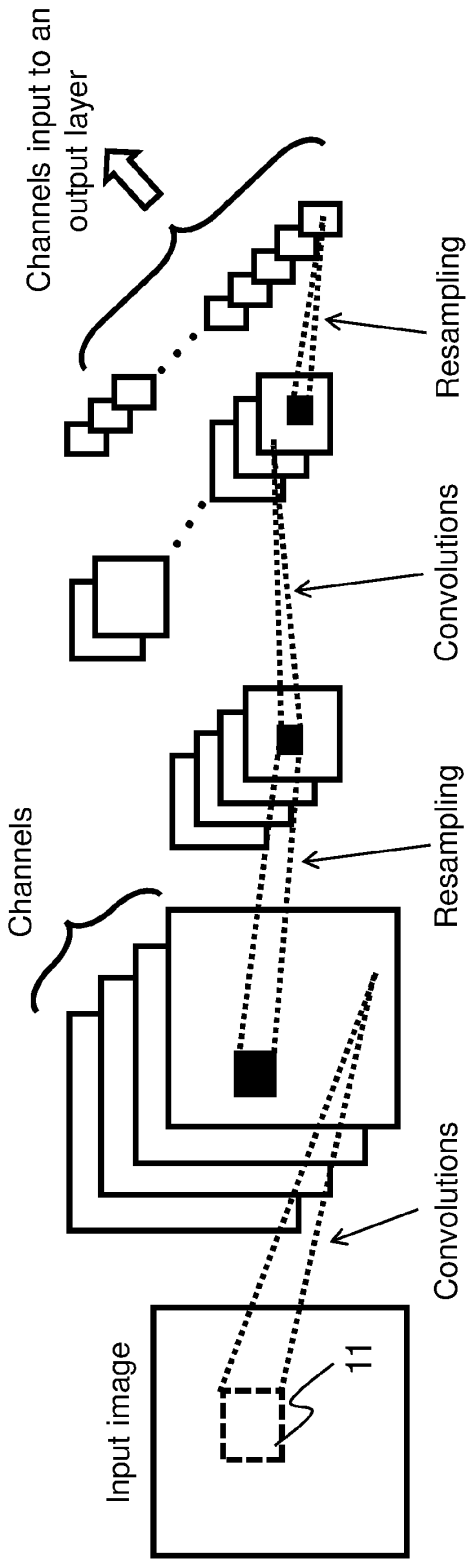

Channels input to an output layer
Resampling
Convolutions
Channels
Resampling
Convolutions
Input image
11

FIG. 1

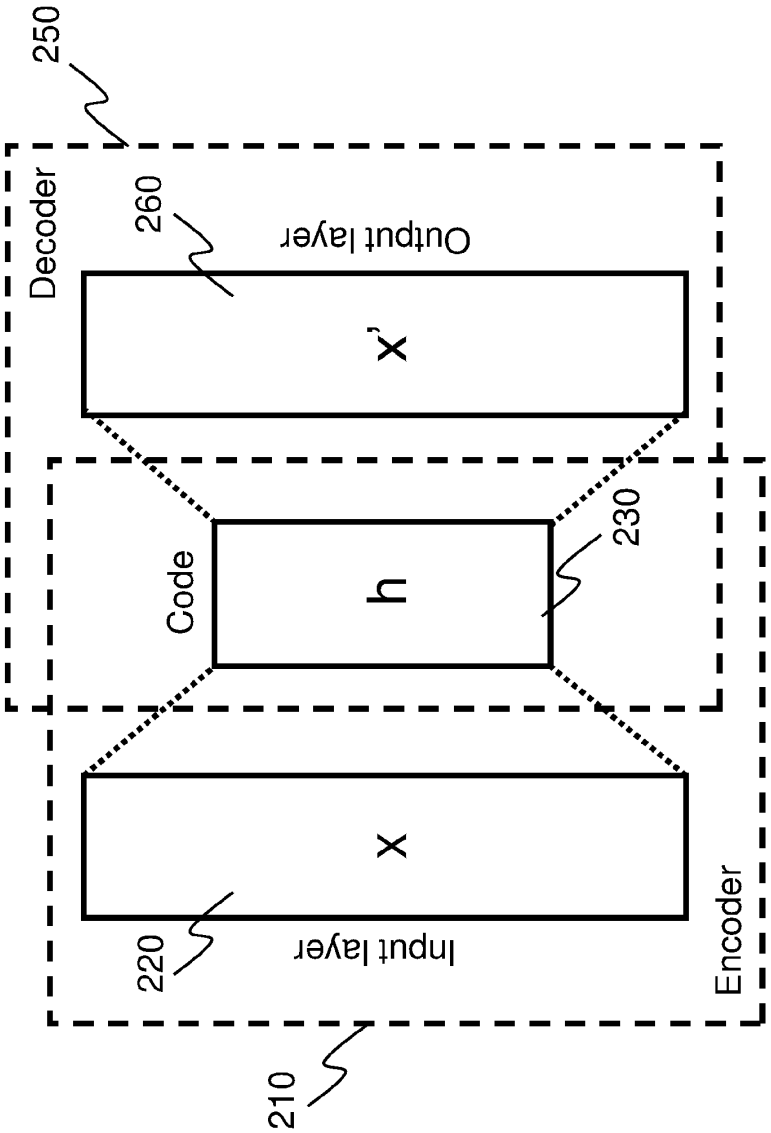

250
Decoder
260
Output layer
x'
230
Code
h
x
220
Input layer
Encoder
210

FIG. 2

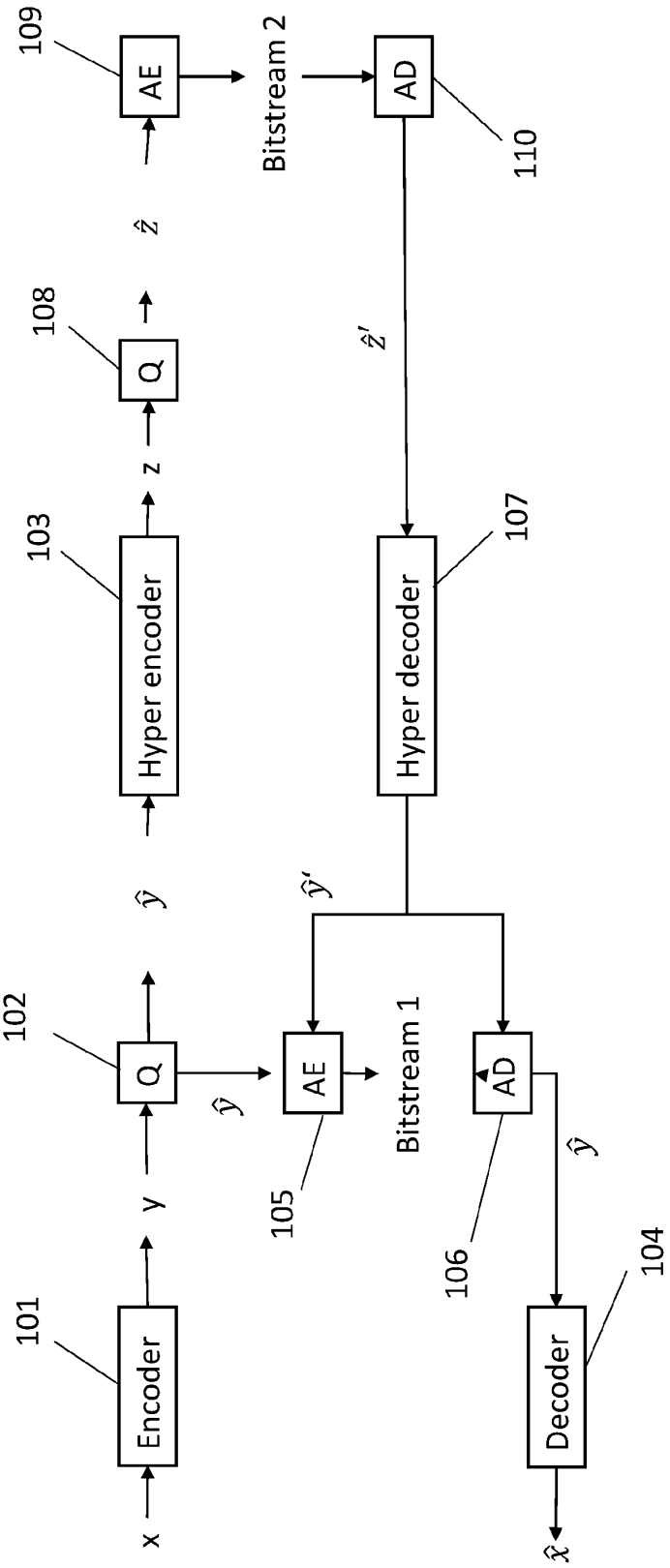

Encoder
101
x
y
Q
102
$\hat{y}$
Hyper encoder
103
z
Q
108
$\hat{z}$
AE
109
Bitstream 2
AD
110
$\hat{z}'$
Hyper decoder
107
$\hat{y}'$
AE
105
Bitstream 1
AD
106
$\hat{y}$
Decoder
104
$\hat{x}$

