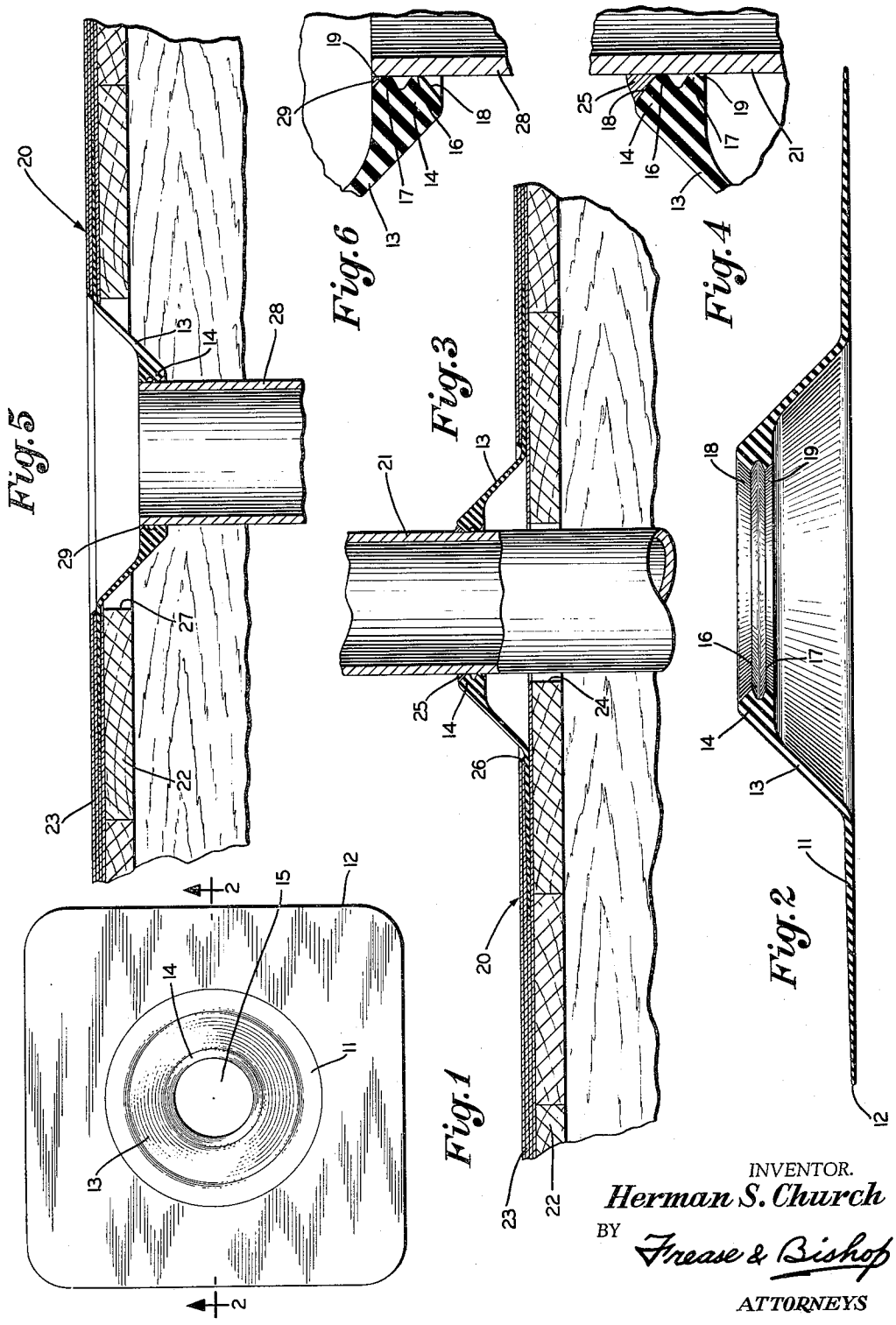
May 23, 1961 H. S. CHURCH 2,985,465

ROOF FLANGE CONSTRUCTION

Filed Dec. 20, 1957 2 Sheets-Sheet 1



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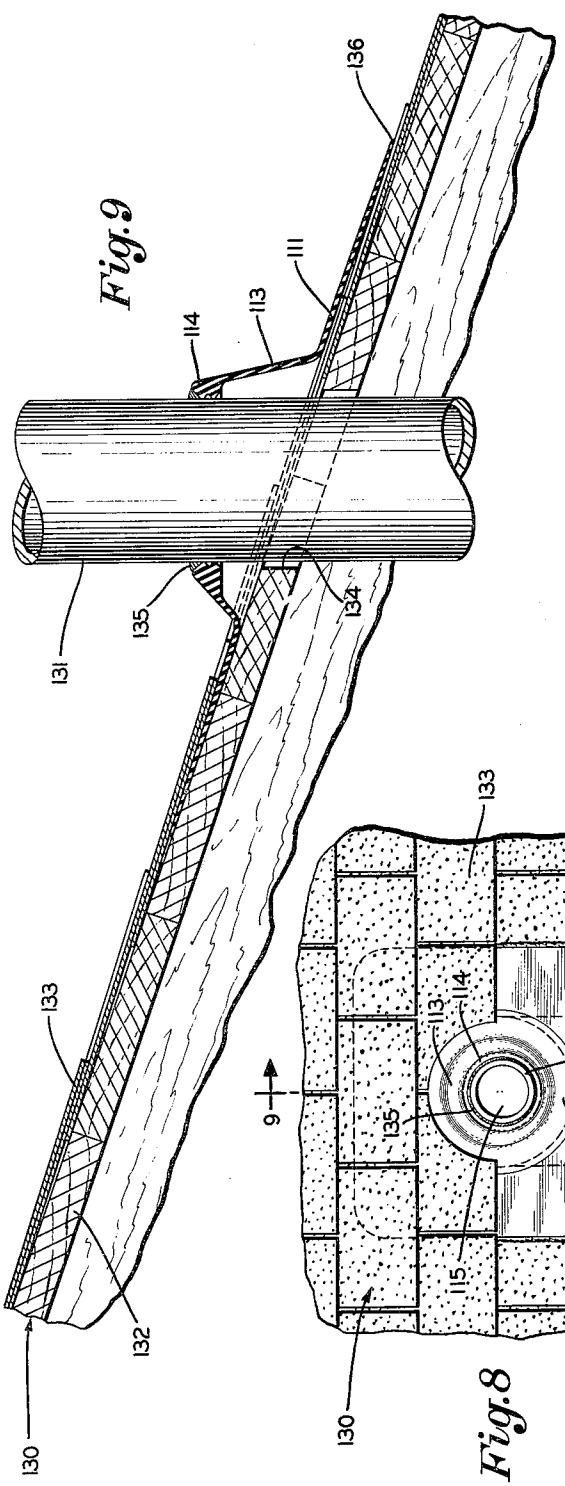

Fig. 9

Fig. 8

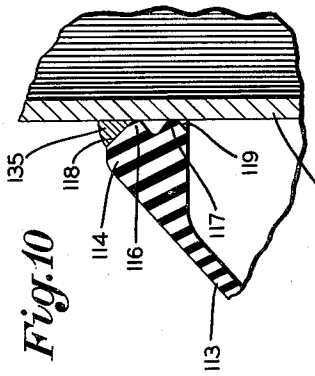

Fig. 10

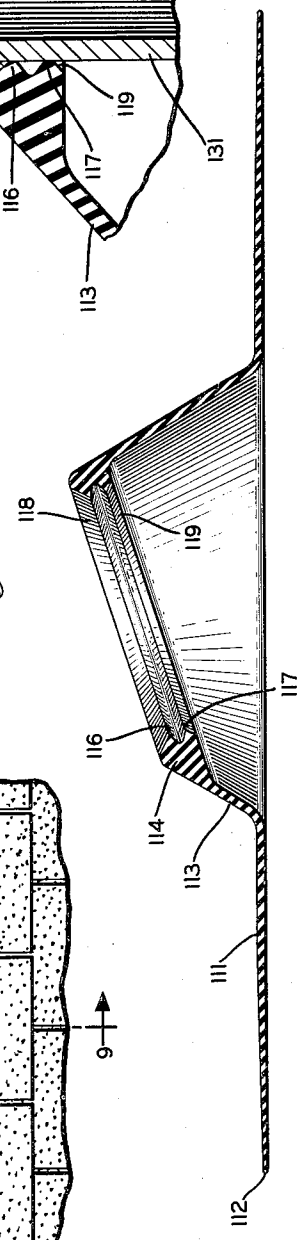

Fig. 7

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ROOF FLANGE CONSTRUCTION

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4 Claims. (Cl. 285—42)

My invention relates generally to improvements in roof flange constructions of the type for providing a waterproof and weatherproof seal between the roof of a building structure and a pipe, such as a vent pipe, protruding therethrough.

The most generally used prior construction of roof flange which has been used in building structures for the foregoing purpose has been formed completely of metal and generally lead. This prior roof flange construction has usually included a flat plate portion secured to the roof and having a necked portion formed centrally thereof to be telescoped over the pipe protruding through the roof, with both the plate portion and neck portion being sealed to the roof and pipe by any usual roofing compound sealing means.

One major difficulty with this prior construction of metal roof flange is that it is difficult to provide a thorough and lasting seal between both the metal plate portion and the roof and the metal neck portion and the metal pipe, since slight irregularities in the roof sheeting and the pipe receiving the neck portion, due to the stiffness of the metal, cause large voids which must be thoroughly filled and sealed requiring skilled workmen to properly accomplish this sealing operation. A further factor which complicates this problem is that the vent pipes are frequently formed of cast iron and, during the formation thereof, a close outer circumference tolerance is not maintained so that there can be variations as much as one-quarter inch in diameter at the outer circumference of the pipe.

Thus for practical production of these metal roof flanges, it is necessary to provide the inside diameter of the necked portions thereof sufficiently large to receive even the largest diameter pipe that might be used. When, however, a pipe is encountered which has the minimum outside diameter, that is, one-quarter inch less, the problem of sealing between the pipe and this neck portion becomes considerably more troublesome.

Still another problem involved in the use of these prior metal roof flanges is caused by the fact that the plate portion thereof is sealing against a wooden roof and the neck portion is sealing against a metal pipe, which metal pipe has a different thickness and is formed of a different metal than this neck portion. For this reason, under changing temperature conditions, the roof, roof flange and pipe will all be affected by different rates of expansion and contraction so that it is difficult, if not impossible, to maintain a proper water-tight and weatherproof seal between the roof flange, the roof and the pipe, even though the sealing means therebetween is a somewhat plastic material.

Finally another problem involved in the use of these prior roof flange constructions is that these prior roof flanges, being formed of metal, are difficult to adapt to the great number of different pitches of roofs encountered in modern home and building construction. Thus it is necessary to provide a large number of different configurations of these roof flanges in order to be able to supply

the particular roof flange for the particular pitch of roof.

It is therefore a general object of the present invention to provide a roof flange construction which overcomes the difficulties and disadvantages encountered in use of the prior constructions.

It is a primary object of the present invention to provide a roof flange construction which can be easily and conveniently installed for sealing between a roof and vent pipe extending through the roof and which does not require any special skill for the installation thereof.

It is a further object of the present invention to provide a roof flange construction which is completely flexible and will readily adapt for changing temperature conditions while still maintaining an efficient seal.

It is still a further object of the present invention to provide a roof flange construction which is formed with special sealing means for sealing around the pipe extending through the roof which roof flange will automatically adapt for various size pipe within reasonable tolerances.

It is also an object of the present invention to provide a roof flange construction for sealing around a pipe extending through a roof which may be used for various pitches of roofs within reasonable limits thereby requiring a lesser number of specific shapes of these roof flanges to be carried by a supplier thereof.

It is an additional object of the present invention to provide a roof flange construction for sealing between a roof and a pipe extending therethrough, which roof flange may also be used for providing waterproof connection and efficient seal between a flat roof and the roof drainpipes thereof.

Finally it is an object of the present invention to provide a roof flange construction which accomplishes all of the above objects and provides all of the above advantages, yet may be manufactured and supplied at a minimum of expense.

These and other objects are accomplished by the parts, constructions, arrangements, combinations and subcombinations comprising the present invention, the nature of which is set forth in the following general statement, preferred embodiments of which—illustrative of the best mode in which applicant has contemplated applying the principles—are set forth in the following description and illustrated in the accompanying drawings, and which are particularly and distinctly pointed out and set forth in the appended claims forming a part hereof.

In general terms the roof flange construction comprising the present invention may be stated as including a substantially flat flexible flange portion having a preferably generally rectangular outer configuration and terminating inwardly in a flexible neck portion extending away from the flange portion. Both the flange and neck portions are relatively thin, with the flange portion preferably tapering to a feather edge at its outer edges.

The neck portion terminates spaced from the flange portion in seal means, preferably having a greatly increased cross-sectional thickness from the cross-sectional thickness of either the neck or flange portions. Further this seal means terminates inwardly in two spaced inwardly projecting sealing lips which are adapted to surround and seal against the outer circumference of a pipe.

Still further each of the sealing lips is preferably triangular in cross section tapering inwardly to an apex and these sealing lips are positioned at the upper and lower extremities of the seal means so that one of the tapered side portions of each of these sealing lips forms the inner extremity of the upper and lower extremities of this seal means. Thus a downwardly angled void is formed between the upper sealing lip and the outer circumference of a pipe against which this lip is sealing and an upwardly angled void is formed between the lower sealing lip and a pipe against which this lip is sealing,

either of which voids may be filled with a plastic roofing compound sealing material for aiding in sealing between the pipe and seal means.

By way of example, embodiments of the roof flange construction of the present invention are illustrated in the accompanying drawings forming a part hereof, wherein like numerals indicate similar parts throughout the several views, and in which:

Fig. 1 is a top plan view of the first embodiment of the roof flange construction comprising the present invention;

Fig. 2, a sectional view, part in elevation, looking in the direction of the arrows 2—2 in Fig. 1;

Fig. 3, a vertical sectional view, part in elevation, showing the roof flange construction of Figs. 1 and 2 installed for sealing between a flat roof and a vent pipe extending therethrough;

Fig. 4, an enlarged fragmentary sectional view taken from Fig. 3 and showing the area of the seal between the roof flange and the pipe;

Fig. 5, a vertical sectional view, part in elevation, showing the roof flange construction of Figs. 1 and 2 installed sealing between a flat roof and a drainpipe of said roof;

Fig. 6, an enlarged fragmentary sectional view taken from Fig. 5 showing the area of the seal between the roof flange and the pipe;

Fig. 7, a vertical sectional view of a second embodiment of the roof flange construction comprising the present invention;

Fig. 8, a top plan view showing the roof flange construction of Fig. 7 installed on a roof and sealing between a roof and vent pipe extending therethrough;

Fig. 9, a sectional view, part in elevation, looking in the direction of the arrows 9—9 in Fig. 8; and

Fig. 10, an enlarged fragmentary sectional view taken from Fig. 9 and showing the area of the seal between the roof flange and the pipe.

The first embodiment of the roof flange construction comprising the present invention is shown in Figs. 1 and 2 and includes a substantially flat flange portion **11**, preferably having a rectangular outer edge **12**. Further flange portion **11** terminates inwardly and preferably central thereof in a neck portion **13** which angles inwardly and upwardly away from the flange portion.

Still further the neck portion **13** terminates upwardly, spaced above the flange portion **11**, in a sealing portion **14** with this sealing portion terminating inwardly in a predetermined size of opening **15**. The entire roof flange construction is formed from a flexible material which may be rubber or one of the synthetic rubber compositions, but it is preferred that this material is neoprene for its oil, acid and sun-checking resistance.

Flange portion **11**, in cross section, may be formed of a steadily decreasing width outwardly and tapers to a so-called feather edge at outer edge **12**. The maximum thickness of flange portion **11** is at the point of connection between this flange portion and the neck portion **13**, with the neck portion **13** having approximately the same cross-sectional thickness as the maximum thickness of flange portion **11**.

Both flange portion **11** and neck portion **13** are, however, relatively thin, as shown, for maximum flexibility, with the sealing portion **14** having a greatly increased thickness in the order of between two and six times the thickness of neck portion **13**. Thus the sealing portion **14** is of greatly increased mass over any given section of the flange portion **11** and neck portion **13** and this sealing portion therefore protrudes inwardly from the neck portion **13** terminating preferably in a circular opening **15**.

Sealing portion **14** at opening **15** is provided with an upper sealing lip **16** and lower sealing lip **17** with both of these sealing lips being substantially triangular in cross section having their apices at the opening **15** and increasing in width outwardly. The lower side of the upper sealing lip **16** and the upper side of the lower sealing lip **17** angle upwardly and downwardly respectively, as best seen in Fig. 2, so that these two sealing lips may be compressed outwardly without interference from each other.

Further the upper sealing lip **16** angles outwardly to the upper extremity of sealing portion **14**, thus forming the angled portion **18** at the top of the sealing portion. Finally the lower sealing lip **17** angles outwardly and downwardly to the lower extremities of the sealing portion **14** forming the angled portion **19** at the lower edge of the sealing portion.

As shown in Figs. 1 and 2, the first embodiment of the roof flange construction has the axis of the opening **15** at right angles to the plane of the flange portion **11** so that the plane of the upper extremities of the sealing portion **14** is generally parallel to the plane of the flange portion **11**. Thus this particular embodiment is adapted for use with a flat roof or a roof having only a slight pitch.

As an example, for showing the increased mass of the sealing portion **14** over the neck portion **13**, the neck portion may have a thickness of about ⅛ inch while the sealing portion **14** at its minimum thickness, that is, the depression formed between the sealing lip **16** and sealing lip **17** may be about ⅜ inch. Furthermore with these dimensions the thickness of the sealing portion at the apex of the upper sealing lip **16** will be about 7/16 inch and at the apex of the lower sealing lip **17** about ⅝ inch, with this sealing portion **14** having substantially the same dimensions throughout its circumference because of the axis of the opening **15** extending at right angles to the plane of the flange portion **11**.

As shown in Fig. 3, the first embodiment of the roof flange construction may be installed for providing a waterproof and weatherproof seal between a flat roof, generally indicated at **20**, and a vent pipe, generally indicated at **21**. The flat roof **20** may be formed of a layer of wood sheathing **22** and a series of layers **23** of asphalt impregnated and coated roofing material of usual construction.

The vent pipe **21** is usually a cast-iron pipe having an outside diameter varying from about four inches to about four and one-quarter inches, and extends upwardly through the roof **20** through an opening **24**. Further the outer surface of the pipe **20** may range from relatively smooth to extremely rough.

The roof flange construction of the present invention is preferably installed by first applying the initial layer of roofing material **23** on the wood sheathing **22** and then telescoping the sealing portion **14** of the roof flange construction over the pipe **21** until the flange portion **11** is lying flat on this first layer of roofing material **23**. An asphalt roof sealing compound may be placed between the flange portion **11** and the first layer of roofing material **23** if desired, but under most circumstances an excellent seal will be provided between these materials and also the additional layers of roofing materials **23** merely by the asphalt coating on this roofing material adhering to and sealing with the flange portion **11**.

The sealing lips **16** and **17** on the roof flange construction are preferably formed with inside diameters of $3\frac{15}{16}$ inches, that is, 1/16 inch less than the possible minimum outside diameter of the pipe **21**, so that when the sealing portion **14** is telescoped over pipe **21**, a compression is provided therebetween compressing the apices of the sealing lips **16** and **17** and providing a tight seal between these sealing lips and the pipe **21**. This compression between the sealing portion **14** and the pipe **21** is insured and maintained indefinitely due to the greatly increased thickness or mass of this sealing portion **14** as hereinbefore described and shown.

The void formed around the pipe **21** between the angled portion of the roof flange and this pipe is filled with a usual asphalt roofing compound shown at **25** and in enlarged view in Fig. 4, thereby completing the seal between pipe **21** and the sealing portion **14** of the roof flange. Finally asphalt roofing compound may be applied between the overlying layers of roofing material **23** and the flange portion **11** of the roof flange as shown

at **26** to provide a more efficient seal at this point and prevent moisture from working back between the flange portion **11** and the layers of roof material **23**.

As shown in Figs. 5 and 6, this first embodiment of the roof flange construction comprising the present invention may also be used for providing a seal between a flat roof and a drainpipe, such pipe being used for draining water from the roof. As shown in Fig. 5, the roof flange construction is installed in a similar manner except that the neck portion **13** extends downwardly rather than upwardly.

Thus the flange portion **11** is positioned between the layers of roofing material **23** of the flat roof **20** and above the wood sheathing **22**, but the neck portion **13** extends through a larger opening **27** and projects downwardly below the wood sheathing **22**.

The drainpipe **28** similarly is telescoped by the sealing portion **14** so that the sealing lips **16** and **17** provide a seal against this drainpipe. Finally, since the angled portion **19** of sealing lips **17** is exposed upwardly, the void formed by the angled portion **19** and the pipe **28** is filled with the roofing compound, as shown at **29**, with this seal between sealing portion **14** and pipe **28** being shown in enlarged view in Fig. 6.

The second embodiment of the roof flange construction comprising the present invention is shown in Fig. 7 and is very similar to the first embodiment with the exception that it is adapted for sealing between a vent pipe and a roof having more than just a slight pitch. The only change required from the first embodiment construction, for providing this second embodiment construction, is that the plane of the upper extremities of the sealing portion does not extend in a plane parallel to the plane of the flange portion, but rather these planes extend at an angle, the degree of which depends on the pitch of the roof.

Referring to Fig. 7, similar to the first embodiment, the roof flange construction includes the flange portion **111** tapering outwardly to the feather edge **112** and terminating inwardly in the upwardly and inwardly angled neck portion **113**. Further neck portion terminates upwardly in the sealing portion **114**, with this sealing portion terminating inwardly at the opening **115** and having the upper sealing lip **116** and lower sealing lip **117**.

Sealing lips **116** and **117** are similarly formed with sealing lip **116** angling upwardly to the upper extremities of the sealing portion **114** forming the angled portion **118** and the lower sealing lip **117** angling downwardly to the lower extremities of the sealing portion to form the angled portion **119**. Finally, flange portion **111** and neck portion **113** are formed relatively thin, whereas the sealing portion **114** is formed of increased thickness and having a minimum thickness in the order of two times that of the neck portion **113** to provide a greater mass of material behind the sealing lips **116** and **117** and insure the proper sealing thereof.

Thus, the sealing portion **114** again may have a thickness of between about two and about six times the thickness of the neck portion **113**, and as an example of the dimensions, the thickness of the neck portion **113** may again be ⅛ inch with the minimum thickness of the sealing portion **114**, that is, between the sealing lips **116** and **117** being about ¼ inch at the right-hand side of the sealing portion as shown in Fig. 7, with this minimum thickness increasing to about ⅜ inch at the left-hand side as shown in Fig. 7. This variation in thickness of the sealing portion **114** is, of course, caused by the fact that the axis of the opening **115** does not extend perpendicularly to the plane of the flange portion **111** so that the plane of the upper extremities of the sealing portion **114** extends at an angle to the plane of the flange portion **111**, as shown.

Further, in the above example the thickness of the sealing portion **114** at the apex of the upper sealing lip **116** is about 7/16 inch throughout the circumference of this sealing lip. Finally the minimum thickness of the sealing portion at the apex of the lower sealing lip **117** is about ½ inch, as shown at the right-hand side of Fig. 7, with the maximum thickness at this point being about ⅝ inch, as shown at the left-hand side of Fig. 7.

As shown in Figs. 8, 9 and 10, this second embodiment of the roof flange construction is applied to the roof, generally indicated at **130**, surrounding and providing a waterproof and weatherproof seal between this roof and the vent pipe **131**. In this case, however, the roof **130** is formed from the usual wood sheathing **132** covered with the usual overlapped asphalt shingles **133**, with the vent pipe **131** extending through the opening **134** in the wood sheathing and shingles.

The same relationship of sizes between the outer diameter of the vent pipe **131** and the inner diameter of the sealing lips **116** and **117** is provided in this second embodiment as was provided in the first embodiment, that is, the inner diameter of the sealing lips being less than the minimum possible outer diameter of the vent pipe **131** to provide compression between these sealing lips and the vent pipe thereby insuring sealing therebetween. Furthermore the usual asphalt roofing compound is applied at **135** filling the void formed between the angled portion **118** of the sealing portion **114** and the vent pipe **131**, thereby completing the seal betwen sealing portion **114** and the vent pipe, such completed seal being shown in enlarged view in Fig. 10.

This second embodiment of the roof flange construction is preferably applied during the application of the shingles **133** to the wood sheathing **132** with the upper half of the flange portion **111** underlying the shingles **133** and the lower half of this flange portion overlying these shingles, as shown. Finally roofing compound may be applied between the edge **112** of flange portion **111** and the shingles **133** where this flange portion overlies the shingles and is therefore exposed, such roofing compound being indicated at **136** in Figs. 8 and 9.

It is important for the purposes of the present invention to provide the flange portion **11** or **111** and the neck portion **13** or **113** relatively thin to obtain maximum flexibility of these portions so that the roof flange construction may conform to the particular roof upon which it is being applied. For instance, as shown in the second embodiment, the pitch of the roof **130** can obviously vary considerably and the flange portion and neck portion **113** will still easily conform to this different pitch of roof. Also, a proper and sufficient seal will still be provided between the sealing portion **114** and any vent pipe **131**.

Further, it is important for the purposes of the present invention that the sealing portion **14** or **114** are formed of increased thickness providing an increased resilient mass at this point over the thickness of the neck portion **113**. With this increased mass of the sealing portions an increased resistance to deformation is provided backing up the sealing lips **16** and **17** or **116** and **117**, thereby insuring an efficient seal between these sealing lips and the particular vent pipes around which they are sealing.

Still further it is advantageous to provide the angled portion **35** or **135** at the upper extremities of the sealing portion **14** or **114** so that the voids formed between these angled portions and the vent pipes can be filled with roofing compound to insure a more complete and lasting seal. It is also advantageous to provide the angled portion **19** or **119** at the lower extremities of the sealing portion **14** or **114** so that this roof flange construction is adaptable for merely being reversed to provide a seal between a roof and a drainpipe from the roof.

Additionally, it is advantageous to taper the flange portion **11** or **111** outwardly and terminate these flange portions in a feather edge **12** or **112** for increased flexibility of the flange portions and for more efficient sealing of the edges against the particular roof. Finally, since the entire roof flanges of the first and second em-

bodiments are formed of one piece and totally of resilient material, these roof flanges will automatically compensate for any differences in expansion and contraction between the various materials while still maintaining a waterproof and weatherproof seal.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example and the scope of the present invention is not limited to the exact details of the construction shown.

Having now described the invention, the construction, operation and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby, the new and useful construction and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

I claim:

1. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having resilient material sealing lip means including spaced upper and lower inwardly tapered sealing lips formed thereon and extending inwardly of the sealing portion surrounding said opening for resiliently sealing against a pipe received in the opening, the sealing lip means upper sealing lip having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the sealing lip means lower sealing lip having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe, and the minimum thickness of the sealing portion at least in outward alignment with the sealing lip means upper and lower sealing lips being greater than the maximum thickness of the neck and flange portions for providing an increased mass to back up and retain the lip means resiliently sealed against the pipe.

2. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having resilient material sealing lip means including spaced upper and lower inwardly tapered sealing lips formed thereon and extending inwardly of the sealing portion surrounding the opening and resiliently sealing against a pipe received in said opening, the sealing lip means upper sealing lip having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the sealing lip means lower sealing lip having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, and at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe.

3. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having spaced upper and lower resilient material sealing lip means formed thereon and extending inwardly of the sealing portion surrounding the opening for resiliently sealing against a pipe received in said opening, the upper sealing lip means having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the lower sealing lip means having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe, and the minimum thickness of the sealing portion at least in outward alignment with the upper and lower sealing lip means being at least double the maximum thickness of the neck and flange portions for providing an increased mass to back up and retain the lip means resiliently sealed against the pipe.

4. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion terminating outwardly in a substantially feather edge, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having resilient material sealing lip means including spaced upper and lower inwardly tapered sealing lips formed thereon and extending inwardly of the sealing portion surrounding the opening and resiliently sealing against a pipe received in said opening, the sealing lip means upper sealing lip having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the sealing lip means lower sealing lip having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, and at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe.

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