Chapter 3

GUNNERY EQUIPMENT

(Completely revised)

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DESCRIPTION

Introduction

1. Gunnery equipment on this aircraft consists of two Hispano 20 mm. No.4, Mk.5 guns installed in the nose of the aircraft in a B.P. Type N, Mk.1 mounting. Ammunition for the guns is stowed in two ammunition boxes, one for each gun, and transferred along feed tracks which incorporate feed assisters, to a belt feed mechanism on each gun. Approximately 195 rounds are accommodated in each ammunition box, approximately 100 rounds in each track system, and approximately 18 rounds in each belt feed mechanism.

2. Two independent ammunition systems, one for each gun, are contained within the nose section of the aircraft. One system is fitted on the port side and one on the starboard; the port system feeds the starboard gun and the starboard system feeds the port gun.

3. On certain aircraft roles, the guns and ammunition systems are removed, provision being made on the port side for the fitment of pyrotechnic stowages. To cater for the weight loss due to the gun removal, removable ballast weight stowages are fitted in the nose of the aircraft.

4. Information on the pyrotechnic stowages is given in Chapter 1 of this Section and full descriptive details of the gun mounting and that part of the ammunition system on the gun mounting is given in A.P.2796N, Vol.1 and Vol.5.

AMMUNITION BOXES

Port box

5. The port ammunition box is mounted

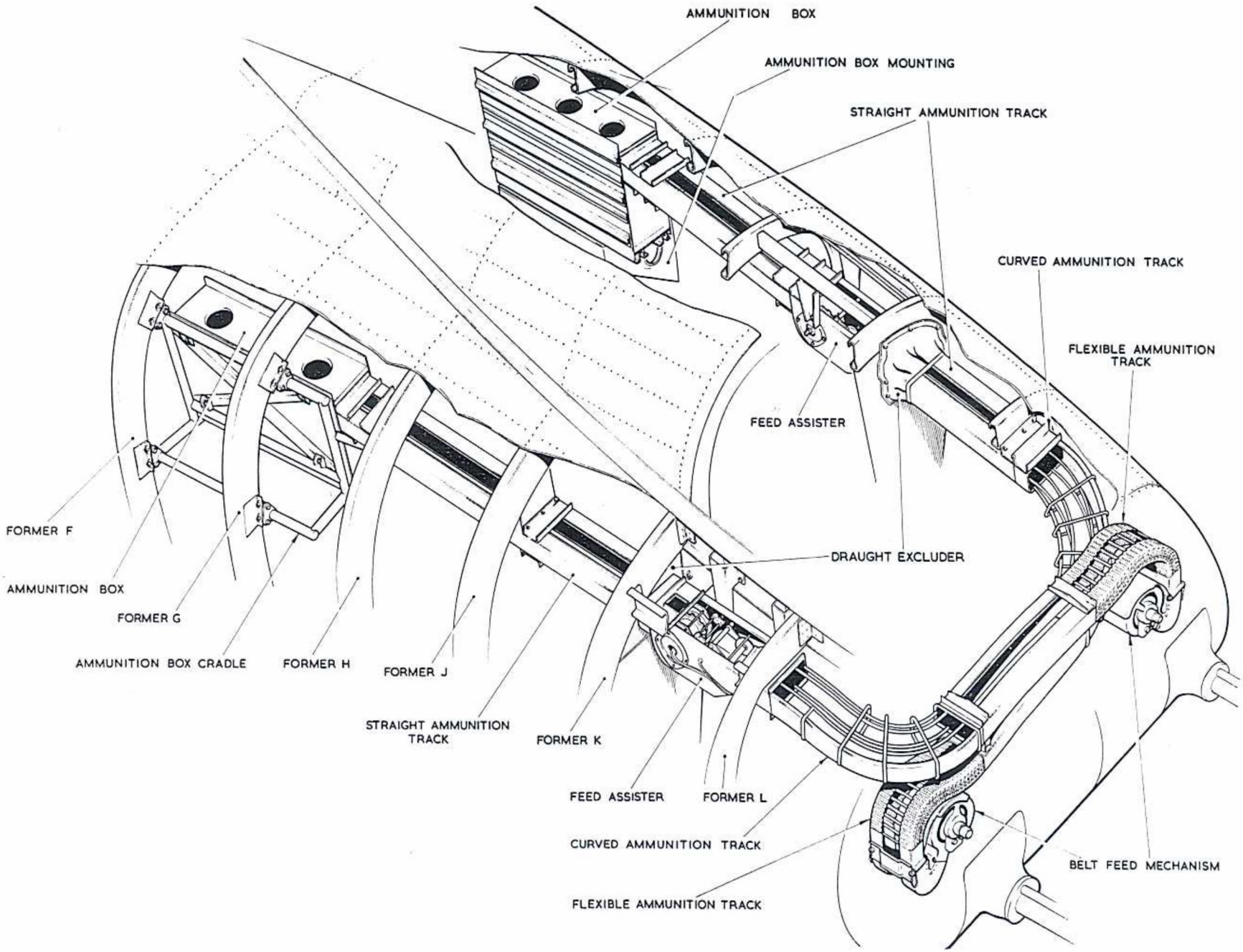

Fig. I. Ammunition system.

RESTRICTED

on a support structure secured to formers F and G. It is secured to top-hat section members on the support structure by eight bolts, four on the bottom and four on the outboard face. When the box is removed from the aircraft five pyrotechnic stowages can be fitted to the support structure.

Starboard box

6. This box is secured to formers F and G by a tubular steel cradle. The box is secured in position on the cradle by eight bolts, four on the bottom and four on the outboard face. The complete assembly is fitted in the aircraft with each of the four cradle attachments points being secured by two bolts and mounting brackets to pick-up points on the formers.

