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Downing et al.

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[54] **HANGER FOR SUSPENDING EXHAUST PIPES FROM A HORIZONTAL SUPPORT**

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[52] **U.S. Cl.** **248/340;** 211/119

[51] **Int. Cl.** **A47j 51/142;** A47f 5/00; A47j 5/00

[58] **Field of Search** 248/214, 215, 211, 301, 248/303, 304, 305, 306, 339, 340, 359, 360, 317; 294/86.24; 211/113, 119

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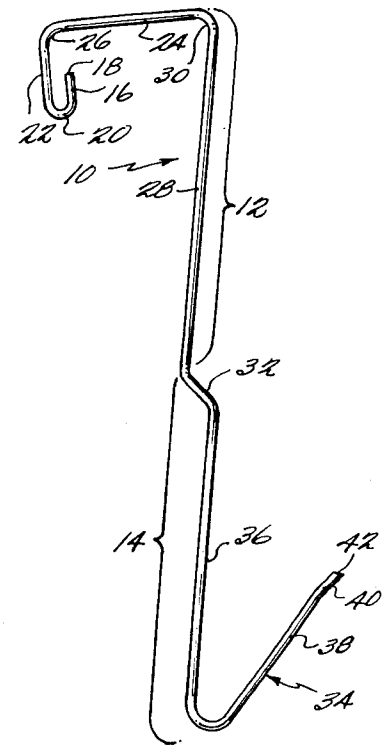
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[57] **ABSTRACT**

A hanger for suspending exhaust pipes and the like from a horizontally extending support comprising an elongated spring steel wire bent to provide a support engaging section and a generally V-shaped pipe engaging section having an outwardly bent pipe gripping tip and a pipe end engaging stop portion, the support engaging section being operable to be engaged in a generally downward direction over the support and including a terminal end portion having an upwardly facing end surface for engaging one side portion of the support and integral portions disposed between the terminal end portion and the pipe engaging section which extend upwardly with respect to the aforesaid one side portion of the support transversely over an upwardly facing portion of the support and downwardly along an opposite side portion of the support, the integral portions having support engaging surfaces operable in response to the suspension of a pipe or the like by engagement with the pipe engaging section for causing the downward force of the pipe load to be transmitted by the integral portions to the terminal end portion in such a way as to tend to move the end surface thereof in a direction upwardly and toward the one side portion of the support an extent which increases as the pipe load increases so that the resultant engagement of the end surface with the one side portion of the support serves to prevent disengagement of the support engaging section from the support.

