In [26]:

```
from keras.preprocessing import image
import numpy as np
import os
import matplotlib.pyplot  as plt

from scipy.spatial import distance
from keras.models import Model
from keras.applications import resnet50
from keras.applications.vgg16 import preprocess_input
```

In [2]:

```
from keras import applications
model = applications.resnet50.ResNet50(weights='imagenet', include_top=True, pooling='avg')
```

In [3]:

```
model.summary()
```

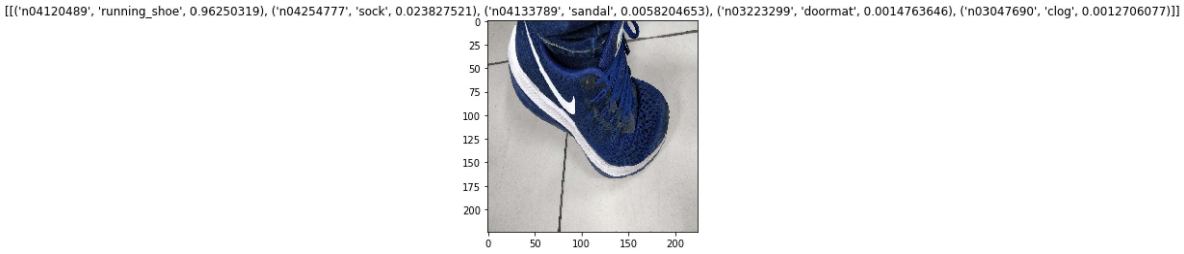
```
activation_9 (Activation)       (None, 55, 55, 64)   0           bn2c_bran
ch2b[0][0]
__________________________________________________________________________
__________________________
res2c_branch2c (Conv2D)         (None, 55, 55, 256)  16640       activatio
n_9[0][0]
__________________________________________________________________________
__________________________
bn2c_branch2c (BatchNormalizati (None, 55, 55, 256)  1024        res2c_bra
nch2c[0][0]
__________________________________________________________________________
__________________________
add_3 (Add)                     (None, 55, 55, 256)  0           bn2c_bran
ch2c[0][0]
                                                                 activatio
n_7[0][0]
__________________________________________________________________________
__________________________
activation_10 (Activation)      (None, 55, 55, 256)  0           add_3[0]
```

In [46]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\images\\IMG_20180808

img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)

# the image is now in an array of shape (3, 224, 224)
# need to expand it to (1, 3, 224, 224) as it's expecting a list
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
prediction = model.predict(x)
label = decode_predictions(prediction)
plt.subplot(1,1,1)
plt.title(label)
plt.imshow(img)
```

Out[46]:

```
<matplotlib.image.AxesImage at 0x204a46089e8>
```

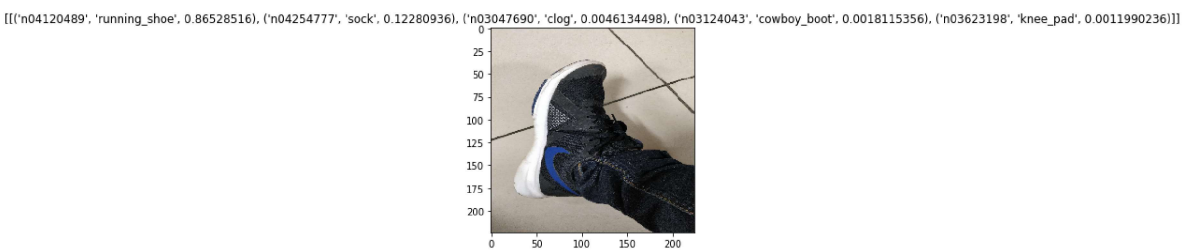


In [47]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\images\\IMG_20180808

img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)

# the image is now in an array of shape (3, 224, 224)
# need to expand it to (1, 3, 224, 224) as it's expecting a list
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
prediction = model.predict(x)
label = decode_predictions(prediction)
plt.subplot(1,1,1)
plt.title(label)
plt.imshow(img)
```