FIG. 3A

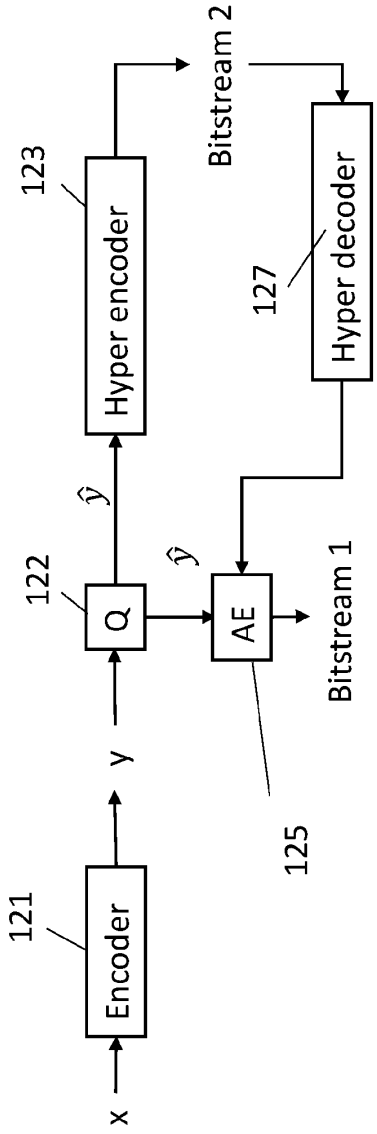

x
Encoder
121
y
Q
122
$\hat{y}$
Hyper encoder
123
Bitstream 2
AE
125
$\hat{y}$
Bitstream 1
Hyper decoder
127

FIG. 3B

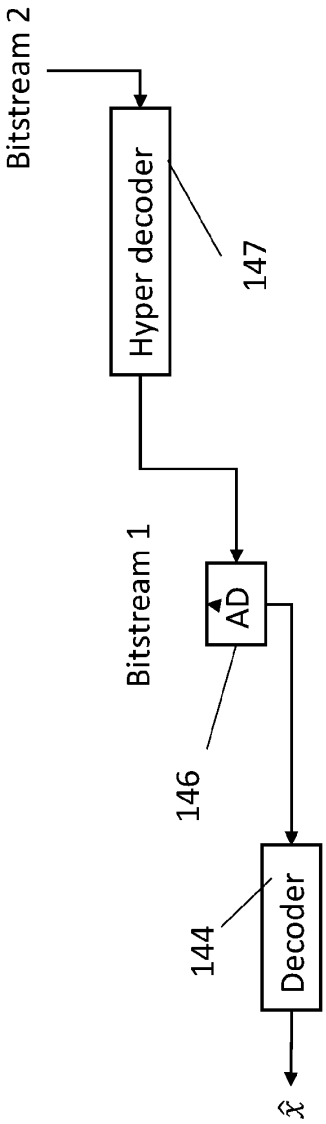
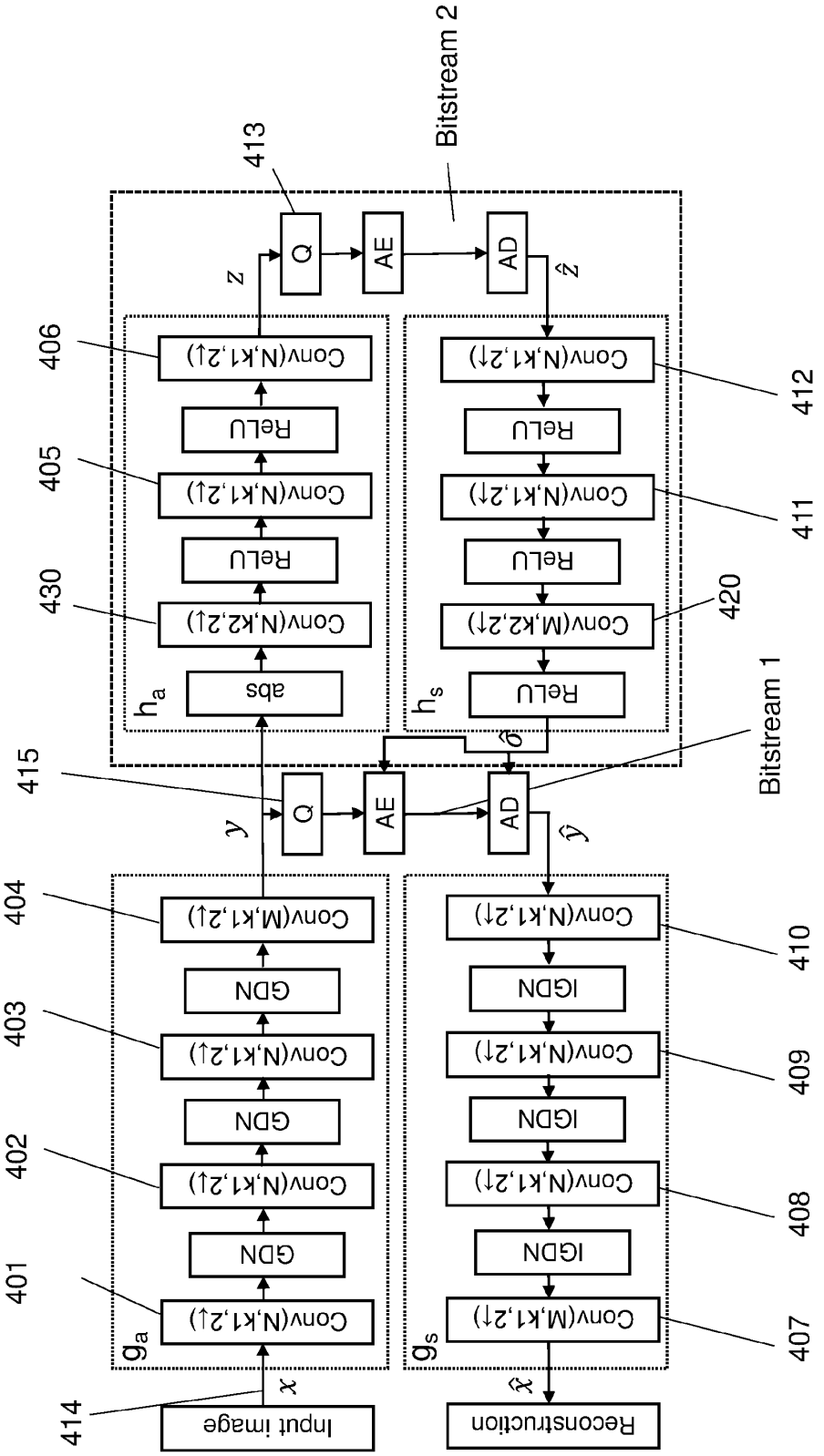

Bitstream 2
Hyper decoder
147
Bitstream 1
AD
146
Decoder
144
$\hat{x}$

FIG. 3C

FIG. 4


Input image
414
x
Conv(N,k1,2↓)
401
GDN
Conv(N,k1,2↓)
402
GDN
Conv(N,k1,2↓)
403
Conv(M,k1,2↓)
404
g_a
y
Q
AE
AD
ŷ
415
Bitstream 1
σ
Conv(N,k1,2↓)
406
ReLU
Conv(N,k1,2↓)
405
ReLU
Conv(N,k2,2↓)
430
abs
h_a
z
Q
AE
AD
ẑ
413
Bitstream 2
Conv(N,k1,2↑)
412
ReLU
Conv(N,k1,2↑)
411
ReLU
Conv(M,k2,2↑)
420
ReLU
h_s
Conv(N,k1,2↑)
410
IGDN
Conv(N,k1,2↑)
409
IGDN
Conv(N,k1,2↑)
408
IGDN
Conv(M,k1,2↑)
407
g_s
x̂
Reconstruction

