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DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Pipe Fittings of Synthetic Resin Material

1 We, THE YORKSHIRE COPPER WORKS (HOLDINGS) LIMITED, formerly The Yorkshire Copper Works Limited, a British Company, of Haigh Park Road, Stourton, Leeds, Yorkshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to pipe fittings of synthetic resin material, i.e., parts for joining together the ends of two plastic flanged pipes or for fitting the end of one such pipe to an article having a bore, such as a faucet.

15 It is known to join together copper or other metal pipes by fittings of the general type herein described but, with the introduction and general adoption of plastic pipes, difficulties have arisen in providing means usable by non-skilled or semi-skilled labour for making the necessary joints easily, permanently and effectively.

20 In order to overcome this difficulty, apparatus and a method has been invented by which flanges may be fabricated on to the ends of plastic pipes by a tradesman with only a short training using only simple apparatus and a plumber's blowlamp or other easy means of generating heat.

30 Such apparatus and method are described in United Kingdom co-pending Application No. 15207/55 (Serial No. 798,692) and the application for Patent of addition thereto No. 17334/56 (Serial No. 818,089) and comprises a portable tool comprising a segmented collar capable of being easily assembled *in situ* and locked firmly on to the pipe near its end so as to leave an end protruding, a mould internally shaped to form the flange, a bayonet or similar joint by which the collar and mould may be locked together and means for longi-

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tudinally displacing the mould relative to the collar and thus to the pipe end. The apparatus, moreover, preferably includes a setting block or distance piece for correct location of the pipe relative to the remainder of the apparatus and such setting block has preferably a sleeve having two internal diameters connected by an internal shoulder. The method of making the flange includes the step of adjusting the amount of pipe so protruding by a setting block of a size relative to that of a pipe to be flanged and then forming the flange by the apparatus hereinbefore described.

The flanges formed on the pipe by this process have the whole or part of their outer edge conical.

It is therefore the object of this invention to provide fittings in plastic material, such as polyethylene, so modified from the general type of those at present known that they will be suitable for joining together the ends of plastic pipes flanged by the method and apparatus hereinbefore described or for joining together one of such pipes to a conventional metal pipe.

The invention consists in a pipe fitting prepared by a moulding process from a synthetic resinous material, in the form of a tubular element of enlarged external diameter at its end, this enlarged portion being externally threaded, and the tubular element having an internal step in said enlarged portion, which step is adapted to co-operate with the end of a pipe inserted into the end of the fitting.

Preferably such fitting is used with a nut internally screw-threaded from one face having an inwardly projecting flange at the other face.

Preferably the fittings are made by injection moulding.

In its preferred form, therefore, the fitting comprises two parts both of polyethylene, i.e.

an interconnecting sleeve axially bored with an unrestricted bore having enlarged ends externally threaded and end openings each internally formed as a part cone of which the smaller diameter is substantially larger than the bore of the fitting so that such cone may mate with the conical or part-conical flange of the pipe to be joined without restricting the flow through the bore, and an inwardly flanged union nut internally threaded to mate with the external thread at each end of the sleeve and being formed throughout of substantial thickness with sufficient clearances so as to compensate for possible contraction under pressure.

Then invention also comprises in combination a pipe flanged by the use of apparatus and by the method hereinbefore described and as claimed in corresponding Patent Applications Nos. 15207/55 (Serial No. 798,692) and 17334/56 (Serial No. 818,089) secured to a fitting as hereinbefore described.

There are shown in the accompanying drawings Figures 6—8, and the drawings filed with the provisional specification Figures 1—5, examples of fittings made in accordance with this invention.

Referring to these drawings:—

Figure 1 is a section through a union nut suitable for use in conjunction with the present invention.

Figure 2 is a part section through a straight coupling according to the present invention.

Figure 3 is a part section through a T-piece according to the present invention.

Figure 4 is a part section through a bend according to the present invention.

Figure 5 is a section of a typical reducer when made in accordance with the invention.

Figure 6 shows in cross-section (on an enlarged scale) one example of a portable tool for fabricating the flange on to a plastic pipe.

Figure 7 shows a setting block for use with the apparatus shown in Figure 6.

Figure 8 shows two pipes each flanged with a tool and setting block such as those shown in Figures 6 and 7 and interconnected by a nut and a connecting piece such as shown in Figures 1 and 2.

