March 29, 1932. W. R. MELMER 1,851,260

AUTOMATIC DOOR CLOSING DEVICE

Filed March 5, 1931

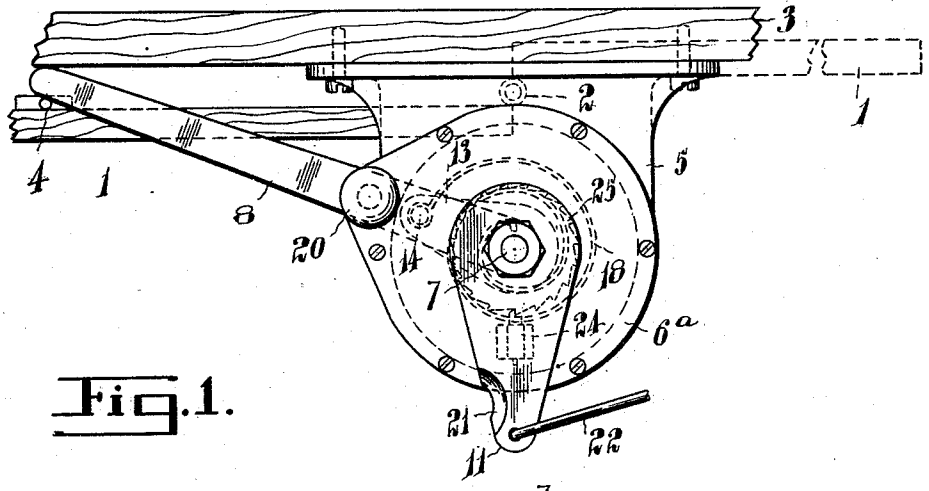

Fig. 1.

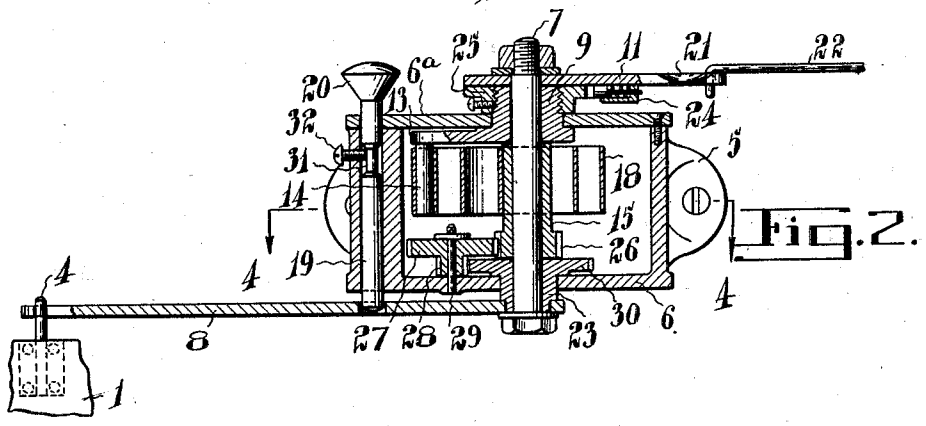

Fig. 2.

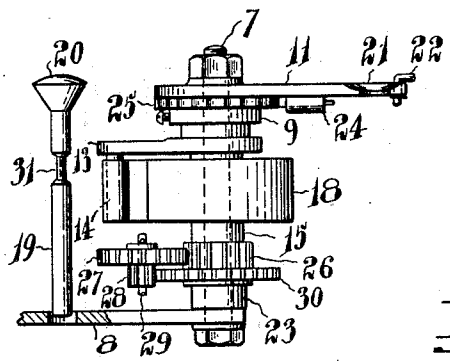

Fig. 3.