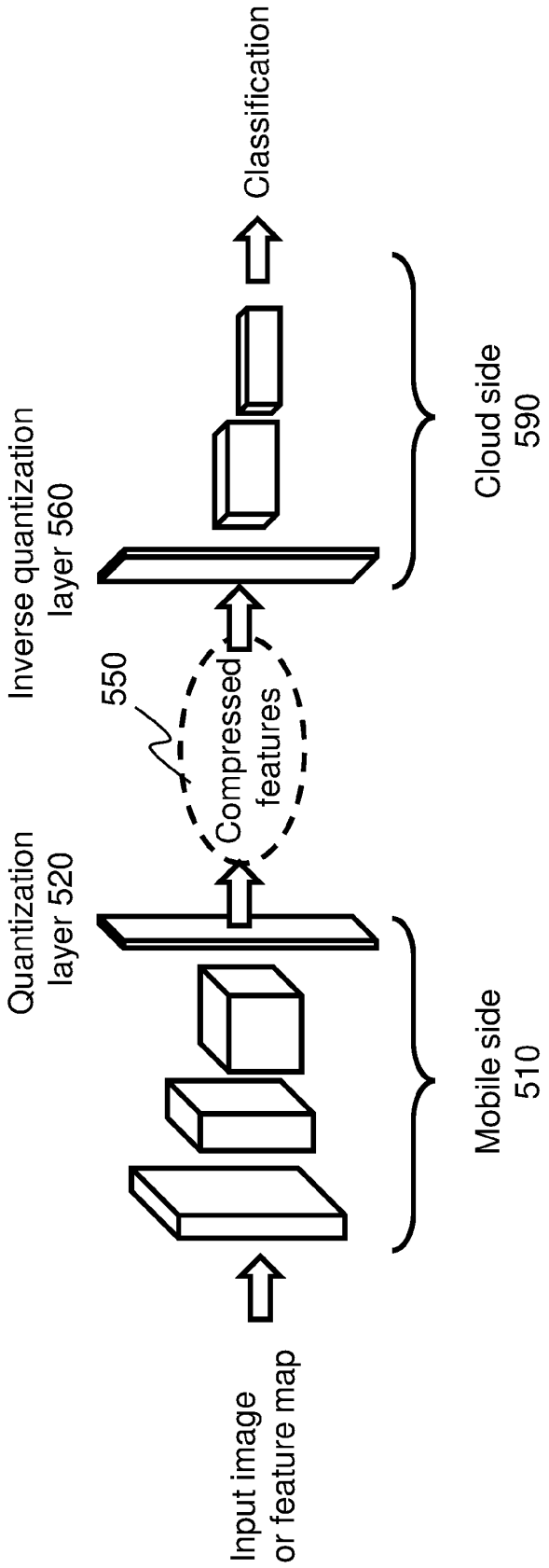

Classification
Cloud side
590
Inverse quantization
layer 560
550
Compressed
features
Quantization
layer 520
Mobile side
510
Input image
or feature map

FIG. 5

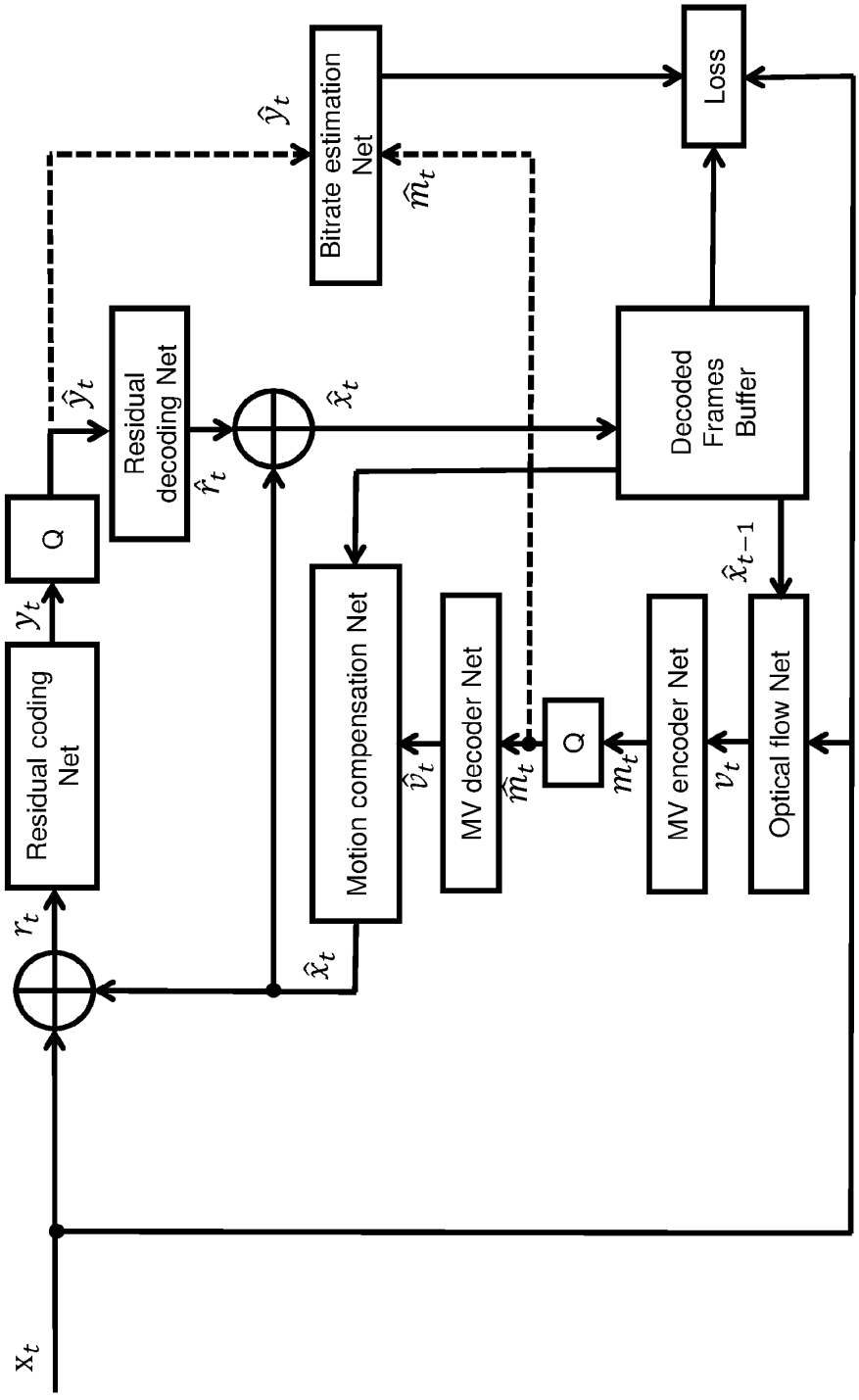

Loss
Bitrate estimation Net
$\hat{y}_t$
$\hat{m}_t$
Residual decoding Net
$\hat{y}_t$
$\hat{r}_t$
$\hat{x}_t$
Decoded Frames Buffer
Q
y_t
Residual coding Net
r_t
Motion compensation Net
$\hat{x}_t$
$\hat{x}_{t-1}$
MV decoder Net
$\hat{v}_t$
$\hat{m}_t$
Q
m_t
MV encoder Net
v_t
Optical flow Net
x_t

FIG. 6A

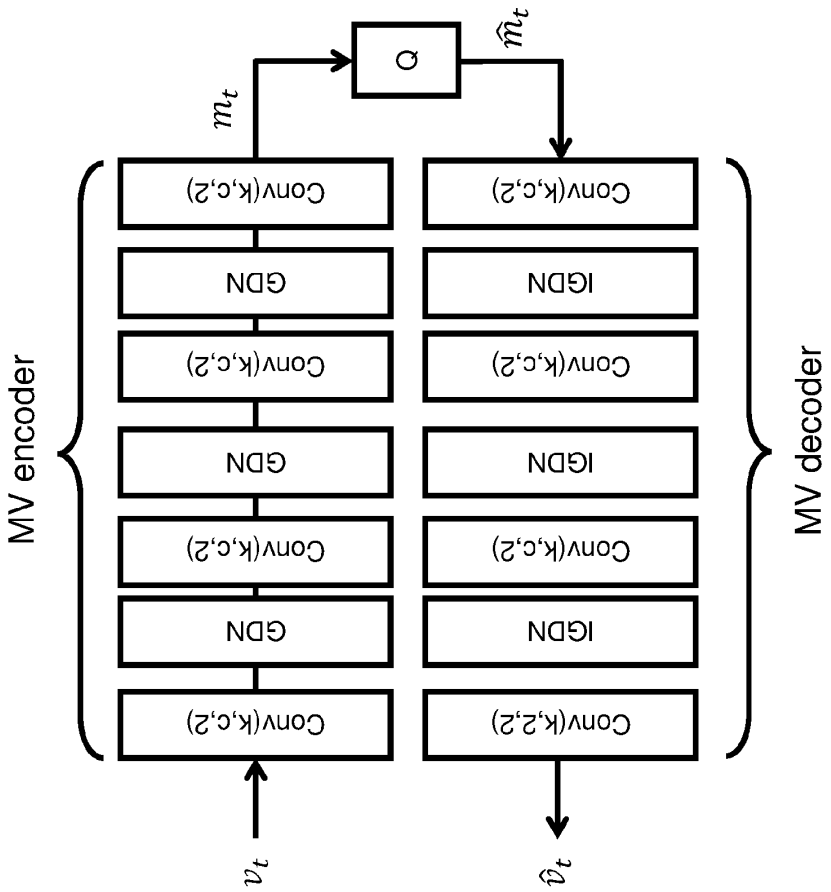

MV encoder
MV decoder
Conv(k,c,2)
GDN
Conv(k,c,2)
GDN
Conv(k,c,2)
GDN
Conv(k,2,2)
IGDN
Conv(k,c,2)
IGDN
Conv(k,c,2)
IGDN
Conv(k,c,2)
Q
m_t
$\hat{m}_t$
v_t
$\hat{v}_t$

