

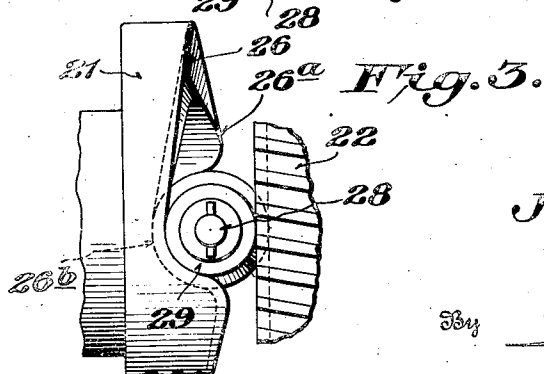
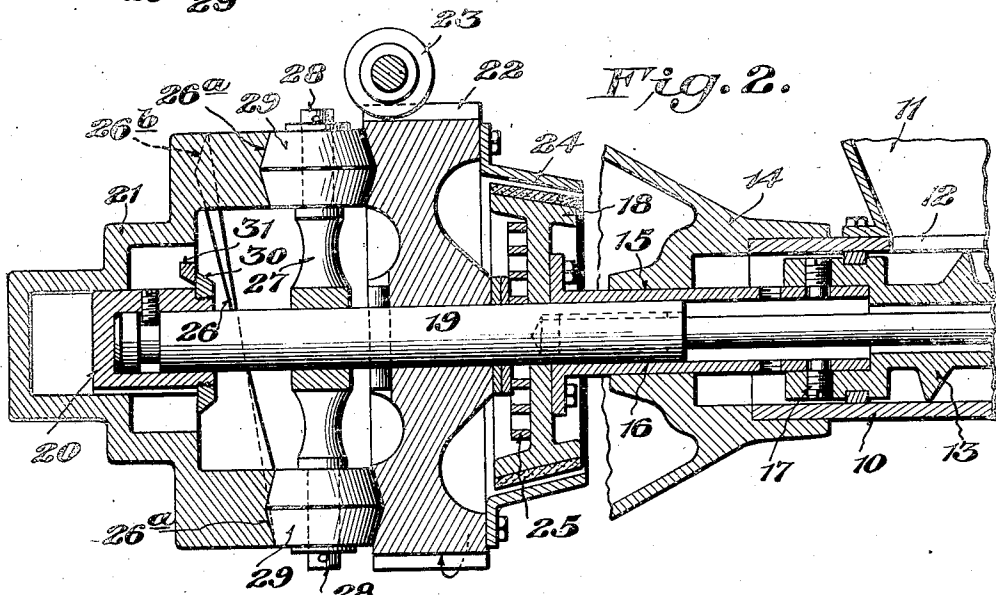
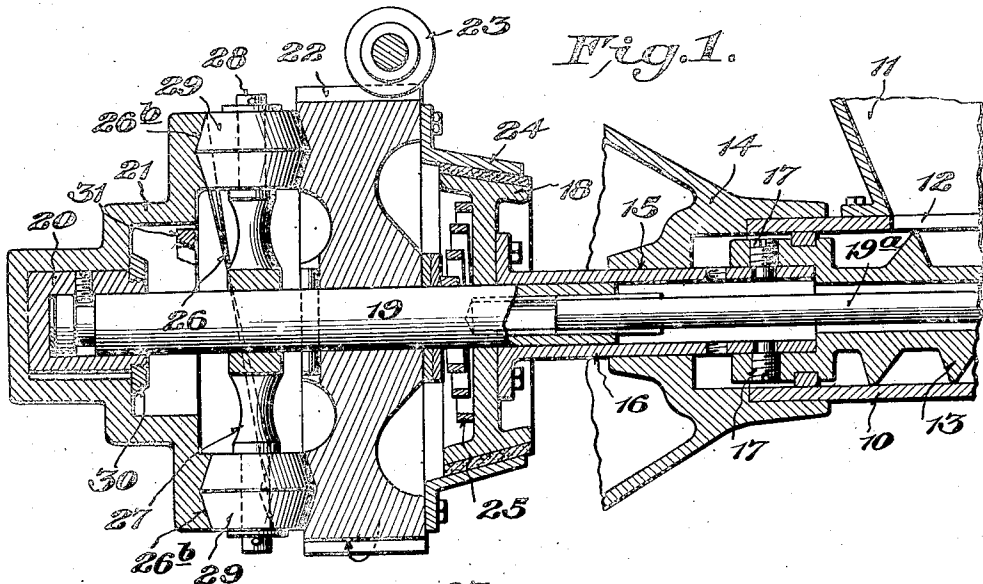
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MATERIAL FEEDING MECHANISM

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MATERIAL FEEDING MECHANISM

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This invention relates to a mechanism for use in feeding coal or other fuel to furnaces, or other materials to other devices, and has particular reference to a mechanism of this character in which the feeding element is in the form of a worm.

