

The invention relates to a pipe of plastics material having the features specified in the pre-characterising portion of Claim 1.

Such a pipe is known from DE-A-31 02 350, which pipe is manufactured of thermoplastic plastics in a multi-layer structure, whereby the individual layers are simultaneously produced in lines of the extrusion press, lead together and joined. The outer layer comprises pure polyvinyl chloride, while the inner pipe comprises re-generated polyvinyl chloride. This is intended to provide that the substantial quantities of polyvinyl chloride which in practice become waste do not have to be destroyed but can be re-used as re-generated polyvinyl chloride. By forming the outer mantle of pure polyvinyl chloride the quality reduction of the re-generated polyvinyl chloride in relation to rigidity and stability is supposed to be counteracted. Such known pipes can offer advantages with regard to re-use of waste or recycling of plastics, but they have no effect on sound conduction or sound transmission properties.

From EP-A-0254 375 there is further known a plastics pipe of thermoplastic material, which on grounds of sound insulation has a surface weight of at least 8kg/m^2 . This surface weight is achieved by addition of an additive of high density, whereby preferably barium sulphate is provided. The density of the plastics material lies in the range of 1.4 to 2.7. This one layer plastics pipe is, in comparison with a conventional plastics pipe, for example in accordance with DIN 19561, considerably heavier. This results in considerably increased costs primarily during transport and in handling during installation on a building site. In recent years the cast metal pipes which earlier were widely used in waste water installations have been in large measure replaced by considerably lighter plastics pipes, which exhibit a not inconsiderably reduced sound transmission behaviour. The teaching of EP-A-254 375 is merely to increase the density of the plastics pipe as a whole, as was already the case for cast metal pipes.

Pipes of the type described serve primarily as conduction systems for liquids and are used in particular in building construction as waste water conduits. As manufacturing processes, extrusion processes or injection processes have proved particularly useful for the production of regular pipes comprising thermoplastic plastics materials. The principal plastics materials used today are polyvinyl chloride (PVC), polypropylene (PP), polyethylene (PE) or acrylonitrile-butadiene-styrene (ABS). The sound transmission and sound diffusion of such a pipe does not compare favourably with a pipe of cast iron. The measures which have previously been proposed for sound insulation comprise essentially surrounding the pipe after installation with insulating material, for example rock wool or glass wool, and avoiding sound bridges to walls. Such measures are labour intensive and must be carried out with great care, particularly since a single sound bridge in a pipe system extending over several storeys has severely disadvantageous consequences with respect to sound transmission.

Based on these considerations the object of the invention is to develop the pipe of the above mentioned art so that sound conduction and sound transmission are effectively reduced whilst maintaining low weight. In comparison to known pipes the installation costs shall be at least not greater, whereby additional measures on the building site are to be avoided if at all possible. Working and handling, especially on site, should not be made more difficult by additional measures.

To achieve this objective, the features set out in the characterising portion of Claim 1 are proposed.

The pipe according to the invention is characterised by reliable and sure construction and, whilst of low weight, exhibits reduced sound conduction and sound transmission in comparison with pipes of the plastics materials which have previously been used. The inner pipe comprises a known plastics material which is accepted under the testing regulations for the respective supply medium. By contrast the outer mantle comprises a material which, in comparison to the material of the inner pipe, has a substantially higher density. The outer mantle serves as a sound protection mantle, in which body and medium sound are damped. Sound waves present in the interior of the pipe or, for example, arising on impact points or bends are broken in the outer mantle and/or reflected, and therefore penetrate to the exterior only in a not inconsiderably reduced measure. The same thermoplastic plastics material is envisaged for the inner pipe and the outer mantle, whereby however a filler is added to increase the density of the plastics material for the outer mantle. The thermal expansion behaviour of the inner pipe and the outer mantle therefore correspond to each other, and no problems are to be expected through separation of the outer mantle from the inner pipe. This is particularly important in view of the required long lifetime of pipes which are installed in buildings. The inner pipe and the outer mantle form an integral unit, which meets in higher measure the operational requirements, substantially avoids the previous disadvantageous effects of plastics pipes and has a high lifetime and durability. The requirements for sound protection are achieved in an optimal manner.

It has proved particularly convenient to form the wall thickness of the inner pipe smaller than the wall thickness of the outer mantle. The ratio between the wall thickness of the inner mantle and the wall thickness of the outer mantle is conveniently in the region of 2:3. Because of the greater wall thickness of the outer mantle optimal sound damping is achieved and, on the other hand, the requirements on the inner pipe, with regard to chemical and or physical durability, are equally satisfied.