FIG. 6B

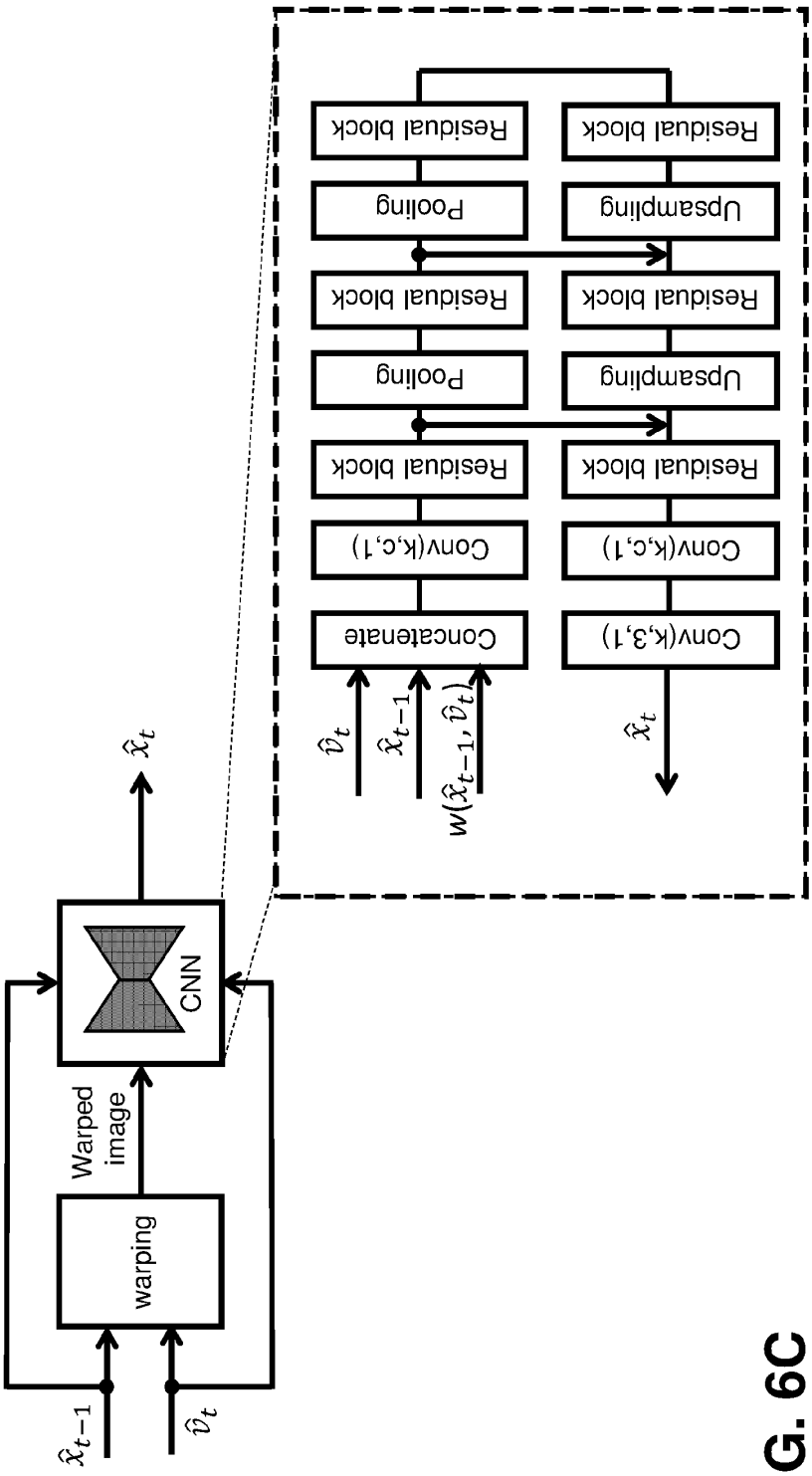

$\hat{x}_{t-1}$
$\hat{v}_t$
warping
Warped image
CNN
$\hat{x}_t$
$\hat{v}_t$
$\hat{x}_{t-1}$
$w(\hat{x}_{t-1}, \hat{v}_t)$
Concatenate
Conv(k,c,1)
Residual block
Pooling
Residual block
Pooling
Residual block
Conv(k,c,1)
Residual block
Upsampling
Residual block
Upsampling
Residual block
Conv(k,3,1)
$\hat{x}_t$

FIG. 6C

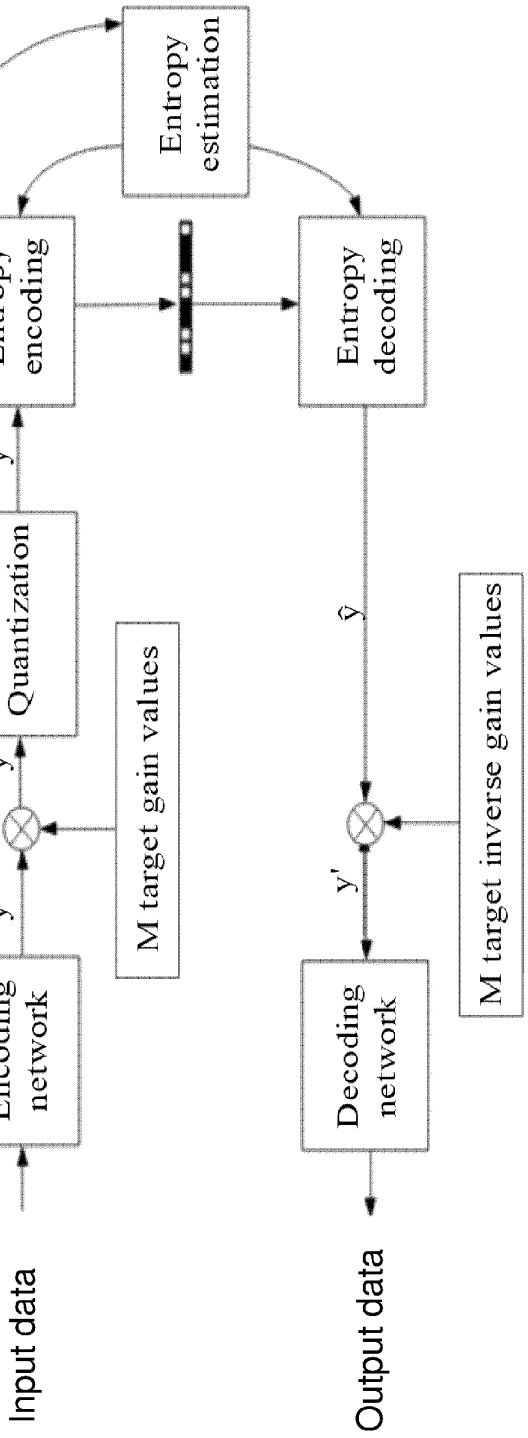

Entropy estimation
Entropy encoding
Entropy decoding
ŷ
Quantization
ȳ
M target gain values
y
Encoding network
Input data
ŷ
M target inverse gain values
y'
Decoding network
Output data

FIG. 7

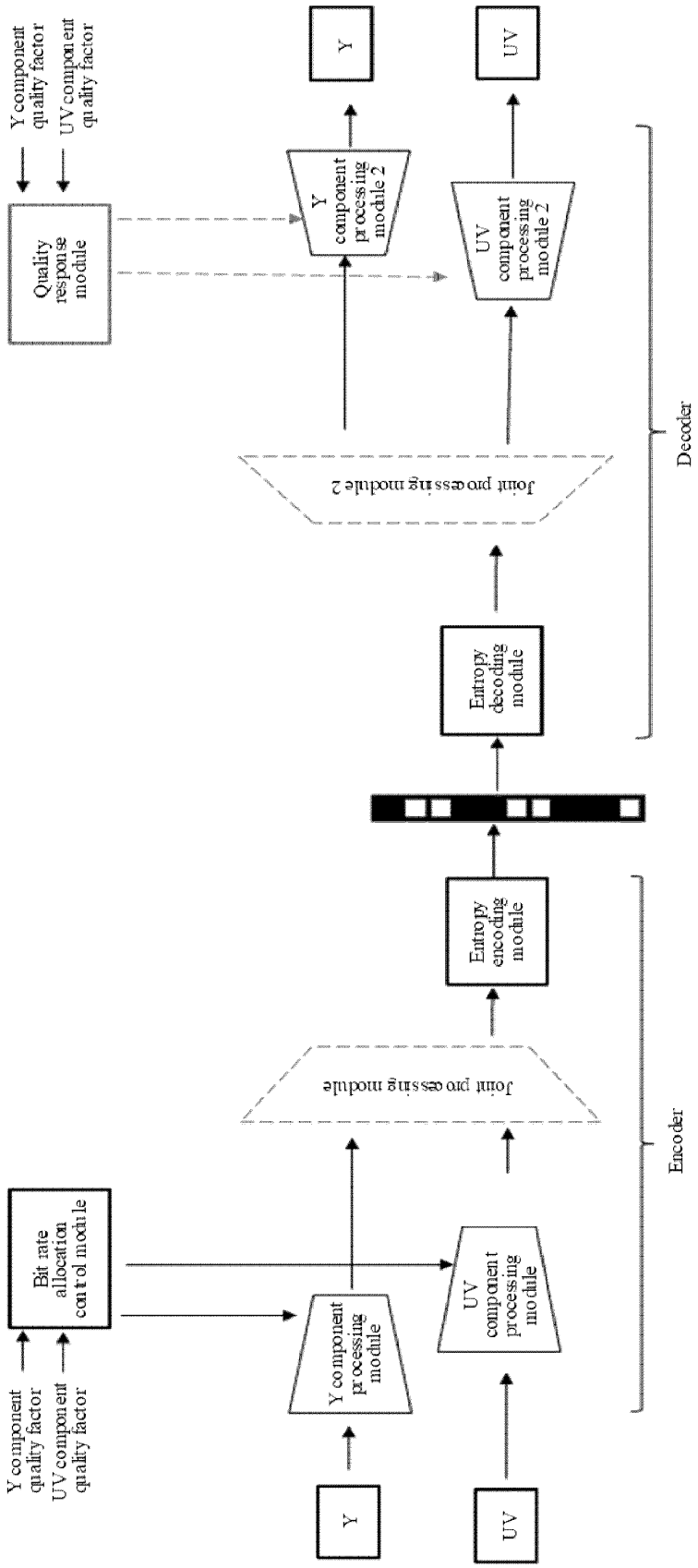
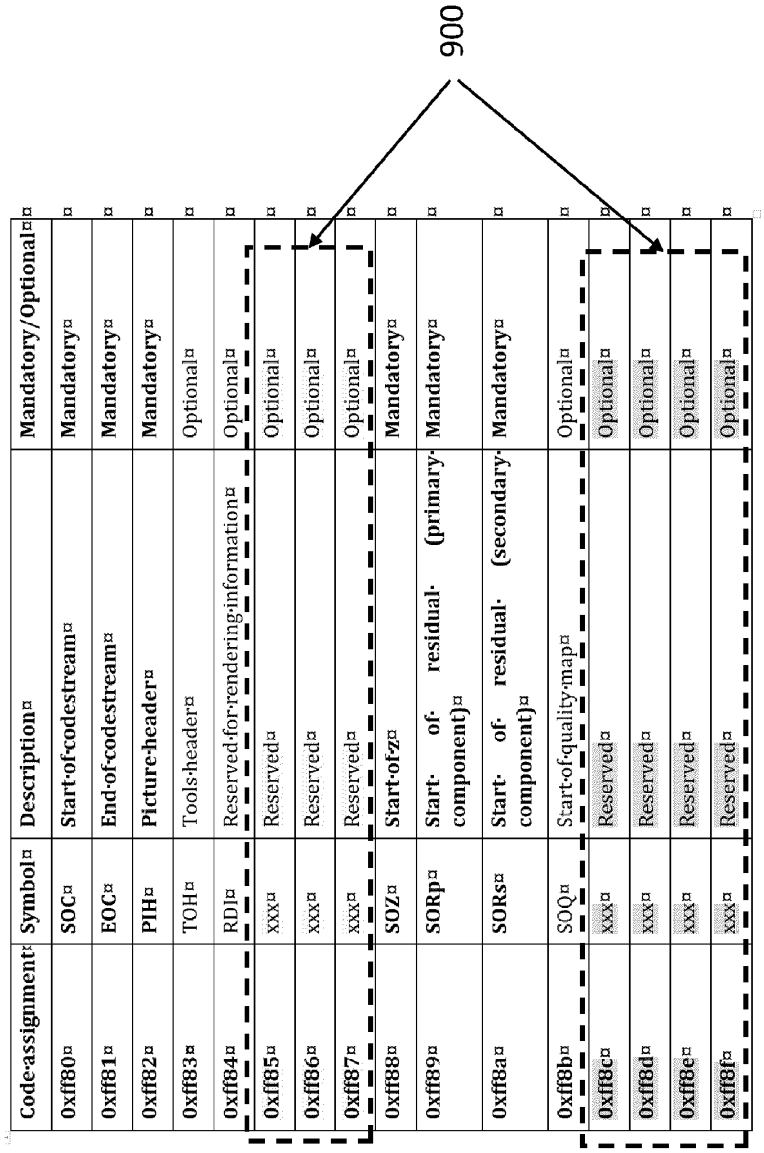

Y component quality factor
UV component quality factor
Bit rate allocation control module
Y component processing module
UV component processing module
Joint processing module
Entropy encoding module
Entropy decoding module
Joint processing module 2
Y component processing module 2
UV component processing module 2
Quality response module
Y component quality factor
UV component quality factor
Y
UV
Encoder
Decoder

FIG. 8



Code assignment	Symbol	Description	Mandatory/Optional
0xff80	SOC	Start of codestream	Mandatory
0xff81	EOC	End of codestream	Mandatory
0xff82	PIH	Picture header	Mandatory
0xff83	TOH	Tools header	Optional
0xff84	RDI	Reserved for rendering information	Optional
0xff85	xxx	Reserved	Optional
0xff86	xxx	Reserved	Optional
0xff87	xxx	Reserved	Optional
0xff88	SOZ	Start of z	Mandatory
0xff89	SORp	Start of residual (primary component)	Mandatory
0xff8a	SORs	Start of residual (secondary component)	Mandatory
0xff8b	SOQ	Start of quality map	Optional
0xff8c	xxx	Reserved	Optional
0xff8d	xxx	Reserved	Optional
0xff8e	xxx	Reserved	Optional
0xff8f	xxx	Reserved	Optional

