similar to that which has just been described with reference to FIGS. 1 to 3, but in which the flared portion or tulip 13 is provided considerably shorter for the purpose of reducing weight. In this case, the sleeve 15 is provided in two portions 15*a* and 15*b*, inserted respectively into the two pipes. It will be noted that, as in the previous case, the weld 18 is substantially arranged in the centre of the assembly 15*a*–15*b*.

The pipes 10 and 11 may also be both provided with straight extremities. The tulip 13 is thus eliminated and, in the example shown in FIG. 5, is replaced by a coupling ring 13'. This latter is passed during assembly over the two pipes brought close together, and is then welded by its ends at 18 on the said pipes.

In another alternative form (see FIG. 6), the two pipes 10 and 11 which also have straight extremities are welded together end to end at 18. The sleeve 15, in two parts 15*a* and 15*b*, is mounted astride the weld 18, as previously. The weld 18 of the two pipes is effected at the place where the two half-sleeves 15*a* and 15*b* are juxtaposed. The two half-sleeves 15*a* and 15*b* can be placed in position either at the factory or on the site of emplacement of the pipes. In the case of a butt weld, the sleeve 15 could be in one piece, if so required (see FIG. 7) which would in practice involve its being placed in position on the site.

Reference will now be made to FIGS. 8 and 9, in which the overlapping of the slot 21 of the sleeve 15 is effected without formation of the tongue 22, simply by means of a spiral winding at 24. This arrangement which results in a superposition of thicknesses, for example over a considerable fraction of the circumference (FIG. 8) or even over one or several turns (FIG. 9), is in practice possible only if the material has in itself a sufficiently small thickness. With materials such as those which have been previously described, in silicated asbestos cardboard, it has been possible to give the cardboard thicknesses less than one millimeter, at the same time respecting the conditions of strength required. Such thicknesses are perfectly suitable for the spiral arrangement shown in FIG. 8 or in FIG. 9. It will be observed that the sleeves such as those shown in FIGS. 8 and 9 have considerable elasticity which enables them to be easily mounted in the pipes and which subsequently ensures a good application in the pipes.

In an alternative form shown in FIG. 10, the sleeve 15 is formed by a strip wound in the form of a helix with adjacent turns 25. These turns could furthermore be made overlapping. The sleeve 15 could also be formed by two or more interleaved helices, with or without overlap. Sleeves could also be made in two or more coaxial layers, each formed in the manner indicated above. The winding of one layer will preferably be effected in the opposite direction to that of an adjacent layer in order to cross the turns.

In a further alternative form shown in FIG. 11, the sleeve 15 is made of asbestos cement and the pipes 10 and 11 are provided with tulips 26 and 27–13 in order to receive it.

The invention is of course not limited to the forms of construction described and shown, but embraces all its alternative forms.

What we claim is:

1. A welded pipe joint assembly, comprising a pair of metal pipes having a welded joint between them, a protective layer of material having a low melting point with-

in the pipes, and an internal asbestos sleeve disposed at the zone of the weld and adapted to resist the heat developed during the welding operation, said protective layer being eliminated at the zone of the weld and being replaced by said sleeve, the inner surface of the sleeve being exposed to the flow of fluid in said pipes and having substantially the same diameter as the inner surface of said protective layer, whereby the asbestos sleeve operates to render noncorrosive the liquid between the said sleeve and said pipes and the continuity of the internal surface of the joint is preserved.

2. A device as claimed in claim **1**, in which the outer surface of said sleeve is in close contact with the bare interior wall of said pipes.

3. A device as claimed in claim **1**, in which said sleeve is slit along one of its generator lines, in order that its external diameter may be adapted to the tolerances of diameter of the pipes.

4. A device as claimed in claim **3**, in which means are provided for covering the slit of said sleeve.

5. A device as claimed in claim **4**, in which said covering means comprise a tongue formed on said sleeve.

6. A device as claimed in claim **1**, in which said sleeve comprises, in addition to asbestos, a chemically basic material.

7. A device as claimed in claim **1**, in which said sleeve is made of a material having a base of asbestos fibers and in which a precipitate of silica, partly converted to anhydrous silica, is distributed throughout said fibers.

8. A device as claimed in claim **1**, in which said sleeve is of asbestos cement.

9. A device as claimed in claim **1**, in which said sleeve is inserted into the extremity of one of the pipes which forms a straight male end, the extremity of the other pipe being flared and receiving said male end, the weld being effected between the end of said flared extremity and said straight male end.

10. A device as claimed in claim **1**, in which the extremities of both said pipes are straight and are welded together end to end.

11. A device as claimed in claim **1**, in which said sleeve is made in one single piece.

12. A device as claimed in claim **1**, in which said sleeve is made in two parts juxtaposed axially.

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JOHN F. CAMPBELL, *Primary Examiner.*

M. L. FAIGUS, *Examiner.*