

WASHING MACHINE HOSE

BACKGROUND OF THE INVENTION

The present invention relates to a drainage hose for use in a state where it is attached to an electric washing machine.

Such conventional washing machine hoses can be generally classified into a hose constituted by two kinds of hoses, one of which is an in-machine hose attached to the inside of a washing machine and the other of which is an out-of-machine hose set along a case of the washing machine, and another hose in which these separately-formed inside and outside different hoses are replaced by a single long hose constituted by an in-machine hose portion and an out-of-machine hose portion are integrally connected to each other in series.

In any of such conventionally generally known washing machine hoses, a water receiving pipe portion to be connected to a drainage pipe provided in a washing machine is provided on one end side of the hose. Further, in an in-machine hose, a pipe portion to be connected to an aperture portion formed in a side wall of a washing machine is provided on the other end side of the hose, while in an in-and-out integrated type hose, a long intermediate pipe portion projecting outside through this aperture portion is provided.

On the other hand, washing machines are grouped into two types, one of which is a two-tub type having a washing tub and a dewatering tub formed separately, and the other one of which is a one-tub type which has a single tub acting as a washing tub as well as a dewatering tub. In any of these types, a drainage pipe in a washing machine is provided vertically and opened downward, and an aperture portion formed in a side wall of the washing machine for connection or passage of the other end of the hose is opened horizontally. Therefore, in any washing machine hose of the in-machine hose



and the in-and-out integrated hose, a water receiving pipe portion should be attached vertically to a drainage pipe in a washing machine, and an external hose connecting pipe portion or an intermediate portion of the hose should be attached to or
5 passed through an aperture of the washing machine horizontally, so that it is necessary to turn the hose at an angle of 90° between the drainage pipe and the aperture of the washing machine.

To increase the capacity of a washing tub of a washing
10 machine, there are two methods in which the diameter of the tub is increased and the vertical height of the tub is increased. In order to increase the diameter, it is necessary to enlarge an outside case of the washing machine and the washing machine appears large in size. Therefore, it is not preferable from
15 any point of view because not only the material cost but also packing materials cost, shipping cost and so on are increased. On the other hand, if the vertical height of the tub is increased so that the washing machine is made high as a whole, not only the above problem arises, but also it becomes
20 difficult for a short person to use the washing machine.

It can be therefore considered, as means to solve these problems, that a lower space in the inside of a washing machine is made as small as possible while the vertical height of a washing tub is increased. This method is an effective one,
25 even in the case of using a washing tub with a current size without any change, in that it is possible to obtain a washing machine which is low in height enough to perform washing easily.

In a conventional drainage hose, however, the bending
30 radius is so large that it is difficult to form a sudden bending under a washing tub, so that a considerably large space is required in a lower portion in the inside of the washing machine. If this space is reduced, the hose is compressed and deformed in the inside of the washing machine so that its shape



as a pipe cannot be maintained.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to solve the foregoing problems belonging to conventional washing machines, and to provide a washing machine hose which can be bent suddenly, which can be arranged while being kept in its pipe-like shape even if a vertical space under a washing tub is small, in which the vertical space under the washing tub can be made as small as possible so that the bottom portion of the washing tub is disposed in a lower position, and by which it is possible to obtain a washing machine low in vertical height as a whole for the vertical height of the washing tub.

To achieve the above object, the washing machine hose according to the present invention comprises a water receiving pipe portion provided on one end side of the hose so as to be connected to a drainage pipe provided in a washing machine, and a bend formation portion to be bent into an L-shape following the water receiving pipe portion, and in which the bend formation portion is made to have a bellows-like corrugated shape constituted by a combination of different-diameter annular portions; and both sides of the bend formation portion in a longitudinal direction of the hose are held by two annular portions projecting from both sides of a base portion of a bend forming tool substantially perpendicularly thereto so that the bend formation portion is bent at almost right angles while large-diameter annular portions of the bend formation portion contact with each other under pressure or are made extremely adjacent to each other at the small-diameter side of the bent portion of the hose.