FIG. 9

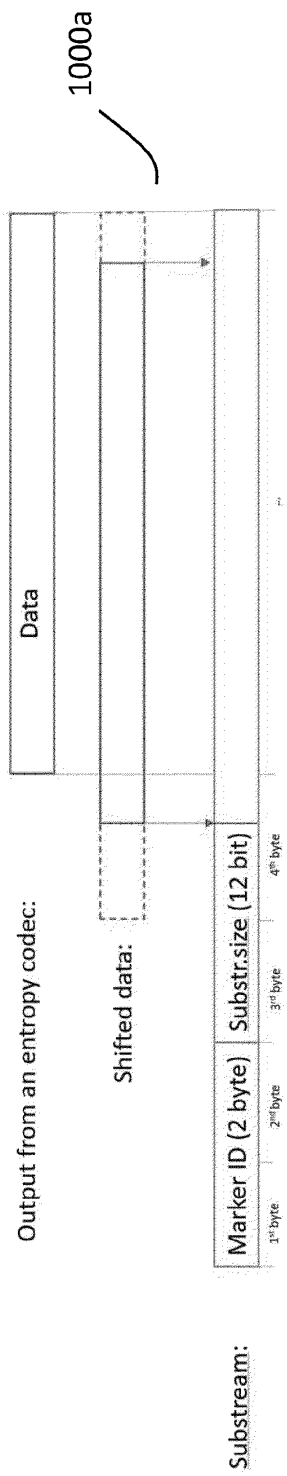


FIG. 10a

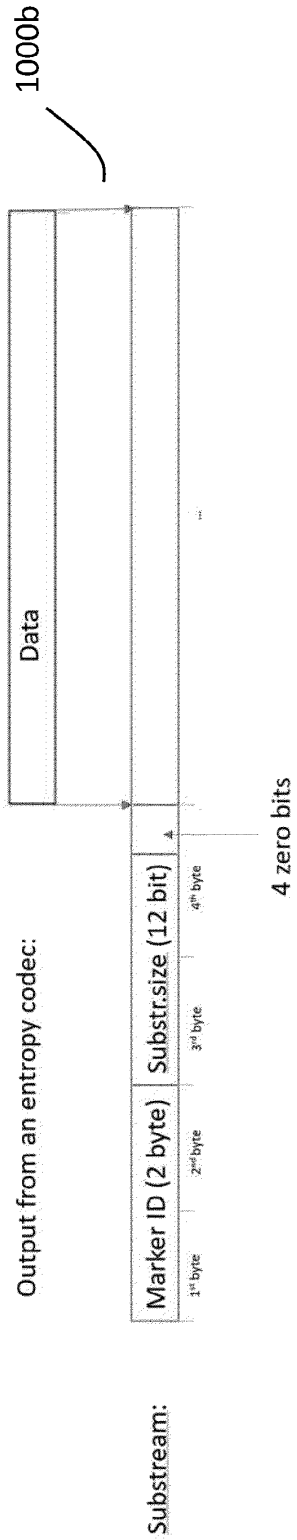


FIG. 10b

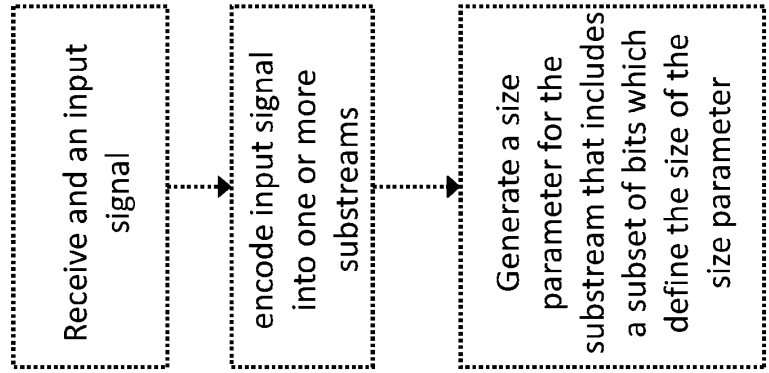

Receive and an input signal
encode input signal into one or more substreams
Generate a size parameter for the substream that includes a subset of bits which define the size of the size parameter
1200

FIG.12

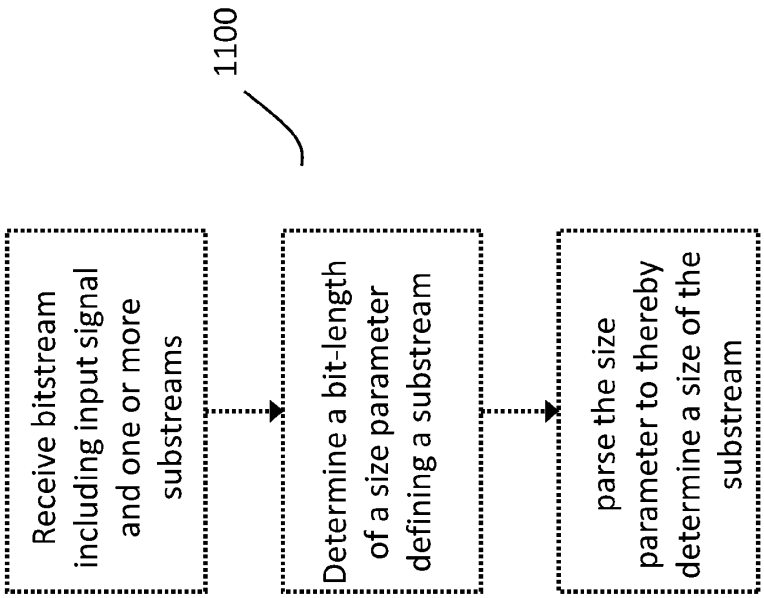

Receive bitstream including input signal and one or more substreams
Determine a bit-length of a size parameter defining a substream
parse the size parameter to thereby determine a size of the substream
1100

FIG.11

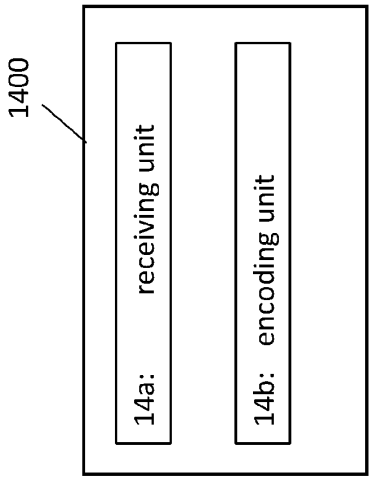

1400
14a: receiving unit
14b: encoding unit

FIG. 14

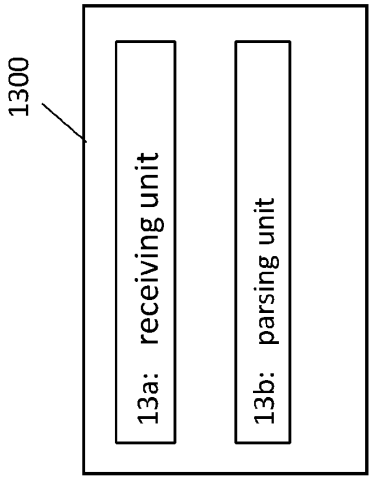

1300
13a: receiving unit
13b: parsing unit

FIG. 13

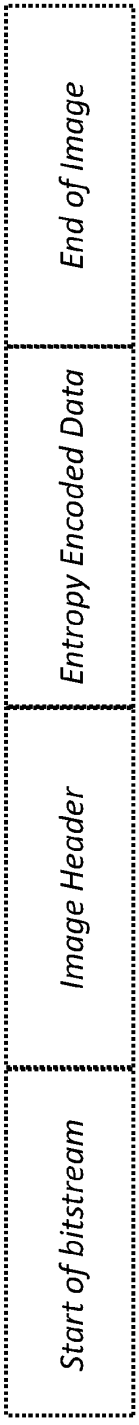

Start of bitstream
Image Header
Entropy Encoded Data
End of Image

FIG. 15

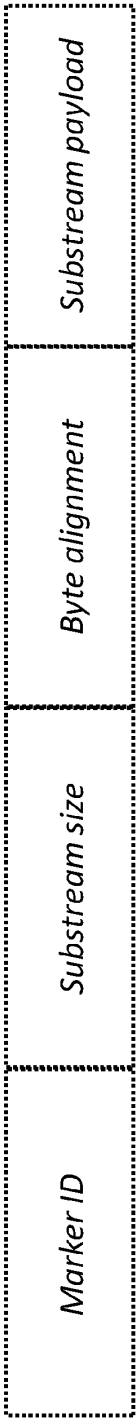

Substream payload
Byte alignment
Substream size
Marker ID

FIG. 16

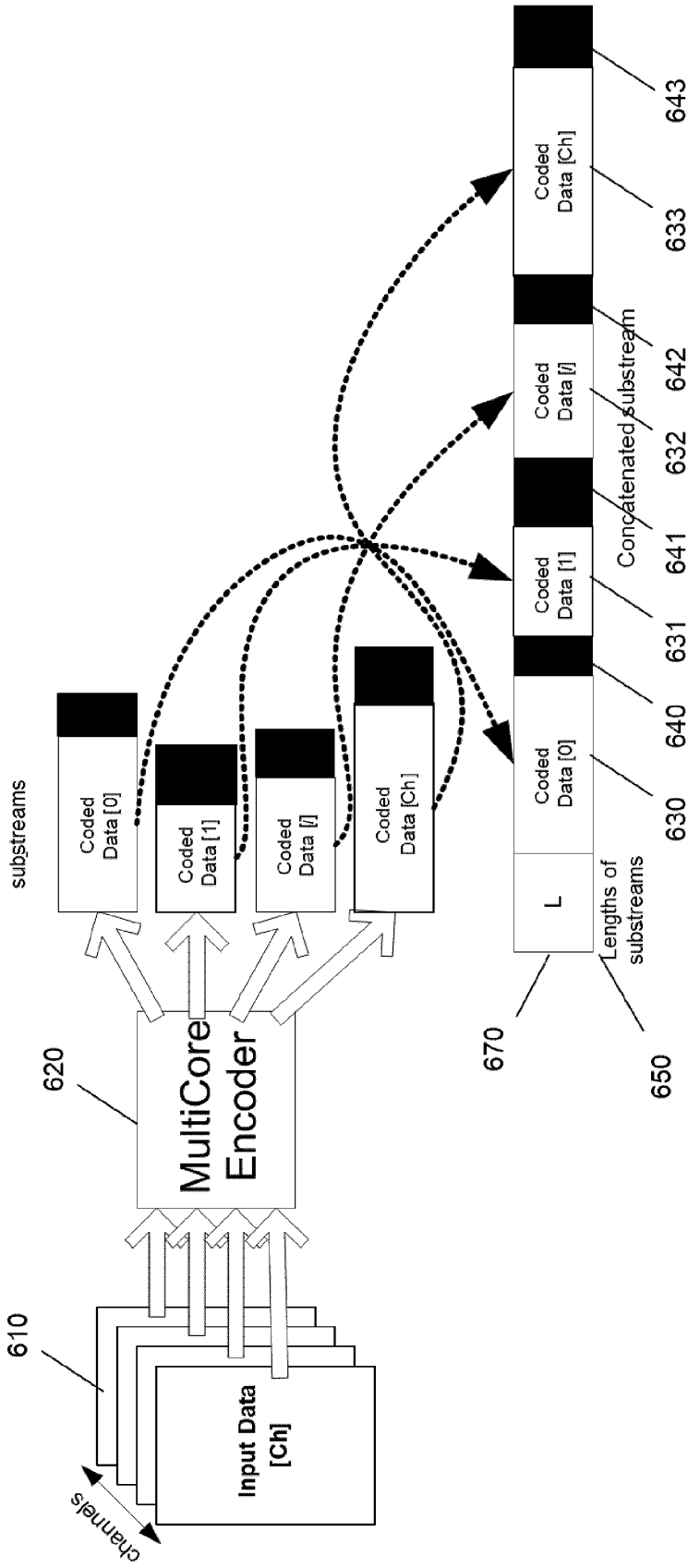

610
Input Data [Ch]
channels
620
MultiCore Encoder
substreams
Coded Data [0]
Coded Data [1]
Coded Data [i]
Coded Data [Ch]
630
640
631
641
632
642
633
643
Concatenated substream
Coded Data [0]
Coded Data [1]
Coded Data [i]
Coded Data [Ch]
L
670
Lengths of substreams
650

