$$
\begin{aligned}
\mathcal{A}' &= (Q', \Sigma, \Gamma', \widehat{q_0}, \Delta', F') \text{ mit} \\
Q' &= \{< q, u >, < q, o > \mid q \in Q\} \cup \{\widehat{q_0}, \widehat{q_1}, \widehat{q_2}\} \\
F' &= \{< q, u >, < q, o > \mid q \in F\} \\
\Gamma' &= \Sigma \cup \{\not b\} \cup \left\{ \begin{bmatrix} x \\ y \end{bmatrix} \middle| x \in \Gamma, y \in \Gamma \cup \{\not c\} \right\} \\
&\quad \text{wobei } \not c \notin \Gamma
\end{aligned}
$$

$\Delta' = \textcircled{1} \cup \textcircled{2} \cup \textcircled{3} \cup \textcircled{4} \cup \textcircled{5}$ mit

$$
\begin{aligned}
\textcircled{1} &= \left\{ \left(\widehat{q_0}, a, \begin{bmatrix} a \\ \not c \end{bmatrix}, r, \widehat{q_1} \right), \left(\widehat{q_1}, a, \begin{bmatrix} a \\ \not b \end{bmatrix}, r, \widehat{q_1} \right) \middle| a \in \Sigma \right\} \\
&\cup \left\{ \left(\widehat{q_0}, \not b, \begin{bmatrix} \not b \\ \not c \end{bmatrix}, n, < q_0, o > \right) \right\} \\
&\cup \{(\widehat{q_1}, \not b, \not b, l, \widehat{q_2})\} \\
&\cup \left\{ \left(\widehat{q_2}, \begin{bmatrix} a \\ \not b \end{bmatrix}, \begin{bmatrix} a \\ \not b \end{bmatrix}, l, \widehat{q_2} \right), \left(\widehat{q_2}, \begin{bmatrix} a \\ \not c \end{bmatrix}, \begin{bmatrix} a \\ \not c \end{bmatrix}, n, < q_0, o > \right) \middle| a \in \Sigma \right\}
\end{aligned}
$$

$$
\begin{aligned}
\textcircled{2} &= \left\{ \left(< q, o >, \begin{bmatrix} x \\ y \end{bmatrix}, \begin{bmatrix} x' \\ y \end{bmatrix}, d, < q', o > \right) \middle| (q, x, x', d, q') \in \Delta, d \in \{l, r, n\}, y \neq \not c \right\} \\
&\cup \left\{ \left(< q, o >, \not b, \begin{bmatrix} x' \\ \not b \end{bmatrix}, d, < q', o > \right) \middle| (q, \not b, x', d, q') \in \Delta, d \in \{l, r, n\} \right\}
\end{aligned}
$$

$$
\begin{aligned}
\textcircled{3} &= \left\{ \left(< q, u >, \begin{bmatrix} x \\ y \end{bmatrix}, \begin{bmatrix} x \\ y' \end{bmatrix}, \bar{d}, < q', u > \right) \middle| (q, y, y', d, q') \in \Delta, d \in \{l, r, n\}, y \neq \not c \right\} \\
&\cup \left\{ \left(< q, u >, \not b, \begin{bmatrix} \not b \\ y' \end{bmatrix}, \bar{d}, < q', u > \right) \middle| (q, \not b, y', d, q') \in \Delta, d \in \{l, r, n\} \right\}
\end{aligned}
$$

$$
\begin{aligned}
\textcircled{4} &= \left\{ \left(< q, o >, \begin{bmatrix} x \\ \not c \end{bmatrix}, \begin{bmatrix} x' \\ \not c \end{bmatrix}, r, < q', u > \right) \middle| (q, x, x', l, q') \in \Delta \right\} \\
&\cup \left\{ \left(< q, u >, \begin{bmatrix} x \\ \not c \end{bmatrix}, \begin{bmatrix} x' \\ \not c \end{bmatrix}, r, < q', o > \right) \middle| (q, x, x', r, q') \in \Delta \right\}
\end{aligned}
$$

$$
\begin{aligned}
\textcircled{5} &= \left\{ \left(< q, o >, \begin{bmatrix} x \\ \not c \end{bmatrix}, \begin{bmatrix} x' \\ \not c \end{bmatrix}, d, < q', o > \right) \middle| (q, x, x', d, q') \in \Delta, d \in \{r, n\} \right\} \\
&\cup \left\{ \left(< q, u >, \begin{bmatrix} x \\ \not c \end{bmatrix}, \begin{bmatrix} x' \\ \not c \end{bmatrix}, \bar{d}, < q', u > \right) \middle| (q, x, x', d, q') \in \Delta, d \in \{l, n\} \right\}
\end{aligned}
$$

wobei $\bar{d} = \begin{cases} l, & d = r \\ n, & d = n \\ r, & d = l \end{cases}$