Mechanisms of the type in which a worm constitutes the feeding element for the fuel or other material are known and are in use. However, according to known mechanisms of this type the worm is, by rotation, caused to force the fuel or other material through a tube in which the worm is disposed, and this generates a great amount of friction on the worm and the tube. Consequently, considerable power is required to operate such mechanisms even when reduction gears are employed between the source of power and the worm, as is usually the case. Then too, the gears complicate the mechanisms and by their friction also absorb considerable power, with the result that such mechanisms are of low efficiency.

Accordingly, the present invention has generally in view to provide a feeding mechanism of the worm type for fuel and other material, which mechanism embodies a construction and mode of operation whereby its efficiency is materially increased as compared with known feeding mechanisms of the worm type.

More particularly the invention has in view to provide, in a feeding mechanism of the worm type, means whereby the worm is moved longitudinally, without rotation, so as to act as a pusher or plunger to advance or feed the fuel, and whereby the worm is returned to a retracted or starting position by rotation, these movements of the worm being produced alternately and automatically as long as the mechanism is in operation.

Another object of the invention is to provide a mechanism which has a novel mode of operation as stated and which includes novel means under thermostatic control whereby operation of the mechanism is initiated and stopped.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawing and defined in the appended claims.

In the drawing:—

Figure 1 is a longitudinal section through the mechanism illustrating the status thereof upon completion of retractile movement of the worm

and as the worm is about to be advanced without rotation thereof.

Figure 2 is a view similar to Fig. 1 illustrating the status of the mechanism upon completion of advance of the worm and rotation of the worm is about to be initiated to effect its retraction; and

Figure 3 is a fragmentary plan view illustrating the cam element of the mechanism.

Referring in detail to the practical embodiment of the invention illustrated in the drawing, 10 designates a fixed tube or casing which is understood to lead to a furnace or other device to which fuel or other material is to be fed, 11 designates a hopper for the fuel or other material disposed to have the fuel or other material delivered therefrom into the tube or casing 10 through an opening 12 therein, and 13 designates a feeding element for the fuel or other material which element is in the form of a worm mounted within the tube or casing 10 for rotation and longitudinal movement relatively thereto.

At the outer end of the tube 10 is a housing 14 having an opening 15 therein in axial alignment with the tube, and slidably and rotatably mounted in this opening is a sleeve 16 which, at its inner end, is suitably secured to the worm 13, as by means of the elements 17, and which, at its outer end, has fixed thereto the male element 18 of a conical clutch.

Slidably and rotatably mounted at its inner end within the outer end portion of the sleeve 16 is a shaft 19 which is of suitable length and which, at its outer end, is rotatably mounted within a cap element 20 which, in turn, is mounted for longitudinal sliding movement in a fixed element 21. The cap element 20 is suitably swiveled to the shaft 19 so that it is movable inwardly with the shaft and so that the shaft cannot move longitudinally outwardly with respect thereto, and preferably, but not necessarily, said cap element is suitably held against rotation within the element 21.

Fixed to the shaft 19 outwardly of the clutch element 18 and inwardly of the element 21 is a worm wheel 22 with which meshes a driving worm 23 deriving its power from any suitable source such, for example, as an electric motor (not shown). At its inner side, the worm wheel 22 carries the female element 24 of the aforementioned cone clutch, while between said worm wheel and the male clutch element 18 is interposed an expansion spring 25 of preferably helical form which tends constantly to move the worm wheel and the male clutch element relatively apart and

to engage the said male clutch element with the female clutch element 24, thus to couple the worm wheel and the fuel feeding element or worm 13 for unitary rotation.

5 Carried by the element 21 and facing the outer side of the worm wheel 22 are two duplicate, substantially semi-circular cam tracks 26 having substantially diametrically opposed high and low points 26^a and 26^b, respectively, which are spaced
10 longitudinally of the mechanism, each track extending circumferentially at a gradual inclination from its low point to its high point.

Mounted loosely on the shaft 19, between the worm wheel 22 and the element 21, is a member
15 27 having diametrically opposed pins 28 on which are journaled rollers 29 which operate between the cam tracks 26 and the adjacent side of the worm wheel 22.

Carried by the cap element 20 at the inner end thereof is a laterally projecting flange 30 having an inwardly beveled edge, while mounted in the element 21 for inward and outward movement relative to the shaft 19 and for cooperation with the flange 30, is a thermostatically or otherwise
20 controlled stop member 31.

