Library

In [73]:

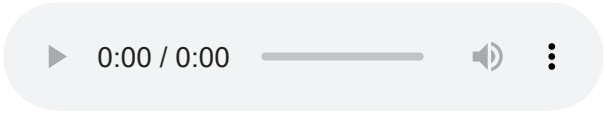
```
import matplotlib.pyplot as plt
%matplotlib inline

import IPython.display as ipd
import librosa
import librosa.display

import pandas as pd
import numpy as np
import os
from tqdm import tqdm
```

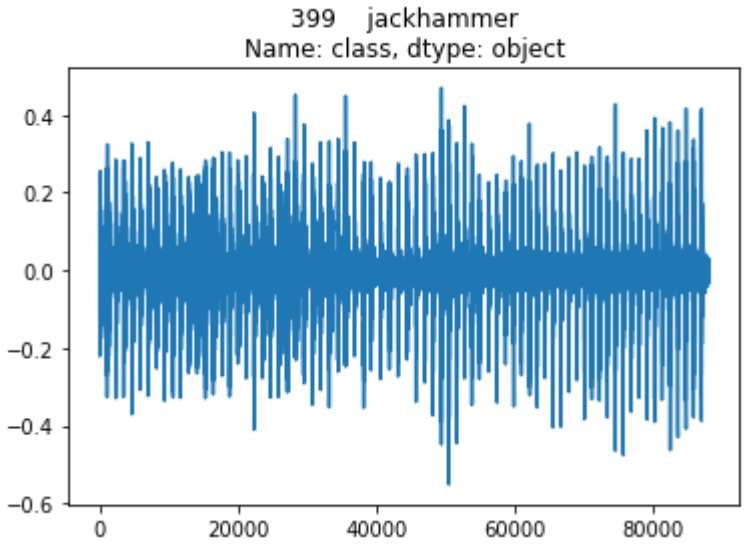
Sample Data

In [16]:

```
filename = 'UrbanSound8K/audio/fold9/105029-7-2-4.wav'
category = filename.split("/")[-1]

data,sample_rate = librosa.load(filename)
title = df[df['slice_file_name']==category]['class']

plt.title(str(title))
plt.plot(data)

ipd.Audio(data,rate=sample_rate)
```

Out[16]:



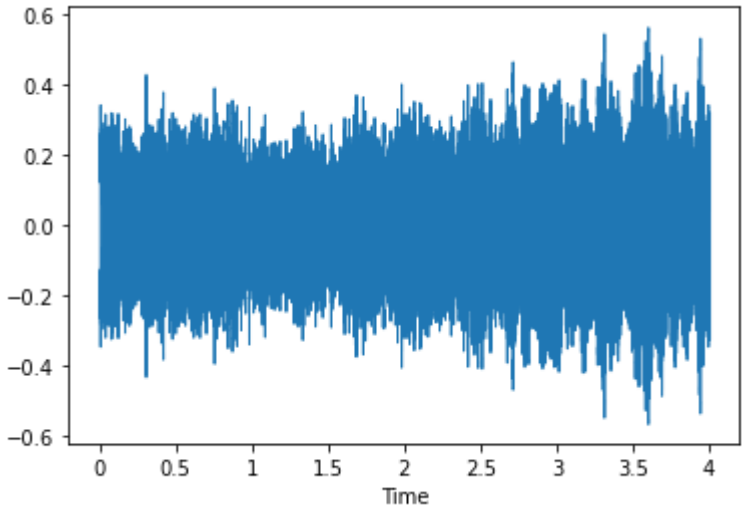


In [7]:

```
1 librosa.display.waveshow(data,sr=sample_rate)
```

Out[7]:

```
<librosa.display.AdaptiveWaveplot at 0x1a78e8fe590>
```



Spectogram

1 STFT

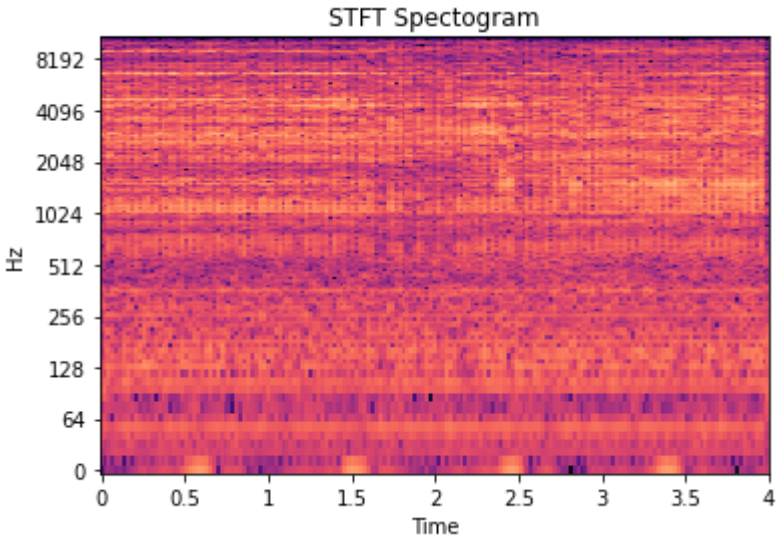
In [47]:

```
stft_spec = librosa.stft(data)
print(f"stft shape : {stft_spec.shape}")

Stft_db = librosa.amplitude_to_db(np.abs(stft_spec), ref=np.max)
print(f"amplitude_to_db shape : {Stft_db.shape}")

librosa.display.specshow(Stft_db, x_axis='time', y_axis='log')
plt.title("STFT Spectogram")
```

```
stft shape : (1025, 173)
amplitude_to_db shape : (1025, 173)
```

Out[47]:

```
Text(0.5, 1.0, 'STFT Spectogram')
```



2 Mel

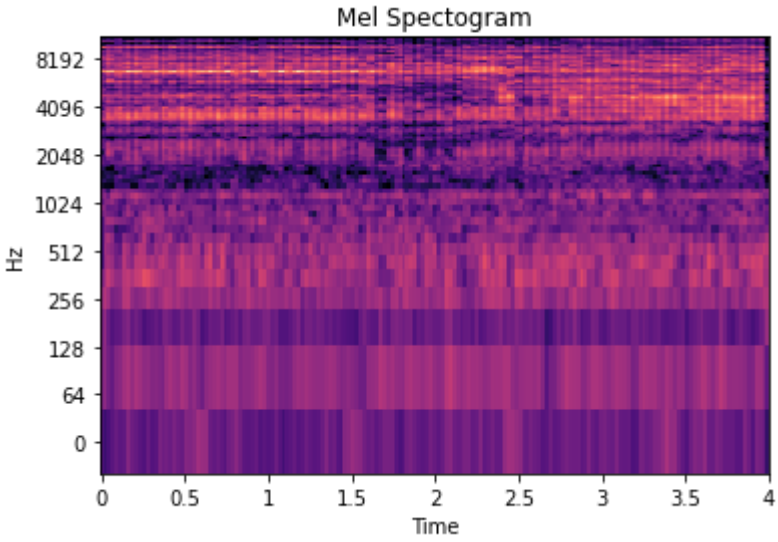
In [46]:

```
mel_spec = librosa.feature.melspectrogram(y=data,sr=sample_rate, n_mels=128)
print(f"mel shape : {mel_spec.shape}")

mel_db = librosa.amplitude_to_db(np.abs(mel_spec), ref=np.max)
print(f"amplitude_to_db shape : {mel_db.shape}")

librosa.display.specshow(mel_db, x_axis='time', y_axis='log')
plt.title("Mel Spectogram")
```

```
mel shape : (128, 173)
amplitude_to_db shape : (128, 173)
```

Out[46]:

```
Text(0.5, 1.0, 'Mel Spectogram')
```



Metadata

In [83]:

```
audio_dataset_path = "UrbanSound8K/audio/"
metadata = pd.read_csv("UrbanSound8K/metadata/UrbanSound8K.csv")
metadata.head()
```

