Feb. 23, 1954 G. B. MORSE 2,670,197

HINGE ASSEMBLY FOR FURNACE DOORS

Filed Oct. 19, 1949

FIG. 1.

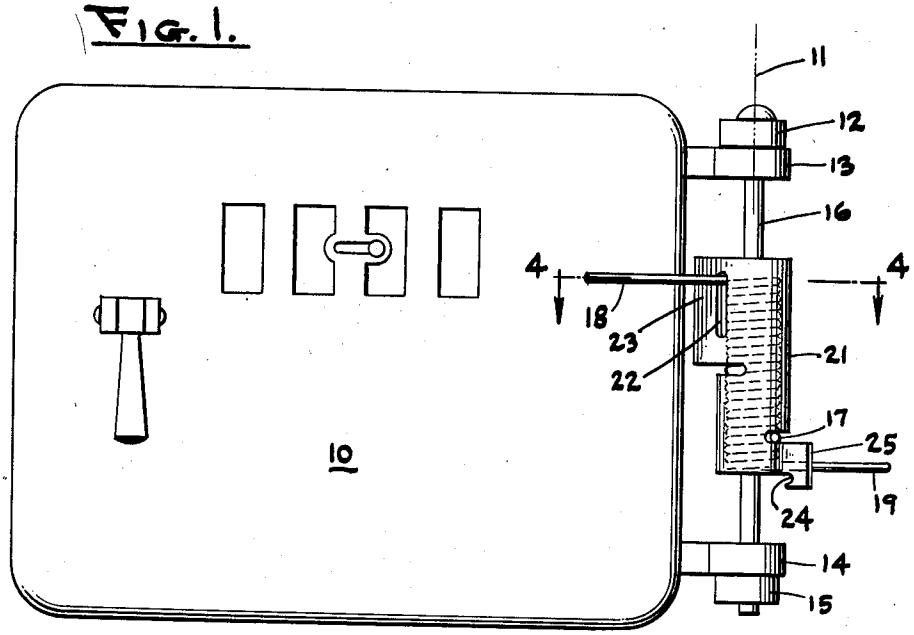
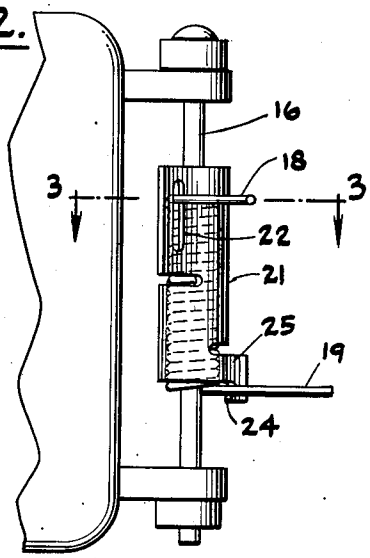


FIG. 2.



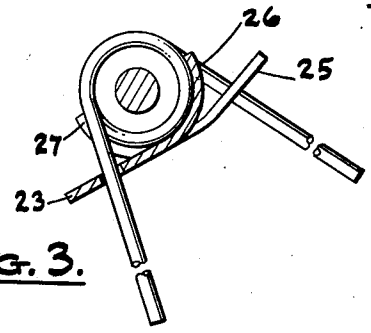


FIG. 3.

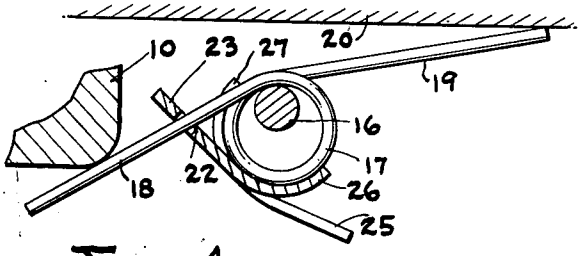


FIG. 4.

