

Anti-Leakage Pipe Sleeve System (Socket)

Field of Invention

This invention relates to plumbing and more particularly to pipe fittings for plastics material
5 pipes.

Background

This invention will be discussed generally in relation to low pressure plastics pipes for use in
application such as drains, stormwater and waste piping systems but the invention is no so limited and
10 may be applied to other pipe line systems such as plastic material pressure piping systems.

Plastics materials pipes can be joined using solvent welding techniques. In such a technique a
pipe end is inserted into a belled end of another pipe or a pipe fitting with a close fit and the solvent
welding is intended to ensure that there is no leakage in the joint. To ensure a good fit the bell socket
has a slight taper so that the bell is slightly narrower at the base of the bell socket (the root) than at the
15 opening of the bell socket (the mouth). This ensures that with the slight softening with the joining
solvent that in optimum conditions a good joint is made.

There can be a problem that if there is a misalignment in the pipe and socket or if insufficient
adhesive is applied the pipe joint can leak.

It is an object of this invention to provide a pipe joining system which will overcome this
20 problem or at least provide the practitioner with a useful alternative.

Brief Description of the Invention

In one form therefore the invention is said to reside in a plastics material pipe connection
socket, the pipe having an pipe internal diameter and a pipe external diameter; the socket comprising
25 an inner sleeve with an outside diameter substantially the pipe internal diameter and an outer sleeve
with an inside diameter substantially the pipe external diameter, the inner and outer sleeves defining
between them an annular recess to receive a pipe end to form a joint, wherein the annular recess is
tapered so that in use, a tight fit is obtained and a good joint is made.

30 Preferably the outer sleeve is longer than the inner sleeve. For instance, the outer sleeve can be
longer than the inner sleeve by approximately 10 to 20%. This will assist with alignment of the pipe
into the socket by enabling a user to insert the pipe end inside the outer sleeve and thereby holding the
pipe end in a round shape before engaging the pipe end into the annular recess.

35 There may be further included an inspection aperture in the outer sleeve. The inspection
aperture can for instance, have a diameter of 5 mm and be positioned near the bottom of the annular
recess such as 7.5 mm from the bottom of the recess.

The annular recess can be tapered.

In a preferred embodiment the pipe and the connection socket are formed from uPVC and the pipe and socket are connected using a solvent cement.

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The connection socket can be formed onto the end of a length of pipe or it can be formed on a pipe fitting selected from the group comprising a plain bend, and inspection opening bend, a rear access bend, a vented access bend, a side access bend, an inspection opening junction, a rear access junction, a double access junction, a plain junction, an inspection opening coupling and a plain coupling.

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In an alternative form the invention resides in a plastics material pipe connection socket, the socket comprising an inner cylindrical sleeve and an outer cylindrical sleeve, the inner and outer sleeves defining between them an annular recess to receive a pipe end to form a joint therebetween, wherein the annular recess is tapered so that in use, a tight fit is obtained and a good joint is made.

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In an alternative form the invention resides in a plastics material pipe fitting comprising at least a first and a second connection arrangement to connect plastics material pipes using the connection arrangements, the pipe having an pipe internal diameter and a pipe external diameter; at least one of the connection arrangements comprising an inner sleeve with an outside diameter substantially the pipe internal diameter and an outer sleeve with an inside diameter substantially the pipe external diameter, the inner and outer sleeves defining between them an annular recess to receive the pipe end to form the connection, wherein the annular recess is tapered so that in use, a tight fit is obtained and a good joint is made.

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Preferably the outer sleeve is longer than the inner sleeve. For instance, the outer sleeve can be longer than the inner sleeve by approximately 10 to 20%. This will assist with alignment of the pipe into the socket.

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There may be further included an inspection aperture in the outer sleeve. The inspection aperture can for instance, have a diameter of 5 mm and be positioned near the bottom of the annular recess.