Out[83]:

	slice_file_name	fsID	start	end	salience	fold	classID	class
0	100032-3-0-0.wav	100032	0.0	0.317551	1	5	3	dog_bark
1	100263-2-0-117.wav	100263	58.5	62.500000	1	5	2	children_playing
2	100263-2-0-121.wav	100263	60.5	64.500000	1	5	2	children_playing
3	100263-2-0-126.wav	100263	63.0	67.000000	1	5	2	children_playing
4	100263-2-0-137.wav	100263	68.5	72.500000	1	5	2	children_playing

In [84]:

```
# Balanced Data
metadata['class'].value_counts()
```

Out[84]:

```
class
dog_bark            1000
children_playing    1000
air_conditioner     1000
street_music        1000
engine_idling       1000
jackhammer          1000
drilling            1000
siren                929
car_horn             429
gun_shot             374
Name: count, dtype: int64
```

In [85]:

```
def get_features(file_name):
    try:
        audio, sample_rate = librosa.load(file_name, res_type='kaiser_fast')
        mfccs = librosa.feature.mfcc(y=audio, sr=sample_rate, n_mfcc=40)
        mfccsscaled = np.mean(mfccs.T,axis=0)

    except Exception as e:
        print("Error encountered while parsing file: ", file_name)
        return None

    return mfccsscaled
```

In [86]:

```
### Now we iterate through every audio file and extract features
### using Mel-Frequency Cepstral Coefficients
extracted_features=[]
for index_num,row in tqdm(metadata.iterrows()):
    file_name = os.path.join(os.path.abspath(audio_dataset_path),'fold'+str(row["fol
    final_class_labels=row["class"]
    data=get_features(file_name)
    extracted_features.append([data,final_class_labels])
```

```
3554it [03:53, 19.34it/s]C:\Python310\lib\site-packages\librosa\core\spect
rum.py:256: UserWarning: n_fft=2048 is too large for input signal of lengt
h=1323
  warnings.warn(
8326it [09:05, 24.42it/s]C:\Python310\lib\site-packages\librosa\core\spect
rum.py:256: UserWarning: n_fft=2048 is too large for input signal of lengt
h=1103
  warnings.warn(
C:\Python310\lib\site-packages\librosa\core\spectrum.py:256: UserWarning:
n_fft=2048 is too large for input signal of length=1523
  warnings.warn(
8732it [09:29, 15.34it/s]
```

In [87]:

```
### converting extracted_features to Pandas dataframe
df=pd.DataFrame(extracted_features,columns=['feature','class'])
df.head()
```

Out[87]:

	feature	class
0	[-217.35526, 70.22338, -130.38527, -53.282898,...	dog_bark
1	[-424.09818, 109.34077, -52.919525, 60.86475, ...	children_playing
2	[-458.79114, 121.38419, -46.52066, 52.00812, -...	children_playing
3	[-413.89984, 101.66371, -35.42945, 53.036358, ...	children_playing
4	[-446.60352, 113.68541, -52.402218, 60.302044,...	children_playing

In [88]:

```
df.shape
```

Out[88]:

```
(8732, 2)
```

In [89]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8732 entries, 0 to 8731
Data columns (total 2 columns):
 #   Column   Non-Null Count  Dtype 
---  ------   --------------  ----- 
 0   feature  8732 non-null   object
 1   class    8732 non-null   object
dtypes: object(2)
memory usage: 136.6+ KB
```

Segregating data

In [90]:

```
### Split the dataset into independent and dependent dataset
X = np.array(df['feature'].tolist())
print(X.shape)

Y = np.array(df['class'].tolist())
print(Y.shape)
```

```
(8732, 40)
(8732,)
```

Dumping data

In [92]:

```
import joblib
joblib.dump(X,"Inputs")
joblib.dump(Y,"Outputs")
```

Out[92]:

```
['Outputs']
```