Paststat register - Exercise 2

In this exercise we will learn about Unitary Patent (UP) data in PATSTAT register. We will build a query that shows the patents for which the request for unitary effect has been rejected, and a query that retrieves the proprietor with the most Unitary patents with effect registered.

In [6]:
```
# Importing the patstat client
from epo.tipdata.patstat import PatstatClient

# Initialize the PATSTAT client
patstat = PatstatClient()

# Access ORM
db = patstat.orm()
# Importing tables as models
from epo.tipdata.patstat.database.models import REG701_APPLN, REG
741_APPLN_STATUS, REG707_PARTIES, REG101_APPLN
```

The REG701_APPLN table

If you look at the logical model of PATSTAT Register in the official documentation (https://link.epo.org/web/searching-for-patents/business/patstat/data-catalog-patsat-ep-register-spring-en.pdf) you can see that Unitary Patent data is based on table `REG701_APPLN` . This table contains application IDs for which unitary effect has been requested. This table only has two fields.

- **ID:** This is the primary key for the table, used to identify the application and is also a foreign key referencing the `REG101_APPLN` table.
- **STATUS:** The current status of the unitary patent, which is a foreign key referencing the `REG741_APPLN_STATUS` table.

Let's take a look at the data in the `REG701_APPLN` table.

In [2]:
```
q = db.query(
    REG701_APPLN.id,
    REG701_APPLN.status
)
res = patstat.df(q)
res
```

Out[2]:

	id	status
0	20163839	4
1	6748170	4
2	18180076	4
3	20191429	4
4	18158904	4
...	...	...
20245	18879480	9
20246	17160607	9
20247	19725218	9
20248	17180658	9
20249	20206682	9

20250 rows × 2 columns

Understanding UP stata

You can see that in table 701 the `status` field is a number, which does not tell us much. In order to find out the definition of each status, we need to use `REG741_APPLN_STATUS`, which contains the description of each of the status numbers.

In [26]:
```
q = db.query(
    REG741_APPLN_STATUS.status_text,
    REG741_APPLN_STATUS.status
)

res = patstat.df(q)
res
```

Out[26]:

	status_text	status
0	Unitary effect registered	9
1	Request for unitary effect filed	6
2	Request for unitary effect withdrawn	4
3	Request for unitary effect rejected	5

Joining the 701 and 741 tables

When analyzing UP data, you probably want to have the description of the events in your query, instead of a number that is not really descriptive. Let's perform a simple join of the two tables.

In [4]:
```
q = db.query(
    REG701_APPLN.id,
    REG741_APPLN_STATUS.status_text
).join(
   REG741_APPLN_STATUS, REG701_APPLN.status == REG741_APPLN_STATU
S.status
)
res = patstat.df(q)
res
```

Out[4]:

	id	status_text
0	18759301	Unitary effect registered
1	21177871	Unitary effect registered
2	19155020	Unitary effect registered
3	19164056	Unitary effect registered
4	18844476	Unitary effect registered
...	...	...
20245	18813702	Request for unitary effect rejected
20246	19162343	Request for unitary effect rejected
20247	8016936	Request for unitary effect rejected
20248	19020506	Request for unitary effect rejected
20249	17780779	Request for unitary effect rejected

20250 rows × 2 columns

Aggregating the applications per status

We can now perform a quick analysis: of all the applications for which unitary effect has been requested, what is the distribution of the different stata.

We need to use SQLAlchemy's `func.count()` to count the number of id entries in the `REG701_APPLN` table. The result is labeled as applications for clarity. We then need to group the query results by the status_text field from the REG741_APPLN_STATUS table. Grouping by status_text ensures that the count of applications is aggregated for each unique status.

In [5]:
```
# we need the func module to count the applications
from sqlalchemy import func

q = db.query(
    func.count(REG701_APPLN.id).label('applications'), # counting
the applications and labeling the result as applications
    REG741_APPLN_STATUS.status_text.label('status')    # labeling
the status text as status
).join(
   REG741_APPLN_STATUS, REG701_APPLN.status == REG741_APPLN_STATU
S.status
).group_by(
    REG741_APPLN_STATUS.status_text # grouping by status
)
res = patstat.df(q)
res
```

Out[5]:

	applications	status
0	26	Request for unitary effect withdrawn
1	12	Request for unitary effect rejected
2	443	Request for unitary effect filed
3	19769	Unitary effect registered

Finding the rejected unitary patents

You can see in the results that the vast majority of requests are registered, but there is a small number of requests that are rejected. Let's get the application number for those patents and a link to the register for each one.

We need to join tables `REG701_APPLN` and `REG101_APPLN`, since table 101 contains the application numbers.

In [ ]:
```
q = db.query(
    REG701_APPLN.id,
    REG101_APPLN.appln_nr
).join(
    # Join REG701_APPLN with REG101_APPLN on matching IDs
    REG101_APPLN, REG701_APPLN.id == REG101_APPLN.id
).filter(
    # Filter to include only applications with status 5, for reje
cted
    REG701_APPLN.status == 5
)
res = patstat.df(q)
res
```

Getting the link to the Register

We can easily generate links to the register for each of the applications, to find out what was the reason for rejection. The register page for each application contains the application number encoded in the url. We simply need to iterate through the dataframe `res` and for each application number we can compose the url inserting the application number into it.

In [12]:
```
# Loop through each row in the resulting DataFrame
for index, row in res.iterrows():
    # Extract the application number from the current row
    appln_nr = row['appln_nr']

    # Print the URL to the register page for the current applicat
ion
    print(f"https://register.epo.org/application?number=EP{appln_
nr}")
```

```
https://register.epo.org/application?number=EP17780779
https://register.epo.org/application?number=EP18191168
https://register.epo.org/application?number=EP10182858
https://register.epo.org/application?number=EP19189650
https://register.epo.org/application?number=EP17165970
https://register.epo.org/application?number=EP18209801
https://register.epo.org/application?number=EP18174013
https://register.epo.org/application?number=EP18190147
https://register.epo.org/application?number=EP19162343
https://register.epo.org/application?number=EP08016936
https://register.epo.org/application?number=EP19020506
https://register.epo.org/application?number=EP18813702
```

The proprietor with most Unitary Patents

For the second part of this exercise we are going create a ranking of the proprietors of Unitary patents. We need to join the `REG701_APPLN` and the `REG707_PARTIES` , since table 707 contains the information about the parties associated with a unitary patent. Table `REG707_PARTIES` is very similar to the table `REG107_PARTIES` that we saw on exercise 1.

In [13]:
```
q = db.query(
    # Select the count of 'REG701_APPLN.id' and label it as "Unitary Patents Registered"
    func.count(REG701_APPLN.id).label("Unitary Patents Registered"),
    # Select 'REG707_PARTIES.name' and label it as 'Proprietor'
    REG707_PARTIES.name.label('Proprietor')
).join(
    # Perform a join between 'REG707_PARTIES' and 'REG701_APPLN' on the matching 'id' field
    REG707_PARTIES, REG701_APPLN.id == REG707_PARTIES.id
).filter(
    # Apply filters where 'REG707_PARTIES.type' is 'A' for proprietor
    REG707_PARTIES.type == 'A',
    # and 'REG701_APPLN.status' is 9 for patents with unitary effect registered
    REG701_APPLN.status == 9
).group_by(
    # Group the results by 'REG707_PARTIES.name'
    REG707_PARTIES.name
).order_by(
    # Order the results by the count of 'REG701_APPLN.id' in descending order
    func.count(REG701_APPLN.id).desc()
)

# Execute the query and convert the result to a DataFrame
res = patstat.df(q)

# Display the result
res
```

Out[13]:

	Unitary Patents Registered	Proprietor
0	233	Samsung Electronics Co., Ltd.
1	149	Telefonaktiebolaget LM Ericsson (publ)
2	136	Ethicon LLC
3	133	Siemens Aktiengesellschaft
4	129	QUALCOMM Incorporated
...	...	...
12299	1	Airinspace
12300	1	Innate S.r.l.
12301	1	MacRae, Allan J.
12302	1	Pyromeral Systems
12303	1	Vogel, Ullrich Felix

12304 rows × 2 columns

In [32]:
```
q = db.query(
    func.count(REG701_APPLN.id).label("Unitary Patents Registered"),
    REG707_PARTIES.name.label('Proprietor')
).join(
    REG707_PARTIES, REG701_APPLN.id == REG707_PARTIES.id
).filter(
    REG707_PARTIES.type == 'A',
    REG701_APPLN.status == 9
).group_by(
    REG707_PARTIES.name
).order_by(
    func.count(REG701_APPLN.id).desc()
)

res = patstat.df(q)
res
```

Out[32]:

	Unitary Patents Registered	Proprietor
0	233	Samsung Electronics Co., Ltd.
1	149	Telefonaktiebolaget LM Ericsson (publ)
2	136	Ethicon LLC
3	133	Siemens Aktiengesellschaft
4	129	QUALCOMM Incorporated
...	...	...
12299	1	Airinspace
12300	1	Innate S.r.l.
12301	1	MacRae, Allan J.
12302	1	Pyromeral Systems
12303	1	Vogel, Ullrich Felix

12304 rows × 2 columns

One more thing...

Tip comes loaded with the most common data processing libraries. One of them is Mathplotlib, a a comprehensive library for creating static, animated, and interactive visualizations in Python. It is widely used for plotting graphs and charts, offering a variety of plotting functions to create line plots, scatter plots, bar charts, histograms, and more.

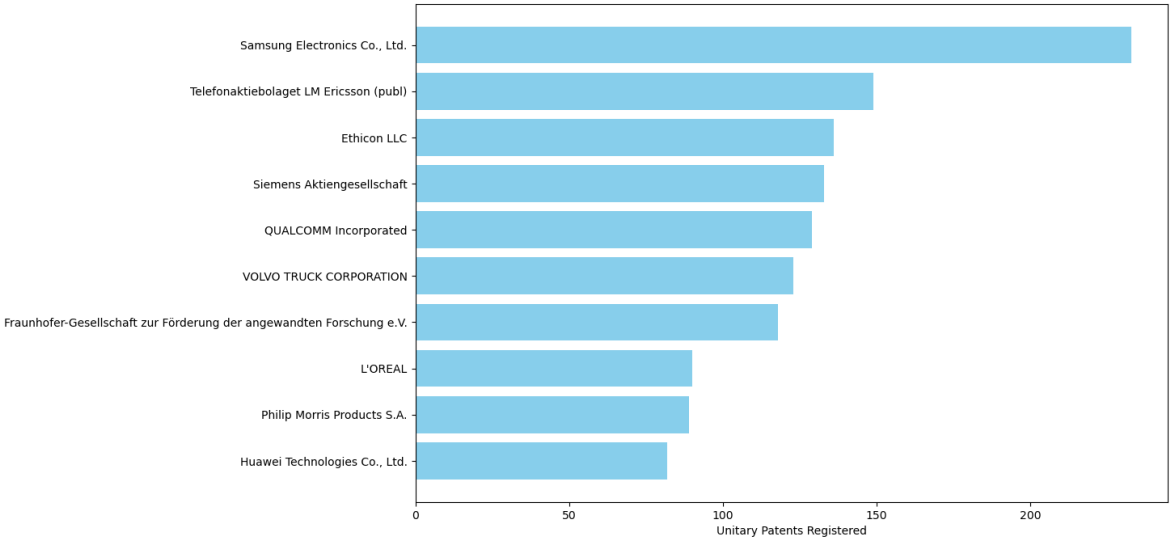
Let's use Mathplotlib to create a visualization of the top 10 UP proprietors.

In [25]:
```
# Creating the bar graph with horizontal bars
plt.figure(figsize=(12, 8))  # Set the figure size to 12 inches by 8 inches

# Create a horizontal bar plot with 'Proprietor' on the y-axis and 'Unitary Patents Registered' on the x-axis
plt.barh(top_10['Proprietor'], top_10['Unitary Patents Registered'], color='skyblue')

plt.xlabel('Unitary Patents Registered')  # Label the x-axis as 'Unitary Patents Registered'

plt.gca().invert_yaxis()  # To display the highest value at the top
plt.show()  # Display the plot
```



In [ ]: