Goldstein

1.3. (1.22): $M\frac{d^2\vec{R}}{dt^2} = \sum_i \vec{F}_i^{(e)} \equiv \vec{F}^{(e)}$, (1.26): $\frac{d\vec{L}}{dt} = \vec{N}^{(e)}$

Suppose 2 particles satisfy both, then

$$M\frac{d^2\vec{R}}{dt^2} = m_1\frac{d^2}{dt^2}\vec{r}_1 + m_2\frac{d^2}{dt^2}\vec{r}_2$$

$$= \vec{F}_1 + \vec{F}_2 = \vec{F}_1^{(e)} + \vec{F}_{21} + \vec{F}_2^{(e)} + \vec{F}_{21}$$

equating this with $\vec{F}^{(e)} = \vec{F}_1^{(e)} + \vec{F}_2^{(e)}$, we have $\vec{F}_{21} + \vec{F}_{12} = 0$.
This is the $\boxed{\text{weak law of action and reaction}}$.

Expanding $\frac{d\vec{L}}{dt}$, we have $\frac{d\vec{L}}{dt} = \frac{d}{dt}[\vec{r}_1 \times \vec{p}_1 + \vec{r}_2 \times \vec{p}_2]$,

$$= \vec{r}_1 \times \vec{F}_1 + \vec{r}_2 \times \vec{F}_2$$

$$= \vec{r}_1 \times [\vec{F}_1^{(e)} + \vec{F}_{21}] + \vec{r}_2 \times [\vec{F}_2^{(e)} + \vec{F}_{12}]$$

$$= \vec{r}_1 \times \vec{F}_1^{(e)} + \vec{r}_2 \times \vec{F}_2^{(e)} + \vec{r}_1 \times \vec{F}_{21} + \vec{r}_2 \times \vec{F}_{12}.$$

The weak law of action and reaction implies $\vec{F}_{12} = -\vec{F}_{21}$,
so $\vec{r}_1 \times \vec{F}_{21} + \vec{r}_2 \times \vec{F}_{12} = (\vec{r}_1 - \vec{r}_2) \times \vec{F}_{21} = \vec{r}_{12} \times \vec{F}_{21}$.

Equating the above quantity with $\vec{N}^{(e)} = \vec{r}_1 \times \vec{F}_1^{(e)} + \vec{r}_2 \times \vec{F}_2^{(e)}$,
we have the $\boxed{\text{strong law of action and reaction}}$, since
$\vec{r}_{12} \times \vec{F}_{21} = 0$ indicates they are aligned.