AMMUNITION TRACKS

General

7. The ammunition is supported in a series of tracks in its travel from the ammunition boxes to the belt feed mechanisms on the guns. Each system comprises a straight track, a curved track and a flexible track; the curved and flexible tracks being part of the Type N, Mk.1 gun mounting. The port and starboard systems vary as described in the following paragraphs.

Port system

8. In the port system the straight track is in two sections with a feed assister interposed between. The rear section connects the ammunition box to the feed assister which is bolted to mounting brackets on former K and on intercostals between formers J and K. From the feed assister the front section of straight track leads to former L, where it is bolted to the former and the curved track. From former L the curved track connects to the flexible track which in turn is connected to the belt feed mechanism of the starboard gun. A neoprene proofed fabric gaiter, secured to the bulkhead at former K, fits snugly around the track to act as a draught excluder. When the ammunition system is removed the draught excluder is replaced by a flat metal plate sealed to the bulkhead with a sponge rubber seal.

Starboard system

9. In the starboard system the single track connects the ammunition box to the feed assister and is supported by being bolted to a mounting bracket on former J. The feed assister is secured, by bolts, to mounting brackets on intercostals between formers K and L. A draught excluder, fitted to the bulkhead at former K, comprises of two synthetic-resin bonded fabric sheets shaped to fit snugly around the track. When the ammunition system is removed the draught excluder is replaced by a flat metal plate sealed to the bulkhead with a sponge rubber seal. From the front of the feed assister the curved track connects to the flexible track which in turn connects to the belt feed mechanism of the port gun.

Feed assisters

10. The electrically-operated feed assisters provide a power-driven belt feed from the ammunition boxes to the belt feed mechanisms on the guns. Each feed assister is automatically operated by the belt tension between the assister and the gun. When the gun commences firing, the belt tightens and lifts tension wheels causing an adjuster screw to operate a micro switch and so start the assister electric motor. The motor drives sprocket wheels to feed the belt to the gun. If the rate of feed is greater than the rate of fire, the belt slackens allowing the tension wheels to be pulled down by a tension spring 'breaking' the micro switch to stop the motor. The feeding of the belt is intermittent but the sequences are so close together that the feed appears to be continuous. To prevent the belt bunching inside the assister when the motor stops, two pivoted guides are retained in contact with the belt by a spring-loaded plunger.

BALLAST

11. Ballast, in the form of lead weights carried in two removable cradles, is fitted in the nose of the aircraft as replacement weight for the two Hispano 20 mm. guns. The ballast cradles are fitted in the apertures to the empties boxes, after the empties chutes have been removed, secured by four bolts, two forward and two rear. The two forward attachment bolts pass through attachment plates, bolted to the cradle side channel members, to engage anchor nuts on the gun beam. The two rear bolts pass through the bottom flange of the cradle side members and the gun beam rear cross member and are fitted with a plain washer, spring washer and stiffnut; the plain washer is fitted between the spring washer and the gun beam cross member.

12. The ballast weights are fitted in two rows, a maximum of eleven in the bottom portion of the cradle and a maximum of twenty in the top portion. The bottom weights are secured by two buffer plates, one each side, secured by bolts fitted with spring washers to the cradle side members. The top weights are fitted on a threaded guide bar located in two bushes, one on the rear face of the cradle and one on the forward face. The guide bar is locked to the rear bush by a shackle pin and split pin. The ballast weights are fitted on to the guide bar from front to rear and secured by two nuts bearing against the rear face of the rear ballast weight. Two clamping plates, one bolted on the top flange of each cradle side member, also secure the top ballast weights.

PYROTECHNIC STOWAGES

13. Pyrotechnic stowages are fitted on the port side of the aircraft nose section, between formers H and J and on the ammunition box mounting structure as des-