A specific mode of the bend formation portion is such that a bellows-like corrugated shape constituted by a combination of large-diameter annular portions and small-diameter annular portions, and another specific mode of the



same is such that a bellows-like corrugated shape constituted by a combination of large-diameter annular portions and annular portions with diameters smaller than the large-diameter annular portions only in part of the transverse directions of the pipe.

5 When the hose is produced, the hose is formed substantially straight over its entire length, and thereafter the above-mentioned bend formation portion is bent into an L-shape by use of a bend forming tool. At this time, the above-mentioned large-diameter annular portions constituting the bend
10 formation portion of the hose are made to be in pressure-contact with each other or made extremely adjacent to each at the small-diameter side in the posture of bending so that the posture of bending is made minimum. Although the material to form the hose is not limited specially, water proof materials
15 such as polyolefin resin or PVC resin are preferable.

In addition, the hose may be formed such that flat pipe portions may be formed on the opposite sides of the bend formation portion so that the annular portions of the bend forming tool can be fitted to the flat pipe portions or an in-
20 machine fixing flat pipe portion is formed in a desired portion of an intermediate portion of the hose so that the fixing flat pipe portion can be fixed in the inside of the washing machine. In addition, the hose may be formed such that an intermediate
25 pipe portion is made to be a flat pipe portion having no irregularities in a portion over a predetermined length, or the corrugated shape of the pipe portion is not limited to a sectionally half-arc corrugated shape, but it may be made to use a scalene-triangular corrugated shape.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Fig. 1 is a partially broken front view of a hose of a first embodiment.

Fig. 2 is a partially broken front view of the hose of Fig. 1 which has not been bent.



Fig. 3 is an expanded front view of a bend formation portion.

Fig. 4 is a partially cut-away front view illustrating the state where the hose is attached to a washing machine.

Fig. 5 is a partially broken front view of a hose of a second embodiment.

Fig. 6 is a partially cut-away front view of the hose of the second embodiment.

Fig. 7 is a front view illustrating a main part of a hose of a third embodiment.

Fig. 8 is a partially broken front view of a hose of a fourth embodiment which has not been bent.

Fig. 9 is an expanded front view of a bend formation portion of the hose of the fourth embodiment.

Fig. 10 is a sectional view taken on line A-A in Fig. 9.

Fig. 11 is a sectional view of a fifth embodiment corresponding to Fig. 10.

Fig. 12 is a sectional view of a sixth embodiment corresponding to Fig. 10.

DETAILED DESCRIPTION OF THE INVENTION

Preferred embodiments of the present invention will be described below with reference to the drawings. Of the drawings, Figs. 1 to 4 shows a hose H according to a first embodiment of the present invention. Fig. 1 is a partly broken view illustrating the structure of the hose H, Fig. 2 is a partly broken view illustrating the structure of the hose H before the hose is bent, Fig. 3 is an expanded view illustrating a bend formation portion where the hose H is bent, and Fig. 4 is a view illustrating the state where the hose H is attached to a washing machine A.

The washing machine hose H according to the present invention is produced such that synthetic resin material such



as polypropylene (PP), which is easy to be molded, moderate in rigidity, and high in elasticity and flexibility, is extruded in the form of a tube into a metal mold from a resin extruder, and this tubular material is subjected to blow-molding into a straight shape. The hose H in the first embodiment is an in-machine hose to be attached in the inside of the washing machine A, as shown in Fig. 4.

The structure of the hose H when the hose H is molded is such that, as shown in Fig. 2, a water receiving pipe portion 1 to be connected to a drainage pipe "a" provided in the inside of a washing machine A is formed on one end side of the hose H, a bend formation portion 2 which will be bent later into an L-shape is formed at a portion following the water receiving pipe portion 1, flat pipe portions 2a and 2a are formed in the opposite sides 23 and 24 of the bend formation portion 2 in the longitudinal direction, and a bellows-like corrugated intermediate pipe portion 3 is formed in an intermediate portion between the pipe portion 2a on the one side 24 and a pipe portion 4 to be connected to an external hose, those pipe portions 1, 2, 2a, 2b, 3 and 4 being integrally formed with each other into one substantially straight pipe as a whole. The bend formation portion 2 is made to have a special bellows-like corrugated shape in which a large-diameter annular portion 21 and a small-diameter annular portion 22 are formed alternately.

