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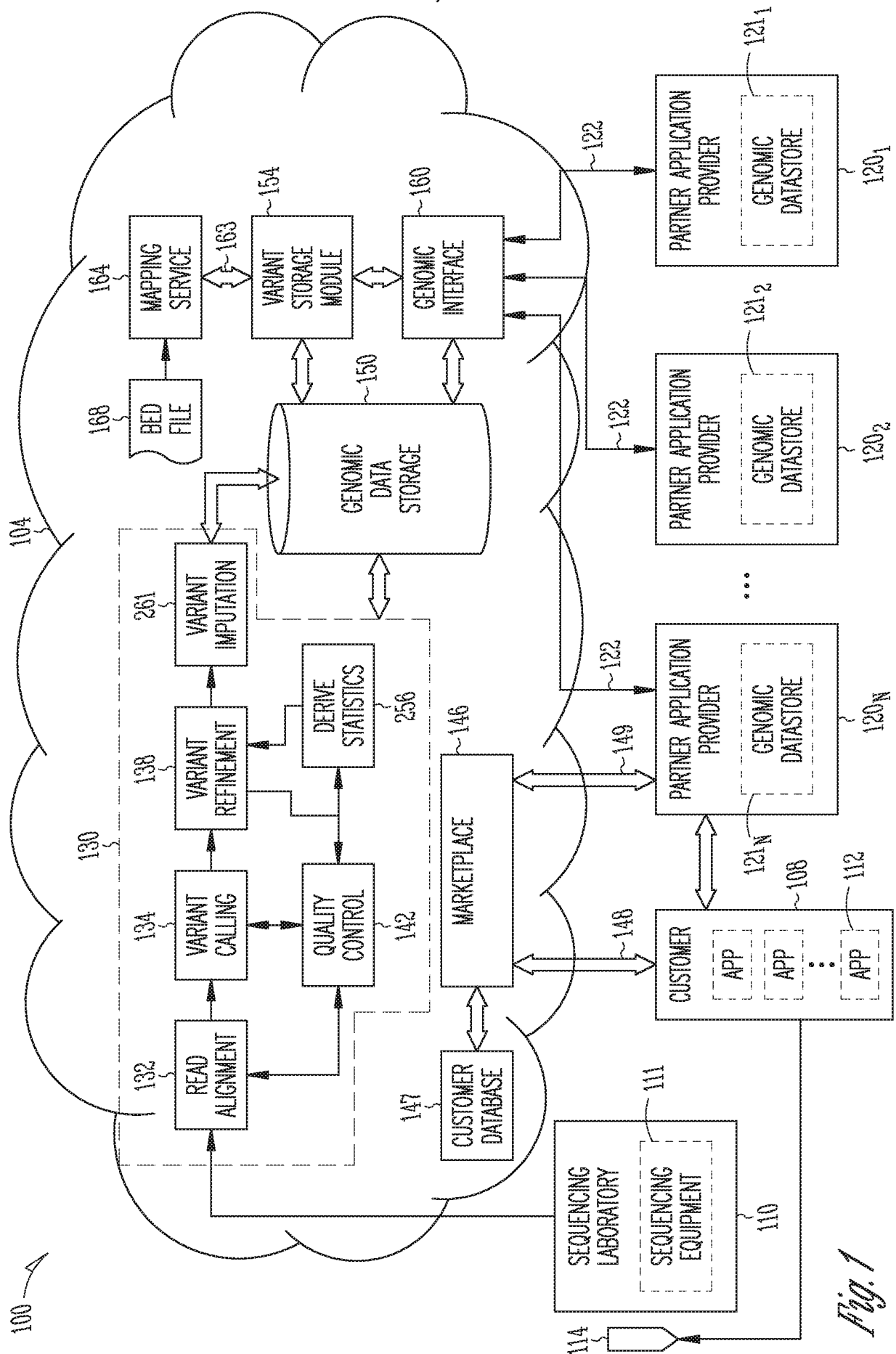


Fig. 1

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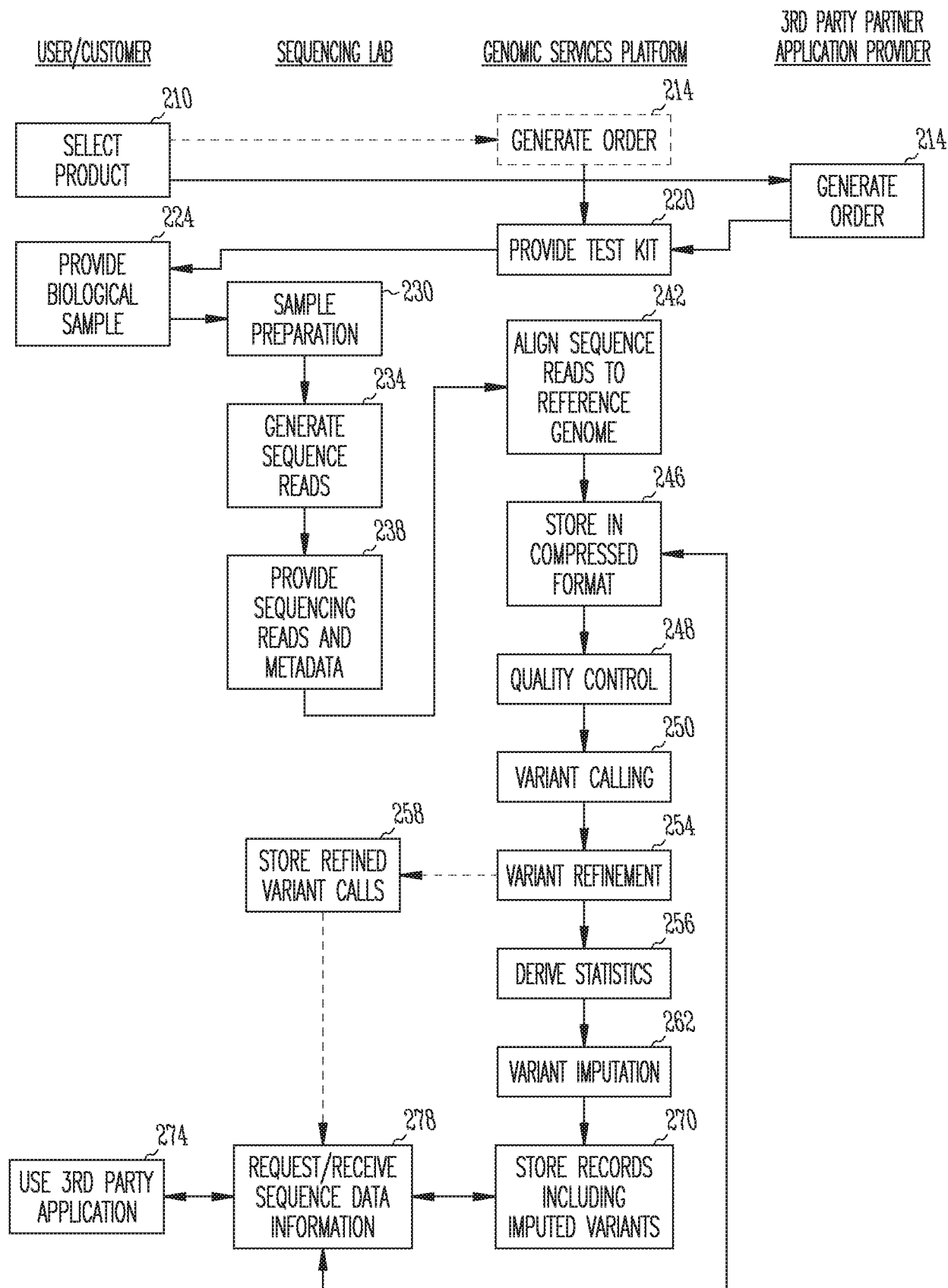
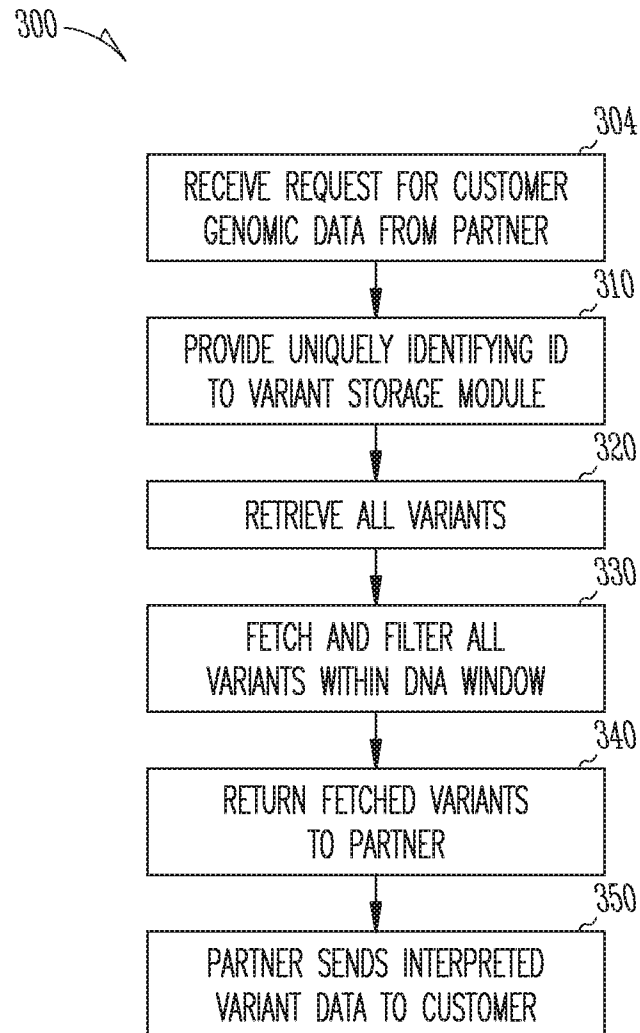


Fig. 2

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*Fig. 3*

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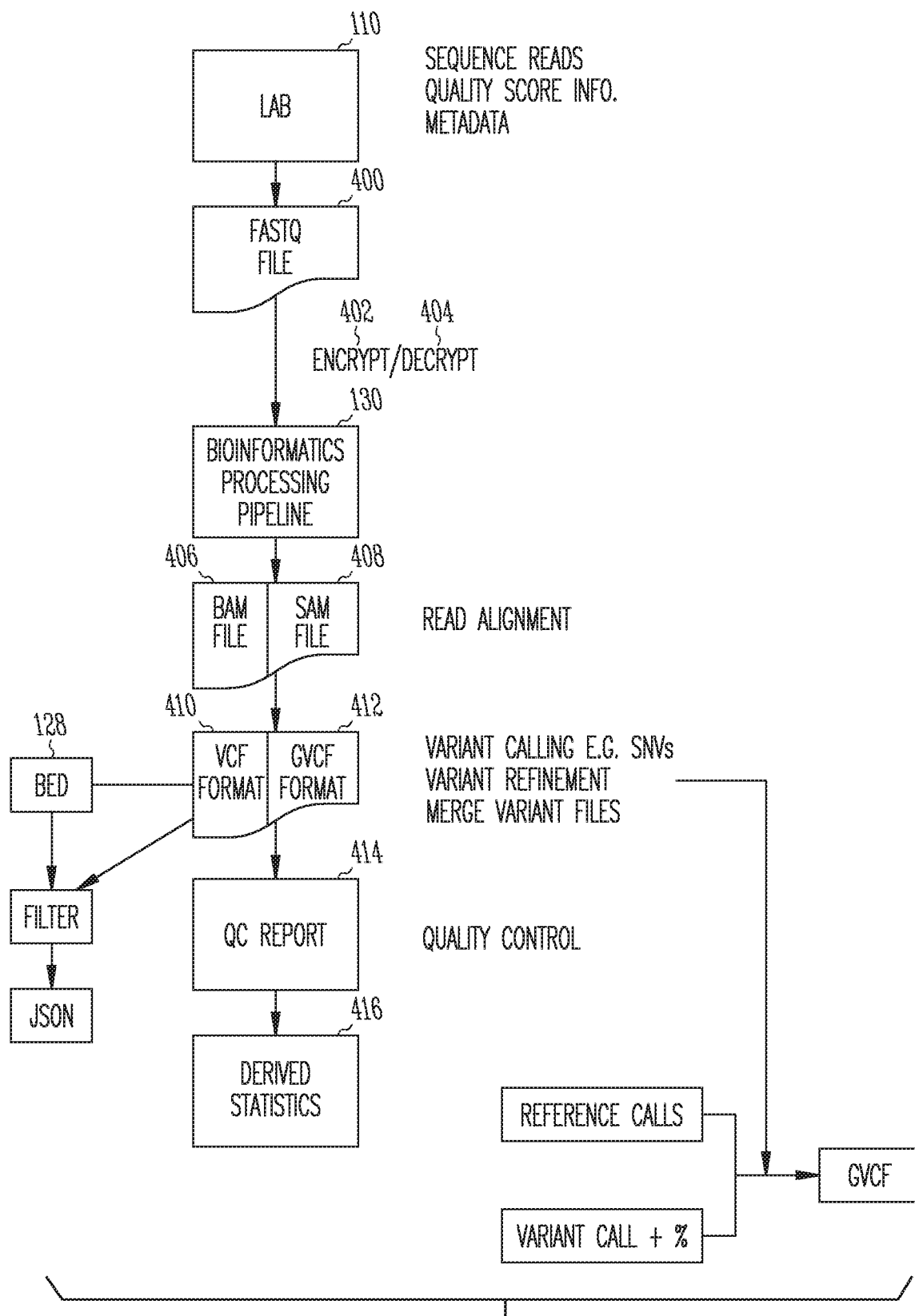


Fig. 4

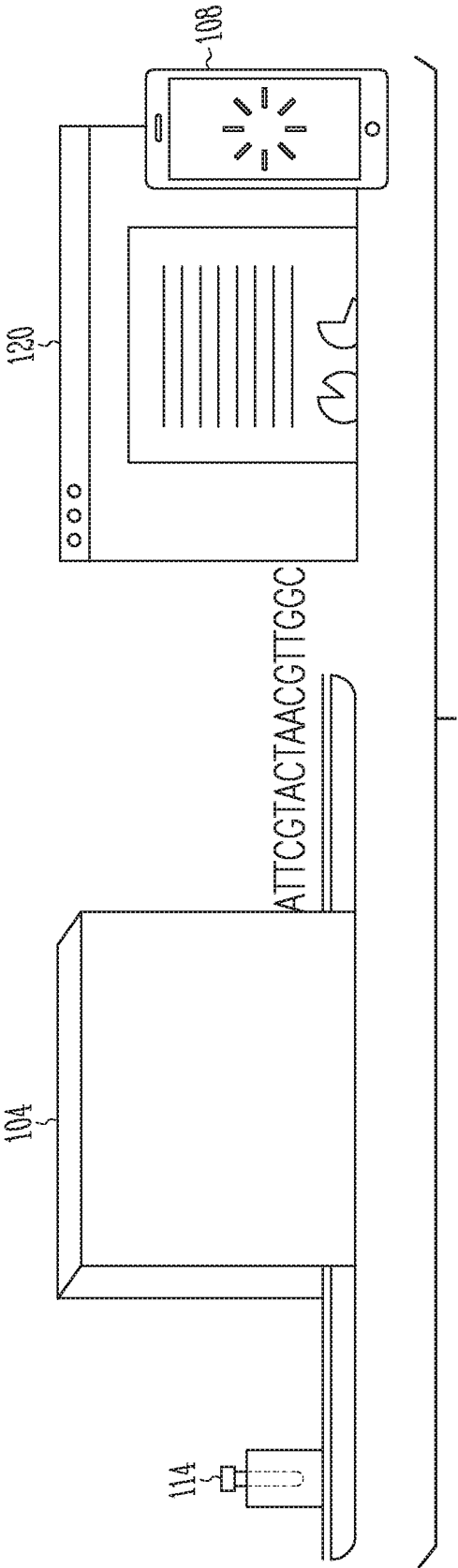
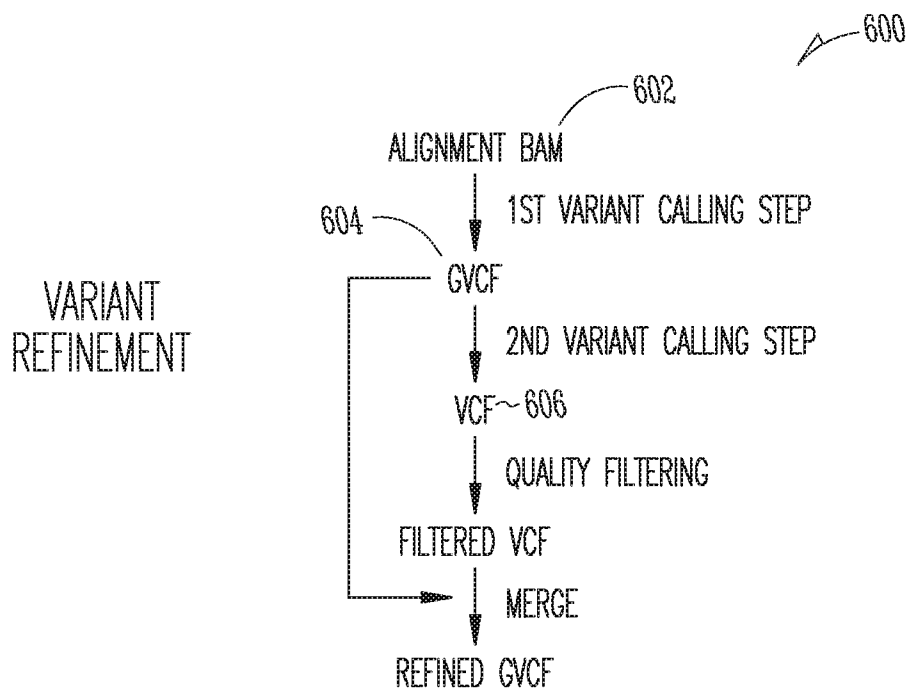


Fig. 5

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*Fig. 6*

700

|       |        |        |
|-------|--------|--------|
| 702   | 704    | 706    |
| chr2  | 17530  | 17531  |
| chr2  | 867341 | 867342 |
| chr12 | 16175  | 16176  |

*Fig. 7*

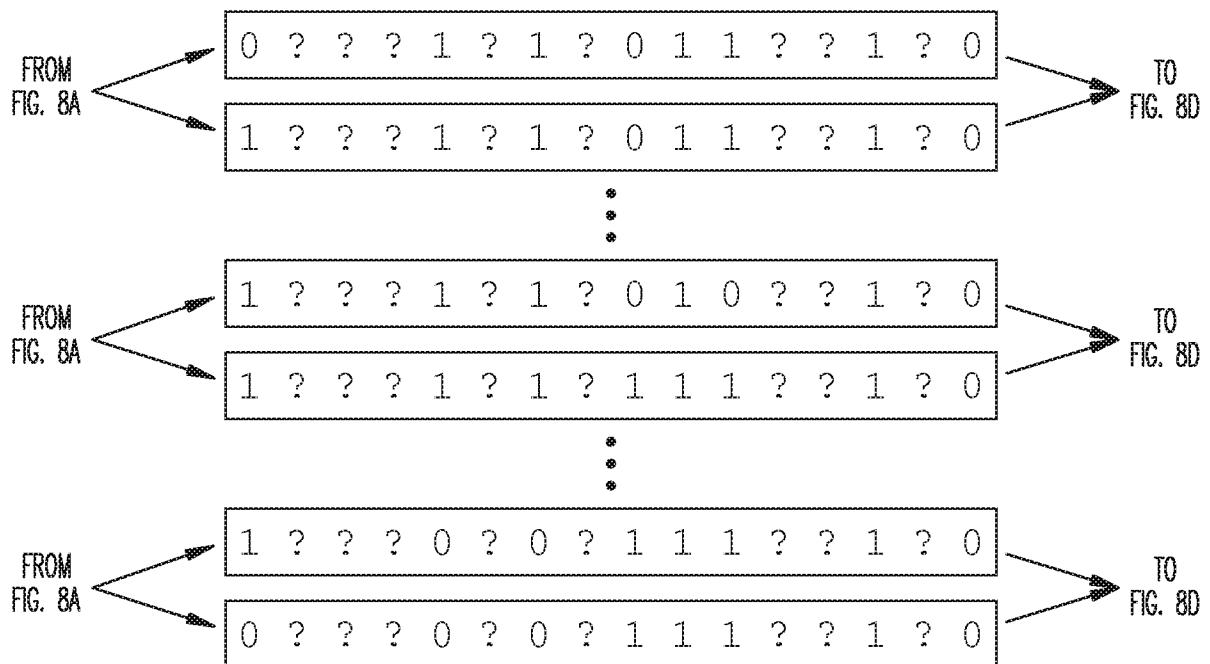
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|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |               |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---------------|
| 1 | ? | ? | ? | 1 | ? | 1 | ? | 0 | 2 | 2 | ? | ? | 2 | ? | 0 | TO<br>FIG. 8C |
| 0 | ? | ? | ? | 2 | ? | 2 | ? | 0 | 2 | 2 | ? | ? | 2 | ? | 0 |               |
| 1 | ? | ? | ? | 2 | ? | 2 | ? | 0 | 2 | 1 | ? | ? | 2 | ? | 0 |               |
| 1 | ? | ? | ? | 2 | ? | 1 | ? | 1 | 2 | 2 | ? | ? | 2 | ? | 0 |               |
| 2 | ? | ? | ? | 2 | ? | 2 | ? | 1 | 2 | 1 | ? | ? | 2 | ? | 0 | TO<br>FIG. 8C |
| 1 | ? | ? | ? | 1 | ? | 1 | ? | 1 | 2 | 2 | ? | ? | 2 | ? | 0 |               |
| 1 | ? | ? | ? | 2 | ? | 2 | ? | 0 | 2 | 1 | ? | ? | 2 | ? | 1 |               |
| 2 | ? | ? | ? | 1 | ? | 1 | ? | 1 | 2 | 1 | ? | ? | 2 | ? | 1 |               |
| 1 | ? | ? | ? | 0 | ? | 0 | ? | 2 | 2 | 2 | ? | ? | 2 | ? | 0 | TO<br>FIG. 8C |

GENOTYPE DATA WITH MISSING DATA AT  
UNTYPED SNPs (GREY QUESTION MARKS)

*Fig. 8A*

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EACH SAMPLE IS PHASED AND THE  
HAPLOTYPES ARE MODELLED AS A MOSAIC OF  
THOSE IN THE HAPLOTYPE REFERENCE PANEL

*Fig. 8B*

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |

REFERENCE SET OF HAPLOTYPES,  
FOR EXAMPLE, HAPMAP

*Fig. 8C*

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|                 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|-----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM<br>FIG. 8B | ➤ | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 2 | 2 | 0 | 2 | 2 | 2 | 2 | 0 |
|                 |   | 0 | 0 | 1 | 0 | 2 | 2 | 2 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 0 |
| FROM<br>FIG. 8B | ➤ | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 0 |
|                 |   | 1 | 1 | 2 | 0 | 2 | 2 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 0 |
|                 |   | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 0 |
|                 |   | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 0 |
| FROM<br>FIG. 8B | ➤ | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 0 | 0 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
|                 |   | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 1 | 1 |
|                 |   | 1 | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 0 |

THE REFERENCE HAPLOTYPES ARE USED TO  
IMPUTE ALLELES INTO THE SAMPLES TO  
CREATE IMPUTED GENOTYPES (SHADED)

*Fig. 8D*

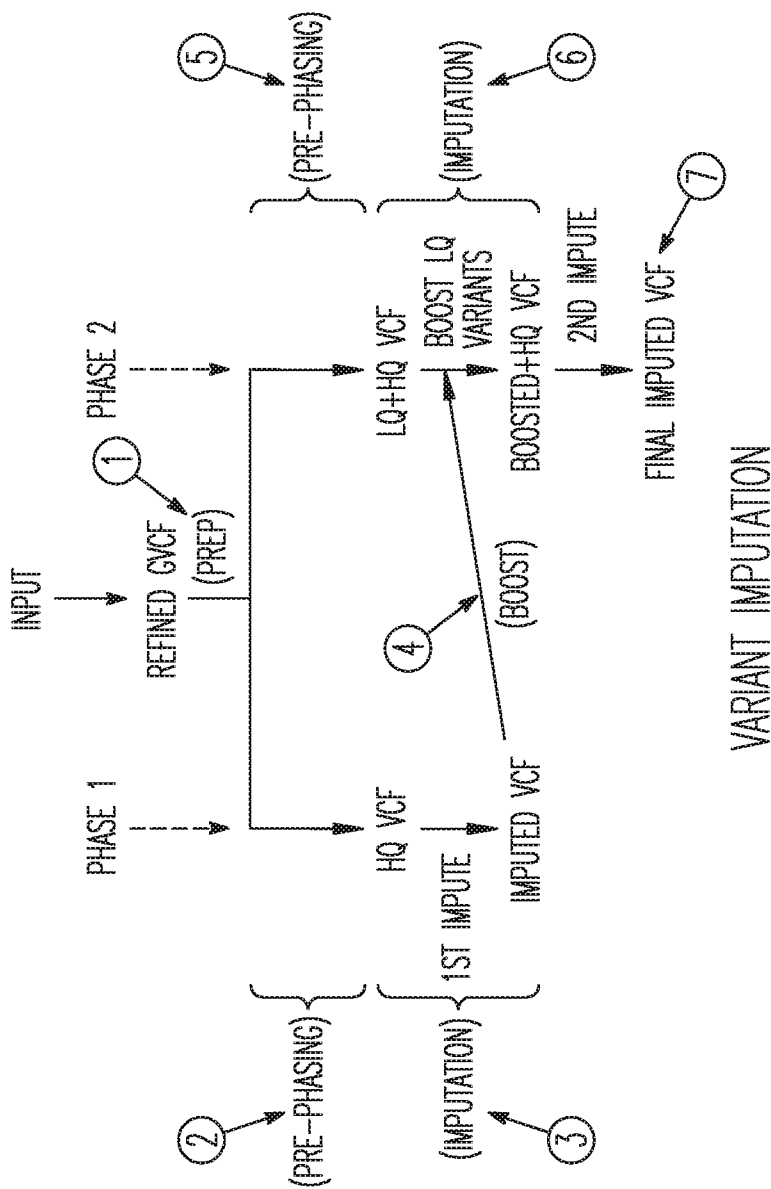
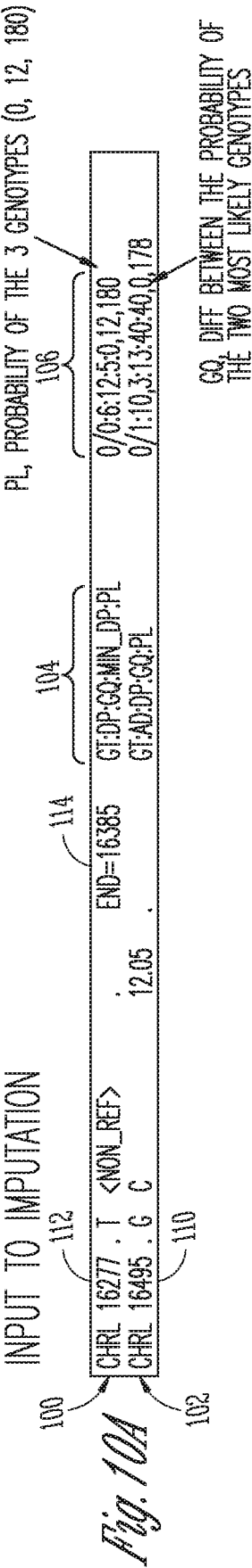


Fig. 9

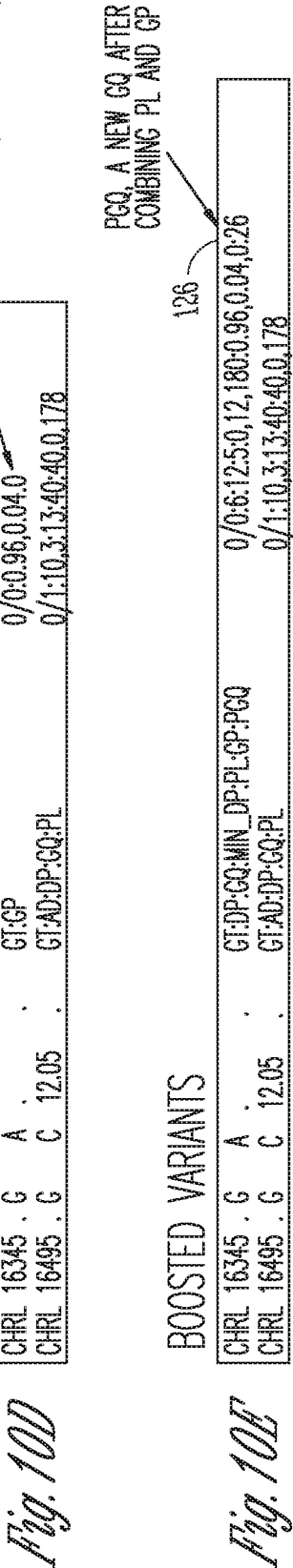
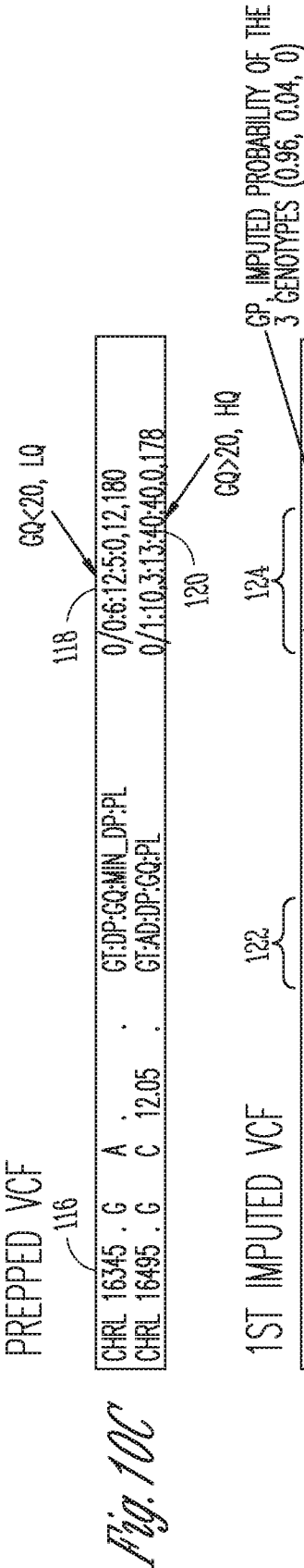


IMPUTATION REFERENCE PANEL

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|                |   |     |      |        |     |     |     |     |
|----------------|---|-----|------|--------|-----|-----|-----|-----|
| CHRL 16345 . G | A | 100 | PASS | GT 0/1 | 0/0 | 1/0 | 0/0 | 1/1 |
| CHRL 16495 . G | C | 100 | PASS | GT 0/0 | 1/0 | 0/0 | 0/1 | 0/0 |

Fig. 10B



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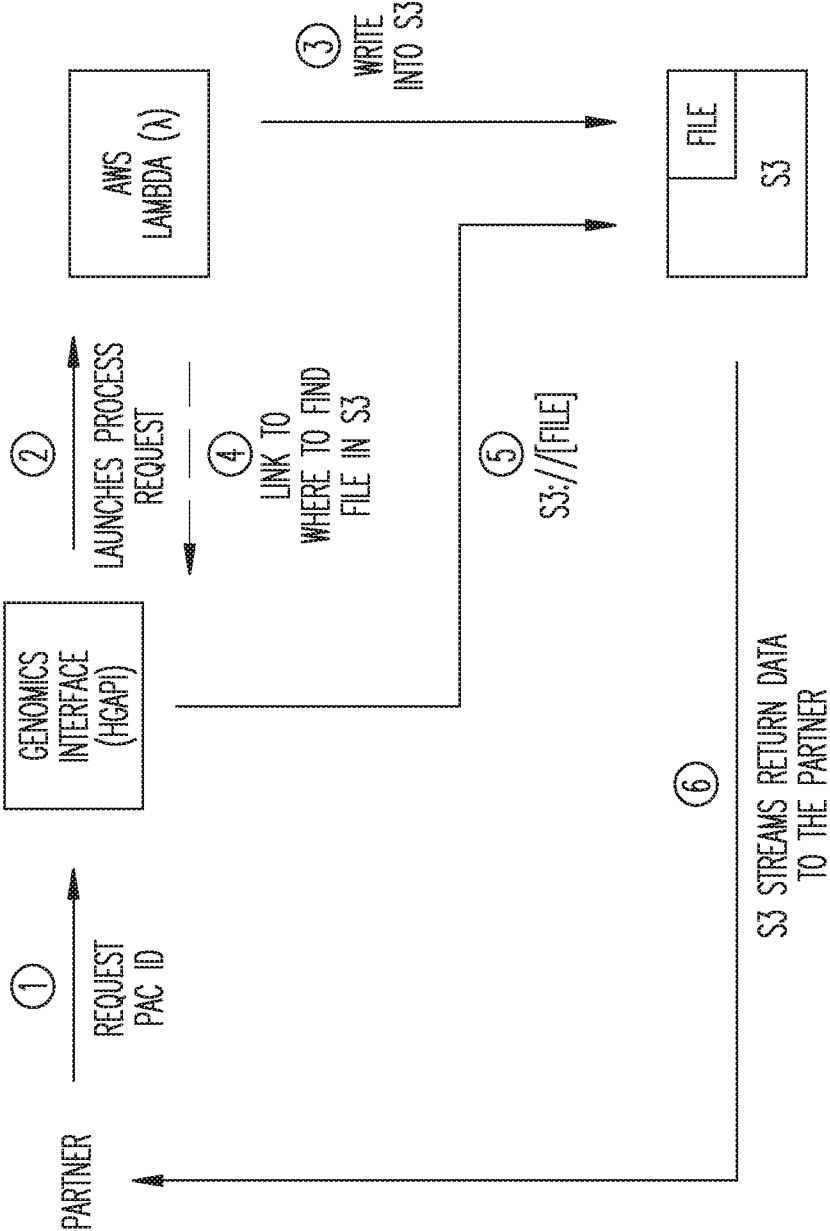


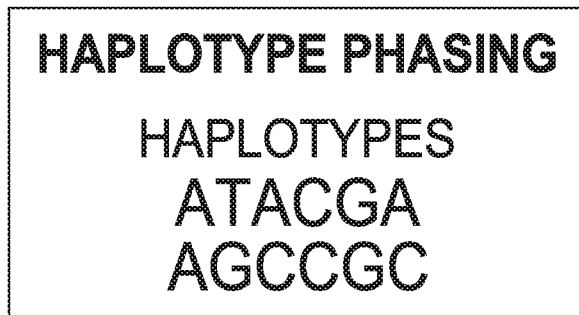
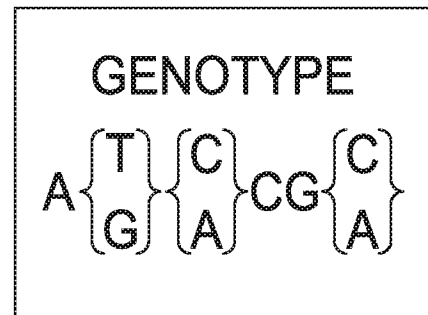
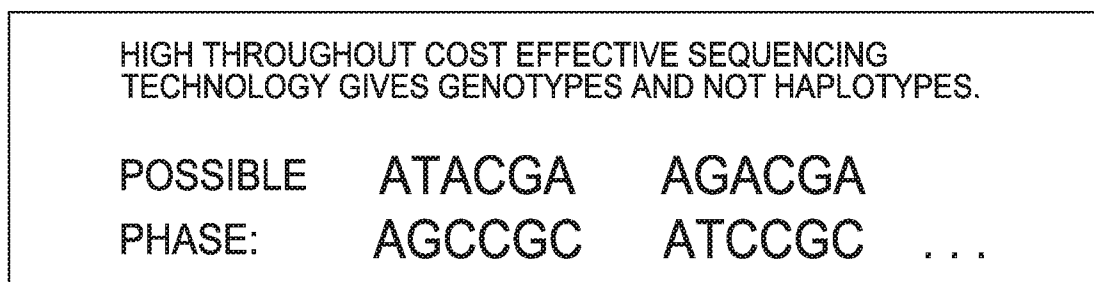
Fig. 11

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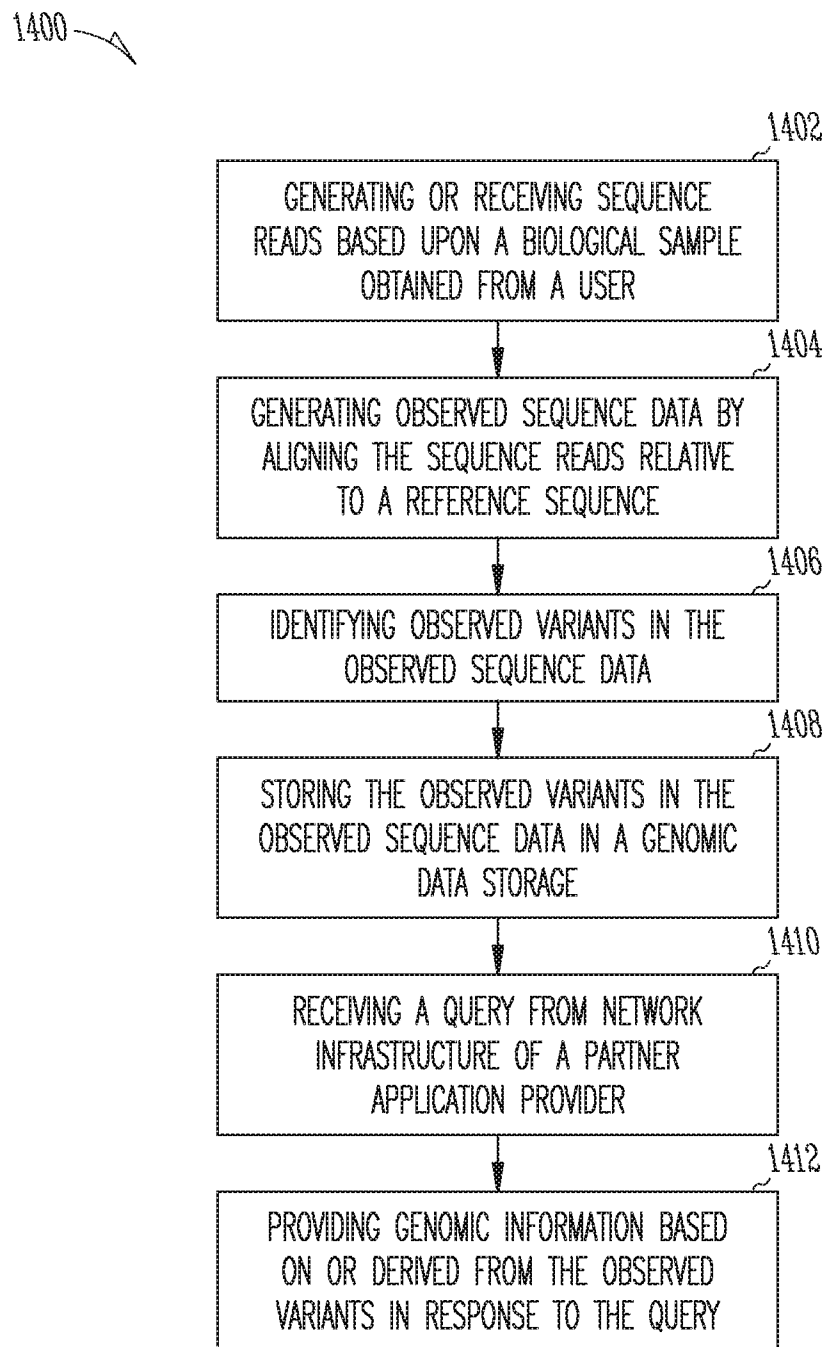
| APPID                       | USERID        | PARTNERAPPCUSTOMERID (PAC ID) | CREATEDAT       |
|-----------------------------|---------------|-------------------------------|-----------------|
| AP-OW690YXSOGWXO4APOCR6LRN2 | US-09NU-RG7YM | PC-222N9M5QRCXMI5I8CY3U0YU    | 5/31/2017 18:47 |
| AP-74NSX48N32E7N8QNF884530  | US-G1CE-S94DU | PC-2222T3F31R529BR6RJLP24K    | 6/20/2017 1:37  |
| AP-W3Q0LWH6GF9FUWNBB929ACED | US-2RZV-6SGHU | PC-222K1S3P7SR0MD1IWT1J39XU   | 7/14/2017 17:50 |
| AP-12FZCM5G52Q0APG639EN38TD | US-JWV-1Z0MV  | PC-2226I13KHJ7HLZ7EDZAJF8B    | 5/8/2017 17:06  |
| AP-FRBEM5KAF0FM3S75TAG6SRJW | US-3GFF-9A29T | PC-222PK1X7FNTVUV1NWK5UNRXJ   | 6/19/2017 17:46 |
| AP-OW690YXSOGWXO4APOCR6LRN2 | US-P3KR-XXS6M | PC-222NQXB7440NR5IYRYT35L74   | 7/21/2017 15:56 |
| AP-OW690YXSOGWXO4APOCR6LRN2 | US-AF03-EZ25A | PC-222KXCTL0CRXF4NWXJ06LI5T   | 5/27/2017 0:42  |
| AP-W3Q0LWH6GF9FUWNBB929ACED | US-CD5R-RHYJI | PC-222G45KPEDBD4FBPIJCMNQA0   | 4/21/2017 22:06 |
| AP-12FZCM5G52Q0APG639EN38TD | US-F7Z2-AKRBD | PC-222VQXCAX1XSR6FEEAL6QP4M   | 7/25/2016 17:32 |
| AP-74NSX48N32E7N8QNF884530  | US-WRZZ-C669V | PC-222K0Q7J4PJEMJY8JFD7A0JI   | 7/18/2017 21:28 |

Fig. 12

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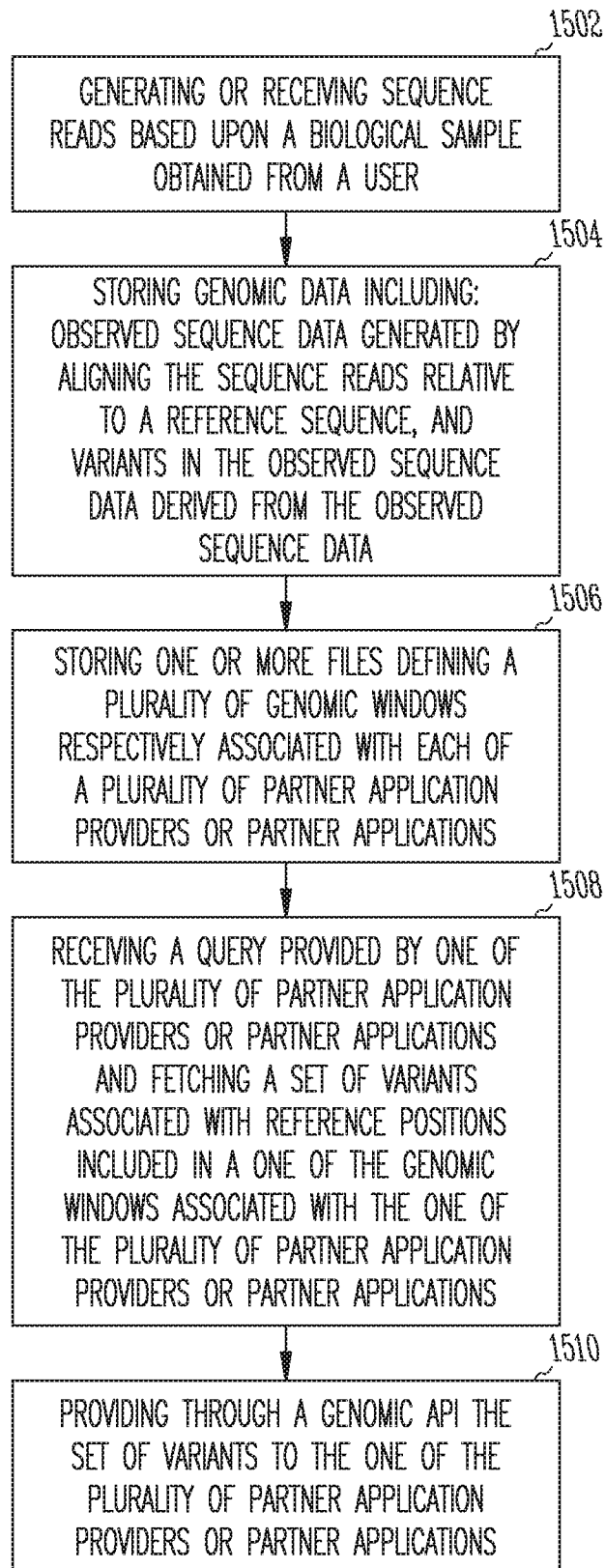
*Fig. 13A**Fig. 13B**Fig. 13C*

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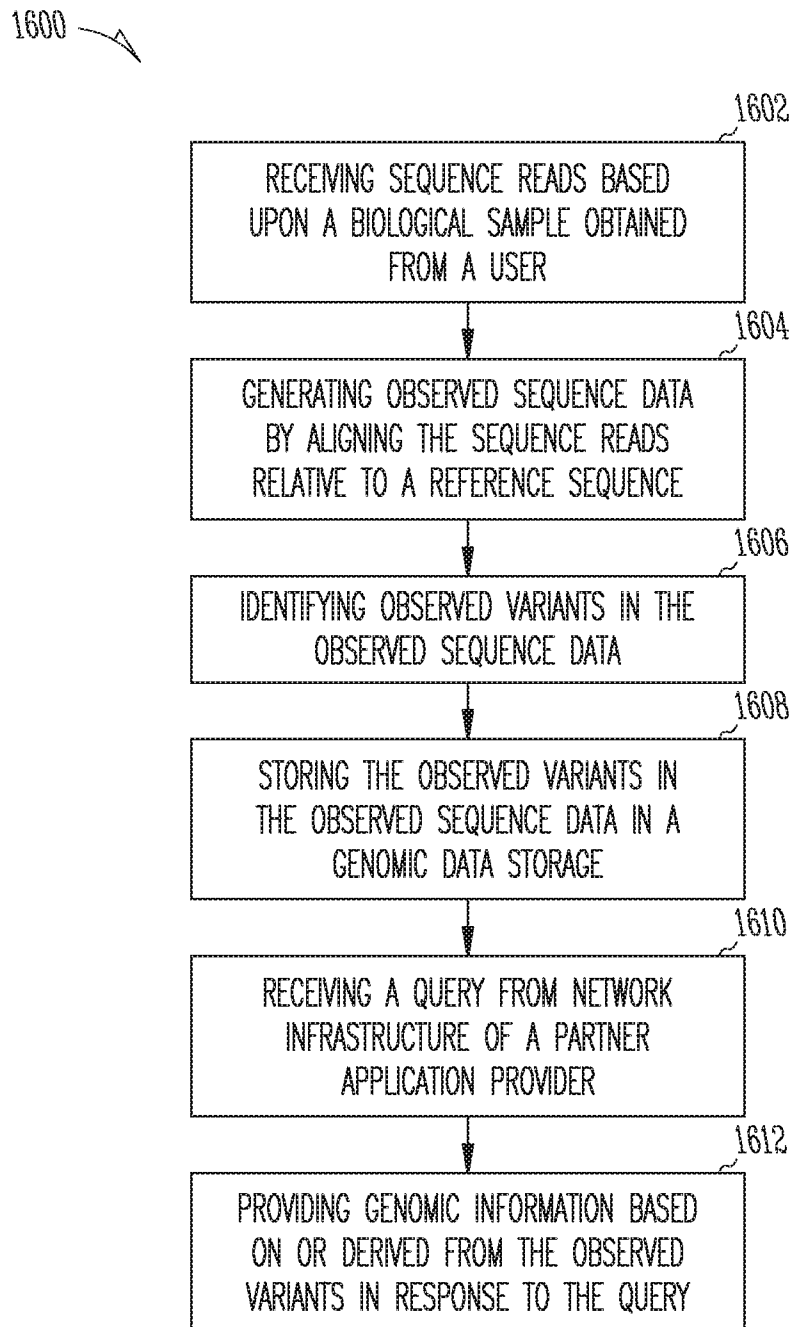
*Fig. 14*

1500

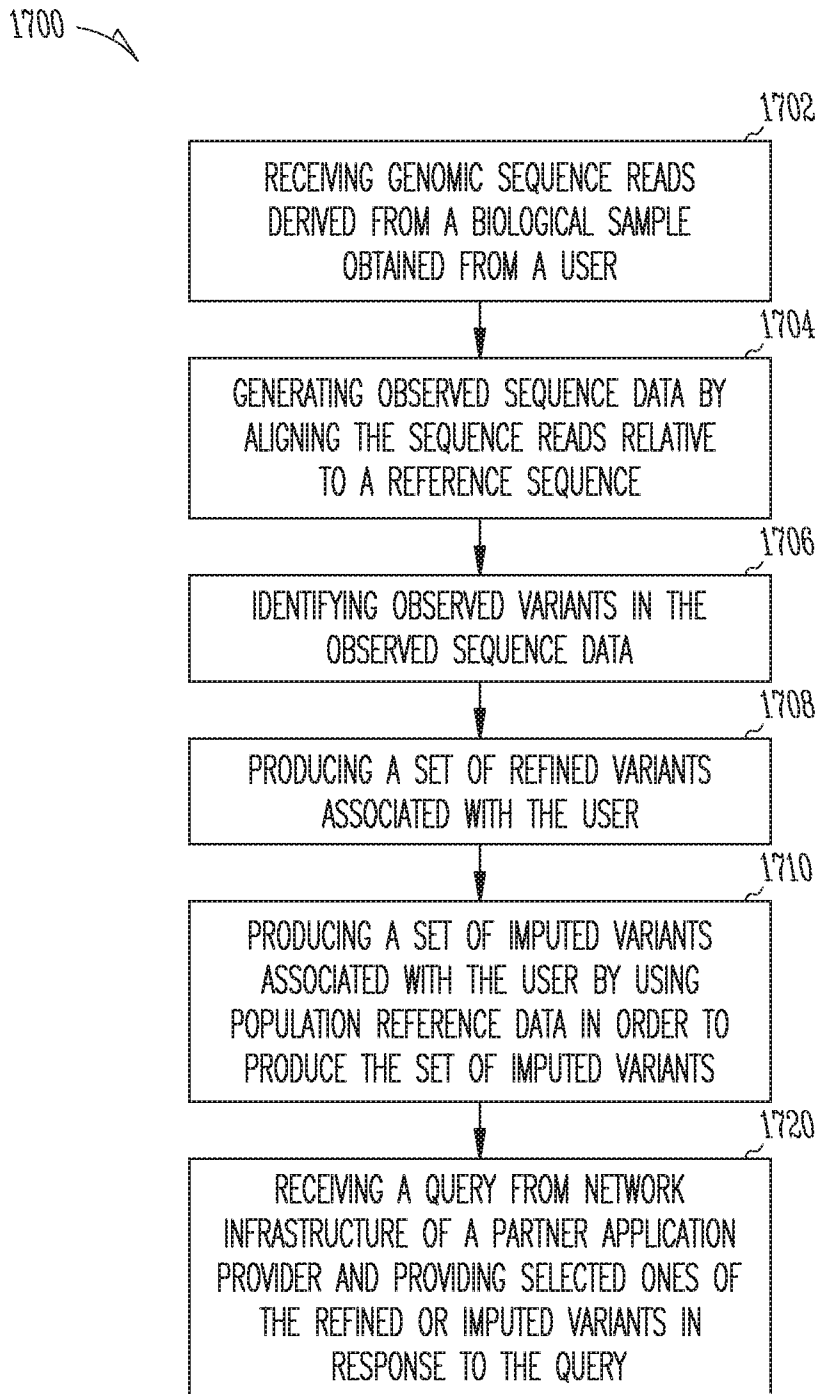
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*Fig. 15*

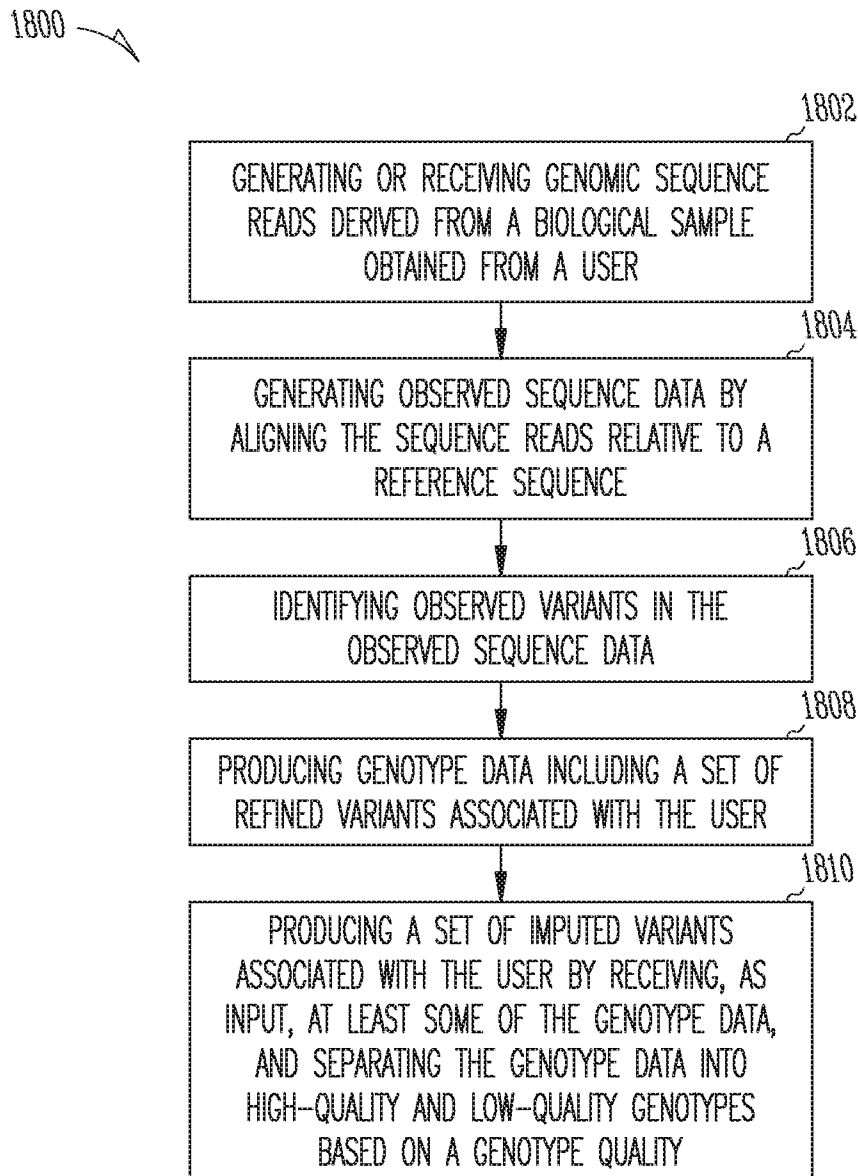
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*Fig. 16*

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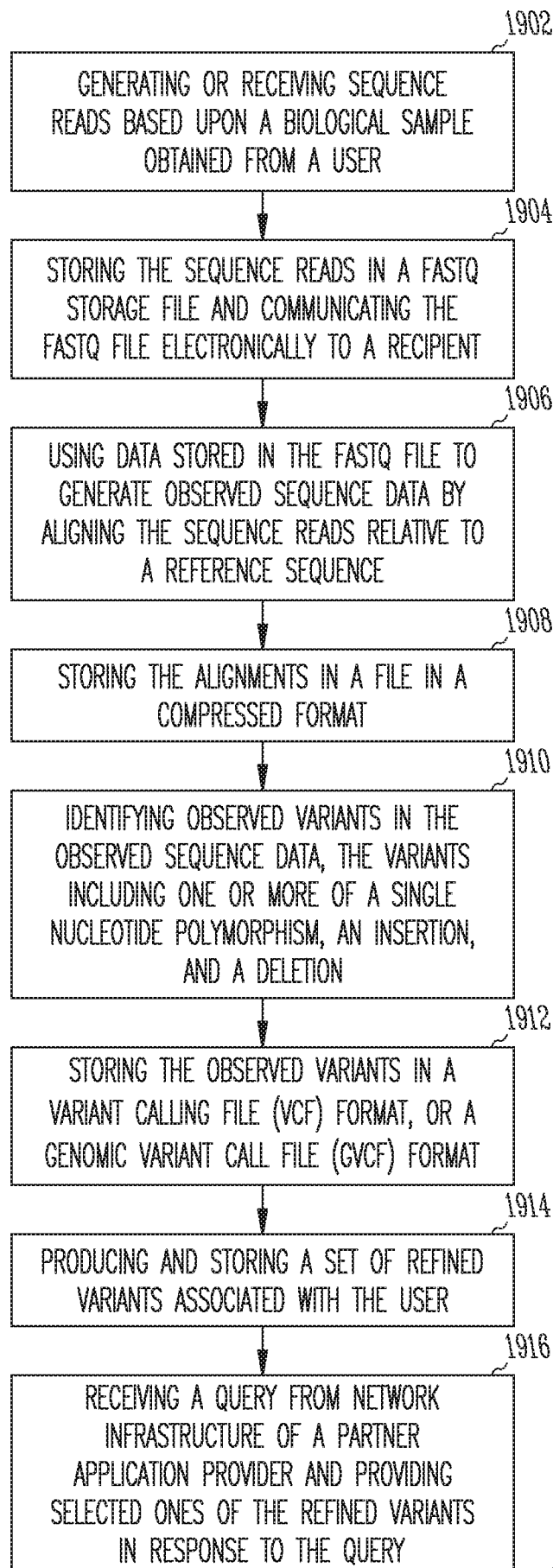
*Fig. 17*

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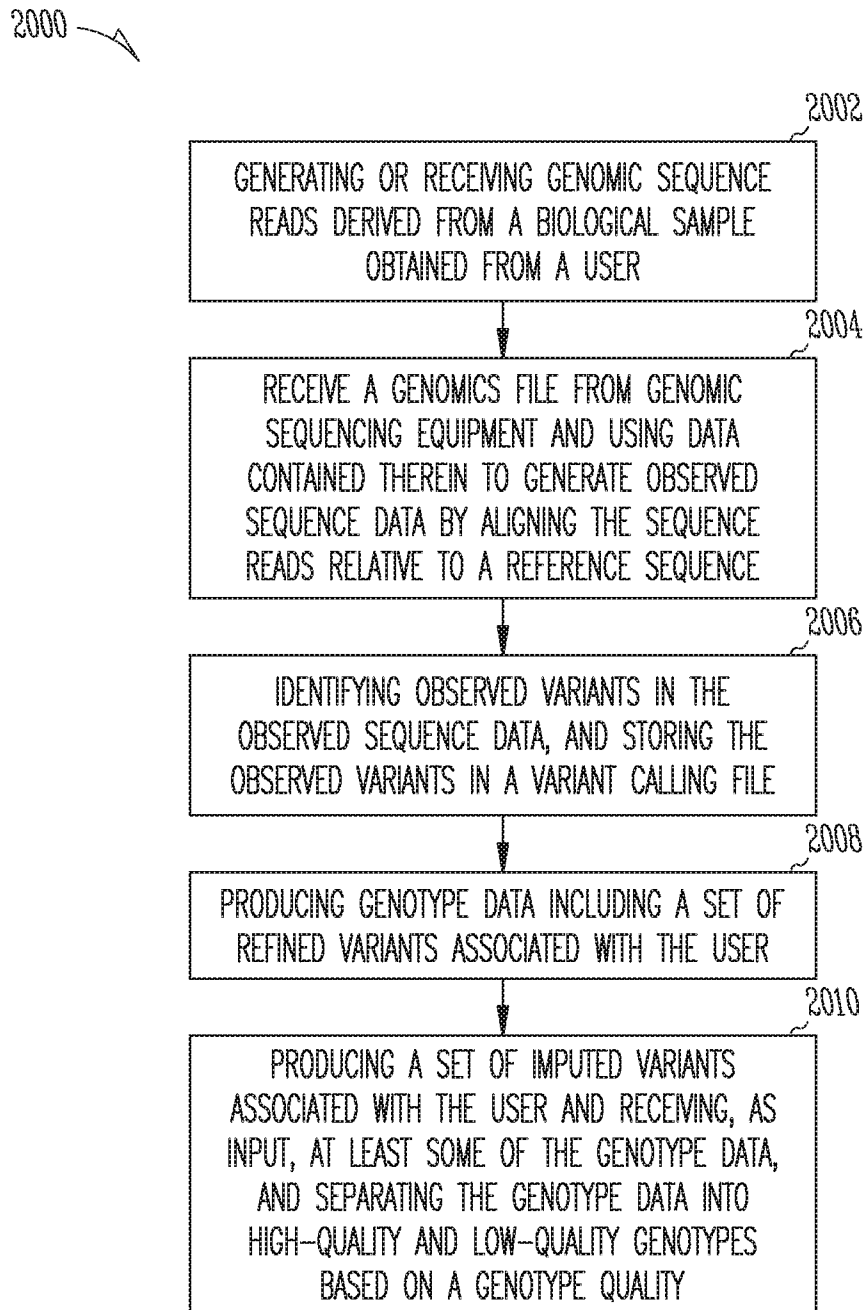
*Fig. 18*

1900 ↗

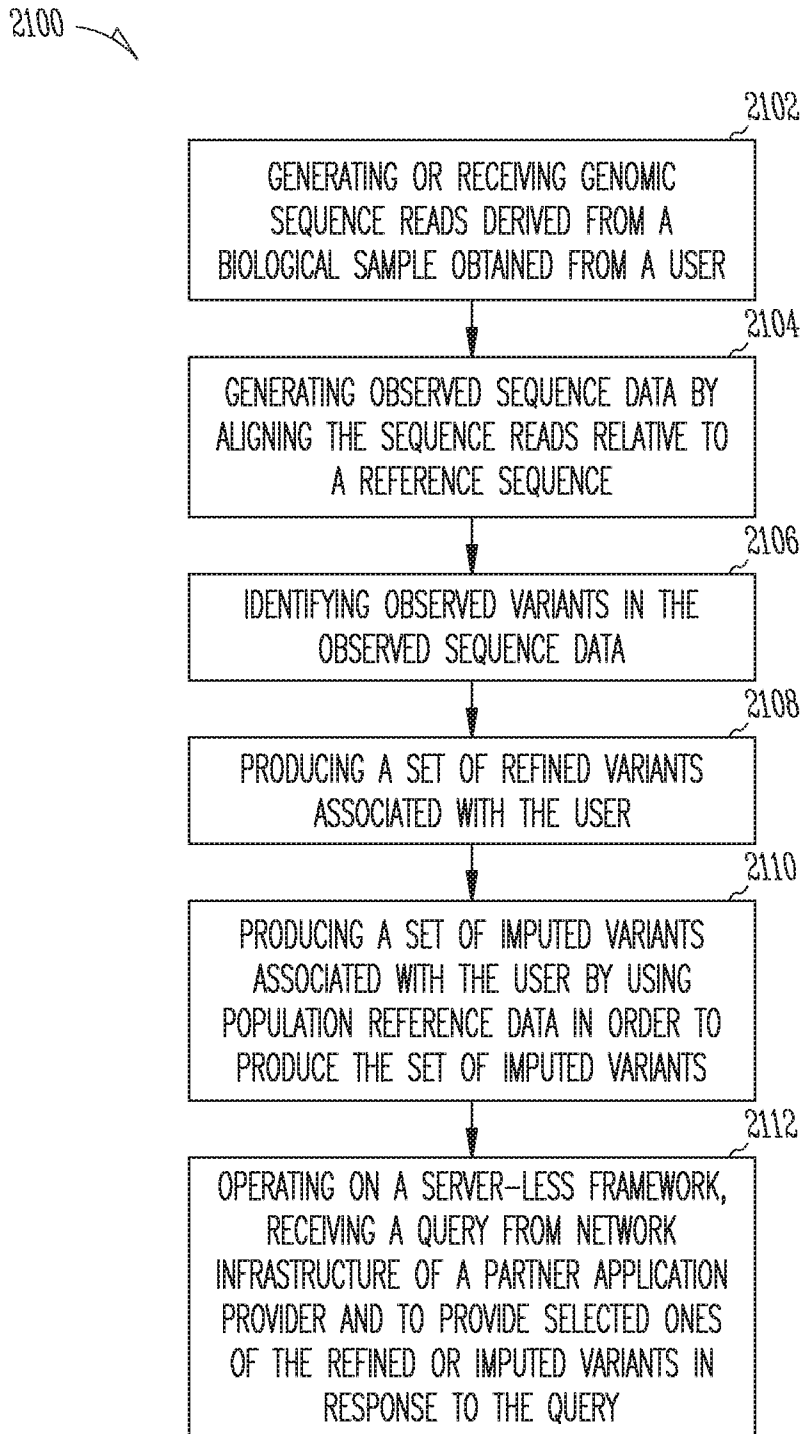
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*Fig. 19*

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*Fig. 20*

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*Fig. 21*