Out[47]:

```
<matplotlib.image.AxesImage at 0x204a44ec588>
```

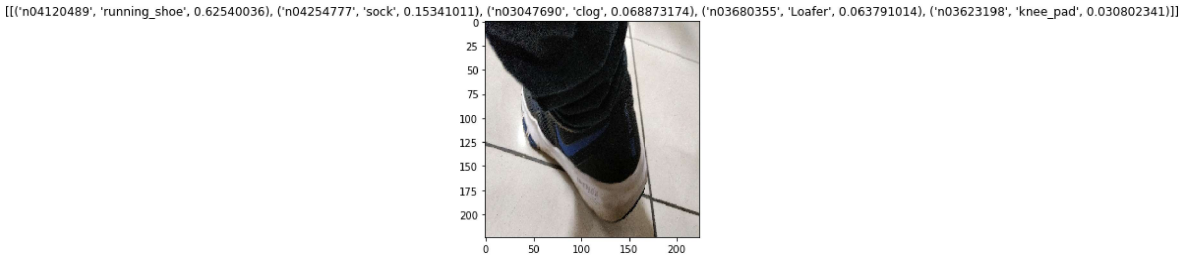


In [48]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\images\\IMG_20180808

img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)

# the image is now in an array of shape (3, 224, 224)
# need to expand it to (1, 3, 224, 224) as it's expecting a list
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
prediction = model.predict(x)
label = decode_predictions(prediction)
plt.subplot(1,1,1)
plt.title(label)
plt.imshow(img)
```

Out[48]:

```
<matplotlib.image.AxesImage at 0x204a3ffae80>
```

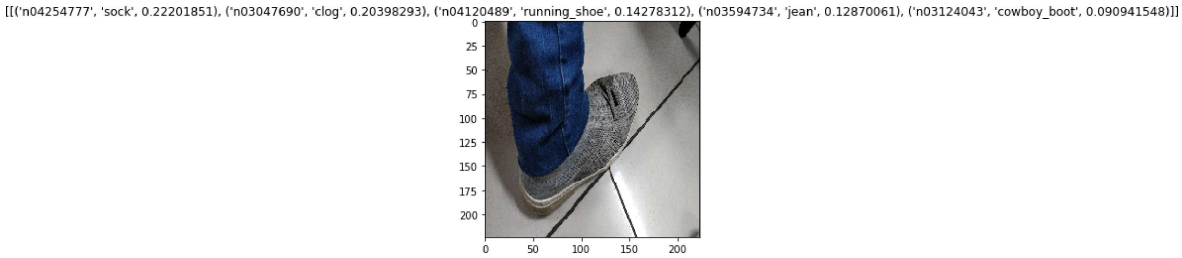


In [51]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\images\\IMG_20180808

img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)

# the image is now in an array of shape (3, 224, 224)
# need to expand it to (1, 3, 224, 224) as it's expecting a list
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
prediction = model.predict(x)
label = decode_predictions(prediction)
plt.subplot(1,1,1)
plt.title(label)
plt.imshow(img)
```

Out[51]:

```
<matplotlib.image.AxesImage at 0x204a8597320>
```

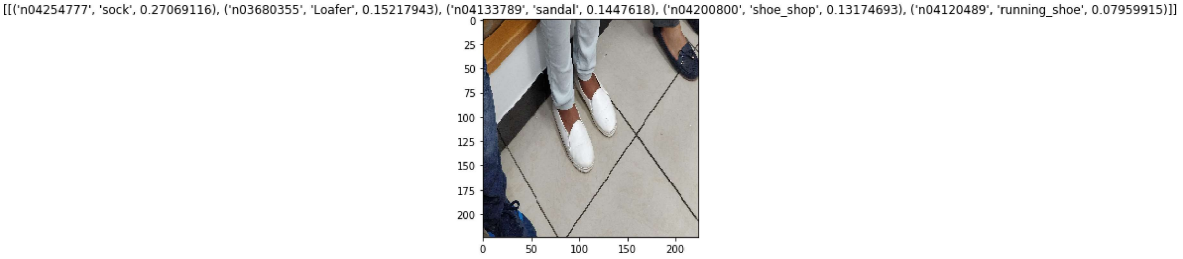


In [52]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\IMG_20180731_172748.

img = image.load_img(img_path, target_size=(224, 224))
x = image.img_to_array(img)

# the image is now in an array of shape (3, 224, 224)
# need to expand it to (1, 3, 224, 224) as it's expecting a list
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
prediction = model.predict(x)
label = decode_predictions(prediction)
plt.subplot(1,1,1)
plt.title(label)
plt.imshow(img)
```

Out[52]:

```
<matplotlib.image.AxesImage at 0x204a87fb5f8>
```



In [42]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\shoes\\"
all_images = os.listdir(img_path)

i = 1

labels = []
for eachImage in all_images:
    img = image.load_img(img_path+eachImage, target_size=(224, 224))
    x = image.img_to_array(img)

    # the image is now in an array of shape (3, 224, 224)
    # need to expand it to (1, 3, 224, 224) as it's expecting a list
    x = np.expand_dims(x, axis=0)
    x = preprocess_input(x)
    prediction = model.predict(x)
    label = decode_predictions(prediction)
    plt.subplot(3,5,i)
    plt.title(i)
    plt.imshow(img)
    labels.append(label)
    i = i+1

i = 1
for eachLabel in labels:
    print(str(i) + " --> " + str(eachLabel))
    print("")
    i = i+1
```

```
1 --> [[('n03047690', 'clog', 0.66802037), ('n04133789', 'sandal', 0.2729458
5), ('n03680355', 'Loafer', 0.046357993), ('n04120489', 'running_shoe', 0.00
81812916), ('n02910353', 'buckle', 0.0013089953)]]

2 --> [[('n03047690', 'clog', 0.20763136), ('n04133789', 'sandal', 0.1673290
3), ('n03680355', 'Loafer', 0.082402728), ('n04120489', 'running_shoe', 0.06
8703368), ('n02916936', 'bulletproof_vest', 0.067413919)]]

3 --> [[('n04099969', 'rocking_chair', 0.1879974), ('n03124043', 'cowboy_boo
t', 0.13520813), ('n04429376', 'throne', 0.11782891), ('n03376595', 'folding
_chair', 0.056964889), ('n04141076', 'sax', 0.037463967)]]

4 --> [[('n04599235', 'wool', 0.33316809), ('n03498962', 'hatchet', 0.080514
342), ('n03623198', 'knee_pad', 0.060904108), ('n04350905', 'suit', 0.055353
958), ('n03980874', 'poncho', 0.040969413)]]

5 --> [[('n04133789', 'sandal', 0.13031365), ('n03584829', 'iron', 0.0601527
84), ('n03047690', 'clog', 0.051909044), ('n03803284', 'muzzle', 0.04851730
2), ('n03481172', 'hammer', 0.034970537)]]

6 --> [[('n02791124', 'barber_chair', 0.53275591), ('n03376595', 'folding_ch
air', 0.24288003), ('n04133789', 'sandal', 0.050592043), ('n04099969', 'rock
ing_chair', 0.046319645), ('n02391049', 'zebra', 0.02354816)]]

7 --> [[('n03777754', 'modem', 0.21756731), ('n04133789', 'sandal', 0.215348
41), ('n03793489', 'mouse', 0.093573645), ('n03787032', 'mortarboard', 0.090
504773), ('n03047690', 'clog', 0.053561993)]]

8 --> [[('n04120489', 'running_shoe', 0.75205374), ('n03680355', 'Loafer',
0.12365797), ('n04133789', 'sandal', 0.0834525), ('n03047690', 'clog', 0.024
949206), ('n04336792', 'stretcher', 0.0023629984)]]
```

```
9 --> [[('n03047690', 'clog', 0.47054273), ('n04133789', 'sandal', 0.2123140
4), ('n04120489', 'running_shoe', 0.14519654), ('n03680355', 'Loafer', 0.045
734026), ('n03814639', 'neck_brace', 0.035514686)]]

10 --> [[('n04133789', 'sandal', 0.68750423), ('n03803284', 'muzzle', 0.1939
9625), ('n03047690', 'clog', 0.054613374), ('n03376595', 'folding_chair', 0.
026967701), ('n02791124', 'barber_chair', 0.015144657)]]

11 --> [[('n03124043', 'cowboy_boot', 0.52519441), ('n03047690', 'clog', 0.0
80722034), ('n02916936', 'bulletproof_vest', 0.063716225), ('n03803284', 'mu
zzle', 0.05411813), ('n02910353', 'buckle', 0.038575497)]]

12 --> [[('n04141076', 'sax', 0.16348933), ('n04536866', 'violin', 0.1265099
5), ('n03272010', 'electric_guitar', 0.088053264), ('n03124043', 'cowboy_boo
t', 0.069971643), ('n03495258', 'harp', 0.065388434)]]

13 --> [[('n04380533', 'table_lamp', 0.15670714), ('n02804610', 'bassoon',
0.089884609), ('n03532672', 'hook', 0.083135866), ('n03838899', 'oboe', 0.08
1255116), ('n03467068', 'guillotine', 0.058745511)]]

14 --> [[('n04133789', 'sandal', 0.74383271), ('n04120489', 'running_shoe',
0.065580279), ('n04099969', 'rocking_chair', 0.049795154), ('n02791124', 'ba
rber_chair', 0.024198521), ('n03584829', 'iron', 0.023387717)]]

15 --> [[('n02910353', 'buckle', 0.077877313), ('n02916936', 'bulletproof_ve
st', 0.03943722), ('n04033901', 'quill', 0.038514894), ('n03763968', 'milita
ry_uniform', 0.030914653), ('n04344873', 'studio_couch', 0.027673434)]]
```