In Figure 2 is shown a typical simple straight pipe coupling according to the invention. This comprises a basic interconnecting sleeve *e* having end openings *f* and *g*. Each of these is externally threaded with moulded threads *h* adapted to mate with the threads *c* (Figure 1). The bores *f* and *g* are formed conically internally at *i* with a step *j* to accept the conical outer edge of the flange on the plastic pipe but the smallest diameter of the cone is still substantially larger than the bore of the pipe so that the flow through the bore is unrestricted.

In Figure 3 is shown a similar construction in the form of a T-piece. The branches may be equal or unequal; each has moulded screw

threads *h* and internal cones *i* for the purpose described.

In Figure 4 is shown a bend similarly constructed, reference letters being as in Figures 1, 2 and 3.

In Figure 5 is shown a reducing piece using similar reference letters, but in this case the end opening *h* is smaller than at *m*.

The various couplings described above with reference to Figures 2—5 are intended to receive the end of a pipe having a flange adapted to fit into the stepped recess at the end of the coupling and such a pipe may be secured to the coupling by a nut adapted to screw on to the thread *h* of the coupling, and having an inwardly directed flange adapted to engage the pipe flange and hold it firmly in the stepped recess. A suitable form of nut is shown in Figure 1 of the drawings accompanying the provisional specification herewith.

It will be seen that nut *a* shown in Figure 1 has an inwardly directed flange *b* and internal screw-threads *c*. The thickness of the parts is greater than in metal to compensate for the material, since contraction may occur. The central aperture *d* is designed to accept the plastic pipe to which it is to be coupled and the flange *b* will abut against the side of the flange on the pipe. The threads *c* are moulded to mate with the external threads *h* of the parts hereinafter described. The nut is made of such dimensions as to ensure its being capable of withstanding at least as high a pressure applied internally as the plastic pipe to which it is to be coupled.

Figure 6 shows a portable tool for flanging the plastic pipes and in the drawing a thermoplastic pipe 10 is illustrated having had formed upon it a flange 11.

The tool includes an internal rod or mandrel 1 of a diameter closely to fit within the pipe 10. The gripping collar comprises segmented cones 2 threaded at their rearward end at 12 so as together to form a continuous thread. A cooperating outer conical compression ring 4 has one portion of a bayonet joint 9 at one end, and is at the other end faced to engage against a locking nut 3.

In use a union nut, such as *b* (Figure 1), is first threaded on to the pipe end. The internal mandrel 1 is then inserted into the bore of the plastic pipe to a depth of approximately three inches in a typical case. The outer conical compression ring 4 is then threaded on to the pipe and moved back clear of the join. The segmented cones 2 are then assembled in position around and near to the end of the pipe leaving rather too much of the pipe protruding. The setting block shown in Figure 7 is then slid over the protruding end of the mandrel and carried forward over the end of the pipe until the shoulder bears against the end of the pipe and the forward end of the block bears against the segmented cones. Further pressure on the setting block then

drives the pipe back through the segmented cones until the correct critical setting is obtained.

5 The outer ring 4 is then pressed into position over the cones and the whole screwed tight by the locking nut 3. It is important to effect the final tightening of the nut 3 after adjusting the position of the pipe 10 to allow the correct amount to protrude from the end. The
10 final tightening of the nut 3 secures the segments 2 in such a position that their forward end will form part of the mould to make the flange and at the same time ensure that the pipe is quite firmly gripped. The outer ring 4
15 may be keyed and pegged to the segments 2 to prevent relative rotation.

Heat is then applied to the protruding end of the pipe 10 by means of a blowlamp or other suitable means so that the material is
20 softened to spongy consistency but is not allowed to ignite or char.

The second portion of the tool comprises the inner mould proper 6 internally shaped to form a flange, an outer casing 5 and a compression member 7. The inner mould 6 is slidably held within the outer casing 5, being
25 moved in a longitudinal direction under pressure by screw threads between parts 5 and 7 operated by the tommy bar 8. The outer casing
30 5 terminates in the mating portion of the bayonet joint 9 so as to mate with that on compression ring 4.

In use, therefore, after the end of the pipe 10 has been softened, the compression ring 4 and
35 outer casing 5 are locked together by the bayonet joint 9 and the tommy bar 8 operated, whereby the mould 6 is pressed against the protruding end of the tube and the flange thus formed. In the operation of heating the
40 end of the tube the conical segments inevitably become heated and this helps to maintain the material in a plastic state while the moulding is taking place.

45 After the flange as been formed the apparatus is allowed to stand for a few minutes to cool and can then be disassembled by slackening off the mould 6, unlocking the bayonet joint and disassembling the conical sections.

50 A further advantage in the use of this tool is in assisting to assemble a brass washer which is preferably used in making the join. Such a washer has to be assembled on the thermoplastic pipe behind the flange and by
55 the use of the setting block a brass washer may be pushed back by the setting block along the thermoplastic pipe leaving sufficient of the pipe protruding clear of the segmented cones and clear of the brass washer to form the flange.

60 Figure 8 shows the pipes 10 interconnected by the piece *c* and locked nuts *a*. It will be seen from this figure how substantial thickness of material is provided and clearances allowed to provide for the expected pressures and contractions.

65 The whole of the fittings hereinbefore des-

cribed and shown in Figures 1-5 are made of plastic material and preferably of polythene and may conveniently be made by injection moulding by any conventional plastic
70 injection moulding machine and the use of these fittings in combination with a pipe flanged by using the apparatus or tool and the method hereinbefore described enables a normal plastic pipe to be flanged if necessary
75 on the site and fitted either to another plastic or metal pipe or to a faucet or similar article with a fluid-tight joint.

The outside of the nuts shown in Figure 1 may be normal hexagons or may have a fluted external shape to enable them to be screwed
80 up simply by hand with a final tightening by a C-spanner.

The fittings may be made of any suitable plastic employing thermoplastic polymers, such as polyethylene, polystyrene, polyvinyl
85 chlorides, polymethyl methacrylate, cellulose acetate butyrate or cellulose acetate.

It will be seen that by forming the fittings with the characteristics shown and described they are especially suitable for use with plastic
90 pipes.

Moreover, by using the combination of pipe flanged as described with polythene two-part fittings, a pipe line can be set up which will
95 resist the corrosive effects of acids, manures and fertilisers, alkalis and corrosive fluids. The fittings will require no wrapping or protection when the pipe lines are to be underground. The fittings so made will be much lighter in weight than corresponding metal fittings and
100 will not cause the pipe line to sag or deflect provided that normal precautions are taken. Also, the fittings, if used as hereinbefore described, provide sound joints having excellent mechanical strength. Installations are
105 flexible enough to "give" to the natural settling down of the soil where pipe lines are buried underground. There is, moreover, no restriction of the bore and strong leak-proof and trouble-free joints can be obtained which
110 will not pull out in frost. The fittings, moreover, are non-toxic and non-contaminating and it will therefore be appreciated that by making fittings in the method hereinbefore described very substantial advantages are
115 obtained.

WHAT WE CLAIM IS:—

1. A pipe fitting prepared by a moulding process from a synthetic resinous material, in the form of a tubular element of enlarged
120 external diameter at its end, this enlarged portion being externally threaded, and the tubular element having an internal step in said enlarged portion, which step is adapted to co-operate with the end of a pipe inserted into
125 the end of the fitting.

2. A fitting as claimed in Claim 1 in combination with a nut internally threaded from one face for engagement on the externally threaded end of the tubular element, and hav-
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drives the pipe back through the segmented cones until the correct critical setting is obtained.

The outer ring 4 is then pressed into position over the cones and the whole screwed tight by the locking nut 3. It is important to effect the final tightening of the nut 3 after adjusting the position of the pipe 10 to allow the correct amount to protrude from the end. The final tightening of the nut 3 secures the segments 2 in such a position that their forward end will form part of the mould to make the flange and at the same time ensure that the pipe is quite firmly gripped. The outer ring 4 may be keyed and pegged to the segments 2 to prevent relative rotation.

Heat is then applied to the protruding end of the pipe 10 by means of a blowlamp or other suitable means so that the material is softened to spongy consistency but is not allowed to ignite or char.

The second portion of the tool comprises the inner mould proper 6 internally shaped to form a flange, an outer casing 5 and a compression member 7. The inner mould 6 is slidably held within the outer casing 5, being moved in a longitudinal direction under pressure by screw threads between parts 5 and 7 operated by the tommy bar 8. The outer casing 5 terminates in the mating portion of the bayonet joint 9 so as to mate with that on compression ring 4.

In use, therefore, after the end of the pipe 10 has been softened, the compression ring 4 and outer casing 5 are locked together by the bayonet joint 9 and the tommy bar 8 operated, whereby the mould 6 is pressed against the protruding end of the tube and the flange thus formed. In the operation of heating the end of the tube the conical segments inevitably become heated and this helps to maintain the material in a plastic state while the moulding is taking place.

After the flange as been formed the apparatus is allowed to stand for a few minutes to cool and can then be disassembled by slackening off the mould 6, unlocking the bayonet joint and disassembling the conical sections.