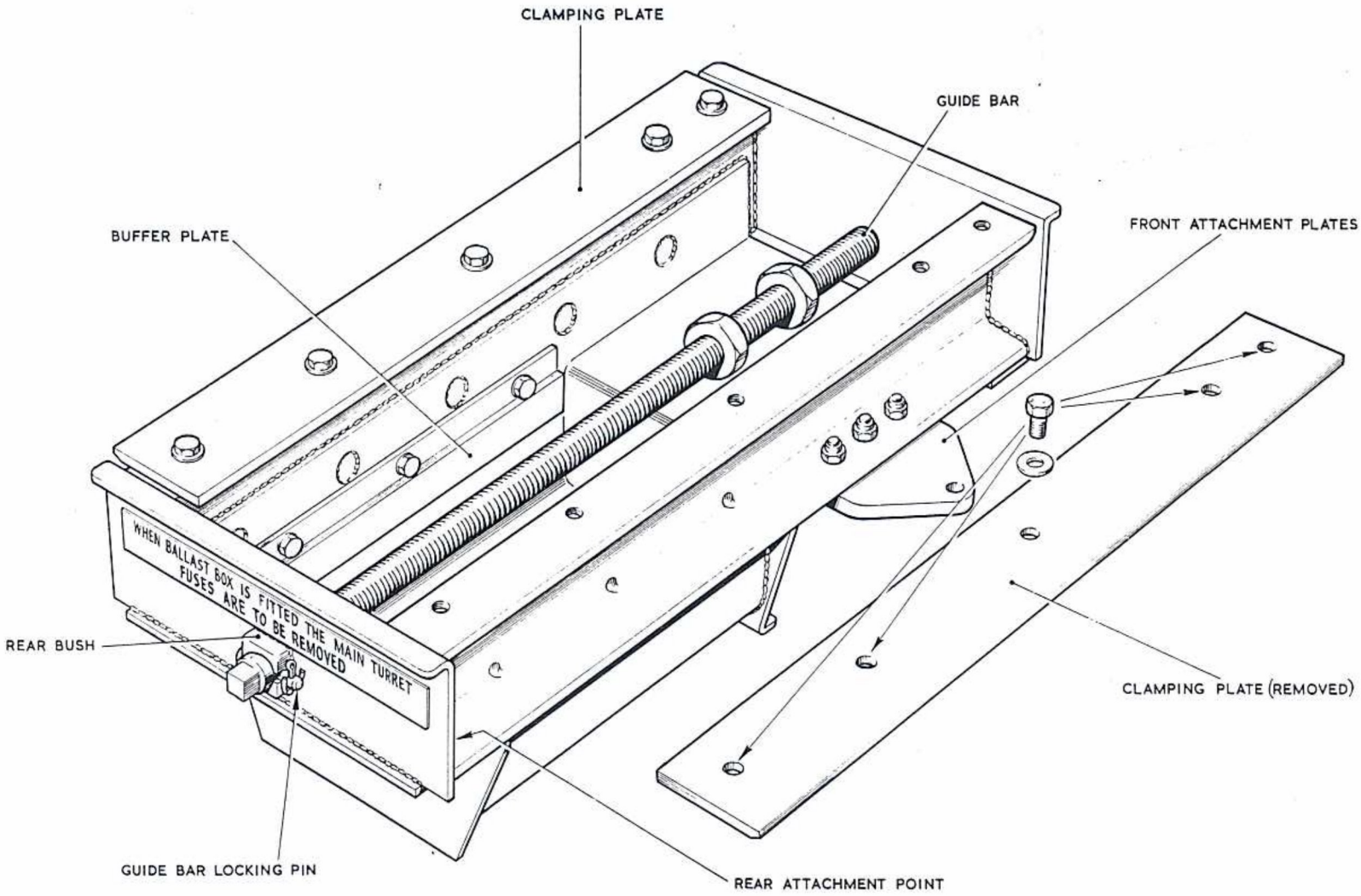

Fig. 2. Ballast cradle

cribed in Chap.1 of this Section. The stowages between formers H and J are in two portions, the upper portion carrying three stores can only be fitted when the ammunition system has been removed. The stowages, for five stores, fitted on the top of the ammunition box stowage can only be fitted when the ammunition system has been removed.

SERVICING

General

14. Servicing the ammunition system must be done in accordance with the instructions in Vol.5 of this Air Publication.

Servicing the BP., Type N, Mk.1 gun mounting must be done in accordance with the instructions in A.P.2796N, Vol.1 and Vol.5. The points illustrated in this chapter must be lightly lubricated using oil OM-13.

REMOVAL AND ASSEMBLY

General

15. The following paragraphs give the procedures for the removal and assembly of the ammunition system, the pyrotechnic stowages which replace the ammunition system, the ballast cradles, and the guns. Prior to commencing any operation, isolate, electrically, the nose gun installation by removing fuse BP9 from the air bomber's panel.

GUNS

General

16. If an aircraft sortie is being undertaken without guns fitted, lead ballast weights must be fitted in the ballast cradles. The following paragraphs give the procedure for removing the guns, fitting the ballast cradles and lead weights, and also gives the reverse procedure.

Gun removal

17. Instructions for removing the guns from the mounting are given in A.P.2796N, Vol.1 and Vol.5. Removal of the gun mounting and its associated equipment is also given in that A.P. To remove the guns from the interior of the aircraft nose section proceed as follows:-

(1) Adjust both pilots' seats to the same height and secure the gun hoist (Ref.No.26FP/419) to the attachment points on the seats, with the Pip-pins attached to the hoist.

(2) Open the top and bottom doors of the parachute escape hatch situated in the structure between the pilots' seat platforms.

(3) Thread the rope, attached to the hoist, around the pulley on the hook, sling (Ref.No.26FP/421) and over the pulley on the hoist.

(4) Fit the sling around the gun and, using the hoist, lower the gun, muzzle first, through the escape hatch.

(5) Fit the blanking covers, Ref. No.26FP/14806 port and Ref. No.26FP/14807 starboard, over the gun apertures in the nose barbette fairing. The covers locate under a retaining angle on the outboard side and are secured to the barbette fairing with 2 B.A. mushroom head bolts and plain washers.

The hoist (Ref.No. 26FP/419) is also used in conjunction with a grab (Ref.No. 26FP/420) to raise boxes of ammunition through the escape hatch. The ammunition must then be transferred to the aircraft ammunition boxes as laid down in A.P.2796N, Vol.1 and Vol.5.

Fitting a ballast cradle

18. To fit the ballast cradle (Part No.3/Z9409) weighing approx. 32·5 lb. in the aperture to the empties box in the gun beam proceed as follows:-

(1) Remove the five 2 B.A. mushroom-head bolts securing the empties chute in the aperture to the empties box. Remove the empties chute.

(2) Position the ballast cradle in the aperture to the empties box and secure the two forward attachment brackets to the anchor nuts on the gun beam with ¼ in. B.S.F. bolts (Ref.No.28D/1011240) and plain washers. Secure the rear of the cradle with ¼ in. B.S.F. bolts, (Ref.No.28D/1011242), spring washers, plain washers and stiff-nuts, one bolt passing through the bottom flange of each side member and the gun beam rear cross-member.

NOTE...
At each rear attachment the plain washer must be fitted between the gun beam cross member and the spring washer.