14 Claims, 4 Drawing Figures



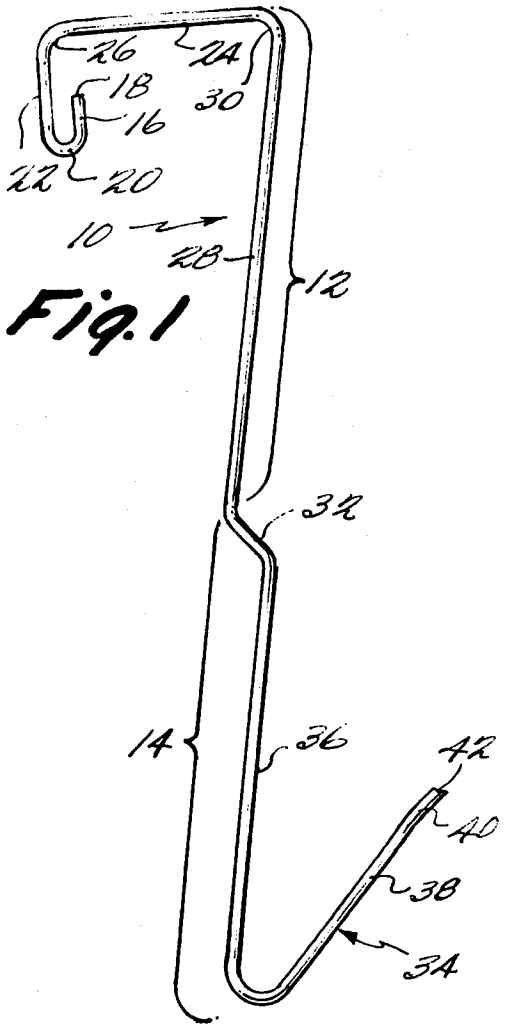


Fig. 1

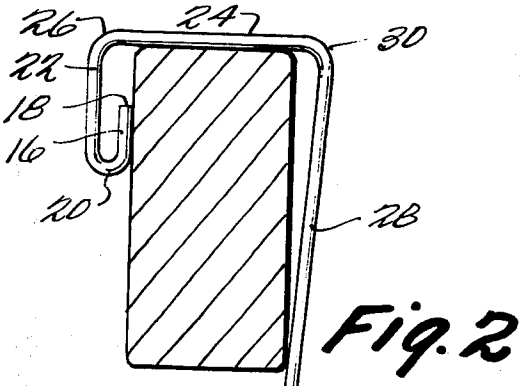


Fig. 2

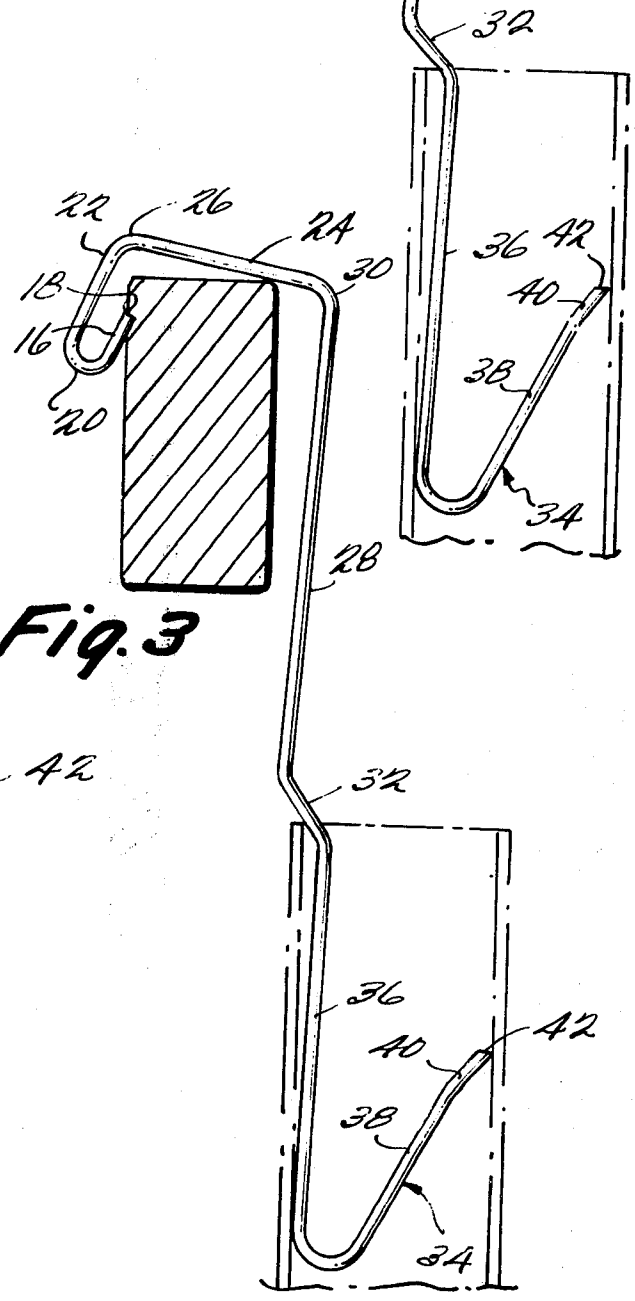


Fig. 3

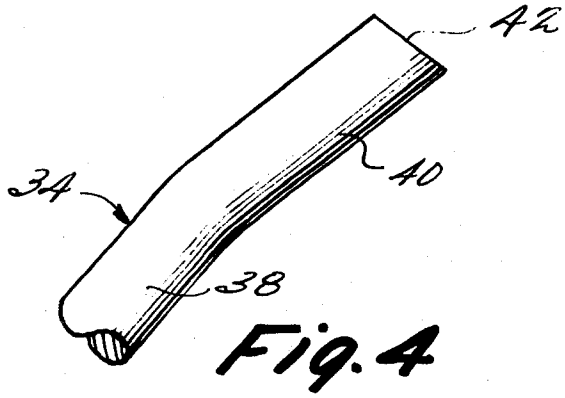


Fig. 4

HANGER FOR SUSPENDING EXHAUST PIPES FROM A HORIZONTAL SUPPORT

This invention relates to hangers and more particularly to hangers for suspending exhaust pipes and the like from a horizontally extending support.

In the merchandising of exhaust system parts, it has been the practice for many years to inventory exhaust pipes and the like by suspending the same in generally vertically extending relation from horizontally extending supports provided, for example, in the warehouse. In order to effect this suspension, hangers or wire hooks have been used. A typical prior art hanger consists of a length of wire bent to provide an upper support engaging section and a lower pipe engaging section. Typically, the upper support engaging section is simply bent into an inverted U-shaped configuration capable of being simply moved generally downwardly into operative engagement over the support. The lower pipe engaging section is typically of V-shaped configuration capable of being engaged axially inwardly within the open end of an exhaust pipe. During this engagement the legs of the V-shaped pipe engaging section are deflected toward one another by opposed interior peripheral portions of the pipe permitting the end surface of the free leg to engage the interior peripheral surface of the pipe to effect a gripping action resisting separation by a straight axially outward movement. Separation of the pipe from the hook could then be effected by a combined rotational and axially outward movement. In other words, the gripping action effectively prevented straight axial separation but permitted the hook to be simply unscrewed relative to the open pipe end to effect separation.

In actual use, the hangers served to suspend the exhaust pipes from the support until removal was desired. The intended procedure for removal was to lift up on the pipe to disengage the support engaging section of the hanger from the support and then to unscrew the hanger from the pipe. Experience has shown, however, that excessive loads were often applied to the hangers when in operative position as by operators attempting to pull on the pipes or by other unintentional engagements with the suspended pipe. Moreover, this condition was exaggerated by the tendency of exhaust system components to become heavier due to added elements and the like.