In one form, the taper is such that at a mouth end nearest an open end of the socket, the annular recess is wider than at a root end nearest the pipe.

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In one form, the taper on the annular recess is provided on either the outer or the inner sleeve.

In one form, the taper on the annular recess is provided in each of the inner and outer sleeve.

In a preferred embodiment the pipe fitting is formed from uPVC and adapted for connection using a solvent cement.

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The pipe fitting can be selected from the group comprising a plain bend, and inspection opening bend, a rear access bend, a vented access bend, a side access bend, an inspection opening junction, a rear access junction, a double access junction, a plain junction and inspection opening coupling and a plain coupling. Where the pipe fitting is configured so that it would be used with a selected connection arrangement always at a lower end then that connection arrangement would be according to the present invention. Where a pipe fitting is constructed such that either or any one of the pipe fittings could be placed at a lower end of the fitting then both or each of the connection arrangements would be according to the present invention.

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It will be seen that by this invention there is provided a connection arrangement for plastics material pipes where an end of a pipe is received in an annular socket and hence has potential for sealing surfaces on both the inner and outer surfaces of the pipe. This will ensure that a better seal is obtained and there is less chance of leakage through the pipe joint.

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Brief Description of the Drawings

This then generally describes the invention but to assist with understanding reference will now be made to the accompanying drawings which show prior art pipe connections and pipe connection arrangements according to the present invention.

In the drawings:

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Figure 1 shows a bell-type pipe socket of the prior art;

Figure 2 shows a pipe fitted into the bell-type socket of Figure 1;

Figure 3 shows a pipe connection into a bell-type socket in which the end of the pipe is cut at an angle;

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Figure 4 shows a prior art pipe connection where there has been inadequate insertion of the pipe into the socket;

Figure 5 shows a first embodiment of a pipe socket for connecting a pipe according to the present invention;

Figure 5A shows a cross section through the line A – A' in Figure 5;

Figures 6A and 6B show a perspective views of a pipe socket according to the present

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invention;

Figure 7 shows a pipe connected into a pipe socket according to the present invention;

Figure 8 shows a pipe socket connected into a pipe socket according to the present invention where the pipe is cut at an angle and there has been inadequate insertion;

Figure 9 shows a pipe connection according to the present invention in which there has been inadequate insertion of the pipe;

Figure 10 shows a pipe fitting according to the present invention in situ and in cross-section showing a pipe connection according to the present invention;

5 Figure 11 shows an alternative pipe fitting incorporating a socket according to the present invention; and

Figure 12 shows a right angle or 90° bend pipe fitting incorporating sockets according to the present invention.

10 Description of Prior Art

Now first looking at the prior art shown in Figures 1 to 4, it will be seen that a pipe 10 has a belled end portion 12 which is of a size to receive the end of another pipe 14 as is shown in Figure 2 where the pipe is connected into the socket. The belled section 12 has a slight internal taper in the region 13 to ensure that the pipe 14 when pushed in engages with a tight fit into the belled end 12. A
15 problem which can exist, however, that with inadequate solvent being used for the connection liquid flowing through the pipe connection can enter the region between the pipe bell and the pipe indicated by the arrow 15 and exit in the region shown by the arrow 16.

Another problem can exist where a pipe 14 is cut off at an angle as shown in Figure 3 and
20 therefore, when the pipe is inserted into the bell 12 at the end of the pipe 10 there is inadequate connection between the pipes which can lead to leaking or undesirable separation.

Figure 4 shows a further problem with prior art pipes in that the pipe 14 can be inadequately inserted into the bell 12 on the end of the pipe 10 and again there is insufficient connection between
25 the pipe and socket which again can lead to leaking or undesirable separation.

It is to these various problems that the connection system of the present invention is directed.