Fitting the ballast weights

19. The ballast weights (Part No.7/Z9409), of approximately 10 lb. each in

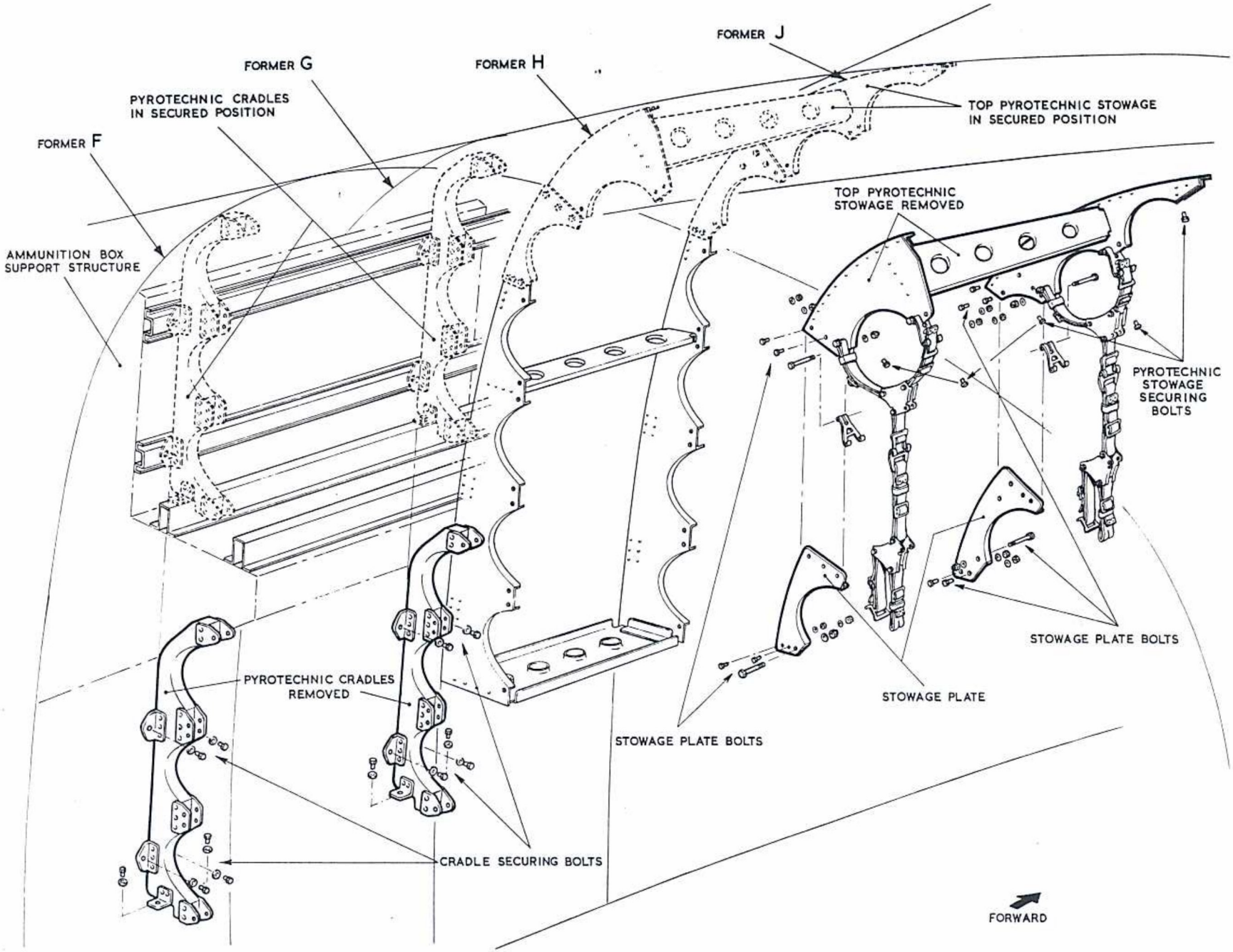

Fig.3. Pyrotechnic stowages

weight, are fitted in the cradle in two rows, one above the other. Eleven weights can be fitted in the bottom row and twenty in the top row, this gives a maximum of sixty two weights in the two cradles. The bottom row must always be fitted first unless the number of weights to be fitted does not fill the bottom portion of the cradle, in this case the weights must be fitted on the guide bar in the top portion of the cradle. The amount of ballast to be fitted is dependent on the aircraft loading and must be calculated to ensure that the aircraft C.G. remains within limits during all stages of a sortie, information on calculating the ballast requirement is given in Sect.2, Chap.3 of this Book. To fit the ballast weights proceed as follows:-

Bottom row

(1) Remove the guide bar op.(6) and (7).

(2) Remove the three ¼ in. B.S.F. bolts and spring washers securing each buffer plate to the cradle side members. Remove the buffer plates.

(3) Remove the four ¼ in. B.S.F. bolts and spring washers securing each clamp plate to the top flange of each side member of the cradle. Remove the clamp plates.

(4) Fit ballast weights to completely fill the bottom portion of the cradle, fit the buffer plates using the bolts and washers removed in op.(1).

NOTE...
If the number of weights required does not fill the bottom portion they must be fitted on the guide bar in the upper portion.

Top row

(5) Remove the four ¼ in. B.S.F. bolts and spring washers securing each clamp plate to the top flange of each side member of the cradle. Remove the clamp plates.

(6) Remove the split pin and shackle pin securing the guide bar to the bush on the rear face of the cradle.

(7) Unscrew the guide bar from the threaded bush on the forward face of the cradle and withdraw the bar to enable the fitment of weights. As the number of weights increases, screw the two nuts, on the guide bar, rearward.