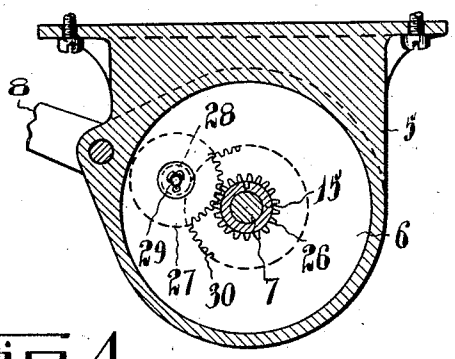

Fig. 4.

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UNITED STATES PATENT OFFICE

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AUTOMATIC DOOR CLOSING DEVICE

Application filed March 5, 1931. Serial No. 520,216.

This invention relates to spring-actuated devices for automatically closing doors when a predetermined temperature is reached adjacent the door, and my object is to devise simple and reliable means for this purpose which will possess the following advantages:

1. An entirely enclosed spring;
2. A quick trip;
3. Power sufficient to rapidly overcome the inertia of the door at the start of the closing operation; and
4. A construction which is readily assembled and installed with the spring in an untensioned position.

I attain my object by means of the constructions which may be briefly described as follows: A casing containing a spiral spring is mounted on the door frame and two arms are concentrically journalled thereon, one a door-operating arm and the other a trip arm adapted to release a detent normally holding the door closing arm out of action. One of said arms is connected with the spring by means including a pawl and ratchet whereby the spring may be tensioned after the device is installed, while the door operating arm is driven by the spring through a train of speed reducing gearing.

The invention is hereinafter more fully described and is illustrated in the accompanying drawings in which

Fig. 1 is a plan view of the device applied to a door;

Fig. 2 a vertical section of the same;

Fig. 3 a side elevation of the moving parts removed from the casing; and

Fig. 4 a sectional plan on the line 4—4 in Fig. 2.

1 is a door which may be of ordinary fireproof construction and is provided with hinges 2 supported on a door frame 3. A projection 4 is also secured to and extends above the upper edge of the door. A casing 5 is secured to the door frame, this casing being preferably provided with an integral bottom 6 and a removable top 6^a. Centrally of the casing is positioned the spindle 7. Journalled on the spindle and in the bottom 6 is a sleeve 23 to which is secured the door-operating arm 8.

The casing, it will be noted, is so positioned that the spindle 7 is as close as possible to the axis on which the door swings. Sleeved on the spindle is a sleeve 9, which is journalled in the top 6^a of the casing. Mounted on the upper end of the spindle is the arm 11, which serves as a trip arm to release means normally holding the door-operating arm 8 in inoperative position as hereinafter described. This arm is provided with a spring-actuated pawl 24 engaging with a ratchet wheel 25 suitably secured on the upper end of the sleeve. The sleeve 23 may thus rotate relative to the arm in one direction only. Formed on the sleeve 9 and located within the casing is a rock arm 13 to which is secured the pin 14.

On the spindle 7 within the casing is positioned a sleeve 15. This sleeve is free to rotate on the spindle. Surrounding the sleeve 15 is a spiral spring 18, one end of which engages the pin 14 while the other is hooked into a notch in or is otherwise secured to the sleeve 15 (see Fig. 2).

This sleeve 15 has a pinion 26 formed thereon which meshes with a gear wheel 27 to which is secured a pinion 28, the gear wheel and pinion being journalled on a pin 29 secured to the bottom of the casing. The pinion 28 meshes with a gear wheel 30 fast on the sleeve 23. The spiral spring will thus serve to move either the arm 8 or the arm 11 depending on which of the two is held stationary. Furthermore, the spring has a direct driving connection with the trip arm, which requires to be moved rapidly, and has a geared driving connection with the door operating arm which provides ample power to overcome the inertia of the door to be moved and set it in motion.

The means for normally locking the door-operating arm 8 in an inoperative position comprises a pin 19 slidably in the casing 5 and provided with a head 20 shaped as an inverted cone. This head is engageable by the inclined portion 21 of the trip arm 11 so that it may be lifted and its lower end disengaged from the arm 8 to allow the latter to swing to operate the door. The pin 19 is in one piece and is formed with a portion 31 of reduced

diameter and a set screw 32 threaded through the wall of the casing projects into the recess so formed to limit the movements of the pin in either direction. The trip arm 11 is normally held in inoperative position by the wire 22 which may either be formed of readily fusible material or include a fusible link.

When the device is to be applied to a door, the spring is in an untensioned condition, making the device perfectly safe to handle. When suitably secured in place and connected up a spanner may be applied to the ratchet wheel 25 to rotate the sleeve 9 to tension the spring 18 as much as may be necessary, the pawl 24 carried by the trip arm 11 serving to hold the sleeve as rotated.

The mode of operation is a follows: The parts being normally in the position shown in Fig. 1, on the release of the trip arm 11, due to the fusing of the connections normally holding it in an inoperative position, the arm swings and lifts the pin 19. The arm 11 is then stationary and the force of the spiral spring 18 is exercised through the arm 8 to close the door.

What I claim as my invention is:

1. In a door closing device, the combination of a casing; a door closing arm and a trip arm concentrically journalled; a rotatable member concentrically journalled with the said arms; a pawl-and-ratchet driving connection between one of the said arms and the said member; a spiral spring having one end connected with the said member; and a driving connection between the spring and the other arm.

2. In a door closing device, the combination of a casing; a door closing arm and a trip arm concentrically journalled; a rotatable member concentrically journalled with the said arms; a pawl-and-ratchet driving connection between the trip arm and the said member; a spiral spring having one end connected with the said member; and a driving connection between the spring and the door closing arm.

3. In a door closing device, the combination of a casing; a door closing arm and a trip arm concentrically journalled; a rotatable member concentrically journalled with the said arms; a pawl-and-ratchet driving connection between one of the said arms and the said member; a spiral spring having one end connected with the said member; and a driving connection between the spring and the other arm comprising a train of speed reducing gearing.

4. In a door closing device, the combination of a casing; a door closing arm and a trip arm concentrically journalled; a rotatable member concentrically journalled with the said arms and having a driving connection with the trip arm; a second rotatable member concentrically journalled with said arms; a spiral spring having its opposite end connected to said members; and a train of gearing connecting said last mentioned member with the door closing arm.

5. In a door closing device, the combination of a casing; a spindle extending through opposite ends of the casing; a sleeve journalled on the spindle and in the upper end of the casing; a trip arm connected with said sleeve outside the casing; a rock arm on the sleeve inside the casing; a sleeve on the spindle inside the casing; a pinion on said sleeve; a spiral spring having one end connected to the sleeve and the other to the rock arm aforesaid; a sleeve journalled on the spindle and in the lower end of the casing; a door closing arm fast on said sleeve outside the casing; a gear wheel on said sleeve within the casing; and a connected pinion and gear wheel coaxially journalled within the casing, the former meshing with the gear wheel and the latter with the pinion aforesaid.

6. In a door closing device, the combination of a casing; a door closing arm and a trip arm concentrically journalled; a rotatable member concentrically journalled with said arms; a trip arm connected to the said member; a spiral spring having one end connected with said member; a driving connection between the other end of the spring and the door operating arm; a one-piece pin slidably mounted in the ends of the casing and positioned to engage the door closing arm and having a bevelled head adapted to be engaged and lifted by the trip arm to disengage the door closing arm, the said pin having a portion of reduced diameter intermediate of its ends; and a set screw threaded through the wall of the casing and engaging in said reduced portion to limit the endwise movements of the pin.

7. In a door closing device, the combination of a casing; a door closing arm and a trip arm concentrically journalled; a spiral spring positioned within the casing; a driving connection between the spring and each of said arms; a speed reducing gear train included in one connection; and a pawl and ratchet included in one connection to permit of the tensioning of the spring after the device is assembled.

Signed at Toronto this 10th day of February, 1931.

WILLIAM R. MELMER.