In a particularly convenient arrangement the connection of two pipes of a pipe system is achieved by means of a sleeve with at least two grooves which receive sealing rings to inhibit direct sound transmission from one pipe to the sleeve or the next pipe. The combination of the two-layered pipe with a plastics inner pipe and a sound damping outer mantle of high density together with the sleeve results in a substantial reduction in the sound

distribution over the pipe system. To further reduce the sound transmission via the end faces of the pipes to be connected, the sleeve is further provided with a U-shaped groove which receives the end of the pipe inserted into the sleeve. This groove is filled with an elastomer or a suitable sealing ring or the like and the end face of the pipe inserted into the sleeve abuts this elastomer or the like without contacting the plastics material of the sleeve itself. A sound bridge resulting from immediate contact between the pipe and a wall part of the sleeve is in this way conveniently avoided.

Further developments and convenient embodiments of the invention can be taken from the sub-claims.

A particular embodiment will be described in more detail in the following, with reference to the drawing.

The drawing shows schematically an end of a pipe 2, which is inserted into a double sleeve 4. It is to be understood that a further pipe end can be inserted from the other side into the double sleeve. Further, the one half of the double sleeve can also be a component of a pipe end, fitting, armature or the like.

The pipe 2 comprises an inner pipe 6 and an outer mantle 8 which surrounds the inner pipe 6. The inner pipe 6 has a wall thickness 10 and the outer mantle 8 a wall thickness 12. The wall thickness 12 of the outer mantle 8 is substantially greater than the wall thickness 10 of the inner pipe 6, whereby a wall thickness ratio of 3:2 has proven particularly convenient. For the usual pipe dimensions, which are laid down in Standards DIN 19560 and DIN 19561 for various pipe widths, the total wall thickness lies in the range between 3.2 to 5.3mm, whereby the usual tolerances for plastics pipes apply. Of particular significance is that the outer mantle 8 consists of a material which has a greater density than that of the inner pipe 6. The inner pipe 6 and the outer mantle 8 consist essentially of the same plastics material, but an additive with a high specific weight is added to the plastics material of the outer mantle 8. Barium sulphate, which has a specific weight of 4.3g/cm^3 , can be used as the additive. Other additives or mixtures thereof can also be used within the scope of the invention. In all cases the additive should have a higher specific weight than that of the plastics material. The density of the pipe mantle lies conveniently in the range 1.4 to 2.8, while the density of the inner pipe lies conveniently in the range 1.1 to 1.4. A double walled pipe formed in such a way can be worked in the same way as the previously customary single-walled pipe, so that no special measures are necessary during laying and installation. The pipe can with no difficulty be cut to the desired length as required, without the homogeneous connection between the inner pipe and the outer mantle being destroyed in any way. During manufacture the plastics material of the inner pipe and that of the outer mantle undergo a quasi inseparable integral connection.

The double sleeve 4 exhibits in each half two grooves 16, 18 which are displaced with respect to one another in the direction

of the longitudinal axis 14. Sealing rings 15 are disposed in these grooves, which sealing rings can be formed as lip seals, air cushion profiles, hollow profiles or the like. Because of the axial separation 20 of the grooves 16, 18 immediate contact between the pipe outer wall 22 and the sleeve inner wall 24 is avoided. Further, in the middle of the double sleeve 4 there is formed a projection 26 with a T-shaped cross-section. As can be seen, two annular grooves 28, 30 are thereby formed, into which the ends of the pipes can be inserted. The annular grooves 28, 30 are open towards the respective ends of the sleeve and contain sound damping material 32 which is formed as a ring of moss rubber, profile rubber or the like. Intermediate contact of the pipe 2 inserted into the sleeve with the sleeve is thereby also prevented in the axial direction. In a particularly convenient way, there is thereby achieved an effective decoupling of the pipe system parts in the direction of both the longitudinal axis 14, by means of the material 32, and also the radial direction, by means of the sealing rings 15, whereby sound transmission is substantially reduced.