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Patented Feb. 23, 1954

2,670,197

UNITED STATES PATENT OFFICE

2,670,197

HINGE ASSEMBLY FOR FURNACE DOORS

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Application October 19, 1949, Serial No. 122,300

2 Claims. (Cl. 267—1)

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The present invention provides a door-closing mechanism primarily for the doors of furnaces. When the usual coal furnace is converted for the use of gas, it is preferable to provide the door with some sort of a biasing device in order to assure that the door is not inadvertently left open so that the flow of air in the combustion chamber is altered, and also to assure that the door does not remain open after an explosion within the furnace. It is the general practice to meet these requirements by replacing the conventional hinge pins with a continuous pin spanning both upper and lower hinges, and to mount upon this continuous hinge pin a helical spring having extended ends. One of these ends is disposed to bear upon the furnace door, and the other to bear against the front of the furnace. When the spring is assembled in this position, a twist is applied to assure that enough initial torsion is generated to assure the proper function of the assembly.

When the assembly discussed above (which is well known) is incorporated in a furnace, situations will inevitably arise when it is desired to leave the door in an open position temporarily for the service or inspection of the interior of the furnace. It is decidedly inconvenient for a serviceman to be forced to carry with him a series of locks or other stops to be placed between the door and the furnace in order to hold the door open, or be required to resort to the attachment of a wire or rope to some convenient post for this purpose.

It may be noted that an undesirable characteristic of the elementary hinge assembly previously discussed is the extreme difficulty of applying the required initial twist to the spring as the spring and hinge rod are assembled in position. It is necessary to properly support the door in position for the hinge pin to cooperate with the hinge fittings, and at the same time to place the spring in position on the rod and apply the required torque. While holding the spring in this position, it is then necessary to shove the hinge rod in place and then release the ends of the spring without injury to the fingers. Obviously, this procedure requires either a high degree of dexterity and consummate skill, or the service of at least two men. This fact plus the fact that the operation cannot be reduced to routine due to the differences in contour of various furnaces results in a rather high installation cost for this type of equipment.

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The present invention provides an added component to the hinge assembled discussed above having a double purpose. The principal purpose of this component is to provide a locking action securing the ends of the spring in a predetermined relationship comparable to the position these ends would assume when the door is in the extreme open position. Locked in this angular relationship, it follows that the biasing action normally present against the furnace door is completely removed. The door can then be left in whatever position desired for service or inspection of the interior of the furnace. When such work has been completed, the restraining action of this added component is removed from the spring and the biasing action restored to the door. Since this type of component makes it possible to secure the spring in the "open" position it follows that the component may be assembled to the spring at the factory so that the mechanic may assemble the components of the hinge without the necessity of applying a torque to the spring. It is merely necessary to slip the spring onto the hinge rod, and then bring the rod into its finally assembled position. When this operation has been performed, the door can be swung to a position slightly beyond the "normally open," thus applying a torque to the spring and permitting the release of the restraining component. The full biasing action of the spring is then applied directly to the door, and the interfering component or "stop" is left in an inactive position until it is again desired to leave the door open for an extended period.

Essentially, the structure of the "stop" includes an engaging section disposed to cooperate with each of the ends of the helical spring, and a torque-transfer section connecting these engaging points. Since the twist at one end will of course exactly balance the twist at the other, the ends of the spring will be securely locked in a predetermined angular relationship as soon as the engaging means are brought to bear upon their respective ends of the spring. To facilitate the attachment of this component to the assembly, it is preferable for one end of the spring to be engageable with the "stop" through a slot arranged generally parallel to the axis of the hinge assembly. At the opposite (preferably the lower end) of this component a notch is provided which is engageable with the related end of the helical spring. The stop member can be slid in a vertical direction enough to permit the en-

gagement of the notch at the lower end with the spring, and it will be seen that the dimensions of the stop member itself will be determined entirely by the axial length of the helical spring.

Since the reaction at the notch and also at the elongated slot are in a generally tangential direction, it follows that means must be provided on the stop member for converting these forces into torque which can be transferred to the opposite end of the stop member. For this purpose, a formed section is preferably provided partially surrounding the outer diameter of the helical spring and arranged to oppose the linear forces generated at the point of engagement of the spring ends with the engaging means. A variety of equivalent arrangements can be used to perform this function, such as the provision of suitable apertured bent ears at opposite ends of the stop device disposed to cooperate with the hinge shaft. Any such arrangement having the general function of maintaining the axial alignment of the stop member with respect to the spring will be adequate, but the system described above and illustrated in the drawings is preferable due to the simplicity of manufacture and assembly associated therewith.