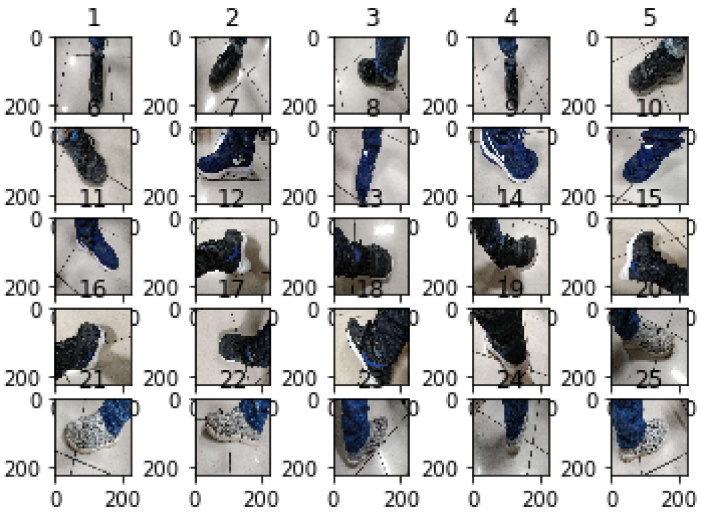
In [43]:

```
img_path = "C:\\Users\\Akhil Suri\\Documents\\Udacity\\shoes-tracking\\images\\"
all_images = os.listdir(img_path)

i = 1

labels = []
for eachImage in all_images:
    img = image.load_img(img_path+eachImage, target_size=(224, 224))
    x = image.img_to_array(img)

    # the image is now in an array of shape (3, 224, 224)
    # need to expand it to (1, 3, 224, 224) as it's expecting a list
    x = np.expand_dims(x, axis=0)
    x = preprocess_input(x)
    prediction = model.predict(x)
    label = decode_predictions(prediction)
    plt.subplot(5,5,i)
    plt.title(i)
    plt.imshow(img)
    labels.append(label)
    i = i+1

i = 1
for eachLabel in labels:
    print(str(i) + " --> " + str(eachLabel))
    print("")
    i = i+1
```

```
1 --> [[('n02165105', 'tiger_beetle', 0.38767579), ('n04458633', 'totem_pol
e', 0.089019969), ('n03532672', 'hook', 0.066321798), ('n02999410', 'chain',
0.053316381), ('n04371774', 'swing', 0.04790822)]]

2 --> [[('n03535780', 'horizontal_bar', 0.29567197), ('n04120489', 'running_
shoe', 0.1872196), ('n03594734', 'jean', 0.076764315), ('n04133789', 'sanda
l', 0.068749957), ('n03680355', 'Loafer', 0.056723014)]]

3 --> [[('n04254777', 'sock', 0.3849965), ('n04120489', 'running_shoe', 0.14
157166), ('n03047690', 'clog', 0.10481855), ('n03223299', 'doormat', 0.05637
5325), ('n03775071', 'mitten', 0.052358791)]]

4 --> [[('n03594734', 'jean', 0.3038294), ('n04254777', 'sock', 0.10292476),
('n03775071', 'mitten', 0.092245862), ('n03535780', 'horizontal_bar', 0.0719
60188), ('n02879718', 'bow', 0.055907059)]]

5 --> [[('n04120489', 'running_shoe', 0.67737514), ('n04133789', 'sandal',
0.13174692), ('n03223299', 'doormat', 0.089125633), ('n03680355', 'Loafer',
0.042587455), ('n03047690', 'clog', 0.015617107)]]

6 --> [[('n04120489', 'running_shoe', 0.97088844), ('n03627232', 'knot', 0.0
068999249), ('n04254777', 'sock', 0.0043959594), ('n04133789', 'sandal', 0.0
040726368), ('n03814639', 'neck_brace', 0.0021258241)]]

7 --> [[('n04120489', 'running_shoe', 0.8329758), ('n04254777', 'sock', 0.06
7249507), ('n03047690', 'clog', 0.066382028), ('n04200800', 'shoe_shop', 0.0
21911962), ('n03680355', 'Loafer', 0.0051178755)]]

8 --> [[('n03594734', 'jean', 0.21933791), ('n02879718', 'bow', 0.17209366),
('n04367480', 'swab', 0.16164699), ('n03876231', 'paintbrush', 0.047095686),
('n04228054', 'ski', 0.04330283)]]
```

```
9 --> [[('n04120489', 'running_shoe', 0.96250319), ('n04254777', 'sock', 0.0
23827521), ('n04133789', 'sandal', 0.0058204653), ('n03223299', 'doormat',
0.0014763646), ('n03047690', 'clog', 0.0012706077)]]

10 --> [[('n04120489', 'running_shoe', 0.66379738), ('n03047690', 'clog', 0.
20823686), ('n04133789', 'sandal', 0.041738264), ('n04254777', 'sock', 0.038
696423), ('n03680355', 'Loafer', 0.017004494)]]

11 --> [[('n04120489', 'running_shoe', 0.58167011), ('n04254777', 'sock', 0.
23295678), ('n03047690', 'clog', 0.074904449), ('n03124043', 'cowboy_boot',