Description of Preferred Embodiments of the Invention

30 Figure 5 shows a pipe connection of the present invention in cross section. A pipe 20 has a connection socket arrangement 21 at an end of the pipe 20. The pipe 20 can be a length of pipe or part of a pipe fitting as is discussed below. The connection socket 21 generally comprises an inner sleeve 23 which has an outside diameter which is substantially the same diameter as the internal diameter of a pipe to be fitted into the socket and an outer sleeve 22 which has an inside diameter substantially the
35 same as the outer diameter of a pipe to be fitted into the socket. Between the inner sleeve 23 and the outer sleeve 22 is an annular recess 24 into which a pipe end, in use, is fitted. The annular recess is of a depth which is sufficient to ensure a good connection between the pipe and the socket. The outer sleeve 22 is longer than the inner sleeve 23 to assist with alignment of the pipe into the socket. The

outer sleeve can be from 10 to 20 % longer than the inner sleeve. Once the end of the pipe is inserted into the outer sleeve portion of the socket it guided more evenly into the annular recess 24.

In practice the annular recess 24 is slightly tapered so that at the mouth end 24a nearest the open end of the socket the annular recess is wider than at the root end 24b nearest the pipe. This ensures that when a pipe is pushed into the socket and with the slight softening of the surface of the pipe by the joining solvent a tight fit is obtained and a good joint is made. The taper in the annular recess may be provided on either the outer or the inner sleeve or may be provided by a taper in each of the inner and outer sleeves. Exemplary dimensions are given below.

Figure 5A shows a cross section through the line A – A' in Figure 5. It can be particularly seen that here is provided in the outer sleeve 22 an inspection aperture 26 to enable inspection of a completed joint, as discussed below, to ensure that a joint is properly made. There can be an inspection aperture 26 on one or both sides of the outer sleeve to ensure that inspection can be carried out in a completed installation.

Figure 6A shows a perspective view of a pipe socket according to the present invention. In a perspective view from above and Figure 6B shows a perspective view from below the joint. It will be noted that on the outer sleeve 22 there is an observation or inspection aperture 26 by which an inspector can ensure after the pipe joint has been made that the pipe has been pushed sufficiently into the connection socket to provide a good connection.

Figure 7 shows the connector system of the present invention with a pipe joined into the socket according to the present invention. The pipe 28 has an end 30 which is inserted into the annular recess 24 and pushed in until there is a tight fit. The end 30 of the pipe 28 has almost reached the full depth of the annular recess so that a good connection has been made.

Figure 8 shows a problem which can occur when a pipe 32 with an angled end cut 34 is inserted into the socket. In this case the end of the pipe 34 does not cover the inspection aperture 26 and the pipe connection can be easily checked to be inadequate.

Similarly in Figure 9 the pipe 36 has been inadequately pushed into the connection socket so that the end 38 does not reach the inspection aperture 26 and again it can be inspected and rejected by observation through the inspection aperture 26.

Figure 10 shows a pipe fitting including a socket according to the present invention in use mounted into a concrete floor. In this embodiment the pipe fitting 40 is set into a concrete floor 42 so that the lower end 43 of the fitting 40 is flush with the soffit 42a. A socket according to the present

invention, generally shown as 44, is provided at the lower end of the pipe fitting 40 and a pipe 46 can be fitted into the pipe socket 44. In this embodiment the pipe fitting has a floor drain generally shown as 48 mounted into it but other types of fittings can also be applied.

5 Figure 11 shows a part sectioned view of a side access junction incorporating a socket of the present invention. The pipe fitting 50 has an uppermost socket 52 for receiving a pipe 54, a side socket 56 for receiving another pipe 58 and a lower socket 60 to receive a pipe 62. A clearing access 64 is provided in the side of the junction fitting. In this embodiment only the lower socket 60 is provided with a socket arrangement according to the present invention as both the socket 52 and the socket 58
10 are angled downwards in use so will not have a problem with leakage.