(8) When the required number of weights is fitted, engage the guide bar with the threaded bush and screw the guide bar until the shackle pin removed in op.(6) can be fitted. Lock the shackle pin with a split pin.

NOTE...
If a new guide bar has to be fitted, screw the guide bar into the threaded bush until 0.18 in. of threaded portion protrudes beyond the forward face of the bush, then drill through the guide bar from the hole in the rear bush and fit the shackle pin.

(9) Push the weights to the forward end of the guide bar and secure them tightly in position using the two nuts on the guide bar.

(10) Fit the clamp plates removed in op.(5).

Gun assembly

General

20. The following paragraphs give the sequence for removing the ballast weights and the ballast cradles, and fitting the guns.

Ballast weight removal

21. It is recommended that the ballast weights be removed prior to removing the ballast cradles. To remove the weights proceed as follows:-

Top row

(1) Remove the ¼ in. B.S.F. bolts and spring washers securing each clamp plate to the top flange of each side member of the cradle. Remove the clamp plates.

(2) Undo the two nuts which secure the weights at the forward end of the guide bar.

(3) Remove the split pin and shackle pin securing the guide bar to the bush on the rear face of the cradle.

(4) Unscrew the guide bar from the threaded bush on the forward face of the cradle.

(5) Remove the ballast weights from the guide bar.

Bottom row

(6) Remove the two nuts from the guide bar and withdraw the guide bar from the stowage.

(7) Remove the three ¼ in. B.S.F. bolts and spring washers securing each buffer plate to the cradle side members. Remove the buffer plate.

(8) Remove the ballast weights.

(9) Fit the buffer plates removed in op.(7).

(10) Fit the guide bar ensuring that the two nuts are fitted. Lock the guide bar with the shackle pin and lock the shackle pin with the split pin.

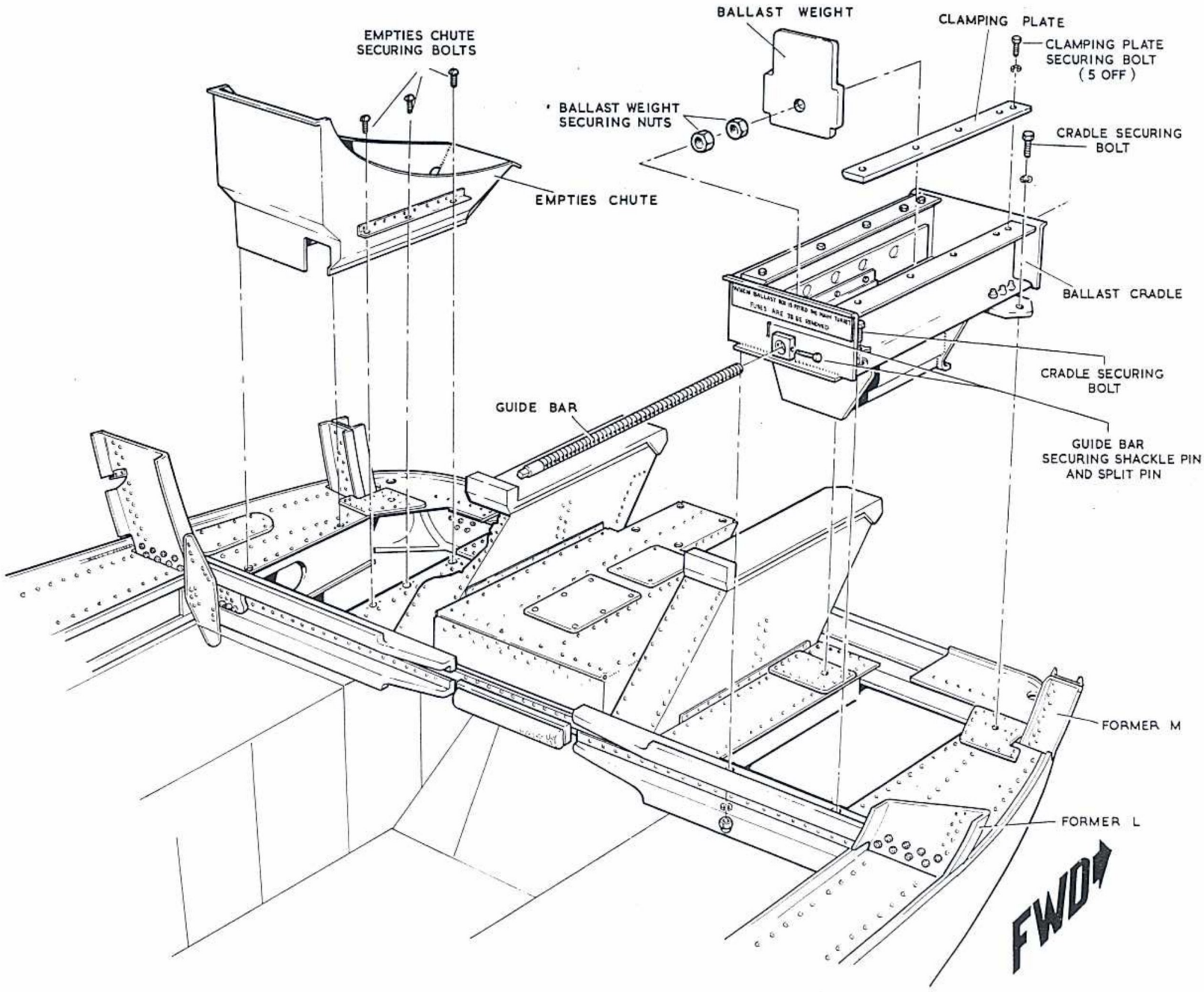

Fig. 4. Ballast cradle installation

(11) Fit the clamp plates removed in op.(1).

