6 **(a)** A capacitor consists of two parallel metal plates, separated by air, at a variable distance $x$ apart, as shown in Fig. 6.1. The capacitance $C$ is inversely proportional to $x$.

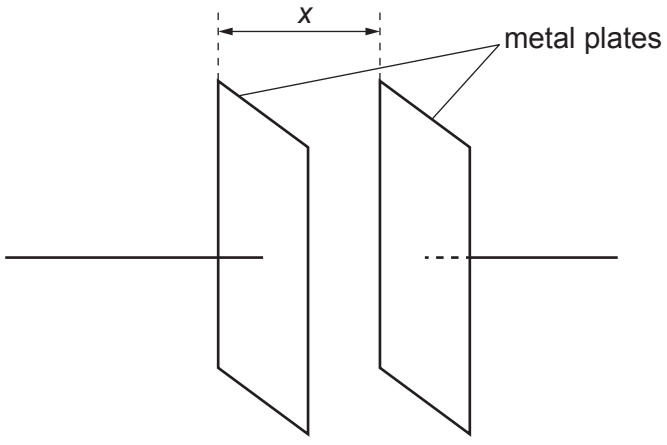


**Fig. 6.1**

The capacitor is charged by a supply so that there is a potential difference (p.d.) $V$ between the plates.

State expressions, in terms of $C$ and $V$, for the charge $Q$ on one of the plates and for the energy $E$ stored in the capacitor.

$Q$ = ..... $E$ = ..... [1]

**(b)** The charged capacitor in **(a)** is now disconnected from the supply. The plates of the capacitor are initially separated by distance $L$. They are then moved closer together by a distance $D$, as shown in Fig. 6.2.

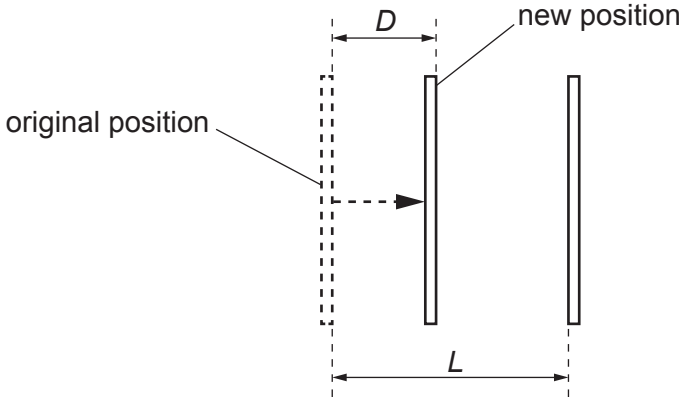


**Fig. 6.2**

State expressions, in terms of $C$, $V$, $L$ and $D$, for:

**(i)** the new capacitance $C_N$

$C_N$ = ..... [1]

**(ii)** the new charge $Q_N$ on one of the plates

$Q_N$ = ..... [1]

**(iii)** the new p.d. $V_N$ between the plates.

$V_N$ = ..... [1]

**(c)** Explain whether reducing the separation of the plates in **(b)** results in an increase or decrease in the energy stored in the capacitor.

.....

.....

..... [1]

[Total: 5]