 Figure 12 shows an alternative pipe fitting according to the present invention. In this embodiment the pipe fitting generally shown as 70 is a right angle or 90° bend pipe fitting incorporating sockets according to the present invention for a drain, waste of stormwater pipe. The
15 pipe fitting 70 has a socket 74 at its lower end and a socket 76 at its upper end. Both the pipe sockets 74 and 76 are formed according to the present invention as this bend can be used in any orientation and therefore both sockets may be susceptible to leakage.

 An example of dimensions for a pipe connection socket according to the present invention are
20 as follows for a nominal 100 mm pipe.

Standard pipe dimensions

	Nominal pipe diameter	100 mm
	External pipe diameter	110 mm
	Internal Diameter of pipe	104 mm
25	Pipe wall thickness	3 mm

Socket dimensions

	Outer sleeve length	55 mm
	Inner sleeve length	45 mm
	Nominal inside diameter of outer sleeve	110 mm
30	Nominal outside diameter of inner sleeve	104 mm
	Depth of Annular recess	45 mm
	Internal taper of Annular recess	
	Width at mouth	3.5 to 4 mm
	Width of root	2.9 to 3.4 mm
35	Angle of taper	0.5 degrees
	Diameter of inspection aperture	5 mm
	Inspection Aperture	7.5 mm from base of the annular recess

Test Results

Tests were carried out to compare a prior art bell type connection (referred to as a conventional pipe sleeve fitting) with a connection socket of the present invention (referred to as an anti-leakage pipe sleeve receiver system) as follows:

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SUBJECT

Testing of an anti-leakage pipe sleeve receiver system.

TESTING OBJECTIVES

- 10 To investigate the effectiveness of an anti-leaking pipe sleeve receiver system compared to conventional pipe sleeves.

DESCRIPTION OF SAMPLE

- 15 A combination of the anti-leakage pipe sleeve fittings and conventional pipe sleeve fittings and were received.

TEST PROCEDURE

- 20 Two similar pipe systems were set up, one set up consisting of the conventional pipe sleeve fittings and the other consisting of anti-leakage pipe sleeve fittings. Both pipe systems were set up without using any solvent cement to simulate a scenario whereby the solvent cement has disintegrated over a long period of time.

- 25 To simulate flushing conditions, a water closet cistern was installed on each pipe system to flush water through the setup at a regular interval of 5 minutes. This was repeated for 10,000 cycles. In addition, both pipe systems were installed at 25° angles to the horizontal plane, to simulate less than ideal conditions of pipe installation. During the test, blue coloured water was used in the flushing cistern to ensure that leaks, if any, could be spotted easily. Throughout the duration, visual inspections were carried out at regular intervals.

TEST CRITERIA

In order to establish that the anti-leakage pipe receiver design is more effective than the conventional one, amount of leakage, if any, must be significantly less than the conventional design.

TEST RESULTS

Sample Reference	Results	Test requirements
Conventional pipe sleeve system	Leakage was observed after 10 flushes	Anti-leakage pipe sleeve system

Anti-leakage pipe sleeve system	No leakage was observed during the full 10,000 cycles	must have significantly less leakage than conventional system
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Conclusion:

5 This test was designed to subject the two pipe systems to less than ideal conditions and to compare how they performed under such conditions. These conditions include possible wear and tear over long periods of usage as well as improper installation methods.

10 In conclusion, the anti-leakage pipe sleeve system met the test criteria of this test and it had no leakage after the full 10,000 cycles compared to that of the conventional pipe sleeve system which had leakages after 10 cycles.

Throughout this specification various indications have been given as to the scope of this invention but the invention is not limited to any one of these but may reside in two or more of these combined together. The examples are given for illustration only and not for limitation.

