Submission:
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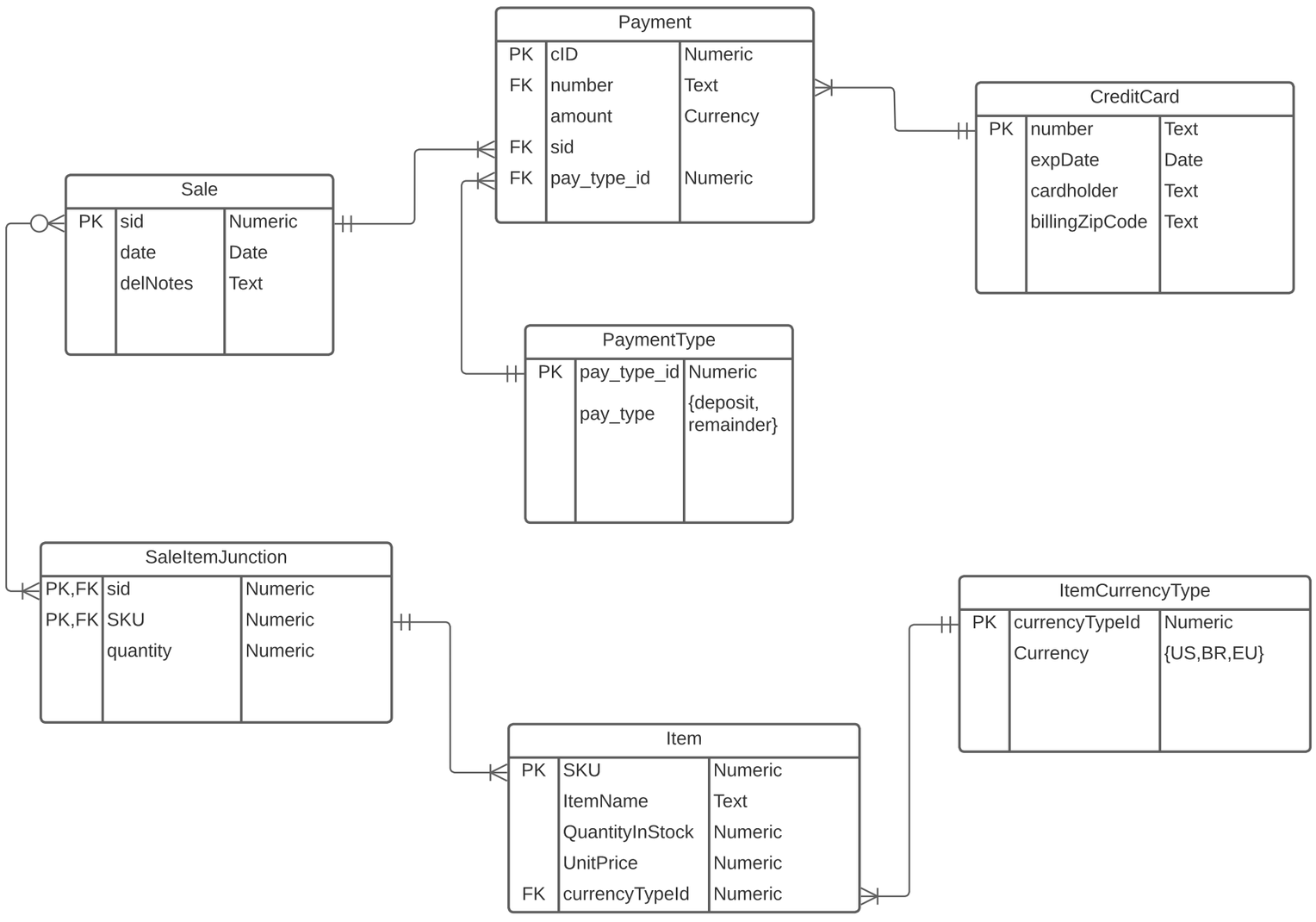

NORMALIZED ORDER ERD

Assumptions:

1. one sid can have multiple quanitities of same SKU

2. one sid can have more than 2 cids (for eg: users pay remainder in multiple installments) (previous design was restricting more than 2 payments)

3. number was a primary key for credit card, so created a separate table for Credit card details

4. ItemName is non-unique value which renders it to be not considered as a key

5. cID is generated as unique id for the payment of every sale

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Functional Dependencies:

1. CreditCard:

number -> expDate
number -> cardholder
number -> billingZipCode

2. Payment:

cID -> number
cID -> amount
cID -> sid
cID -> pay_type_id

3. Sale:

sid -> date
sid -> delNotes

4. SaleItemJunction:

sid ->SKU
{sid,SKU} -> quantity

5. Item:

SKU -> ItemName
SKU -> QuantityInStock
SKU -> UnitPrice
SKU -> currencyTypeId

6. ItemCurrencyType:
currencyTypeId ->Currency

Proof of 3NF Compliance:

1. The tables are in 1NF:
- each table cell value is sinlgle and unique

2. The tables are in 2NF:
-The tables are in 1NF
-The non-key attributes are functionally dependent on the primary key

For the tables to be in 3NF, conditions are:

1. **The table should be in 2NF**
2. **There should not exist any type of transitivity dependency among non-key attributes**

Previously, there existed a transitivity dependency in the Payment table where:

cid -> number

number -> expDate,
number -> cardholder,
number -> billingZipCode

cid -> expDate,
cid -> cardholder,
cid -> billingZipCode

To make the tables in 3NF, a table called CreditCard is generated where number is treated as a primary key.

The non-key attributes no longer have any transitive dependency on one another after the creation of CreditCard table.

The functional dependencies after converting the schema into 3NF form is as follows:

1. CreditCard:

number -> expDate
number -> cardholder
number -> billingZipCode

2. Payment:

cID -> number
cID -> amount
cID -> sid
cID -> pay_type_id

Thus, proved that above relational schema is in 3NF form.

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