As the actuating means for the stop member 31 may be of any suitable type and does not, in itself, form part of the invention, it has not been illustrated. On the contrary, it is sufficient to say
25 that when the mechanism is used for feeding fuel to a furnace and when a desired temperature of the house or other enclosure to be heated has been attained, the control means for the stop element 31 operates to move said member inwardly to the position shown in dotted lines in Fig. 1 and in full lines in Fig. 2, and that when the temperature falls below a predetermined degree, the control means operates to move said stop member outwardly to the full line position
30 shown in Fig. 1 and to hold it in this position. Alternatively, if the mechanism is used for feeding some material other than fuel, any suitable means, operable in response to the feeding of a greater or a lesser amount of the material than has been predetermined as being desirable, may be employed to actuate the stop element 31.

Assuming that the stop element 31 is held in its outer position, the operation of the mechanism is as follows: The driving worm 23 rotates the worm wheel 22 and with it the female clutch element 24. With the parts in the relative positions shown in Fig. 1; that is, with the rollers 29 engaging the low points 26^b of the cam tracks and the material feeding worm 13 in its retracted position, and inward longitudinal or material advancing movement thereof resisted by the material, rotation of the worm wheel 22 results in rotation of the rollers 29 about their pins 28. As the rollers thus rotate they roll against and climb up the cam tracks 26, and since the cam tracks are fixed, this climbing of the rollers results in the worm wheel 22 being pushed inwardly or, as illustrated in Fig. 1, in a right hand direction. As soon as inward movement of the worm wheel 22 is initiated, compression of the spring 25 against the restrained male clutch element 18 is initiated and the female clutch element is moved inwardly relative to the male clutch element, thereby disengaging the clutch so that rotation of the worm wheel 22 is not imparted to the feed worm 13. Upon continued inward movement of the worm wheel 22 the spring 25 soon is fully compressed and then acts as a positive compression element between said worm wheel and the
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sleeve 16, as illustrated in Fig. 2, so that upon further inward movement of the worm wheel the feed worm 13, due to its connection with the sleeve 16, is forced longitudinally inward and thereby is caused to act as a piston or plunger to advance the material through the tube 10. When finally the rollers 29 reach the high points 26^a of the cams the inward or fuel feeding stroke of the worm 13 is completed, and when the rollers ride over the cam high points 26^a and are no longer restrained against outward movement, the spring 25 immediately expands and, reacting from the male clutch element 18, moves the worm wheel 22 outward, thereby causing engagement of the female clutch element with said male clutch element and coupling the worm wheel 22 and the feeding worm 13 for unitary rotation. The direction of rotation of the worm wheel and the feeding worm is such as to unscrew the latter from the material which has been advanced. Consequently, continued rotation of the worm wheel results in rotatable retractile movement of the feeding worm and, of course, axial outward movement of the worm wheel. When the rollers 29 ride over the high points of the cams 26 and thereby are spaced from the low points of said cams, they no longer are revolved or planetated about the axis of shaft 19 but, on the contrary, remain aligned with the low points of the cams. Consequently, as the worm wheel 22 is moved outwardly due to unscrewing of the feeding worm, the rollers approach the low points of the cams and finally contact therewith upon completion of retractile movement of the feeding worm. Thereupon, continued rotation results in the rollers again beginning to climb the cam tracks with the result of first disengaging the clutch and immediately thereafter initiating non-rotative advance or inward pushing movement of the feeding worm as previously explained. Obviously, as long as the stop member 31 is maintained retracted and the driving worm 23 continues to turn the operations recounted are repeated and intermittent feeding of the fuel or other material is effected. On the other hand, if, during operation of the mechanism, the stop member 31 is moved inwardly, feeding operation of the mechanism is stopped even though the worm 23 may continue to drive the worm wheel 22. That is to say, when the stop member 31 is moved to its inner position it is disposed in the path of longitudinal movement of the flange 30 of the cap element 20, so that when said cap element moves inwardly with the shaft 19, the flange 30 rides across said stop member and momentarily forces the same outwardly, whereupon the stop member drops or is projected behind said flange. This occurs just prior to the rollers 29 reaching the high points 26^a of the cams 26, so that when the rollers 29 ride over said high points outward movement of the shaft 19 and, consequently, of the worm wheel 22, is prevented. The spring 25 then cannot expand to engage the clutch elements and as a result the worm wheel 22 simply rotates idly. When, however, the stop member 31 subsequently is withdrawn from behind the flange 30, the spring 25 is permitted to expand to engage the clutch and operation of the mechanism again is initiated with unscrewing of the feeding worm from the material.