FIG. 17

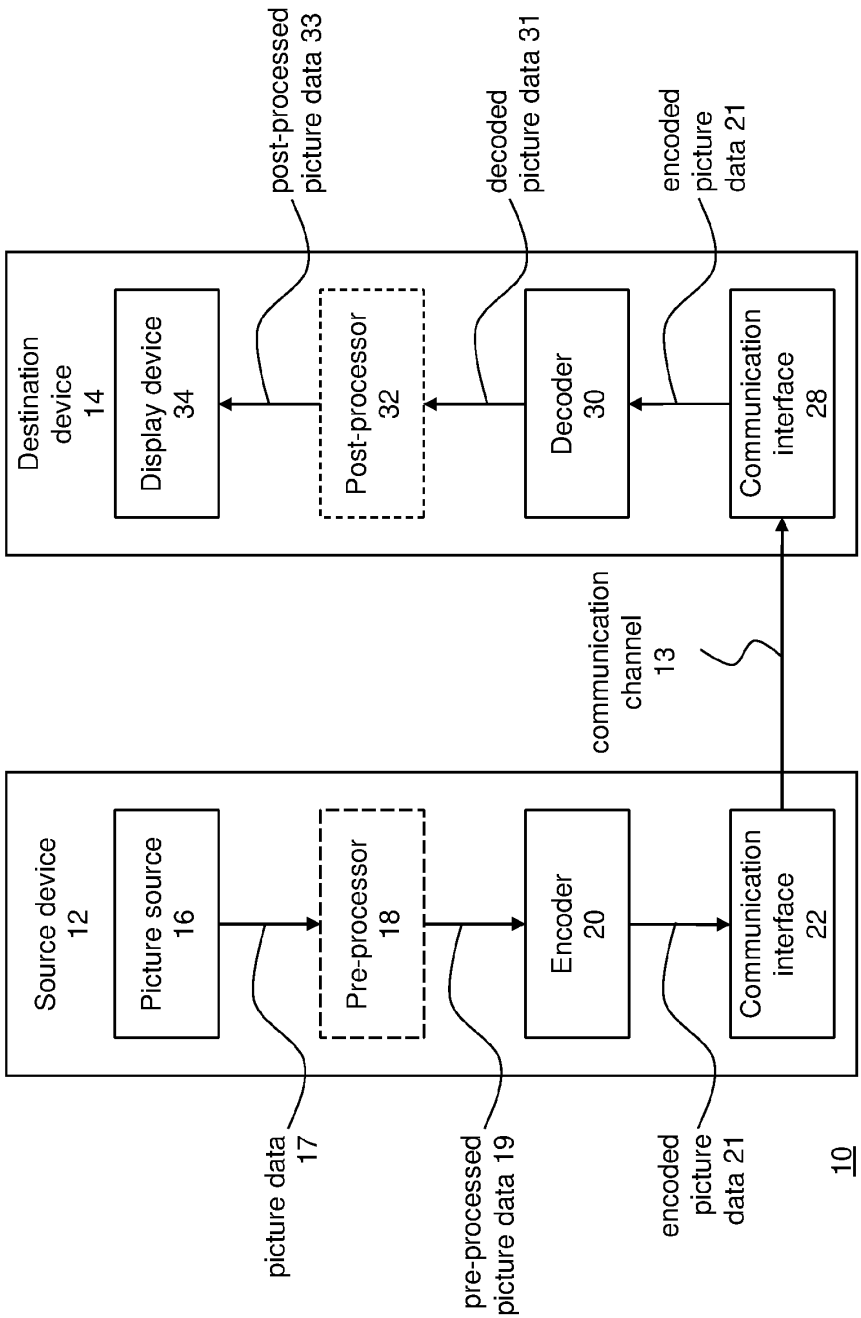

Source device
12
Picture source
16
Pre-processor
18
Encoder
20
Communication
interface
22
picture data
17
pre-processed
picture data 19
encoded
picture
data 21
10
communication
channel
13
Destination
device
14
Display device
34
Post-processor
32
Decoder
30
Communication
interface
28
post-processed
picture data 33
decoded
picture data 31
encoded
picture
data 21

FIG. 18

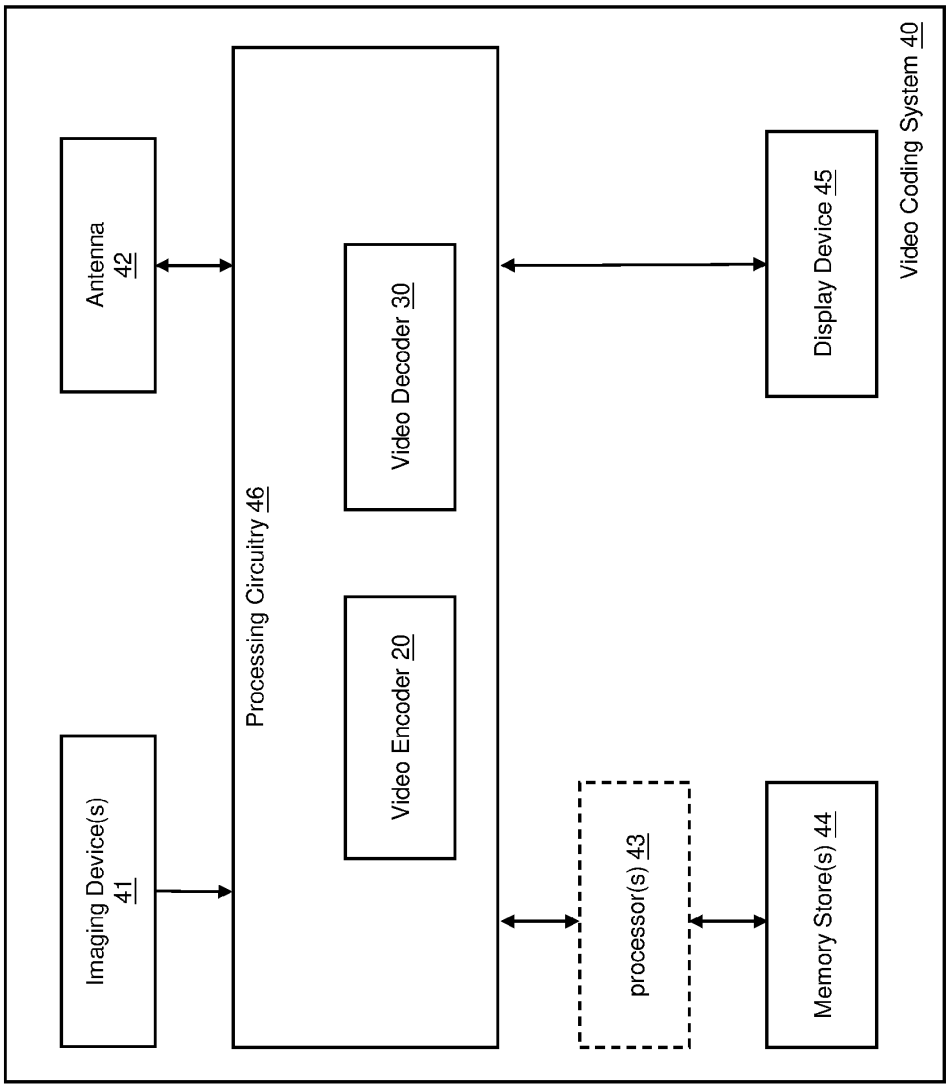

Video Coding System 40
Antenna 42
Imaging Device(s) 41
Processing Circuitry 46
Video Decoder 30
Video Encoder 20
Display Device 45
processor(s) 43
Memory Store(s) 44

FIG. 19

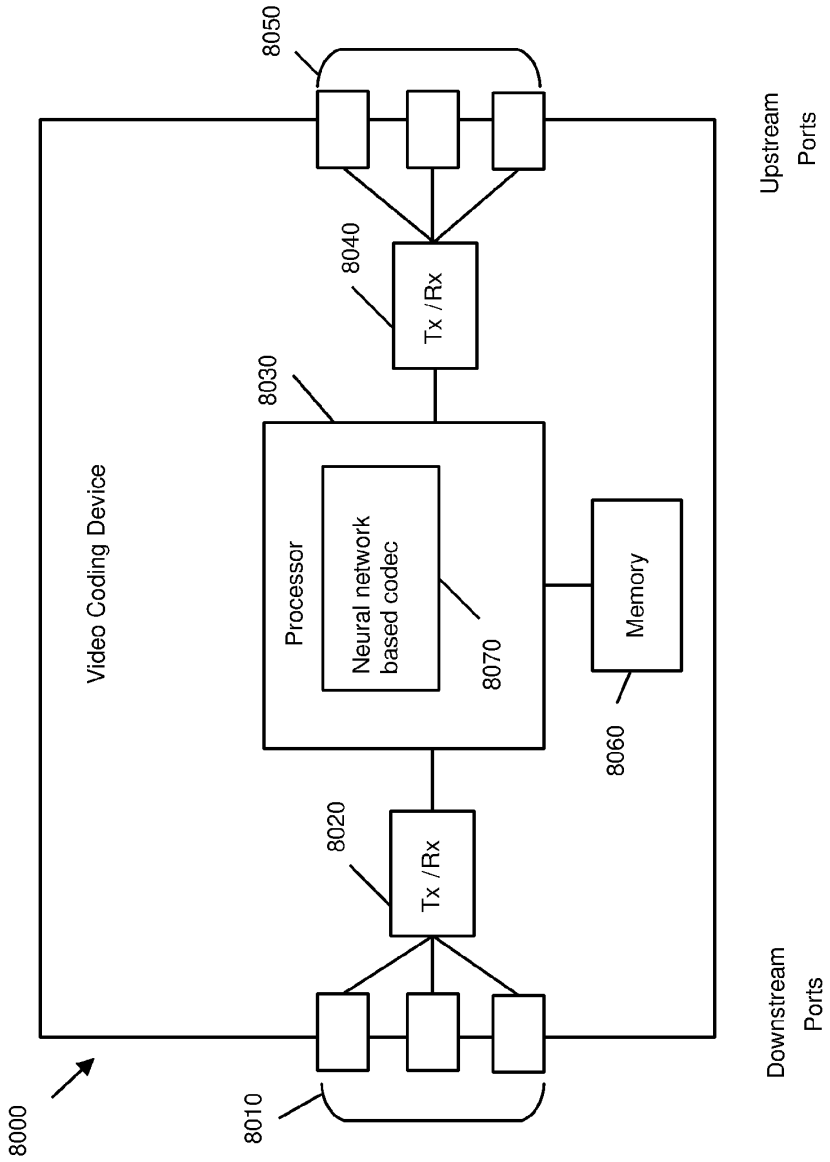

8050
Upstream Ports
8040
Tx /Rx
8030
Video Coding Device
Processor
Neural network based codec
8070
Memory
8060
8020
Tx /Rx
Downstream Ports
8000
8010

FIG. 20

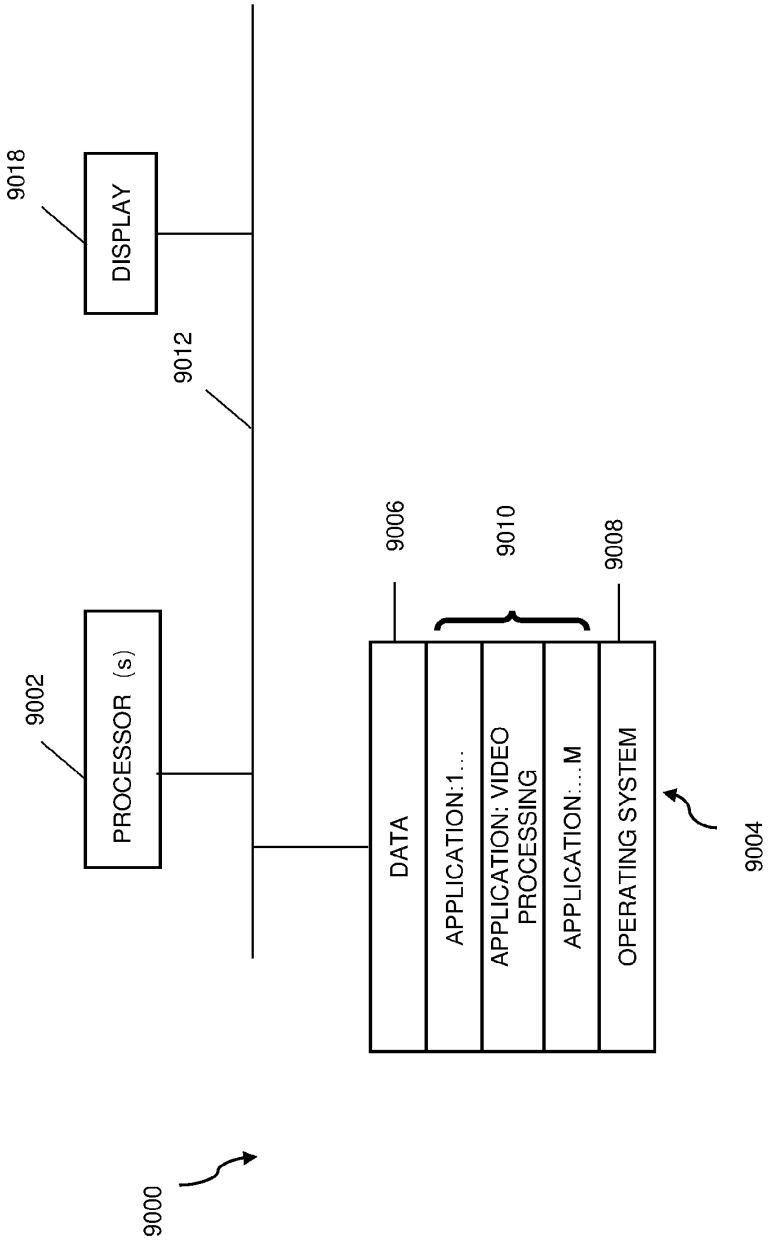

9000
9002
PROCESSOR (s)
9012
9018
DISPLAY
9004
OPERATING SYSTEM
9008
APPLICATION:...M
APPLICATION: VIDEO PROCESSING
9010
APPLICATION:1...
DATA
9006

FIG. 21

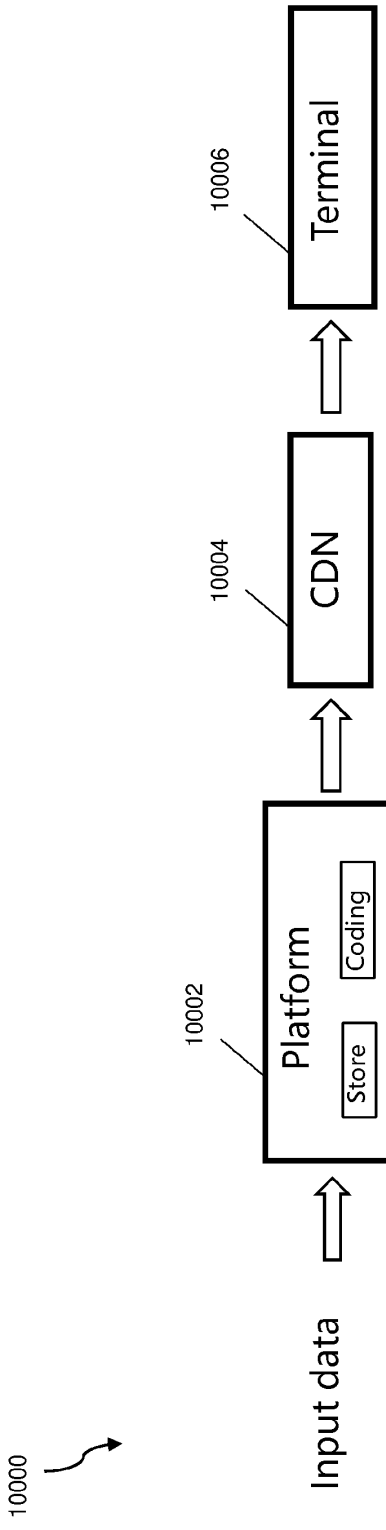

10000
Input data
10002
Platform
Store
Coding
10004
CDN
10006
Terminal

FIG. 22