

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Mounting of Insulators on Supporting Spindles

We, GALVANIZING INDUSTRIES PROPRIETARY LIMITED, a Company incorporated under the Laws of the State of Victoria, Commonwealth of Australia, of 30—38, Albert Street, Preston, in the State of Victoria, Commonwealth of Australia, 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:—

This invention relates to improvements in or relating to insulator spindles and their manufacture and particularly concerns a method of manufacturing a novel insulator spindle and the spindle itself.

Electrical insulators of glass, porcelain or similar material, which are used for carrying telephone lines and low tension electric power transmission lines or the like, are normally mounted on metal spindles or pins which are in turn bolted or otherwise secured to the cross-arms of a suitable pole. Such insulators normally comprise a head, neck and skirt, the head being uppermost and joined to the skirt by the neck and the skirt being provided internally with a threaded socket which is adapted to be screwed over an externally threaded head section provided on the spindle. For many years the spindle head has been hand-cast from a soft metal such as lead, since to form the head integrally with the spindle stem from a hard metal would be likely to split or otherwise damage the insulator itself. Not only is this method laborious and expensive but the head of the complete spindle, (that is, the spindle stem with the head fitted) is easily damaged during handling and, once again, there is danger of cracking or damaging of the insulator. Furthermore, it is often found that the head works loose on the stem while in use leading eventually to the breakage of the insulator.

It is therefore an object of this invention to provide an improved method of forming such an insulator spindle for attachment to a conventional insulator whereby the disadvantages associated with the known method are substantially overcome. It is also an object of this invention to provide a spindle which may be used with the conventional insulator and which does not suffer from the abovementioned defects.

Accordingly, therefore, we provide a method of manufacturing insulator spindles comprising the steps of forming a spindle stem, shaping the head carrying portion of the spindle stem to ensure that the subsequently moulded head is axially fixed thereto and moulding a resilient head on the head carrying portion of the spindle stem. Preferably however, the spindle head is firmly located both axially and rotationally on the head carrying portion of a metallic spindle stem, and the head itself is formed by injection moulding a quantity of suitable resilient plastic material onto the head carrying portion of the stem.

Also in accordance with this invention we provide an insulator spindle having a metallic stem and a resilient head moulded thereon, the head carrying portion of the stem being shaped so that the head is firmly located with respect to the stem. Once again, the resilient head may be formed by injection moulding a suitable resilient plastic material onto the head carrying portion of the stem which may be shaped so that the head is firmly located both axially and rotationally with respect thereto.

In order to further describe this invention a particular example will now be given by way of illustration only. The particular embodiment chosen will be described with reference to the accompanying drawings in which:—

[Price 4s. 6d.]

Figure 1 is a sectional view of a conventional insulator fitted to an insulator spindle, formed in accordance with the invention, which is in turn attached to the cross-arm of a telephone pole;

Figure 2 is a general side elevational view of the spindle of Figure 1;

Figure 3 illustrates, diagrammatically, how the spindle head may be formed on the head carrying portion of the stem by an injection moulding process and shows a spindle stem in place in a mould ready to receive a plastic head;

Figures 4, 5, 6, 7 and 8 are perspective views of the head carrying portion of various spindles and illustrate how this portion may be formed in order to locate the head firmly on the spindle.

Referring to Figure 1 and 2 of the accompanying drawings, the particular embodiment of the invention concerns a spindle 1 for use in connection with a porcelain or glass insulator 2 and which provides a convenient means whereby insulator 2 may be secured to a cross-arm 3 of a telephone pole. The insulator 2 is of conventional construction and comprises a head portion 4, neck portion 5 and skirt portion 6. An internally threaded socket 7 is situated centrally within the skirt 6 and provides means whereby the spindle may be coupled to the insulator. Normally such insulators are used in connection with telephone wires and the wires are supported by looping them around the neck 5 or laying them into the groove 4a.

It will be appreciated that, not only are the insulators subjected to a constant mechanical loading due to the wires but they are also subject to a variable force caused by high winds, snow or ice forming on the wires and it is essential that the spindle be secured to the insulator in the firmest way possible. It has been found that the insulators often tend to chatter loose on the conventional spindles and, owing to the decreased supporting area, tend to break and therefore result in a line breakdown. Frequently, on the other hand, instead of the insulator working loose on the head, the head itself (of the conventional spindle) works loose on the stem with the same result.

In this particular embodiment of the invention the above dangers are greatly reduced by constructing the spindle in accordance with the invention. The spindle 1 basically consists of a spindle stem 8 and a spindle head 9. The stem 8 has a head carrying portion 8a formed on one end over which the head 9 is formed and has a screw thread 8b formed on the other end so that it can be secured by a corresponding nut 10 to the cross-arm 3. A shoulder 11 and square shank 11a are provided to locate the stem with respect to the cross-arm. It may also be desirable to provide a similar shoulder

12 on the spindle stem 8 which locates it axially with respect to the head 9 (shown dotted in Figure 1).

The head carrying portion 8a of the spindle stem 8 may be formed by any suitable stamping, forging or shaping process and need not be formed to close tolerances and thereby obviates the necessity for expensive machining operations. In this particular embodiment, the head carrying portion 8a is simply stamped by a sharp "T"-shape tool which forms the corresponding indentation. It is also preferable after having formed the spindle stem 8 to galvanize its exterior as a protection from rust and corrosion.

It may, of course, not be necessary to form the end of the spindle 8b which is attached to the cross-arm 3 in exactly the way shown in this embodiment, since it is possible to provide it with a wood-screw thread which is suitable for securing it directly into a pilot hole in the cross-arm 3. The spindle in this case may be introduced into the pilot hole by turning it in the manner of an ordinary wood-screw, excepting that the spindle is turned by means of a spanner or the like which co-operates with flats formed on the collar 11 of the stem.

In accordance with this particular embodiment of the invention the head 9 is formed from resilient plastic material by moulding in an injection moulding machine of any suitable construction. The resilient plastic material is preferably a polyethylene moulding material such as that which is sold under the trade name of "XRM-20". The plastic material when moulded has sufficient resilience to ensure that the insulator 2 can be attached to the spindle without any damage to the former and to ensure that damage does not occur to the insulator when strains are applied thereto by the movement of the cable or wires during winds or the like. The plastic material is also of sufficient strength to ensure that the insulator and the spindle head will be retained on the spindle stem even when the assembly is subjected to high tensile axial stresses. It is possible, of course, to form the spindle head 9 from other plastic materials according to this invention and nylon, various other polyethylene derivatives and plastics of the polyethylene type may be used.

Referring to Figure 3, once the spindle stem 8 has been formed and the head carrying portion 8a has been suitably shaped, the spindle stem 8 is placed within a mould consisting of two halves 13 and 14 which locate the spindle stem 8 so that the head carrying portion 8a is retained in a cavity 15 having an internal shape corresponding to the desired external shape of the spindle head 9. The suitably prepared plastic material is injected into the cavity 15 from a storage

chamber via the passageway 16 and, after it has set, the completed spindle is removed from the mould by separating the mould halves 13 and 14.

5 It is very often the practice for the spindles and the insulators to be manufactured in different factories by entirely different organizations so that they must be transported independently to the customer who wishes to use them. Thus the spindles are usually 10 packed in crates or boxes as soon as they have been completed and are handled considerably between their completion and their insertion into the corresponding insulators. 15 With the conventional spindles the handling operations lead in very many cases to the damage of the spindle head causing the threads to be deformed or knocking the whole head out of alignment with the stem. When 20 the customer tried to assemble such spindles and insulators, the deformed spindle head often broke the insulators and frequently were the cause of subsequent failures when the insulators were in actual use.

25 Since the spindle head of the spindle of this invention is formed in the manner described from a resilient plastic material, there is negligible danger that the heads will be damaged during normal handling conditions and consequently the customer can be reasonably certain that the spindles with which he is supplied will serve satisfactorily with the corresponding insulators.

30 In order to retain the head 9 on the spindle stem 8, the head carrying portion 8a of the spindle is shaped in any one of a number of ways so that the head is both axially and rotationally fixed with respect to the stem. It is necessary, of course, to fix the head 35 axially to the stem to prevent the insulator from pulling the head off the stem when the assembly is in use, and it is necessary to locate the head rotationally with respect to the stem so that the spindle may be screwed 40 firmly into the insulator and the danger of the insulator working loose is reduced.

45 Figure 4, 5, 6 and 7 of the accompanying drawings illustrate various methods of securing the spindle head 9 to the spindle stem 8 by shaping the head carrying portion 8a appropriately. Figure 4 illustrates the head 50 carrying portion of the spindle stem illustrated in Figures 1, 2 and 3, that is, it has a "T"-shaped slot or indentation 17 formed 55 on its curved surface. It may be desirable to form more than one such slot on the curved surface of the head carrying portion 8a of the spindle stem 8, and it may even be advantageous to form a slot in the end surface 60 of the stem. The "T"-shape slot 17 effectively prevents the plastic head which is subsequently moulded on the head carrying portion 8a of the stem from moving relatively to the stem. The slot is preferably formed 65 in a stamping press by a suitable die in a

separate operation although it may be desirable, where circumstances permit, to form the "T"-slot or similar indentation during the forging operation.

70 Figure 5 illustrates a very simple, and under some circumstances the most preferable, manner in which the head carrying portion may be formed to carry the head firmly thereon. In this example the head portion 75 is not shaped differently from the spindle stem and no collar is provided but it is merely roughened, by heavy knurling for example, so that deep grooves or knicks 18 are provided on its curved surface so that the head may grip the spindle firmly. The 80 end surface of the spindle may also be marked or shaped by the groove 19 as indicated.

The methods of forming the head carrying portion illustrated in the abovementioned 85 figures have the advantage that the spindle is not significantly weakened thereby. The forms illustrated in the subsequent figures do not embody this advantage.

90 Referring to the alternative form of spindle shown in Figure 6, the head carrying portion of the spindle is circular in cross section but has the general shape of an inverted 95 frusto-conical section. The lower end 20 of the head carrying portion is of a smaller diameter than the upper end 21 so that it will not be possible to move the head axially with respect to the spindle. In this case however the collar 22 is formed square or non-circular and when the head is moulded 100 over the collar it cannot be rotated with respect to the spindle.

Figure 7 illustrates yet another simple method of forming the head-carrying portion of the spindle stem. A groove 23 of the 105 type shown is cut diagonally into the side of the stem and serves the double function of preventing the rotatory and the axial movement of the head.

110 Figure 8 illustrates a more complex head carrying portion which has a generally square end portion 24 divided from a similar portion 25 by an undercut cylindrical portion 26 forming a depression in the spindle stem. In this case the shoulder 27 does not play 115 any part in the actual fixing of the head other than locating it axially and serving to define the head carrying portion. When the spindle head is moulded around the appropriate portion of the spindle stem the material of the head closely follows the contour of the head 120 carrying portion and therefore, once the head has set, it will be practically impossible to turn it or slide it with respect to the spindle in view of the shape of the head carrying portion. 125

It can be seen that we have provided a method of forming an insulator spindle of the type described which is simple, economical and effective, and which overcomes the serious disadvantages of the prior art. 130



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WHAT WE CLAIM IS:—

1. A method of manufacturing insulator spindles comprising the steps of forming a metallic spindle stem and injection moulding a resilient spindle head from plastic material onto the head carrying portion of the spindle stem so that the head is firmly attached to the stem. 50
2. A method of manufacturing insulator spindles comprising the steps of forming a spindle stem, shaping or otherwise forming the head carrying portion of the spindle stem to ensure that the subsequently moulded head is axially fixed thereto, and moulding a resilient spindle head on the head carrying portion of the spindle stem. 55
3. A method of manufacturing insulator spindles comprising the steps of forming a metallic spindle stem shaping the head carrying portion of the spindle stem so as to ensure that the subsequently moulded head is firmly located both axially and rotationally thereon, and injection moulding a resilient spindle head from plastic material onto the head carrying portion of the spindle stem. 60
4. An insulator spindle having a metallic stem and a resilient head moulded thereon, the head carrying portion of the stem being shaped so that the head is firmly located with respect to the stem. 65
5. An insulator spindle having a metallic stem and a resilient head injection moulded thereon, the resilient head being firmly attached to the stem and externally shaped so as to correspond with the spindle receiving socket of the insulator. 70
6. An insulator spindle according to Claim 4 or Claim 5 having the resilient head formed by injection moulding a suitable resilient plastic material onto the head carrying portion of the stem, and having the head carrying portion of the stem roughened, indented and/or otherwise shaped so that the head is firmly located both axially and rotationally thereon. 75
7. An insulator spindle according to Claim 4, 5 or 6 in which the head carrying portion of the spindle is indented in at least one place by forming a slot in its curved surface so that a subsequently moulded head will be firmly attached thereto. 80
8. An insulator spindle according to any one of Claims 4 to 7 inclusive in which the head carrying portion of the stem is shaped by undercutting it or by forming a part or parts having a transverse cross-section substantially smaller than that of the remainder of the head carrying portion, and by forming a part or parts of the head carrying portion of non-circular transverse cross-section. 85
9. An insulator spindle according to any one of Claims 4 to 8 inclusive in which the head is formed with an external thread corresponding to an internal screw thread provided in the socket of the insulator. 90
10. A method according to Claim 1, 2 or 3 or an insulator spindle according to any one of the Claims 4 to 9 inclusive in which the resilient plastic material forming the spindle head is a polyethylene derivative such as nylon or is a plastic material of the polyethylene type. 95
11. A method of manufacturing insulator spindles substantially as hereinbefore described with reference to the accompanying drawings. 100
12. An insulator spindle substantially as hereinbefore described with reference to Figures 1, 2 and 3 of the accompanying drawings. 105
13. An insulator spindle having a head carrying portion shaped as hereinbefore described with reference to any one of Figures 4, 5, 6, 7 or 8 of the accompanying drawings. 110

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