With the thus structured hose, as shown in Figs. 1 and 3, two annular portions 12 and 12 of the separately molded bend forming tool 10 which are formed so as to project from the opposite sides of a base portion 11 of the tool 10 substantially perpendicularly to each other are fitted to and held by the pipe portions 2a and 2a on the opposite sides 23 and 24 of the above-mentioned bend formation portion 2 in the longitudinal direction, so that the bend formation portion 2 is bent substantially at right angles into an L-shape in which the



above-mentioned large-diameter annular portions 21, 21... are in press-contact with each other or made extremely adjacent to each other at the small-diameter side of this bent portion and the outer circumferential portions of the small-diameter annular portions 22, 22... are enveloped by the side walls of the large-diameter annular portions 21, 21... adjacent to the respective small-diameter annular portions (especially see Fig. 3).

With such a structure, the bend formation portion 2 is bent with an extremely small bending radius so that this bent posture is minimized. In addition, in the hose H of this embodiment, as illustrated in the enlarged view of Fig. 3, a portion 23 which is formed adjacent to the bend formation portion 2 and on one end of the water receiving pipe portion 1 formed to be connected to the drainage pipe "a" of the washing machine A is made to serve also as the fitting pipe portion 2a for one of the annular portions 12 of the bend forming tool 10, so that the length of the water receiving pipe portion 1 is reduced. Reference numeral 7 shown in Figs. 1 and 2 represents a fitting portion to be inserted and fitted to an aperture portion "c" opened in a side wall "b" of the washing machine A (see Fig. 4).

In such a manner, the hose H according to the present invention can be bent with the minimum vertical width in use. Therefore, as shown in Fig. 4, the lower end of a washing tub "d" inside the washing machine A can be disposed at a greatly lowered position, and a vertical space "e" under the washing tub "d" can be made the minimum in use.

A hose H of a second embodiment shown in Figs. 5 and 6 is an in-and-out integrated hose in which a portion to be attached to the inside of a washing machine A and a portion to be used in a state where it is projected to the outside from a hose insertion aperture portion "c" formed in a side wall "b" of the washing machine A are integrally and continuously formed



into a single hose as shown in Fig. 6.

That is, the hose H in this embodiment is a long in-and-out integrated hose, in which a water receiving pipe portion 1 is formed on one end of the hose H so as to be connected to a drainage pipe "a" provided in the inside of the washing machine A, a bellows-like corrugated bend formation portion 2 in which large-diameter annular portions 21 and small-diameter annular portions 22 are formed alternately in the same manner as in the first embodiment, is formed in a portion following the water receiving pipe portion 1, a long intermediate pipe portion 3 following the bend formation portion 2 and having a portion to be disposed in the inside of the washing machine A and a portion to be projected to the outside through the aperture portion "c" of the side wall "b" is formed in an annular corrugated shape, a pipe portion 7 to be fixed to the aperture portion "c" of the side wall "b" is formed in the intermediate portion of the intermediate pipe portion 3, a pipe portion 8 to be removably locked to a hose lock portion "f" fixed at an upper portion of the side wall "b" of the washing machine A, and a pipe portion 6 for draining water are formed on an end of the outside projecting portion of the intermediate pipe portion 3, these pipe portions being formed integrally and continuously as a whole.

It is the same as in the first embodiment that the opposite sides 23 and 24, in the longitudinal direction, of the above-mentioned bend formation portion 2 are held by two annular portions 12 and 12 of a bend forming tool 10 so as to be bent substantially at right angles into an L-shape so that, on the small-diameter side of this bent portion, the above-mentioned large-diameter annular portions 21, 21... are in press-contact with each other or made extremely adjacent to each other. A generally well-known hook-type hose hanger may be attached to the pipe portion 8 for removable locking at an end side of the hose H.