A further advantage in the use of this tool is in assisting to assemble a brass washer which is preferably used in making the joint. Such a washer has to be assembled on the thermoplastic pipe behind the flange and by the use of the setting block a brass washer may be pushed back by the setting block along the thermoplastic pipe leaving sufficient of the pipe protruding clear of the segmented cones and clear of the brass washer to form the flange.

Figure 8 shows the pipes 10 interconnected by the piece *c* and locked nuts *a*. It will be seen from this figure how substantial thickness of material is provided and clearances allowed to provide for the expected pressures and contractions.

The whole of the fittings hereinbefore des-

cribed and shown in Figures 1—5 are made of plastic material and preferably of polythene and may conveniently be made by injection moulding by any conventional plastic injection moulding machine and the use of these fittings in combination with a pipe flanged by using the apparatus or tool and the method hereinbefore described enables a normal plastic pipe to be flanged if necessary on the site and fitted either to another plastic or metal pipe or to a faucet or similar article with a fluid-tight joint.

The outside of the nuts shown in Figure 1 may be normal hexagons or may have a fluted external shape to enable them to be screwed up simply by hand with a final tightening by a C-spanner.

The fittings may be made of any suitable plastic employing thermoplastic polymers, such as polyethylene, polystyrene, polyvinyl chlorides, polymethyl methacrylate, cellulose acetate butyrate or cellulose acetate.

It will be seen that by forming the fittings with the characteristics shown and described they are especially suitable for use with plastic pipes.

Moreover, by using the combination of pipe flanged as described with polythene two-part fittings, a pipe line can be set up which will resist the corrosive effects of acids, manures and fertilisers, alkalis and corrosive fluids. The fittings will require no wrapping or protection when the pipe lines are to be underground. The fittings so made will be much lighter in weight than corresponding metal fittings and will not cause the pipe line to sag or deflect provided that normal precautions are taken. Also, the fittings, if used as hereinbefore described, provide sound joints having excellent mechanical strength. Installations are flexible enough to "give" to the natural settling down of the soil where pipe lines are buried underground. There is, moreover, no restriction of the bore and strong leak-proof and trouble-free joints can be obtained which will not pull out in frost. The fittings, moreover, are non-toxic and non-contaminating and it will therefore be appreciated that by making fittings in the method hereinbefore described very substantial advantages are obtained.

WHAT WE CLAIM IS:—

1. A pipe fitting prepared by a moulding process from a synthetic resinous material, in the form of a tubular element of enlarged external diameter at its end, this enlarged portion being externally threaded, and the tubular element having an internal step in said enlarged portion, which step is adapted to co-operate with the end of a pipe inserted into the end of the fitting.

2. A fitting as claimed in Claim 1 in combination with a nut internally threaded from one face for engagement on the externally threaded end of the tubular element, and hav-

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ing an inwardly projecting flange at the other face, adapted to engage a flange on the inserted pipe in order to secure the pipe in the tubular element.

5 3. A fitting as claimed in Claim 1 or 2 comprising a tubular coupling element externally threaded at each end and having at each end a stepped recess adapted to receive the end of a pipe with which the coupling is used.

10 4. A fitting as claimed in Claim 3 wherein each end recess has side walls convergent or inwardly tapering from the open end of the coupling element.

15 5. A fitting as claimed in Claim 3 or 4 comprising a tubular side branch extending from the tubular coupling element, the open end of the side branch being threaded.

20 6. A fitting as claimed in Claim 5 wherein the open end of the branch is formed with a stepped recess having convergent side walls, of substantially the same form as the open ends of the tubular coupling element proper.

25 7. A fitting as claimed in Claim 3 or 4 wherein the tubular coupling element is of curved shape between its ends.

30 8. A fitting as claimed in Claim 3 or 4 wherein part of the internal bore of the tubular coupling element is of convergent or conical form.

35 9. A pipe fitting comprising a coupling element as claimed in any of Claims 3—8, engaged by a nut as claimed in Claim 1 or Claim 2 whereby the end of a pipe is held in engagement with the coupling element.

10. A pipe fitting comprising two parts both of moulded polyethylene, i.e., an interconnecting sleeve axially bored with an unrestricted bore having end portions of enlarged diameter which are externally threaded and internally formed as a part cone of which the smaller diameter is substantially larger than the bore of the fitting (so that such cone may mate with a conical or part-conical flange previously formed on the pipe to be joined without restricting the flow through the bore) and an inwardly flanged union nut internally threaded to mate with the external thread at each end of the sleeve, the whole fitting being formed throughout of substantial thickness with sufficient clearances so as to compensate for possible contraction under pressure.