The motor for driving the worm 23 may operate continuously in order to continuously rotate the shaft 19 which has splined thereto a shaft extension 19^a for operating an ash conveyor. Also,

air may be fed through the housing 14 and the worm 13 to promote combustion in the furnace.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:—

1. A material feeding mechanism comprising a material feeding element, a motor driven rotatable power element, cam means operated by said power element to move said feeding element longitudinally and non-rotatably to advance the material slowly, and clutch means for connecting said feeding element with the motor driven rotatable power element thereby to rotate said feeding element and effect its retraction quickly.

2. A material feeding mechanism comprising a material feeding element, a rotatable power element, and means operable in response to continuous rotation of said power element to alternately move said feeding element longitudinally non-rotatively to advance the material and to rotate said feeding element to effect its retraction.

3. A material feeding mechanism comprising a material feeding element, a rotatable power element, means operable by said power element to move said feeding element longitudinally to advance the material, a clutch between said power element and said feeding element, means to disengage said clutch when material advancing longitudinal movement of the feeding element is initiated, and means to engage said clutch upon completion of such movement of said feeding element.

4. A material feeding mechanism comprising a material feeding element, a rotatable power element, cam means operable by said power element to move said feeding element longitudinally to advance the material, a clutch between said power element and said feeding element, means to disengage said clutch when material advancing longitudinal movement of the feeding element is initiated, and means to engage said clutch upon completion of such movement of said feeding element.

5. A material feeding mechanism comprising a material feeding element, a rotatable power element, means operable in response to continuous rotation of said power element to alternately move said feeding element longitudinally to advance the material and to rotate said feeding element to effect its retraction, and means operable to render the mechanism inoperative while the power element continues to rotate and without disturbing the driving connection between the power element and the mechanism.

6. A material feeding mechanism comprising a material feeding worm, a clutch element affixed thereto, a power driven wheel, a clutch element carried by said wheel for cooperation with said first mentioned clutch element, spring means tending constantly to shift said wheel axially in a direction to effect engagement of said clutch elements, means whereby axial movement of said wheel in an opposite direction effects disengagement of said clutch elements and longitudinal material feeding movement of said worm, and cam and cam follower means rendered effective in response to rotation of said wheel to move the latter in the last mentioned axial direction and subsequently to permit said spring means to act

to shift said wheel to engage the clutch elements and to permit resulting retractile rotative and longitudinal movement of the feeding worm.

7. A material feeding mechanism as set forth in claim 6 including stop means to prevent axial movement of the power wheel in the first mentioned direction whereby the clutch is maintained disengaged.

8. A material feeding mechanism comprising a rotatable and axially movable material feeding worm, a coaxial rotatable power driven wheel, a clutch element affixed to the worm, a cooperating clutch element carried by said wheel, spring means tending constantly to shift said wheel axially outward to effect engagement of said clutch elements, fixed cam means outwardly of said wheel, and rollers between said cam means and said wheel cooperating therewith in response to rotation of the wheel to move the wheel inwardly to disengage the clutch and subsequently to force the feeding worm inwardly.

9. A material feeding mechanism comprising a rotatable and axially movable feeding worm, a sleeve extending outwardly from the outer end of the feeding worm, a male conical clutch element affixed to said sleeve, a shaft having its inner end journaled in said sleeve, a power driven wheel affixed to said shaft outwardly of said male clutch element, a female conical clutch element carried by said wheel, a spring between said male clutch element and said wheel tending constantly to move the wheel axially outward to effect engagement of the clutch elements, fixed cam means outwardly of said wheel, and rollers between said cam means and said wheel cooperating therewith in response to rotation of the wheel to move the wheel inwardly to disengage the clutch and subsequently to force the feeding worm inwardly.

10. A material feeding mechanism comprising a rotatable and axially movable feeding worm, a sleeve extending outwardly from the outer end of the feeding worm, a male conical clutch element affixed to said sleeve, a shaft having its inner end journaled in said sleeve, a power driven wheel affixed to said shaft outwardly of said male clutch element, a female conical clutch element carried by said wheel, a spring between said male clutch element and said wheel tending constantly to move the wheel axially outward to effect engagement of the clutch elements, fixed cam means outwardly of said wheel, rollers between said cam means and said wheel cooperating therewith in response to rotation of the wheel to move the wheel inwardly to disengage the clutch and subsequently to force the feeding worm inwardly, a stop formation carried by the shaft, and a cooperating stop formation to prevent outward movement of the shaft and wheel when the feeding worm has been advanced to its innermost position.

11. A material feeding mechanism as set forth in claim 1 in which the material feeding element is of hollow construction to provide an air passageway, and in which an operating shaft for an ash conveyor extends through said feeding element and is operatively connected with the power element.

12. A material feeding mechanism as set forth in claim 9 in which the feeding worm is of hollow construction to provide an air passageway, and in which an operating shaft for an ash conveyor extends through said worm and has a splined connection with the shaft which carries the power driven wheel.

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