The particular features of the present invention will be discussed in detail by analysis of the embodiments illustrated in the accompanying drawings. In these drawings,

Figure 1 is a view in elevation of a conventional furnace door provided with a hinge assembly embodying the present invention.

Figure 2 is a view taken in elevation of the mechanism shown in Figure 1, with the "stop" component in the locked position and showing the furnace door free from the biasing action of the spring. With the components in the position shown in Figure 2, the assembly including the helical spring and the "stop" is free to slide axially along the rod, but is shown in the position indicated for clarity.

Figure 3 is a section taken on the plane 3—3 of Figure 2.

Figure 4 is a section taken on the plane 4—4 of Figure 1.

Referring to Figure 1, the furnace door generally designated as 10 is hinged upon the axis 11 by the cooperating action of the hinge members, 12, 13, 14, and 15, and also the hinge rod 16. The helical spring 17 is provided with the tangentially extending arms 18 and 19. The arm 18 bears against the edge of the furnace door 10, and the arm 19 bears against the front of the furnace 20.

The stop member 21 is provided with an elongated slot 22 adapted to cooperate with the end 18 of the spring. As will be noted in Figures 3 and 4, the slot 22 is disposed in a tangential portion 23 of the stop member, and the notch 24 at the opposite end of the stop member 21 is disposed in a tangential portion 25. To obtain the desired angular relationship, it will be noted that (in the device illustrated in these drawings) an approximately 30 degree angle exists between the planes of these two portions of metal.

To oppose the tangential forces generated at the slot 22 and at the hook 24, formed sections 26 and 27 are provided. It will be noted that the formed section 26 reaches around approximately 90 degrees of the outer periphery of the helical spring with respect to the tangential portion 23, and that the formed section 27 has a similar relationship with the tangential portion 25. The interaction of the engaging points and the formed portions result in a generation of torque at each end of the spring which is in direct opposition to the torque generated at the opposite end. If it were not for the formed sections 26 and 27, or their equivalent, the stop member would simply tend to rotate in a counterclockwise direction as shown in Figure 1 as soon as the engaging ends are brought to bear upon the spring. As noted above, a great variety of equivalent means are readily available for the prevention of such displacement of the stop member with respect to the axis of the spring.

With the illustrated device, the spring and the stop member can be placed in a position shown in Figure 2 and the article supplied for installation in that condition. With the angular relationship of the spring ends 18 and 19 thus determined, it is obvious that these components can be simply slipped onto the hinge rod 16 after passing the rod through either the upper or lower hinge members, since the assembly of the spring and the "stop" permit easy axial movement along the rod. The biasing action can be applied to the door by simply urging the door in the "open" direction far enough to permit the notch 24 to pass over and disengage the end of the spring 19. This movement will of course involve some axial displacement of the stop member, and this is accommodated by the slot 22 while still maintaining the stop member in assembled relationship with the other components. Such a stop member may be added to an already existing assembly involving a helical spring by the rotating of the spring end 18 far enough to permit the engagement of the stop member at the elongated slot. After the stop member has been shoved into the position shown in Figure 1, the spring end can be released to again bear upon the furnace door.

The appended claims are intended to be comprehensive of all modifications of the invention coming within their scope.

I claim:

1. In combination with a helical spring having tangentially projecting ends, a lock for establishing relatively angular relationship of the ends of said spring comprising: first and second engaging means adapted to cooperate respectively with the ends of said spring, said engaging means each including a stop disposed to bear against the respective end of said spring, and also including an opposite aligning member, said aligning member being disposed to cooperate with the side of said spring in abutting relationship at points thereon where a radius to the axis of said spring is substantially parallel to the direction of the force applied to said stop by the end of said spring, and torque-transfer means fixing the relative position of said first and second engaging means so as to maintain an angular relationship of the ends of the said springs substantially less than 180 degrees against a biasing action of said spring tending to increase said angular relationship.

2. In combination with a helical spring having tangentially projecting ends, a lock for establishing relatively angular relationship between the ends of said spring, comprising: a plate having slots on opposite sides separating each of said sides into at least two portions, one of said portions on each side having a stop disposed to bear against the respective end of said spring, the

opposite portion therefrom on the other side of said plate being disposed to cooperate with the side of said spring in abutting relationship at points thereon where a radius to the axis of said spring is substantially parallel to the direction of force applied to said stop by the end of said spring.

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