0.035798304), ('n03594734', 'jean', 0.03359849)]]

12 --> [[('n04120489', 'running_shoe', 0.95161003), ('n04254777', 'sock', 0.
037469119), ('n03623198', 'knee_pad', 0.0036620402), ('n03047690', 'clog',
0.001406283), ('n04133789', 'sandal', 0.00089003105)]]

13 --> [[('n04040759', 'radiator', 0.22088349), ('n02892767', 'brassiere',
0.1679198), ('n04553703', 'washbasin', 0.1247906), ('n04367480', 'swab', 0.0
4675477), ('n04209239', 'shower_curtain', 0.039590936)]]

14 --> [[('n04371774', 'swing', 0.53011668), ('n04141975', 'scale', 0.063588
127), ('n02233338', 'cockroach', 0.042358946), ('n04367480', 'swab', 0.03710
9628), ('n04209239', 'shower_curtain', 0.033899475)]]

15 --> [[('n04120489', 'running_shoe', 0.86528516), ('n04254777', 'sock', 0.
12280936), ('n03047690', 'clog', 0.0046134498), ('n03124043', 'cowboy_boot',
0.0018115356), ('n03623198', 'knee_pad', 0.0011990236)]]

16 --> [[('n04120489', 'running_shoe', 0.96827388), ('n04254777', 'sock', 0.
023798337), ('n03047690', 'clog', 0.0015583526), ('n04228054', 'ski', 0.0009
8795013), ('n04019541', 'puck', 0.00061028061)]]

17 --> [[('n04254777', 'sock', 0.18229786), ('n03814906', 'necklace', 0.1211
3282), ('n03775071', 'mitten', 0.076794155), ('n03627232', 'knot', 0.0724519
04), ('n04599235', 'wool', 0.050962016)]]

18 --> [[('n04120489', 'running_shoe', 0.60407412), ('n03680355', 'Loafer',
0.050080195), ('n04371430', 'swimming_trunks', 0.047808781), ('n04133789',
'sandal', 0.038947504), ('n02909870', 'bucket', 0.036540736)]]

19 --> [[('n04120489', 'running_shoe', 0.62540036), ('n04254777', 'sock', 0.
15341011), ('n03047690', 'clog', 0.068873174), ('n03680355', 'Loafer', 0.063
791014), ('n03623198', 'knee_pad', 0.030802341)]]

20 --> [[('n04254777', 'sock', 0.34496668), ('n04120489', 'running_shoe', 0.
24503992), ('n03124170', 'cowboy_hat', 0.11375143), ('n03047690', 'clog', 0.
050166488), ('n02229544', 'cricket', 0.034453318)]]

21 --> [[('n04254777', 'sock', 0.54544842), ('n03047690', 'clog', 0.08510274
4), ('n04133789', 'sandal', 0.05131777), ('n02808304', 'bath_towel', 0.03928
4345), ('n03814906', 'necklace', 0.031770259)]]

22 --> [[('n04254777', 'sock', 0.34548089), ('n03047690', 'clog', 0.3382488
8), ('n04120489', 'running_shoe', 0.091805249), ('n03124170', 'cowboy_hat',
0.031452164), ('n04599235', 'wool', 0.02086864)]]

23 --> [[('n04254777', 'sock', 0.22201851), ('n03047690', 'clog', 0.2039829
3), ('n04120489', 'running_shoe', 0.14278312), ('n03594734', 'jean', 0.12870
061), ('n03124043', 'cowboy_boot', 0.090941548)]]
```

```
24 --> [[('n03047690', 'clog', 0.39808133), ('n03594734', 'jean', 0.2681276
5), ('n04120489', 'running_shoe', 0.072790429), ('n04254777', 'sock', 0.0647
79125), ('n04553703', 'washbasin', 0.05360835)]]

25 --> [[('n03047690', 'clog', 0.44291309), ('n03594734', 'jean', 0.184887
9), ('n03680355', 'Loafer', 0.10832791), ('n04254777', 'sock', 0.099838518),
('n03124043', 'cowboy_boot', 0.075667344)]]
```



In [ ]: