This invention relates to a hydraulic buffer and closing device for doors in which the door and door frame are not permanently interconnected by links or the like and wherein two armed levers oscillatable over the dead centre position are employed which during the closing of the door are disengaged from their dead centre position which forms at the same time the locking position for the compressed spring, and effect the closing of the door.

As compared herewith the invention consists substantially in that during the opening of the door a spring in the door closing device is compressed in this condition until, during the closing or banging of the door, the shock absorber or buffer enters a known positive guide which is released from its locked position by the turning of the spring case through an angle, and liberates the spring which closes the door through the intermediary of the door buffer which is utilized as closing lever.

In a particularly advantageous form of construction the pressure cylinder is pivotally mounted by means of a foot on a frame by which the door lever is fixed preferably in vertical direction on the upper bar of the door and also hingedly connected by means of the piston rod to one arm or an elbow lever pivoted on the frame. The other longer arm of this lever carries a rubber roller which is guided in a U-shaped guide element open in downward direction and fixed on the door frame. The outer arm of the guide element is so short that the rubber roller of the shock absorber, which moves downwards during the opening of the door, can leave the guide element whereas the inner arm of the guide element is bent slightly in outward direction and extends so far downwards that the approaching rubber roller abuts against same, is guided obliquely in upward direction and swings one arm of the elbow lever beyond its dead centre position so that the spring can become operative for the door closer. Further the fulcrum of the elbow lever is so situated that the piston rod of the pressure cylinder is swung inwards beyond its dead centre position when the door is open, the elbow lever being supported by the frame.

In a further development of the invention the pressure cylinder has on the inside side of its lower portion known channels extending in longitudinal direction, the position of which channels can be changed relative to the piston by adjusting the pressure cylinder in longitudinal direction so that the closing force of the spring can be regulated as desired.

An embodiment of the invention is illustrated by way of example in the accompanying drawing in which:

Fig. 1 shows the device in closing position in front elevation, partly in section.

Fig. 2 is a side elevation of Fig. 1.

Fig. 3 is a side elevation shortly before the complete closing of the door.

Fig. 4 is a section on line IV—IV of Fig. 1.

In a bracket b fixed on the upper lining bar of a door a a sleeve d, oscillatable around a bolt c, is mounted into which pin a a reduced end e of a compression cylinder f is screwed. A piston rod g carries on its lower end a piston h having two bores i, in which two balls l rest which are secured by pins k against dropping out. In alignment with the bores i two bores m of smaller diameter are arranged, which terminate in the interior of the compression cylinder f. A disc n rests loosely on the piston h, one end of a pressure spring o bearing against this disc, whereas the other end of the spring bears against a cover y of the compression cylinder f. The piston rod g is connected to one arm p of an elbow lever, the other arm q of which carries a rotatably mounted rubber roller r. The elbow lever is oscillatable around a pin s of the casing b. The rubber roller r is guided, during the opening and closing of the door, in a U-shaped guide t fixed on the door frame u.

The operation of the device during the opening of the door is as follows:

The rubber roller r is pulled downwards from its position shown in Figs. 1 and 2 during the opening of the door and oscillates the lever arm q towards the door frame until the other arm p of the elbow lever has oscillated to beyond its dead centre position, whereby the lever arm q is positively pressed against the upper edge v of the casing b. The door a is then no longer connected to the frame u and can assume any desired position. If the door is closed by hand, the rubber roller r strikes against one arm of the U-shaped guide, and slight pressure is sufficient to oscillate the lever q outwards beyond its dead centre position, whereupon the spring o immediately becomes operative. It presses against the piston h, the rubber roller bears against the outer arm of the guide t, and the door a is positively closed.

It is possible to allow the closing of the door to be effected quickly or slowly, that is with more or less pressure. If the piston h is situated in the position shown in Fig. 1, when the door is closed, the grooved
channels $w$ in the inner wall of the cylinder are shut off from the spring compartment by the ring-shaped piston part $n$. When the door is, however, in open position, the device assumes the position shown in Fig. 3, the spring $o$ is put under tension and the piston $h$ lies higher in the cylinder. The quantity of glycerine employed in known manner as pressure fluid in the cylinder space above the piston flows during the opening of the door into the space below the piston, into which it is drawn by the movement of the piston. If, during the closing of the door, the force of the compressed spring is liberated by the oscillation of the elbow lever $q$, $p$, the piston $h$ again moves downwards until it reaches the position shown in Fig. 1. During this movement a portion of the glycerine is pressed into the cylinder space above the piston through the channels $i$, $m$, which are suitably throttled by the balls, so that the known braking effect is obtained which does not allow the force of the spring to act suddenly but gradually and gently, so that a hard banging of the door is prevented. Consequently, in this position of the compression cylinder $f$ relative to the piston $h$, the channels $w$ are not operative.

By turning the cylinder $f$, which is effected by hand, the screw threaded reduced end of the cylinder is unscrewed from the threaded sleeve $d$. Thus, the distance between the cylinder cover $y$ and the piston is increased and the spring slightly relieved. However, at the same time the channels $w$ in the inner wall of the cylinder are shifted over the upper edge of the piston, and, according to the distance which the cylinder is shifted, the channels $w$ are utilized more or less for conducting the glycerine around the piston, so that the hydraulic braking effect which takes place through the channels $i$ and $m$ is disengaged so that the spring can exert its full effect. Thus, the spring force liberated becomes greater than if it were partly throttled by the hydraulic braking effect.

It is thus possible, by raising or lowering the cylinder $f$, which, as above mentioned, can be effected easily by hand without the aid of any tools or the like, to shut the door rapidly or slowly. This is material in so far as the slow closing of the door will evidently take place more silently than the rapid closing.

I claim:

1. A hydraulic shock absorber with closing device for doors, comprising in combination with the door and door frame, a frame fixed on the upper portion of said door, a pressure cylinder oscillating in a vertical plane mounted on said frame, a piston shiftable in said cylinder, a piston rod projecting from the upper end of said said cylinder, an elbow lever mounted in said frame, one arm of said lever connected to said piston rod, a rubber roller mounted on the other arm of said lever, and a U-shaped guide element open in downward direction mounted on said door frame adapted to guide said rubber roller.

2. A hydraulic shock absorber as claimed in claim 1, comprising in combination with the door, the cylinder the elbow lever, the rubber roller mounted on one arm of said lever, and the guide element, said guide element having a short outer arm to allow said roller to leave said element 100 during its downward movement during the opening of the door, and a longer inner arm extending obliquely downwards to engage said rubber roller during the closing of the door after said lever has passed its dead centre position.

3. A hydraulic shock absorber as claimed in claim 1 in which the fulcrum of the elbow lever 110 is arranged so that piston rod swings beyond its dead centre position when the door is open.

4. A hydraulic shock absorber as claimed in claim 1, comprising in combination with the piston and the pressure cylinder said cylinder 115 having channels extending in longitudinal direction in its lower end, means for displacing said pressure cylinder in longitudinal direction to regulate the position of said channels relative to said piston.

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