15 Throughout this specification unless the context requires otherwise, the words 'comprise' and 'include' and variations such as 'comprising' and 'including' will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

CLAIMS

1. A plastics material pipe connection socket, the pipe having an pipe internal diameter and a pipe external diameter; the socket comprising an inner sleeve with an outside diameter substantially the pipe internal diameter and an outer sleeve with an inside diameter substantially the pipe external diameter, the inner and outer sleeves defining between them an annular recess to receive a pipe end to form a joint, wherein the annular recess is tapered so that in use, a tight fit is obtained and a good joint is made.
2. The plastics material pipe connection socket as in Claim 1 wherein the outer sleeve is longer than the inner sleeve.
3. The plastics material pipe connection socket as in Claim 1 wherein the outer sleeve is longer than the inner sleeve by approximately 10 to 20%.
4. The plastics material pipe connection socket as in Claim 1 further including an inspection aperture in the outer sleeve.
5. The plastics material pipe connection socket as in Claim 1 further including two inspection apertures in diametrically opposed sides of the outer sleeve.
6. The plastics material pipe connection socket as in Claim 1 further including an inspection aperture in the outer sleeve the inspection aperture having a diameter of 5 mm and being near the bottom of the annular recess.
7. The plastics material pipe connection socket as in Claim 1 wherein the taper is such that at a mouth end nearest an open end of the socket, the annular recess is wider than at a root end nearest the pipe.
8. The plastics material pipe connection socket as in Claim 1, wherein the taper on the annular recess is provided on either the outer or the inner sleeve.
9. The plastics material pipe connection socket as in Claim 1, wherein the taper on the annular recess is provided in each of the inner and outer sleeve.
10. The plastics material pipe connection socket as in Claim 1 wherein the pipe and the connection socket is formed from uPVC and the pipe and socket are connected using a solvent cement.

11. The plastics material pipe connection socket as in Claim 1 wherein the connection socket is formed on a pipe fitting selected from the group comprising a plain bend, and inspection opening bend, a rear access bend, a vented access bend, a side access bend, an inspection opening junction, a rear access junction, a double access junction a plain junction and inspection opening coupling and a plain coupling.

12. A plastics material pipe connection socket; the socket comprising an inner cylindrical sleeve and an outer cylindrical sleeve, the inner and outer sleeves defining between them an annular recess to receive a pipe end to form a joint therebetween, wherein the annular recess is tapered so that in use, a tight fit is obtained and a good joint is made..

13. A plastics material pipe fitting comprising at least a first and a second connection arrangement to connect plastics material pipes using the connection arrangements, the pipe having an pipe internal diameter and a pipe external diameter; at least one of the connection arrangements comprising an inner sleeve with an outside diameter substantially the pipe internal diameter and an outer sleeve with an inside diameter substantially the pipe external diameter, the inner and outer sleeves defining between them an annular recess to receive the pipe end to form the connection, wherein the annular recess is tapered so that in use, a tight fit is obtained and a good joint is made..

14. The plastics material pipe fitting as in Claim 13 wherein the outer sleeve is longer than the inner sleeve.

15. The plastics material pipe fitting as in Claim 13 further including an inspection aperture in the outer sleeve.

16. The plastics material pipe fitting as in Claim 13 further including two inspection apertures in diametrically opposed sides of the outer sleeve.

17. The plastics material pipe fitting as in Claim 13 wherein the taper is such that at a mouth end nearest an open end of the socket the annular recess is wider than at a root end nearest the pipe.

18. The plastics material pipe fitting as in Claim 13, wherein the taper on the annular recess is provided on either the outer or the inner sleeve.

19. The plastics material pipe fitting as in Claim 13, wherein the taper on the annular recess is provided in each of the inner and outer sleeve.

20. The plastics material pipe fitting as in Claim 13 wherein the connection socket is formed from uPVC.

21. The plastics material pipe fitting socket as in Claim 13 wherein pipe fitting is selected from
5 the group comprising a plain bend, and inspection opening bend, a rear access bend, a vented access bend, a side access bend, an inspection opening junction, a rear access junction, a double access junction a plain junction and inspection opening coupling and a plain coupling.