Ballast cradle removal

22. To remove the ballast cradle and fit the empties chute prior to fitting the guns proceed as follows:-

(1) Remove the ballast weights from the cradle (para.21).

(2) Remove the nuts, plain washers, spring washers and bolts securing the cradle side members to the gun beam rear cross member.

(3) Remove the bolts and plain washers securing the cradle forward attachment brackets to the anchor nuts on the gun beam.

(4) Lift the cradle from the aperture to the empties box and remove the cradle from the aircraft.

(5) Fit the empties chute in the aperture to the empties box and secure it using five 2 B.A. mushroom-head screws, three inboard and two outboard.

Fitting the guns

23. To fit the guns in the aircraft proceed:-

(1) Adjust both pilots' seats to the same height and secure the gun hoist (Ref.No.26FP/419) to the attachment points on the seats with the Pip-pins attached to the hoist.

(2) Open the top and bottom doors of the parachute escape hatch situated in the structure between the pilots' seat platforms.

(3) Position the gun under the escape hatch and fit the hook sling (Ref. No.26FP/421) to the gun.

(4) Thread the rope, attached to the gun hoist, around the pulley on the hoist sling and over the pulley on the hoist.

(5) By pulling on the rope, hoist the gun, breach first, up the escape hatch and into the aircraft.

(6) Remove the covers, Ref.No.26FP/14806 port and Ref.No.26FP/14807 starboard, from the gun apertures in the nose barbette fairing.

(7) Fit the guns to the mounting in accordance with A.P.2796N, Vol.1 and Vol.5.

AMMUNITION SYSTEM

General

24. The procedures in the following paragraphs give the sequence of removing the ammunition systems and fitting the additional pyrotechnic stowages and also give the reverse procedure when removing the pyrotechnic stowages and fitting the ammunition systems. The additional pyrotechnic stowages are only fitted on the port side of the aircraft nose section.

Port ammunition system removal

Box removal

25. To remove the port ammunition box from the mounting structure, ensure that all the ammunition is removed from the box, refer to fig.5 and proceed as follows:-

(1) Disconnect the straight ammunition track from the ammunition box neck by removing the four 2 B.A. bolts, stiffnuts and plain washers.

NOTE ...
The straight track must be supported after the attachments bolts are removed.

(2) Remove the four 2 B.A. bolts, plain washers and spring washers securing the outboard face of the box to the top-hat members on the support structure. These bolts engage threaded blocks on the diagonal stiffeners on the outboard face of the box (detail C).

(3) Remove the four 2 B.A. bolts, plain washers, and stiffnuts securing the bottom of the box to the top-hat members on the support structure.

(4) Lift the box clear of the support structure and remove it from the aircraft.

Track removal

26. This paragraph gives the procedure for removing the straight ammunition tracks and assister only. The curved and flexible tracks are removed with the gun mounting, instructions for the removal of which are given in A.P.2796N, Vol.1 and Vol.5. To remove the straight tracks and assister proceed as follows:-

(1) Remove the ammunition box (para.25).

(2) Isolate, electrically, the nose gun installation by removing fuse BP9 from the air bomber's fuse panel.

(3) Remove the electrical leads from the terminal block on the feed assister, tape back the leads and stow.

(4) Support the rear section of straight track and remove the four 2 B.A. bolts, plain washers and stiffnuts securing the track to the feed assister. Remove the track from the aircraft.

(5) Undo the zip fastener on the draught excluder on the front gunner's bulkhead. Remove the draught excluder by removing the bolts and washers securing it to