11. A fitting as claimed in any preceding claim having secured thereto a pipe flanged by the use of apparatus and by the method described in co-pending Applications Nos. 15207/55 (Serial No. 798,692) and 17334/56 (Serial No. 818,089).

12. A moulded synthetic resin pipe fitting, substantially as described herein with reference to any of Figures 2—5 of the drawings accompanying the provisional specification herewith.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Pipe Fittings of Synthetic Resin Material

65 We, THE YORKSHIRE COPPER WORKS LIMITED, a British Company, of Haigh Park Road, Stourton, Leeds, Yorkshire, do hereby declare this invention to be described in the following statement:—

70 This invention relates to plastic pipe fittings i.e. the essential parts for joining together the ends of two plastic pipes or for fitting the end of one pipe to an article having a bore such as a faucet.

75 It is known to join together copper or other metal pipes by fittings of the type herein described but with the introduction and general adoption of plastic pipes difficulties have arisen in providing means usable by normal labour for making the necessary joints easily, permanently and effectively. In order to overcome this difficulty, apparatus has been invented which is protected by co-pending Application No. 15207/55 (Serial No. 798,692) by which flanges may be fabricated on to the ends of plastic pipes by a tradesman with only a short training, using only the apparatus described in such patent applica-

tion and a plumber's blowlamp or other simple means of generating heat. It is therefore the object of this invention to provide fittings in plastic material such as polythene for joining together the ends of pipes which have been flanged in this or other manner.

90 A pipe fitting made in accordance with this invention is formed throughout of plastic material such as polythene and comprises an interconnecting sleeve having externally threaded end openings and in which the inner bore of at least one of such openings is conical and of a size adapted to mate with the conical ends or flanges of the flanged pipes, so that by the use of an inwardly flanged union nut which co-operates with the said external threads and the flanges preformed on the pipe, the pipe may be drawn into the conical bore of the fitting and a fluid-tight joint be made.

95 Preferably such fittings comprise the combination of such interconnecting sleeve with a flanged union nut as hereinbefore described.

100 Preferably the fittings are made by injection moulding. 110

There are shown in the accompanying drawings examples of fittings made in accordance with this invention:—

Referring to these drawings:—

5 Figure 1 is a section through a union nut made in accordance with the invention;

Figure 2 is a part section through a straight coupling;

10 Figure 3 is a part section through a T-piece; Figure 4 is a part section through a bend;

Figure 5 is a section of a typical reducer when made in accordance with the invention.

It will be seen that nut *a* shown in Figure 1 has an inwardly directed flange *b* and threads *c*. The central aperture *d* is designed to accept the flange on the pipe referred to in the said co-pending Application No. 15207/55 (Serial No. 798,692). The threads *c* are moulded to mate with the external threads *h* of the parts hereinafter described. The nut is made of such dimensions as to ensure it being capable of withstanding at least as high a pressure applied internally as the plastic tube or pipe with which it is to be used.

15 In Figure 2 is shown a typical simple straight coupling. This comprises a basic inter-connecting sleeve *e* having end openings *f* and *g*. Each of these is externally threaded with moulded threads *h* adapted to mate with the threads *c* (Figure 1). The bores *f* and *g* are formed conically internally at *i* to accept the conical surface of the flange on the pipe made according to the said co-pending patent application.

20 In Figure 3 is shown a similar construction in the form of a T-piece. The branches may be equal or unequal; each has moulded screw threads *h* and internal cones *i* for the purpose described.

In Figure 4 is shown a bend similarly constructed, reference letters being as in Figures 1, 2 and 3.

In Figure 5 is shown a reducing piece using similar reference letters, but in this case the end opening *k* is smaller than that at *m*.

45 The whole of the fittings hereinbefore described may conveniently be made by injection moulding by a convenient plastic injection moulding machine and the use of these fittings together with the apparatus described in co-pending Application No. 15207/55 (Serial No. 798,692) enables a normal plastic pipe to be flanged if necessary on the site and fitted either to another pipe or to a faucet or similar article with a fluid-tight joint.

50 The outside of the nuts shown in Figure 1 may be normal hexagons or may have a fluted external shape to enable them to be screwed up simply by hand with a final tightening by a "C" spanner.

60 The fittings may be made of any suitable plastic employing thermoplastic polymers, such as polyethylene, polystyrene, polyvinyl chloride, polymethyl methacrylate, cellulose acetate butyrate, cellulose acetate, and similar materials.

70 It is believed that fittings made in accordance with this invention will meet the demand for parts which can be easily fitted on the site and will enable normal workmen to use polythene or similar pipes effectively and without labour difficulties.

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