$$
\begin{array}{l}
ChainAndForkInv \triangleq \\
\quad \land -MAX\_BLOCK\_BODY \leq chain2\_fork\_block\_number \\
\quad \land chain2\_fork\_block\_number \leq 0 \\
\quad \land all\_blocks = chain1 \cup chain2 \\
\quad \text{\textit{chain}1\_\textit{tip} is the maximum block in chain 1} \\
\quad \land \forall\, b \in chain1 : b.body \leq chain1\_tip.body \\
\quad \text{block numbers on chain 1 simply go from 0 to } chain1\_tip.body \\
\quad \land \forall\, b1,\, b2 \in chain1 : \\
\qquad \land b1.body \geq 0 \land b1.body \leq chain1\_tip.body \\
\qquad \land (b1.body \geq b2.body) \equiv (b1.slot \geq b2.slot) \\
\quad \text{there are no gaps in the block numbers} \\
\quad \land \forall\, i \in 0 \,..\, MAX\_BLOCK\_BODY : \\
\qquad i \leq chain1\_tip.body \Rightarrow \exists\, b \in chain1 : b.body = i \\
\quad \text{\textit{chain}2\_\textit{tip} is the maximum block in chain 2} \\
\quad \land \forall\, b \in chain2 : Abs(b.body) \leq Abs(chain2\_tip.body) \\
\quad \text{Positive block numbers on chain 2 go from 0 to } -chain2\_fork\_block\_number - 1, \\
\quad \text{if there was a fork.} \\
\quad \text{Negative block numbers on chain 2 go from } -chain2\_fork\_block\_number \text{ to} \\
\quad chain2\_tip.body, \text{ if there was a fork.} \\
\quad \text{If there was no fork, all block numbers on chain 2 are non-negative.} \\
\quad \land \forall\, b1,\, b2 \in chain2 : \\
\qquad \land (b1.body \geq 0) \Rightarrow (b1.body < -chain2\_fork\_block\_number) \lor \neg IsForked \\
\qquad \land (b1.body < 0) \Rightarrow (b1.body \leq chain2\_fork\_block\_number) \land IsForked \\
\qquad \land (Abs(b1.body) \geq Abs(b2.body)) \equiv (b1.slot \geq b2.slot) \\
\quad \text{there are no gaps in the block numbers (some of them are negative)} \\
\quad \land \forall\, i \in 0 \,..\, MAX\_BLOCK\_BODY : \\
\qquad i \leq Abs(chain2\_tip.body) \Rightarrow \exists\, b \in chain2 : Abs(b.body) = i \\
\quad chain2\_fork\_block\_number \text{ has to be in } chain2 \\
\quad \land \exists\, b \in chain2 : b.body = chain2\_fork\_block\_number \\
\quad \text{when there is no fork, the tips coincide} \\
\quad \land \neg IsForked \Rightarrow chain2\_tip = chain1\_tip \\
\quad \text{before the fork point, } chain2 \text{ and } chain1 \text{ coincide} \\
\quad \land \forall\, b \in chain2 : \\
\qquad b.body \geq 0 \Rightarrow b \in chain1
\end{array}
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