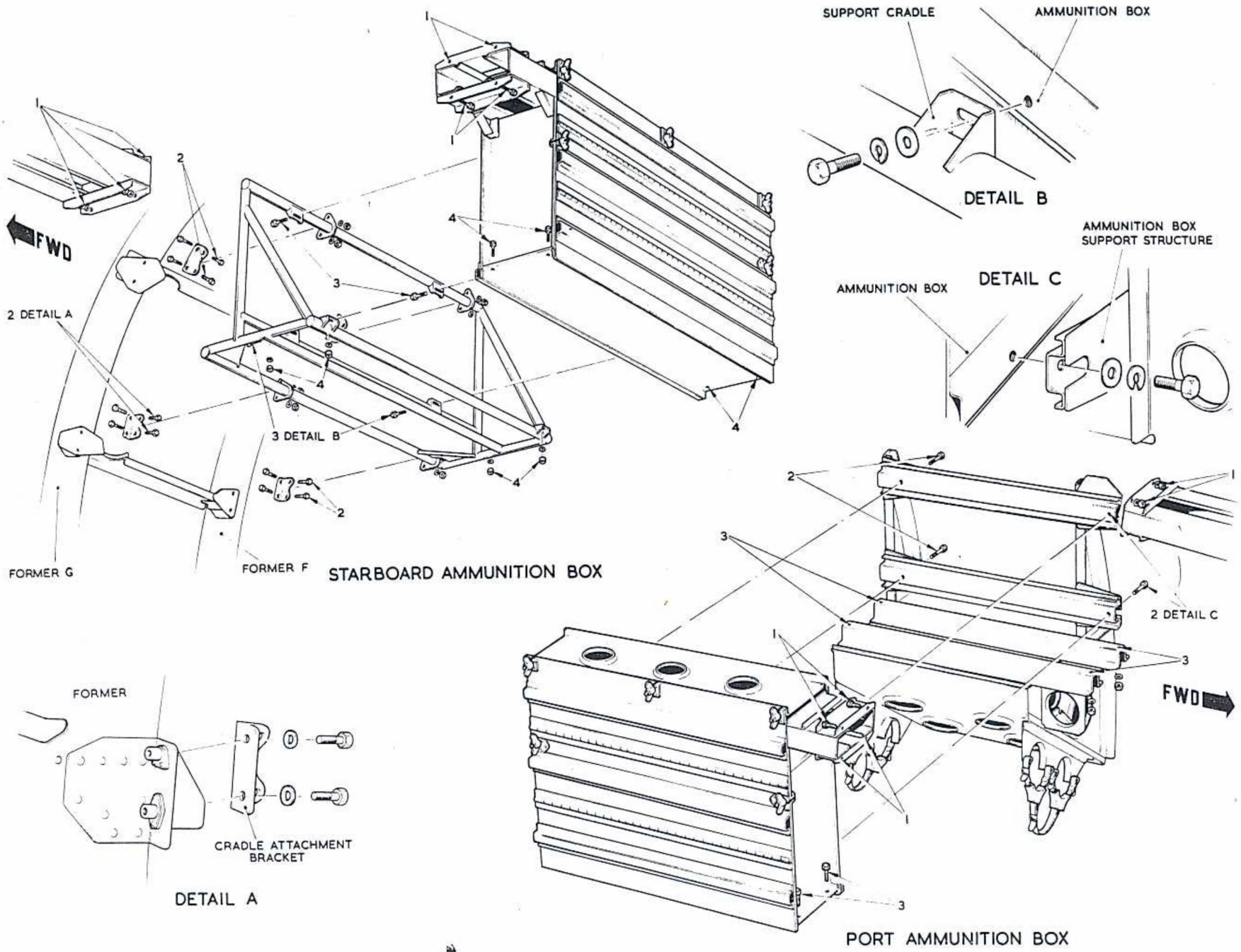

Fig. 5. Ammunition box removal.

the bulkhead. Retain the bolts and washers.

(6) Support the front straight track and remove the four 2 B.A. bolts, stiffnuts and plain washers securing the track to the feed assister.

(7) Remove the five 2 B.A. bolts, plain washers and stiffnuts securing the front straight track to the curved track and to former L. Remove the track from the aircraft.

(8) Remove the stiffnuts and plain washers from the tie-rods securing the feed assister to the mounting brackets. Remove the tie-rods and remove the assister from the aircraft.

(9) Fit the draught excluder plate (Part No.53/D10054) complete with sponge rubber seal, over the track aperture in the front gunner's bulkhead, using the items retained in op.(5).

Fitting pyrotechnic stowages

27. Additional pyrotechnic stowages can be fitted on the port side of the aircraft nose section, after removing the ammunition box and the ammunition track. Stowages for five stores can be fitted to the ammunition box mounting structure and stowages for three stores can be fitted to formers H and J above the existing stowages for seven stores.

Ammunition box structure

(1) Remove the ammunition box (para.25).

(2) Position the stowage (Part No.2/X2188) at the forward end of the ammunition box mounting structure and secure it to the six anchor nuts in the top-hat members using 2 B.A. bolts and plain washers. The anchor nuts are located in pairs, one pair on each member on the outboard vertical face of the structure, the third pair is on the outboard member on the base of the structure.

(3) Position the stowage (Part No.2/X2188) at the rear end of the ammunition box structure and secure it to the six anchor nuts in the top-hat members using 2 B.A. bolts and plain washers. The nuts are located similar to that given in op.(2).

Formers H and J

(4) Remove the ammunition tracks (para.26).

(5) Position the stowage comprising rear stowage (Part No.2/X2187), forward stowage (Part No.3/X2187), and intercostal (Part No.13/X2187), and secure it to formers H and J using ¼ in. B.S.F. bolts (Ref. No.28D/1008145), three bolts at former J and two at former H.

(6) Position the stowage plate (Part No.27/X2187) and secure it at former H to the stowage fitted in op.(5) using 2 B.A. bolts, plain washers and stiffnuts and to the lower stowage using two 4 B.A. bolts, plain washers and stiffnuts.

(7) Secure the straps to the stowage using 2 B.A. bolts, plain washers and stiffnuts and distance pieces. The bolts pass through the stowages and the stowage plate from rear to front.

(8) Position the stowage plate (Part No.28/X2187) and secure it at former J to the stowage fitted in op.(5) using three 2 B.A. bolts, plain washers and stiffnuts and to the lower stowage using two 2 B.A. bolts, plain washers and stiffnuts.

(9) Secure the straps to the stowage plate using 2 B.A. bolts, plain washers, stiffnuts and distance pieces. The bottom bolt passes through the stowage plate and the top stowage.

Starboard ammunition system removal

Box removal

28. To remove the starboard ammunition box from the aircraft, ensure that all the ammunition is removed from the box, refer to fig.5 and proceed as follows:-

(1) Disconnect the straight ammunition track from the ammunition box neck by removing the four 2 B.A. bolts, plain washers and stiffnuts.

NOTE...
The straight track must be supported after the attachment bolts are removed.

(2) Support the ammunition box and remove the two 2 B.A. bolts and plain washers securing each of the four cradle attachment brackets to the aircraft structure, two attachments each at formers F and G (detail A). Remove the box complete with cradle.

To remove the box from the cradle:-

(3) Remove the four 2 B.A. bolts, plain washers and spring washers securing the outboard face of the box to the cradle (detail B).

(4) Remove the four 2 B.A. bolts, plain washers and stiffnuts securing the bottom of the box to the cradle. Lift the box from the cradle.

Track removal

29. This paragraph gives the procedures for removing the straight ammunition track and the feed assister. The curved and

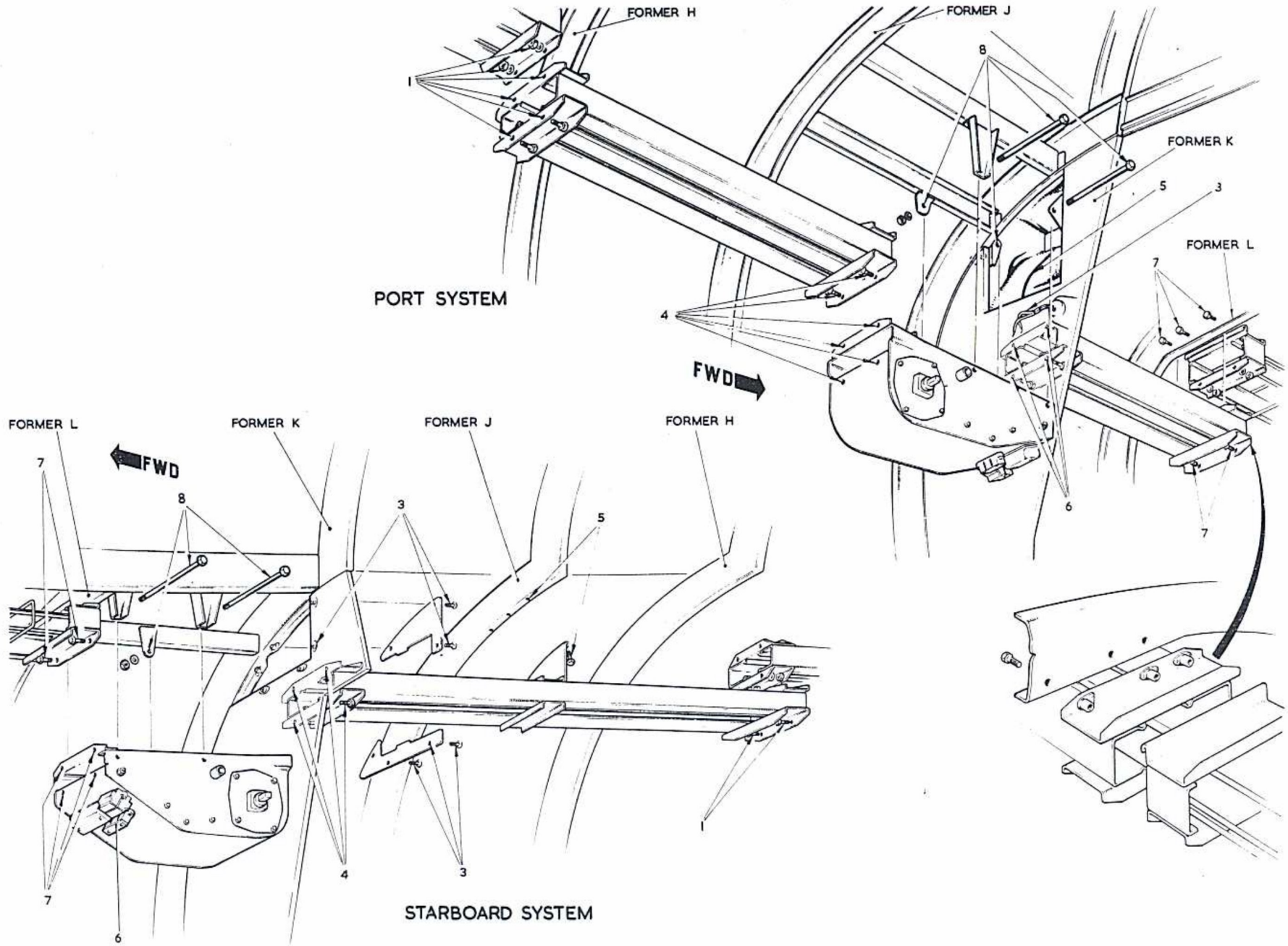

Fig. 6. Ammunition track and feed assister removal.

flexible tracks are removed with the gun mounting, instructions for the removal of which are given in A.P.2796N, Vol.1 and Vol.5. To remove the straight track and feed assister proceed as follows:-

(1) Remove the ammunition box (para.28).

(2) Isolate, electrically, the nose gun installation by removing fuse B.P.9 from the air bomber's fuse panel.

(3) Remove the six 2 B.A. mushroom-head screws and plair washers securing the draught excluder to the gunner's bulkhead. Retain the screws and washers.

(4) Remove the four 2 B.A. bolts, plain washers and stiffnuts securing the straight track to the feed assister.

(5) Support the track, remove the three 2 B.A. bolts and plain washers securing the track support bracket to former J and remove the track from the aircraft.

(6) Disconnect the electrical leads from the terminal block on the feed assister, tape back the leads and stow.

(7) Remove the four 2 B.A. bolts, plain washers and stiffnuts securing the curved track to the feed assister.

(8) Remove the stiffnuts and plain washers from the tie-rods securing the feed assister to the mounting brackets. Withdraw the tie-rods and remove the assister from the aircraft.

(9) Fit the draught excluder plate (Part No.54/D10054) complete with sponge rubber seal, over the track aperture in the gunner's bulkhead using the items retained in op.(3).

Ammunition system assembly

30. If the additional pyrotechnic stowages are fitted on the port side of the aircraft nose section, it is necessary to remove these prior to fitting the port ammunition system. The sequence of operations for removing the stowages and fitting both the port and starboard ammunition systems is the reverse of those given in para.25 to 29.