Fig. 7 shows another structure of the hose H according to a third embodiment in which the structure of the bend formation portion 2 in the first and second embodiments is modified so that two small-diameter annular portions 22 and 22 are interposed between two adjacent large-diameter annular portions 21 and 21. The hose H according to the present invention can be produced in this manner.

Figs. 8 to 12 show embodiments in which a bend formation portion 2 is formed so that the diameter of small-diameter annular portions 22, 22... interposed between two adjacent large-diameter annular portions 21, 21... is smaller only partially in the transverse direction of the pipe than that of the large-diameter annular portions 21.

In the case of a fourth embodiment shown in Figs. 8 to 10, the sectional shape of each of the small-diameter annular portions 22 is contracted in one direction (downward in Fig. 10) in comparison with the round large-diameter annular portions 21 as shown in Fig. 10. In a fifth embodiment shown in Fig. 11, each of the small-diameter annular portions 22 is modified so that only its upper half is made smaller in diameter than the large-diameter annular portions 21. In a sixth embodiment shown in Fig. 12, each of the small-diameter annular portions 22 is modified so that its two, upper and lower portions are made smaller in diameter than the large-diameter annular portions 21.

Although the embodiments regarded as representative of the present invention have been described, the invention is not always limited to the structures of these embodiments, but it can be modified desirably within a range in which the above-mentioned constituents of the invention are provided, the object of the invention is attained, and the following effects are exhibited.

As has been already apparent from the above description, in a hose according to the present invention, even



if it is either a hose to be arranged in a washing machine or an in-and-out integrated hose, a portion following a water receiving pipe portion formed on one end of the hose so as to be connected to a drainage pipe provided in the inside of a washing machine is made to be a bend formation portion having a bellows-like corrugated shape in which annular portions made different in diameter, such as large-diameter annular portions and small-diameter annular portions, are provided alternately, and the opposite sides of this bend formation portion are held and bent by two annular portions of a bend forming tool so that the hose is bent substantially at right angles in a state where the large-diameter annular portions are in press-contact with each other or made extremely adjacent to each other at the small-diameter side of the bent portion. Accordingly, sudden bending can be made, the hose can be arranged while keeping its pipe shape without being flattened by the bending even if a vertical space under a washing tub is small, and the vertical space under the washing tub can be made as small as possible so that a bottom portion of the washing tub can be disposed in a lower position.

Therefore, it is not necessary to increase the vertical height of the washing machine as a whole even if the vertical height of the washing tub is increased to enlarge the capacity of the tub. In addition, in the case of a washing tub which is equal in size to a conventional one, such a conspicuous effect can be expected that it is possible to obtain a washing machine which is low in vertical height so that even a short person can wash easily.

This Sheet Has Been Replaced





WHAT IS CLAIMED IS:

1. A washing machine hose, comprising:

5 a water receiving pipe portion located at one end of said hose so as to be connected to a drainage pipe provided in a washing machine;

a bend formation portion bent into an L-shape located at a portion following said water receiving pipe portion; and

10 a bend forming tool including a base portion and two annular portions projecting from both sides of said base portion substantially perpendicularly to each other;

wherein said bend formation portion has a bellows-like corrugated shape constituted by a combination of different-diameter annular portions including large-diameter annular portions;

15 wherein both sides of said bend formation portion in a longitudinal direction of said hose are held by said two annular portions; and

20 wherein said bend formation portion is bent at almost right angles so that said large-diameter annular portions of said bend formation portion contact with each other under pressure or are made extremely adjacent to each other at a small-diameter side of said bent portion of said hose.

25 2. A washing machine hose as claimed in claim 1, wherein said bend formation portion includes said large-diameter annular portions and small-diameter annular portions.

30 3. A washing machine hose as claimed in claim 1, wherein said bend formation portion includes said large-diameter annular portions and annular portions each having a diameter smaller than said large-diameter annular portions only in part of transverse directions of said hose.

