

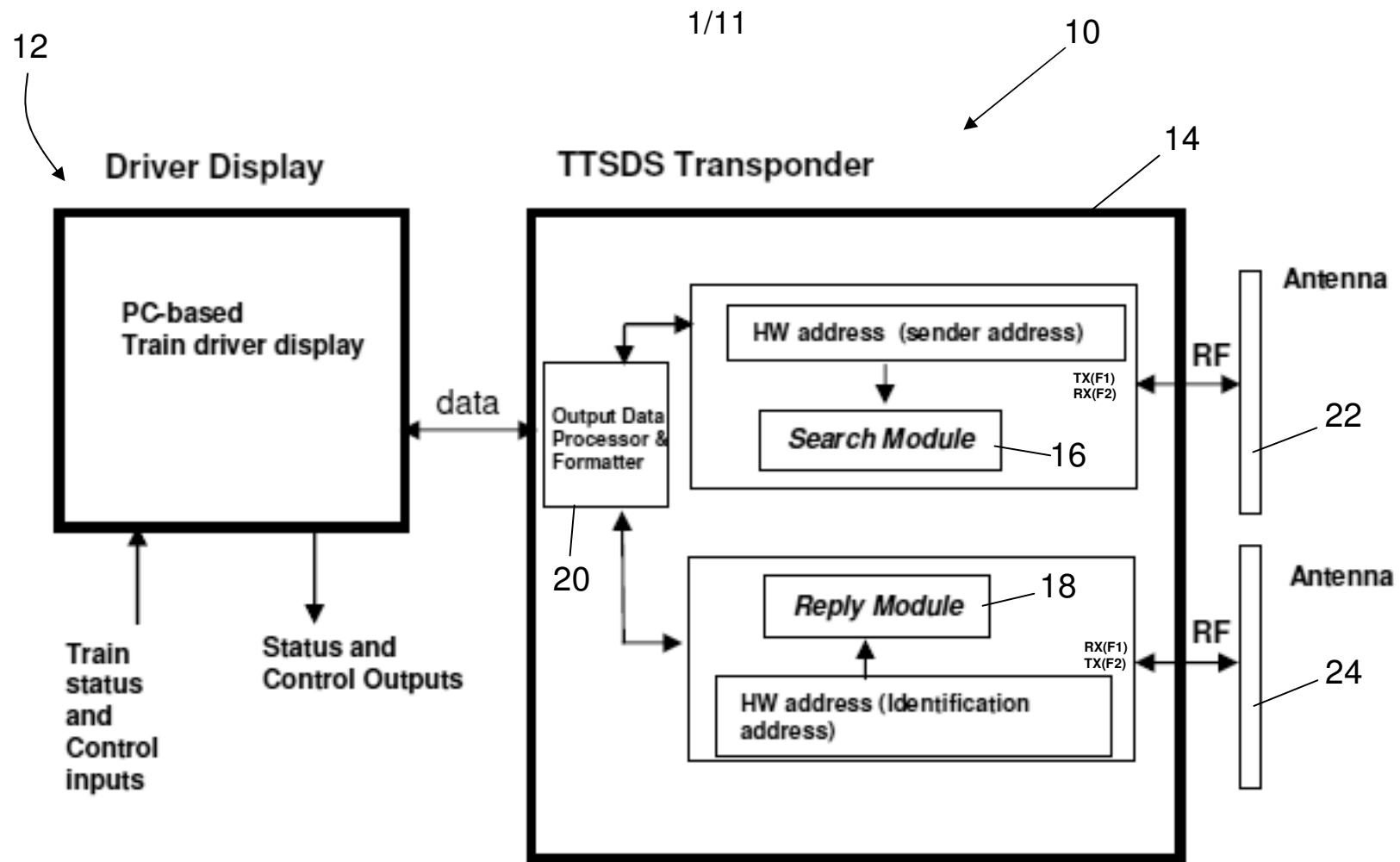


FIG. 1

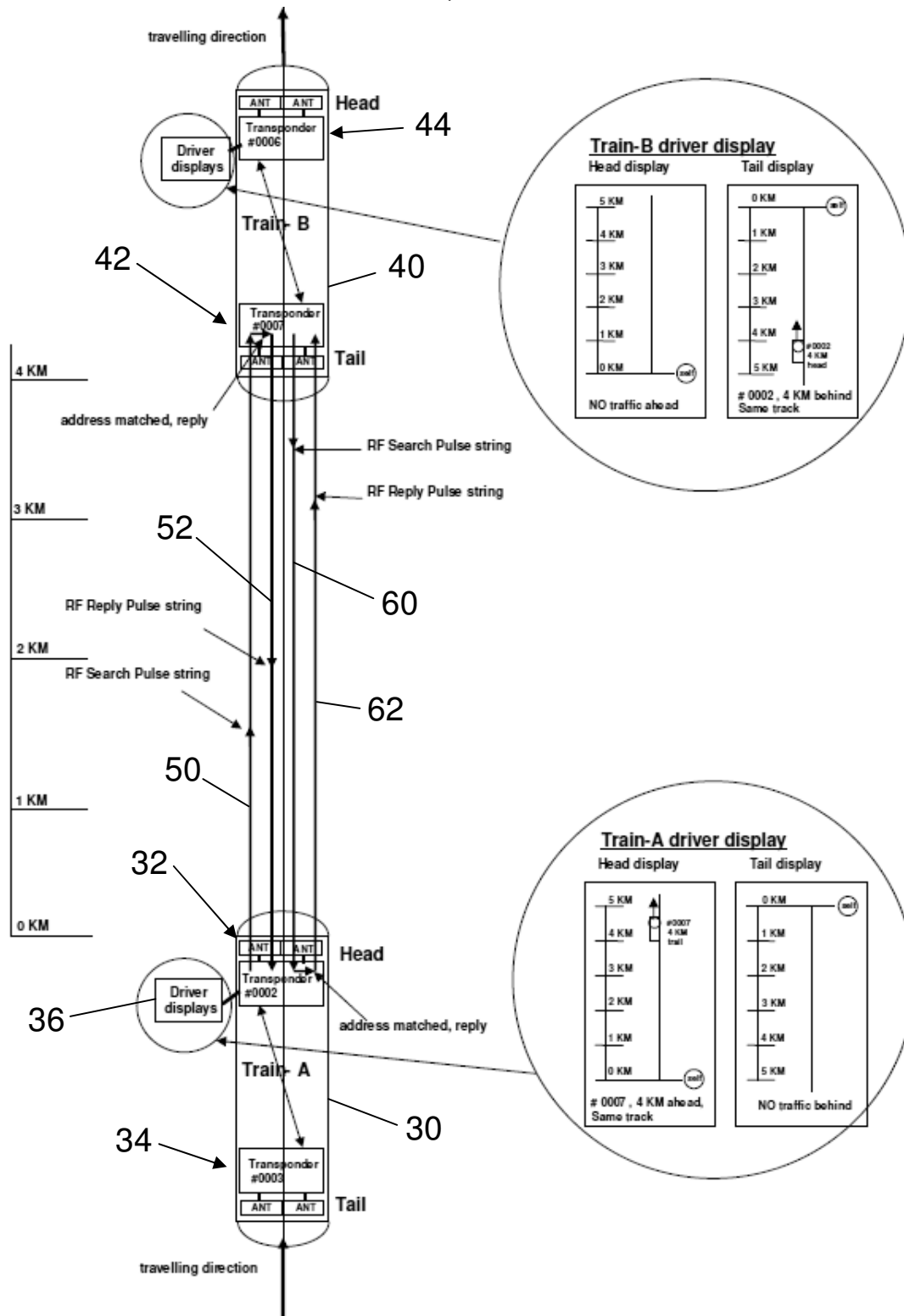


Fig. 2

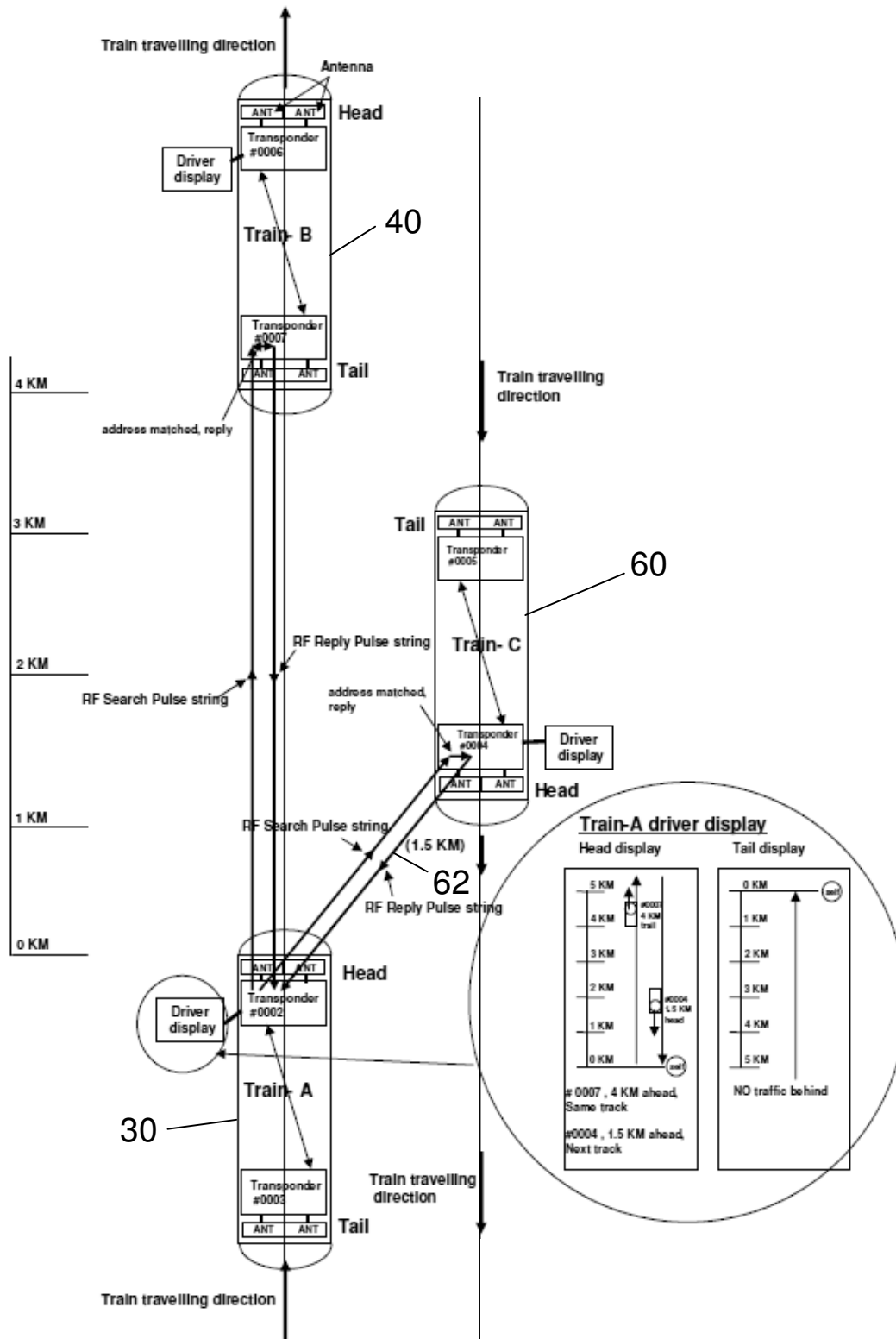


FIG. 3

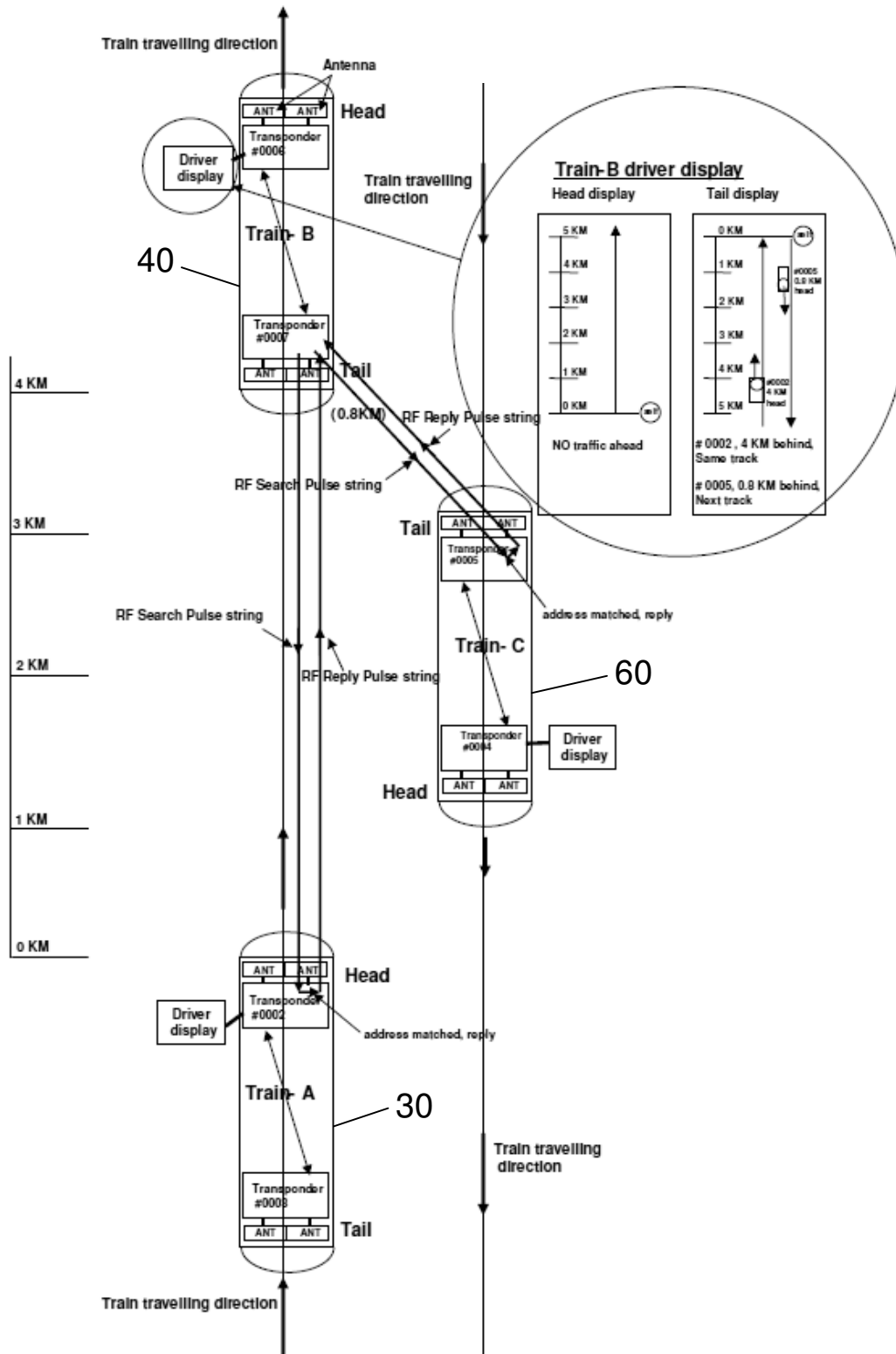


FIG. 4

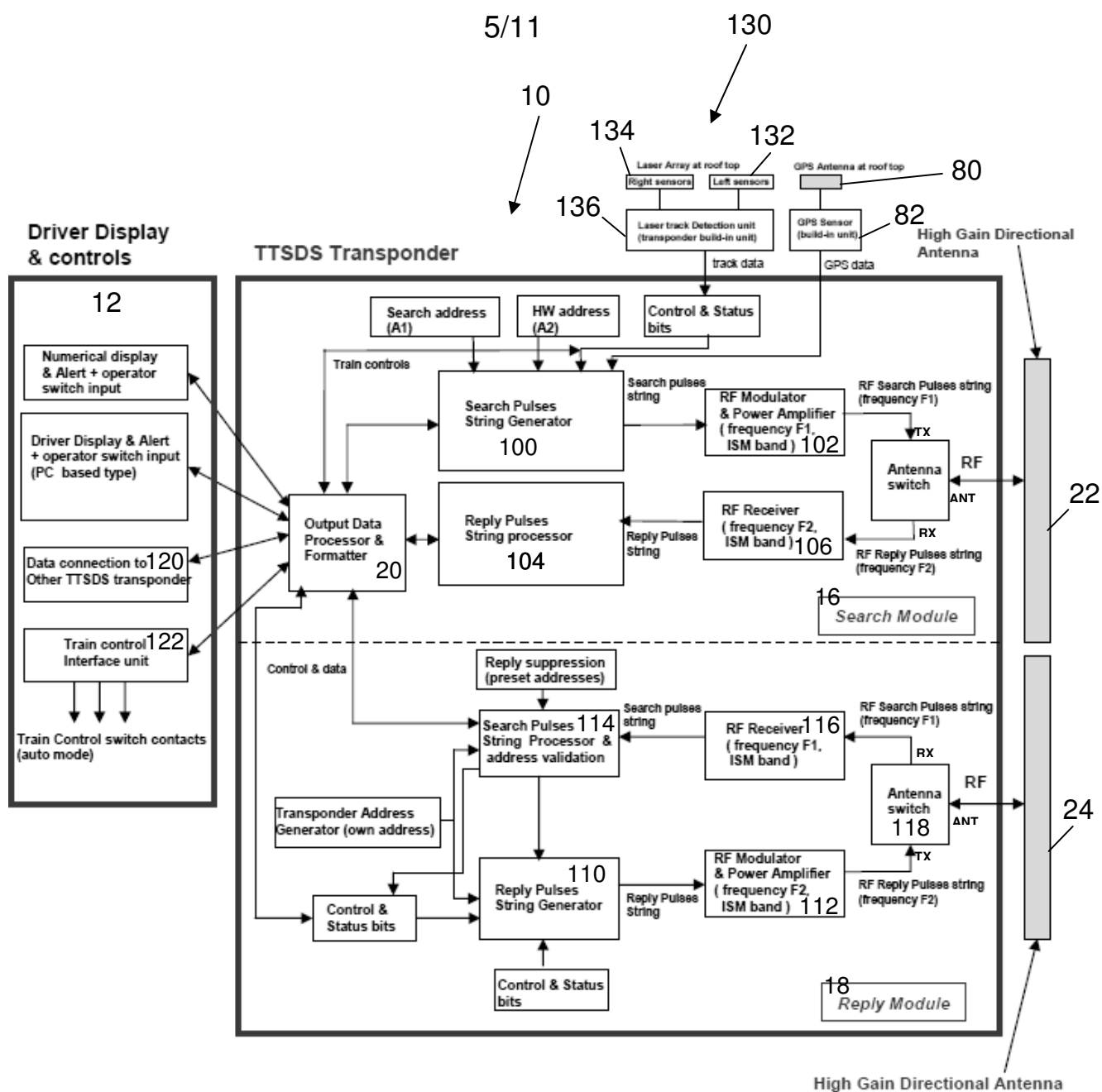
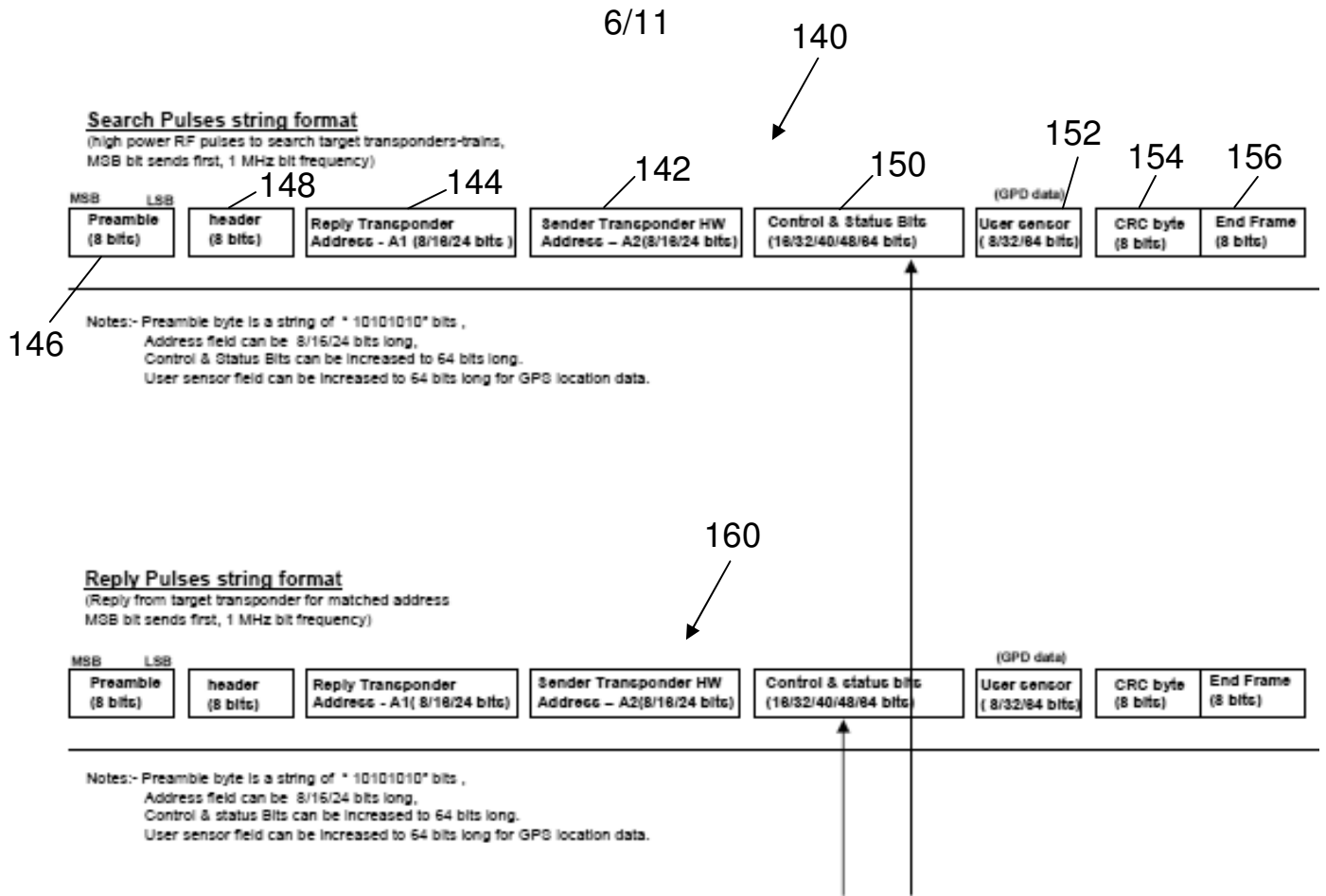


FIG. 5



Control & Status bits format (16/32/40/48/64 bits , programmable by user)

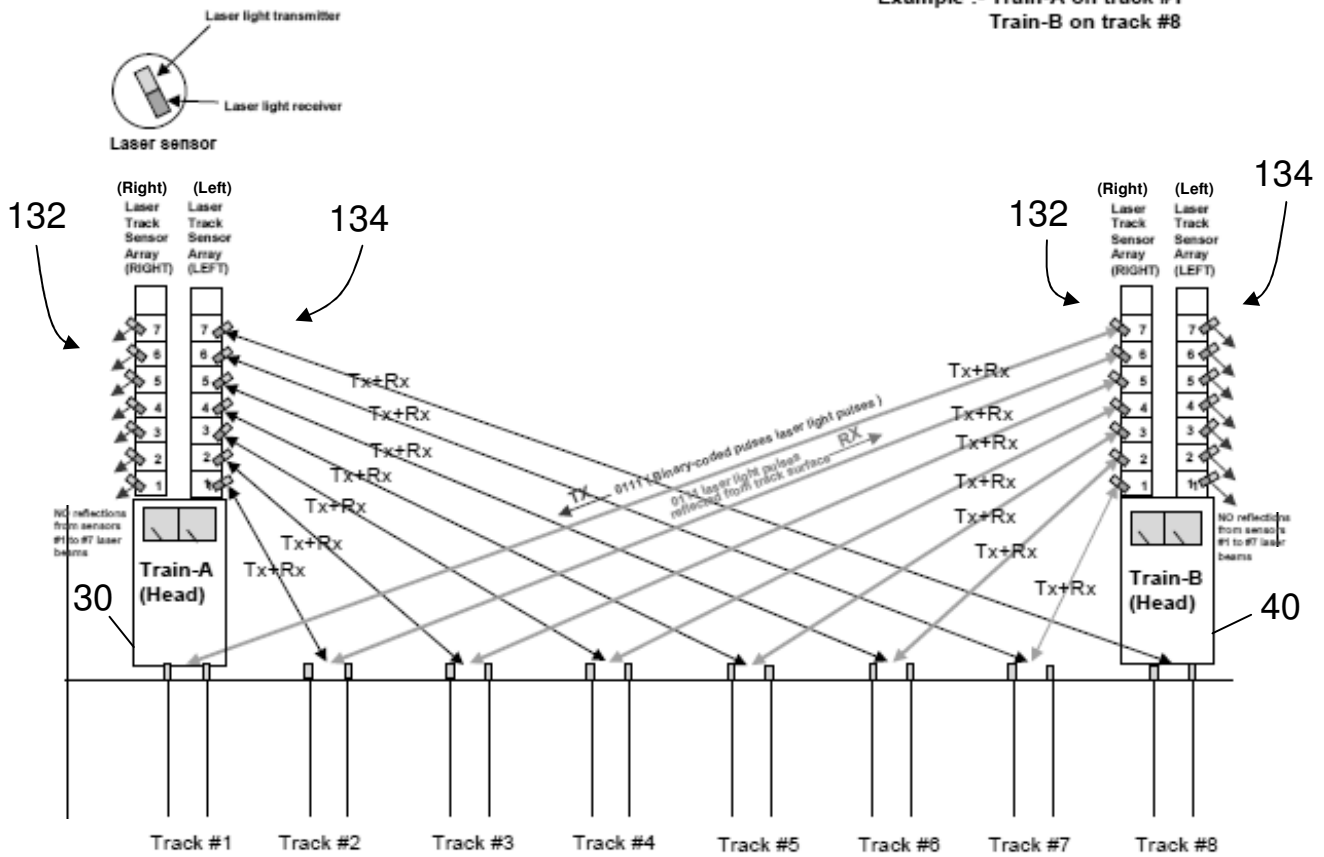
Example (40-bit control and status format) :-

Bit No.	size	Function/usage
Bit-1	1 bit	Reserved
Bit-2	1 bit	communication failure
Bit-3	1 bit	Electrical system failure
Bit-4	1 bit	Train stopped
Bit-5	3 bits	Train type
		0= passenger train
		1= cargo train
		2= maintenance train
		3= cross-country, none stop
		4= ????
		5= ????
Bit-8	6 bits	Length ,number of carriages (1 – 63 carriages)
Bit-14	1 bit	0= Front (train head) sensor, 1= Rear (train tail) sensor
Bit-15	1 bit	Emergency Stopped
Bit-16	4 bits	number of tracks at right (0 to 15 tracks)
Bit-20	4 bits	number of tracks at left (0 to 15 tracks)
Bit-24	4 bits	number of tracks detected (1 to 15 tracks)
Bit-28	1 bit	track data available (1=valid track data , 0= no track data)
Bit-29	1 bit	reserved
Bit-30	4 bits	Platform Number (0 to 15)
Bit-34	7 bits	reserved for train controls

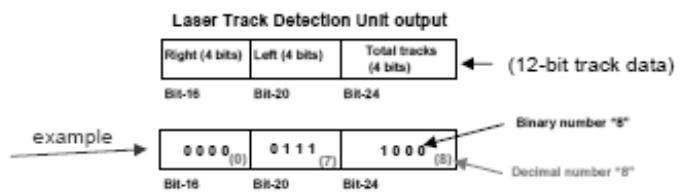
Track information output
from Laser Track Detection Unit

FIG. 6

Example :- Train-A on track #1
Train-B on track #8



Train-A :-
 Right sensor output = R 0000000
 Number of tracks at Right = 0
 Left sensor output = L 1111111
 Number of tracks at Left = 7
 Number of tracks detected = 0+7+1 = 8



Train-B :-
 Right sensor output = R 1111111
 Number of tracks at Right = 7
 Left sensor output = L 0000000
 Number of tracks at Left = 0
 Number of tracks detected = 7+0+1 = 8

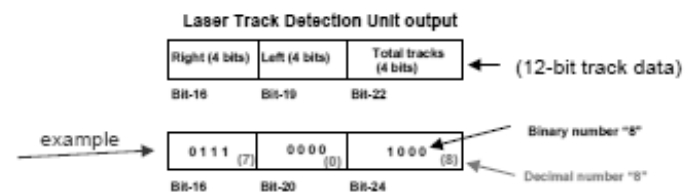


FIG. 7

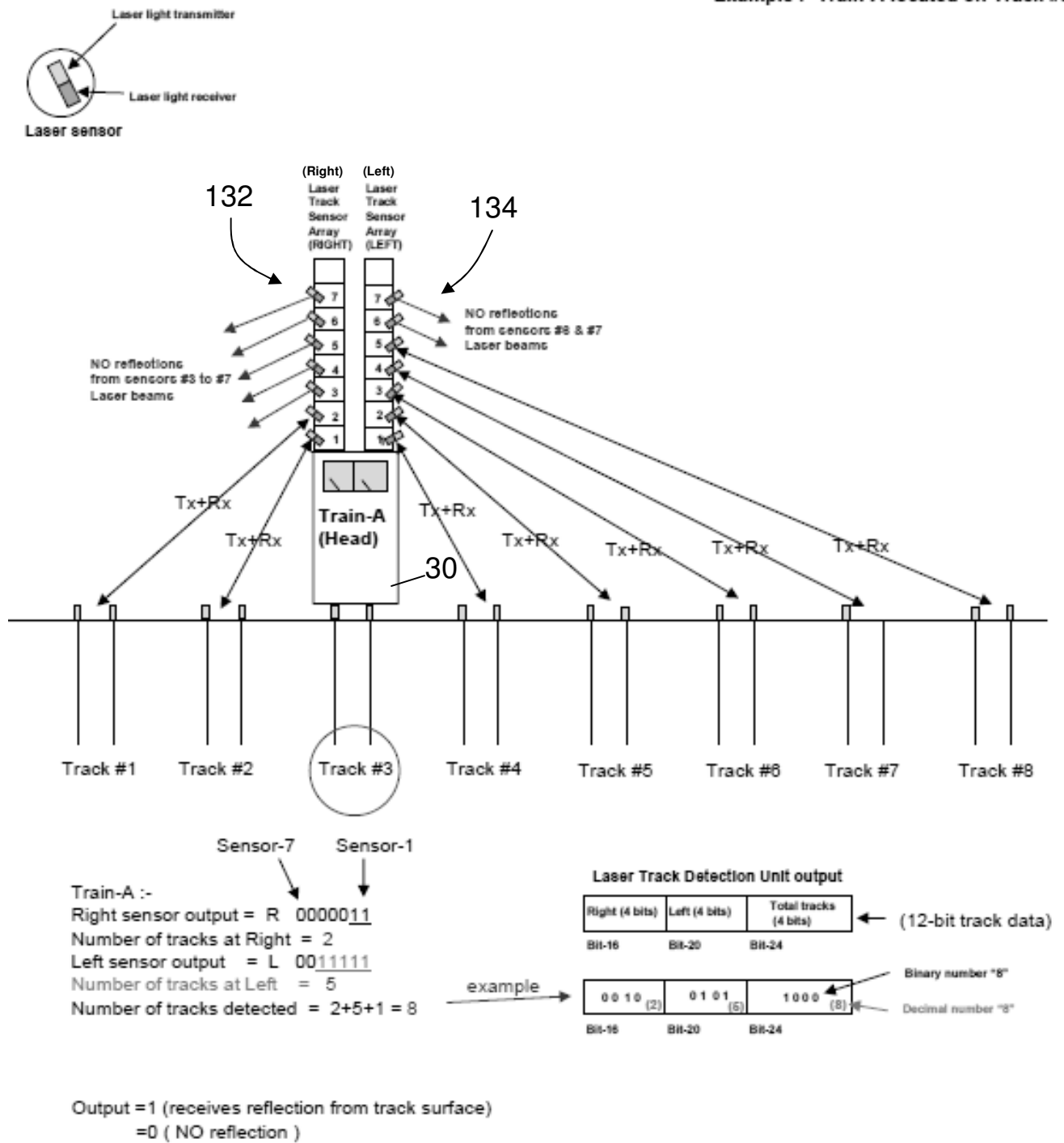
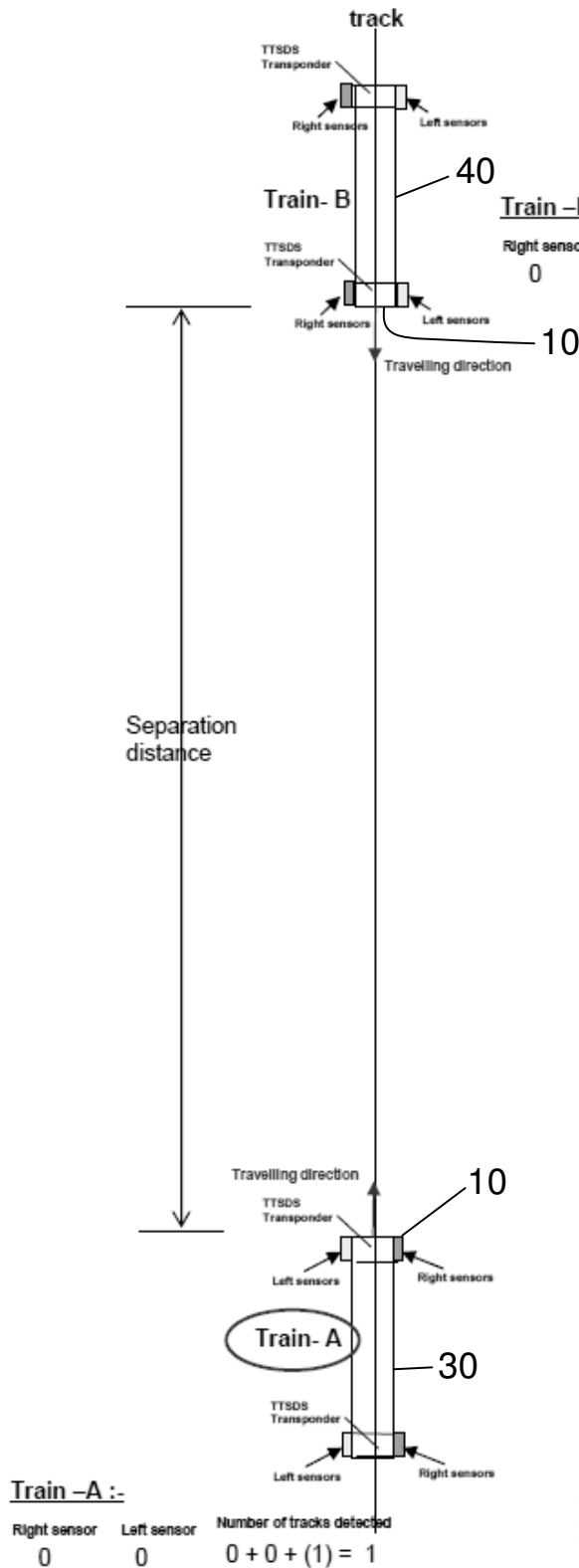


FIG. 8



**Case – 1 track zone,
Track as viewed by Train-A**

(The TTSDS Transponder-A will issue a Head-to-Head Collision Warning in this case.)

**TTSDS collision pre-warning logic (for Train-A) :-
Train-A issued the search**

Note : No need to swap opposite train sensor values for trains travelling in the same direction.

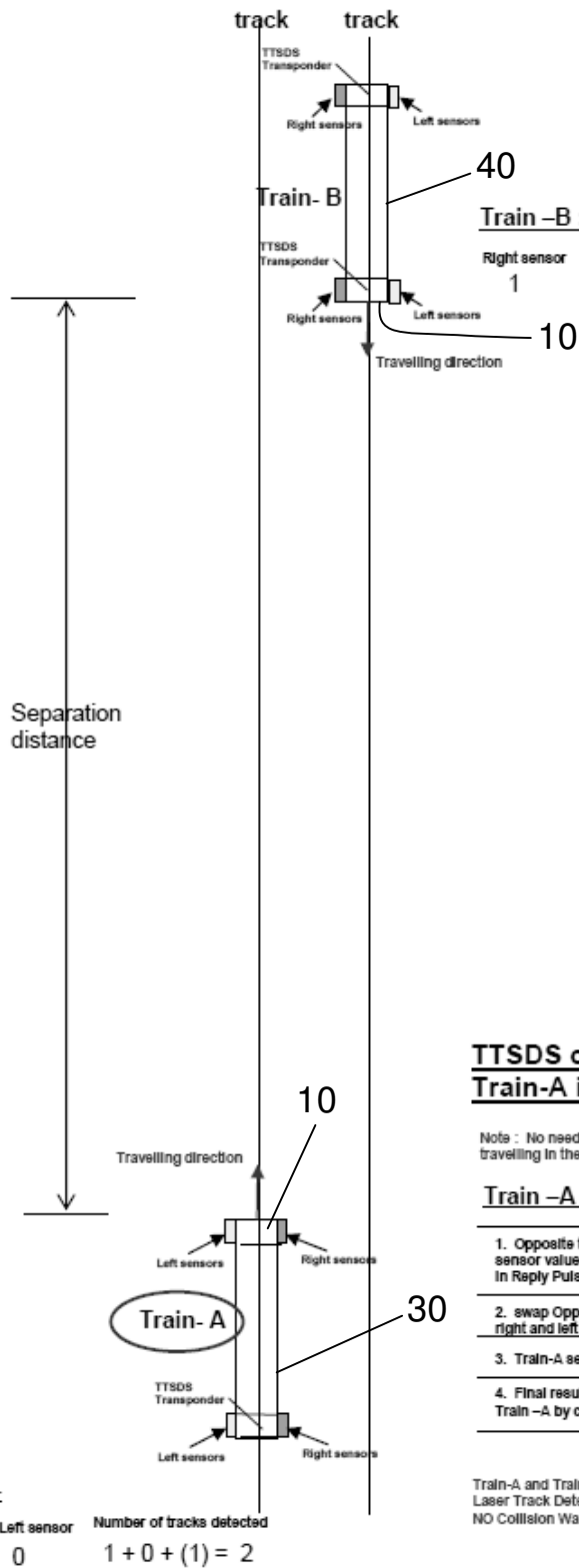
Train-A :-

	Right sensor	Left sensor	Number of tracks detected
1. Opposite train-B sensor value as reported in Reply Pulses string	0	0	$0 + 0 + (1) = 1$
2. swap Opposite sensor right and left values (see note)	0	0	$0 + 0 + (1) = 1$
3. Train-A sensor values	0	0	$0 + 0 + (1) = 1$
4. Final result as viewed by Train-A by comparison	same	Same value	1 track

Train-A and Train-B are travelling in Opposite Direction on the Same Track as detected by the Laser Track Detection Unit.
The TTSDS Transponder will issue a Head-to-Head Collision Warning.

Fig. 9

10/11



Case - 2 tracks zone,
tracks as viewed by Train-A

NO Collision Warning
issued by TTSDS Transponder-A

Train-B :-

Right sensor	Left sensor	Number of tracks detected
1	0	$1 + 0 + (1) = 2$

TTSDS collision pre-warning logic (for Train-A) :- Train-A issued the search

Note : No need to swap opposite train sensor values for trains travelling in the same direction.

Train-A :-

	Right sensor	Left sensor	Number of tracks detected
1. Opposite train-B sensor value as reported in Reply Pulses string	1	0	$1 + 0 + (1) = 2$
2. swap Opposite sensor right and left values (see note)	0	1	$0 + 1 + (1) = 2$
3. Train-A sensor values	1	0	$1 + 0 + (1) = 2$
4. Final result as viewed by Train-A by comparison	different		Different value

Train-A and Train-B are travelling in opposite direction on (Different tracks) as detected by the Laser Track Detection Unit.
NO Collision Warning Issued by TTSDS Transponder.

FIG. 10

Example for Train-A (head transponder) searches Train-B (tail transponder)

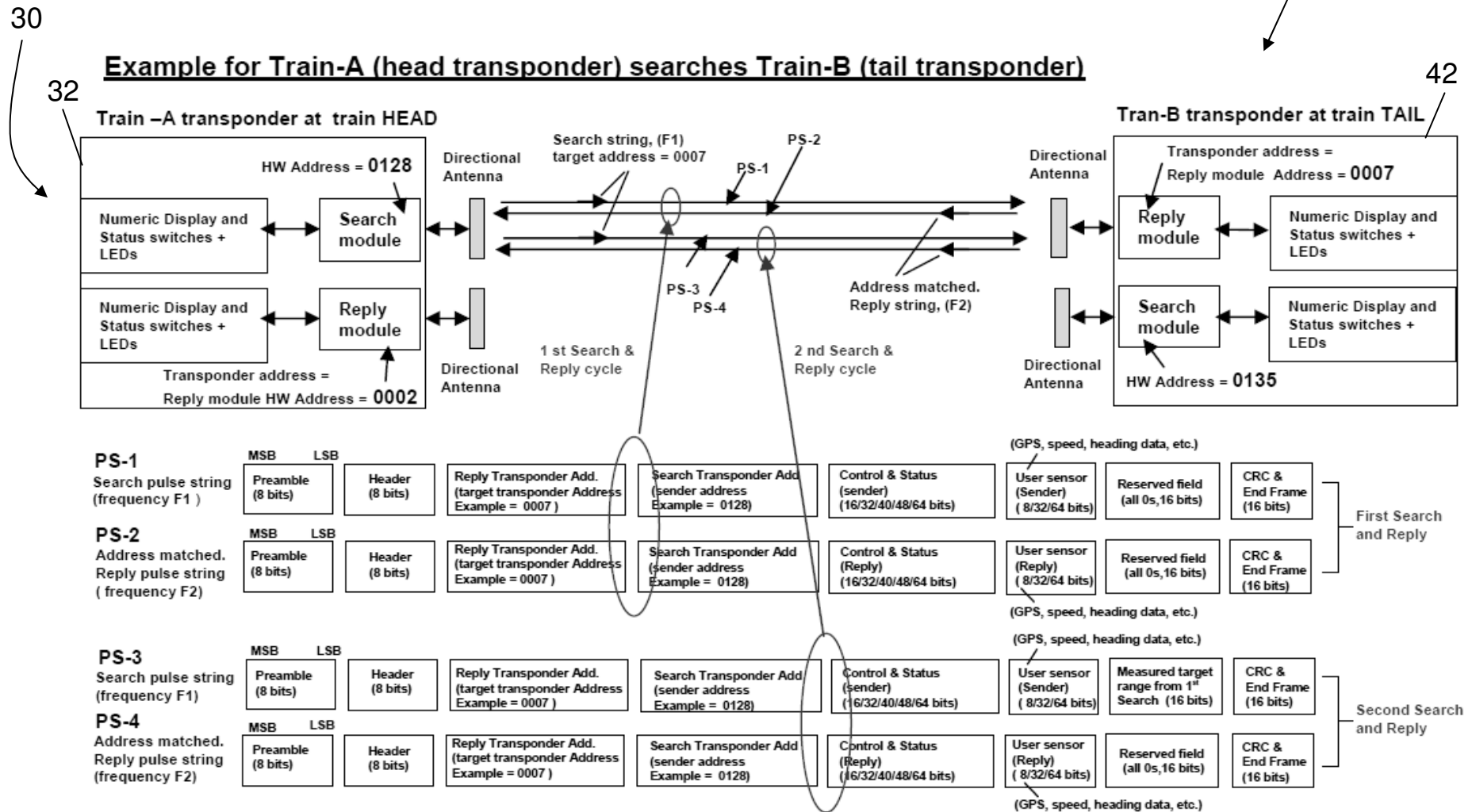


Fig. 11