If one assumes that the double sleeve 4 is mounted vertically as illustrated and waste water flows through the pipe 2 vertically downwards in the direction of the arrow 36, one is faced with the problem that dirt can penetrate into the annular groove 28 which is open to the direction of flow. The material 32, which is conveniently an elastomer, inhibits penetration of dirt particles, sand or the like into the region of the groove 18 and damage to the sealing ring. It should be noted that as a result of changes in length due to the influence of temperature the pipe 2 moves axially relative to the fixed double sleeve 4; consequently abrasive effects in the region of the groove 18 and the sealing ring present there are to be feared. By means of the projection 26 and the material 32 located in it, which material is compressable in the axial direction and always ensures a reliable seal in the region of the end face of the pipe 2, these problematic effects are reliably prevented.

Between the two central grooves 18, 19 an annular chamber 34 is present on the outer surface of the double sleeve. This annular chamber 34 is preferably used for mounting a pipe clamp or the like, by means of which the double sleeve 4 is fixed to the masonry. The double sleeve 4 and thereby be used as a fixed point for laying of the conduit, without any additional measures being necessary on the double sleeve. The axial separation of the two central grooves 18, 19 is determined with regard to this feature.

Claims

1. Pipe for liquids, in particular for waste water, consisting of plastics material, preferably polyvinylchloride or polyethylene, whereby an inner pipe (6) and an outer mantle (8) which surrounds the inner pipe (6) are provided, characterised in that the density of the outer mantle (8) is greater than the density of the inner pipe (6) and is in the range 1.4 to 2.8,

of the longitudinal axis 14. Sealing rings 15 are disposed in these grooves, which sealing rings can be formed as lip seals, air cushion profiles, hollow profiles or the like. Because of the axial separation 20 of the grooves 16, 18 immediate contact between the pipe outer wall 22 and the sleeve inner wall 24 is avoided. Further, in the middle of the double sleeve 4 there is formed a projection 26 with a T-shaped cross-section. As can be seen, two annular grooves 28, 30 are thereby formed, into which the ends of the pipes can be inserted. The annular grooves 28, 30 are open towards the respective ends of the sleeve and contain sound damping material 32 which is formed as a ring of moss rubber, profile rubber or the like. Intermediate contact of the pipe 2 inserted into the sleeve with the sleeve is thereby also prevented in the axial direction. In a particularly convenient way, there is thereby achieved an effective decoupling of the pipe system parts in the direction of both the longitudinal axis 14, by means of the material 32, and also the radial direction, by means of the sealing rings 15, whereby sound transmission is substantially reduced.

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Claims

1. Pipe for liquids, in particular for waste water, consisting of plastics material, preferably polyvinylchloride or polyethylene, whereby an inner pipe (6) and an outer mantle (8) which surrounds the inner pipe (6) are provided, characterised in that the density of the outer mantle (8) is greater than the density of the inner pipe (6) and is in the range 1.4 to 2.8,



in that the outer mantle (8) contains an additive with a substantially higher specific weight than the plastics material, in that the wall thickness (12) of the outer mantle (8) is greater than the wall thickness (10) of the inner pipe (6), and in that the inner pipe (6) consists of the same plastics material as the outer mantle (8) and has a density in the range 1.1 to 1.4.

2. Pipe according to Claim 1, characterised in that the outer mantle (8) contains barium sulphate or a mixture thereof as additive.

3. Pipe according to Claim 1 or Claim 2 characterised in that the wall thickness (12) of the outer mantle (8) is greater than the wall thickness (10) of the inner pipe (6) by a factor of between 1.25 and 1.75, preferably by a factor of 1.5.

4. Pipe according to one of Claims 1 to 3, characterised in that the density of the outer mantle (8) lays in the range of 1.8 to 2.2.

5. Conduit with a pipe according to one of Claims 1 to 4, whereby the connection between two such pipes is made with a sleeve, characterised in that the sleeve is provided on its internal wall (24) with two grooves (16, 18) which are separated in the direction of the longitudinal axis (14) and which each receive a sealing ring (15) and is further provided with an annular groove (28) which is open towards the sleeve end, in which annular groove a ring of elastic material (32) is arranged and into which the end of the pipe (2) extends.

6. Conduit according to Claim 5 characterised in that the sleeve is formed as a double sleeve (4) and is provided centrally with a T-shaped projection (26), which forms two annular grooves (28, 30) which are open towards the respective ends of the sleeve.

7. Conduit according to Claim 6 characterised in that the total of four grooves on the double sleeve (4) are arranged substantially equidistantly, whereby a chamber (34) present on the outer wall of the double sleeve between the two central grooves (18, 19) serves for fixing of a pipe clamp or the like.