It will be understood that when added loads are applied to hanger suspended exhaust pipes an unintentional disengagement of the pipe from the hanger or of the hanger from the support could present a hazardous condition to personnel as well as possible damage to the equipment. Support disengagement usually occurred as a result of the inverted U-shaped support engaging section simply deflecting beyond its elastic limit and letting go. Hanger disengagement occurred as a result of a slippage of the gripping action of the V-shaped pipe engaging section.

An object of the present invention is the provision of a hanger of the type described which will obviate the problems noted above. In accordance with the principles of the present invention, this objective is obtained by forming an upwardly extending terminal end portion on the support engaging section of the hanger for engaging a side portion of the support when the hanger is in operative position thereon. The terminal end portion has an upwardly facing end surface and is so related to

the remaining portions of the pipe engaging section that downward forces applied to the support engaging section, as by the pipe load and other loads, tends to move the end surfaces in a direction upwardly and toward the support side portion into engagement therewith to an extent which increases as the load increases. This action prevents disengagement of the hanger from the support even when loads are applied sufficient to deflect the hanger beyond its elastic limit.

Accordingly, it is a further object of the present invention to provide a hanger of the type described which is constructed and functions in accordance with the principles enunciated above.

Another object of the present invention is the provision of a hanger of the type described having a pipe engaging section of improved construction which is operable to obviate the problems of unwanted hanger-to-pipe separation heretofore encountered in prior art hangers as indicated above. In accordance with the principles of the present invention this objective is obtained by providing a transversely extending stop portion at the upper end of the pipe engaging section for engaging the open pipe end during hanger engagement to insure a proper engaged relationship therebetween and an outwardly bent tip on the free end of the V-shaped portion of the pipe engaging section which enables the hanger to accommodate a wider range of pipe sizes with a more effective gripping action while still providing for effective separation when desired.

Another object of the present invention is the provision of a hanger of the type described having an improved pipe engaging section which is constructed and functions in accordance with the principles enunciated above.

Another object of the present invention is the provision of a hanger of the type described which is simple in construction, effective in operation and economical to manufacture.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

FIG. **1** is a side elevational view of a hanger embodying the principles of the present invention;

FIG. **2** is a view similar to FIG. **1** illustrating the hanger in its operative pipe suspending position;

FIG. **3** is a view similar to FIG. **2** showing one position of the hanger when an excessive load is applied thereto; and

FIG. **4** is an enlarged fragmentary elevational view of the pipe gripping tip of the hanger.

Referring now more particularly to the drawings, there is shown therein a hanger, generally indicated at **10,** for suspending exhaust pipes and the like from a horizontally extending support. The preferred embodiment shown is constructed of a single elongated metallic member formed to provide a support engaging section **12** and a pipe engaging section **14.** In the preferred embodiment shown the elongated member is in the form of a hard drawn spring steel wire, a specific example being type HB having a diameter of one-eighth inch.

As shown, the support engaging section **12** includes an upwardly extending substantially straight terminal

end portion **16** having an upwardly facing transverse end surface **18** at the free end thereof. The opposite end of the terminal end portion **16** is integrally interconnected with one end of an arcuate portion **20** of an arcuate extent of approximately 180° which extends downwardly and then outwardly and upwardly from the terminal end portion **16.** Integrally interconnected with the opposite end of the arcuate portion **20** is a substantially straight, generally upwardly extending portion **22** which is disposed in generally parallel relation with the terminal end portion **16.**

The support engaging section **12** also includes a substantially straight generally horizontally extending portion **24** which is disposed at an angle of approximately 90° with respect to the upwardly extending portion **22** and is integrally connected therewith, as by a bent portion **26.** Finally, the support engaging section **12** includes a substantially straight, generally downwardly extending portion **28** which is disposed at an angle of approximately 80° with respect to the horizontally extending portion **24** and is integrally interconnected therewith, as by a bent portion **30.**

The pipe engaging section **14** includes a generally transversely extending stop portion **32** which is integrally connected with the downwardly extending portion **28** of the support engaging section **12** and a V-shaped portion, generally indicated at **34,** which is integrally connected with the stop portion **32.** The V-shaped portion opens upwardly and is formed by a pair of legs **36** and **38** which are preferably of substantially straight configuration and of unequal longitudinal extent. The longer leg **36** is integrally interconnected with the stop portion **32** and the shorter leg **38** has an outwardly bent tip **40** on the free end thereof. As shown, the longer leg **36** extends in a direction generally parallel to the direction of extent of the downwardly extending portion **28** and the leg **38** extends therefrom at an angle of approximately 40°. The leg **38** is disposed outwardly of the leg **36** in a horizontal direction opposed to the outward horizontal direction of extent of the horizontally extending portion **24** with respect to the downwardly extending portion **28** of the support engaging section **12.**

The pipe gripping tip **40** is bent outwardly at an angle of approximately 10° with respect to the longitudinal extent of the associated straight leg **38** and includes a planar end surface **42** which intersects with the periphery of the tip. As shown, end surface **42** is disposed in a plane which intersects with the outer peripheral surface of the tip at an included angle of approximately 60°.

As previously indicated, the hanger **10** is specifically constructed for the purpose of suspending exhaust pipes and the like from a horizontally extending support, such as might be found in a warehouse or the like. In actual operation, suspension is effected by the operator grasping a hanger **10** and inserting the pipe engaging section **14** thereof axially inwardly of the open end of the exhaust pipe to be suspended. It will be noted that during this movement of the hanger **10** into the pipe, the extent of axial inward movement is determined when the stop portion **32** of the hanger engages the end of the pipe. It will also be noted that during this movement, the legs **36** and **38** of the V-shaped portion **34** will initially engage opposed portions of the interior periphery of the pipe and be flexed or bent inwardly toward one another until the end surface of the tip passes into the open end of the pipe. The flexure in the V-shaped portion **34** thus tends to bias the free leg **38** outwardly so that the outer edge defined by the end surface **42** will engage the inner periphery of the pipe. This engagement prevents the pipe from being disengaged from the hanger by a movement which is in the axial outward direction alone. Separation can be effected by imparting a relative motion between the hanger and the pipe which has both a rotational component and an axially outward component. As previously indicated, disengagement is effected by simply unscrewing the hanger pipe engaging section **14** from the pipe.

It is of significance to note that the V-shaped configuration of the legs **36** and **38** and the outwardly bent tip **40** enable the portion **34** to properly function with a wide range of pipe sizes, as, for example, from 1¼ inch O.D. pipe to 2½ inch I.D. pipe. The provision of the stop portion **32** is of considerable importance since it insures a simple engagement of the hanger within the pipe at a proper operative position which is neither insufficiently disposed within the open end, or disposed within the open end to an excessive extent.

Suspension of the pipe on the support is completed by the operator grasping the pipe with the hanger **10** engaged within one open end thereof as aforesaid, and then moving the support engaging section **12** thereof over the support and then with a generally downward direction into engagement therewith, as shown in FIG. **2.** The construction of the support engaging section **12** of the present hanger is of particularly significant importance in that it enables the pipe to be suspended on the support in a manner which effectively prevents unwanted separation between the hanger and the support due to increased loading, while still permitting a simple and effective disengagement when desired. The construction is also significant in that it is capable of such effective operation with a variety of different support structures, as for example, supports constructed of wooden 2 × 4's, supports constructed of inverted channel irons, and supports constructed of tubular metal stock, both round and square.

The effectiveness of the connection between the support engaging section **12** of the present hanger **10** and supports of the type indicated above was demonstrated by actual tests of the preferred embodiment disclosed above, utilizing one-eighth inch hard drawn spring steel wire type HB. First, it should be noted that a normal pipe load is within the range of 8 to 14 pounds. When the hanger **10** was used with a wooden 2 × 4 support, a load of this type had the effect of slightly moving the end surface **18** upwardly and inwardly into engagement with the side of the 2 × 4. Where excessive pipe loads of the order of 30 to 35 pounds were applied to the hanger, the hanger was deformed into the position such as shown in FIG. **3.** It will be noted that a downward load as applied to the portion **28** serves to move the end surface **18** upwardly and inwardly into biting engagement with the side portion of the 2 × 4. The downward load on the portion **28** is transmitted to the terminal end portion **16** through the integral portions interconnected therebetween by virtue of the exterior surface means of these portions engaging the upwardly facing surface of the support. When the hanger was then loaded in increments up to approximately 116 pounds, the upward and inward deflection of the terminal end portion **16** increased with increased load until the end portion had substantially entered the 2 × 4 up to its

connection with the arcuate portion **20.** At 116 pound load the remaining integral portions of the pipe engaging section had deformed beyond the elastic limit of the steel wire. With the 36 pound loading, as indicated in FIG. **3,** the elastic limit of the wire was not exceeded and the hanger sprung back into its normal position as shown in FIG. **1,** as the load was relieved. With respect to FIG. **3,** it will be noted that the engagement of the end surface **18** clearly serves to maintain the connection of the support engaging section **12** with the support. When the load is relieved and the hanger assumes its normal position, separation can be readily accomplished without interference by a simple upward movement. During this movement, the end surface **18** is out of gripping engagement with the side portion of the support and hence does not interfere in any way.

Similar tests with respect to a 2 inch inverted channel iron exhibited similar characteristics at the **16** pound and 36 pound loading. Of course, the end portion **18** did not actually move into the side portion of the channel iron as was the case with the wooden 2 × 4, due to the hardness of the material. Tests with the 2 inch channel further revealed that a loading of up to 141 pounds was effective without separation or even bending of the wire beyond its elastic limit. This effective action could be achieved because of the slightly greater horizontal dimension of a 2 inch channel as compared with the dressed 2 inch dimension of a conventional 2 × 4 and because of the resistance provided by the metal to the movement of the end portion.

When the hanger **10** of the present invention was moved into engagement with a 1½ inch O.D. iron pipe, the loading at 16 pounds and 36 pounds exhibited similar characteristics as comparable loading with a 2 × 4 support and a 2 inch channel support. However, since the exterior support engaging surface of the portion **24** was at the middle of the upwardly facing surface of the support pipe, a greater lever arm was provided which resulted in a substantial deflection of the hanger at 56 pounds load. At 66 pounds load, the deflection was such that the end surface **18** had moved into a position of surface-to-surface contact with the periphery of the pipe at the middle of the upper left-hand quadrant. This engagement continued with the end surface moving toward the upper surface of the pipe even with a loading of 106 pounds, at which point the integral portions of the section **12** had all deflected beyond the elastic limit of the spring steel wire.

It can thus be seen that there has been provided a hanger which will effectively prevent unwanted disengagement heretofore experienced in prior art hangers of this type, while at the same time permitting desired disengagement with great ease and facility. These results are achieved by a construction which is as economical as constructions of the prior art.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing preferred specific embodiment has been shown and described for the purpose of illustrating the functional and structural principles of this invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

What is claimed is:

1. A hanger for suspending exhaust pipes and the like from a horizontally extending support comprising an elongated metallic member formed to provide a support engaging section and a pipe engaging section, said support engaging section being operable to be engaged in a generally downward direction over the support into an operative pipe suspending position with respect thereto, said support engaging section including a terminal end portion for engaging one side portion of the support when said support engaging section is disposed in said operative position, said terminal end portion including end surface means which faces generally upwardly when said support engaging section is disposed in said operative position, said support engaging section including integral portions disposed between said terminal end portion and said pipe engaging section which extend upwardly with respect to the aforesaid one side portion of the support transversely over an upwardly facing portion of the support and downwardly along an opposite side portion of the support when said support engaging section is disposed in said operative position, said integral portions having support engaging surface means operable in response to the suspension of a pipe or the like by engagement with said pipe engaging section for causing the downward force of the pipe load to be transmitted by said integral portions to said terminal end portion in such a way as to tend to move said end surface means in a direction upwardly and toward the one side portion of the support an extent which increases as the pipe load increases so that the resultant engagement of said end surface means with the one side portion of the support serves to prevent disengagement of said support engaging section from the support.

2. A hanger as defined in claim **1** wherein said elongated member is formed of spring steel wire.

3. A hanger as defined in claim **1** wherein said terminal end portion is straight.

4. A hanger as defined in claim **3** wherein said integral portions include an arcuately bent portion of approximately 180° extending downwardly from the terminal end portion and then outwardly and upwardly.

5. A hanger as defined in claim **4** wherein said integral portions include a straight portion extending upwardly from said arcuately bent portion in parallel relation with said terminal end portion.

6. A hanger as defined in claim **5** wherein said integral portions include a generally horizontally extending substantially straight portion disposed at an angle of approximately 90° with respect to said upwardly extending straight portion and a bent portion integrally joining said upwardly extending portion with said horizontally extending portion.

7. A hanger as defined in claim **6** wherein said integral portions include a generally downwardly extending substantially straight portion disposed at an angle of approximately 80° with respect to said horizontally extending portion and a bent portion integrally interconnecting said horizontally extending portion with said downwardly extending portion.

8. A hanger as defined in claim **1** wherein said pipe engaging section includes an upwardly opening generally V-shaped portion for engagement axially inwardly of an open end of a pipe, said V-shaped portion having end surface means for gripping the interior peripheral surface of the pipe (1) to prevent axial movement of said pipe in a downward direction when disposed in suspended relation by said V-shaped portion with said support engaging section in said operative position and

(2) to permit separation of the pipe therefrom by a combined rotational and axially outward movement with respect thereto, and a transversely extending stop portion between said V-shaped portion and said support engaging section in a position above the end surface means of said V-shaped portion for engaging the open end of the pipe and limiting the axially inward movement of the same with respect to said V-shaped portion.

9. A hanger as defined in claim **8** wherein said V-shaped portion includes two legs of unequal longitudinal extent, the longer of said legs being integrally interconnected with said stop portion, the shorter of said legs having an outwardly bent tip at the free end thereof, said tip having a transversely extending end surface intersecting the periphery thereof, the outer intersection of said tip end surface with the tip periphery defining the end surface means of said V-shaped portions.

10. A hanger as defined in claim **9** wherein said legs are substantially straight and define an angle of approximately 40° therebetween.

11. A hanger as defined in claim **10** wherein said tip is substantially straight and extends from the remainder of said shorter leg at an angle of approximately 10°.

12. A hanger as defined in claim **11** wherein said tip end surface is substantially planar and intersects the outer tip periphery at an angle of approximately 60°.

13. A hanger for suspending exhaust pipes and the like from a horizontally extending support comprising a length of spring steel wire bent to provide a support engaging section and a pipe engaging section, said support engaging section being operable to be engaged in a generally downward direction over the support into an operative pipe suspending position with respect thereto, said support engaging section including a substantially straight upwardly extending terminal end portion for engaging one side portion of the support when said support engaging section is disposed in said operative position, said terminal end portion including end surface means which faces generally upwardly when said support engaging section is disposed in said operative position, said support engaging section also including an arcuately bent portion of approximately 180° extending downwardly from the terminal end portion and then outwardly and upwardly, a straight portion extending upwardly from said arcuately bent portion in parallel relation with said terminal end portion, a generally horizontally extending substantially straight portion disposed at an angle of approximately 90° with respect to said upwardly extending straight portion, a first bent portion integrally joining said upwardly extending portion with said horizontally extending portion, a generally downwardly extending substantially straight portion disposed at an angle of approximately 80° with respect to said horizontally extending portion, and a bent portion integrally interconnecting said horizontally extending portion with said downwardly extending portion, said pipe engaging section including an upwardly opening generally V-shaped portion for engagement axially inwardly of an open end of a pipe, and a transversely extending stop portion between said V-shaped portion and said support engaging section for engaging the open end of the pipe and limiting the axially inward movement of the same with respect to said V-shaped portion, said V-shaped portion including two legs of unequal longitudinal extent, said legs being substantially straight and defining an angle of approximately 40° therebetween, the longer of said legs being integrally interconnected with said stop portion, the shorter of said legs having an outwardly bent tip at the free end thereof, said tip being substantially straight and extending from the remainder of said shorter leg at an angle of approximately 10°, said tip having a transversely extending end surface intersecting the periphery thereof, said tip end surface being substantially planar and intersecting the outer tip periphery at an angle of approximately 60°.

14. A hanger for suspending an exhaust pipe or the like from a horizontally extending support comprising a length of steel wire bent to provide an upper support engaging section and a lower pipe engaging section, said support engaging section being of generally inverted U-shaped configuration for engagement over the support and having vertically extending portions of unequal longitudinal extent, said pipe engaging section including a lower generally V-shaped portion for engagement within an open end of the pipe having legs of unequal longitudinal extent, said legs being substantially straight and defining an angle of approximately 40° therebetween, the shorter of said legs having an outwardly bent tip on the free end thereof, said tip being substantially straight and being bent outwardly an angle of approximately 10° with respect to the longitudinal extent of the associated shorter leg, said tip including an end surface disposed in a flat plane which intersects with the outer periphery of the tip at an included angle of approximately 60°, and a stop portion for engaging the open end of the pipe extending transversely between the upper end of the longer leg of said V-shaped portion and the lower end of the longer vertically extending portion of said support engaging section.

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