

[54] **ENDOTRACHEAL TUBE HOLDER AND AIRWAY**

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[51] Int. Cl. **A61m 25/02**

[58] Field of Search..... 128/133, 205, 208, 128/351, DIG. 26

[56] **References Cited**

UNITED STATES PATENTS

2,705,959	4/1955	Elmore	128/351
2,820,457	1/1958	Phillips	128/351
2,908,269	10/1959	Cheng	128/351 X
3,106,916	10/1963	Matthes	128/351 X
3,306,298	2/1967	Raimo.....	128/351
3,542,321	11/1970	Kahabka	128/DIG. 26

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[57]

ABSTRACT

An airway and an endotracheal tube holder face plate are detachably connected to constitute a unitary assembly for insertion in the mouth of a patient. The inner face of the plate carries bite block means in telescoping engagement with resilient biased detents carried by the airway and engageable against the outer face of the plate to prevent its separation from the airway until the detents are released by manual pressure. Latching means on the outer face of the face plate is operative to engage an intubated endotracheal tube and hold it against axial movement in either direction. The face plate is provided with apertures through which the detents extend and through which suction catheters and other tubular conduits may be passed for intubation. The body of the face plate is provided with an upper edge opening recess for receiving an intubated endotracheal tube to which the face plate is applied in service.

11 Claims, 5 Drawing Figures

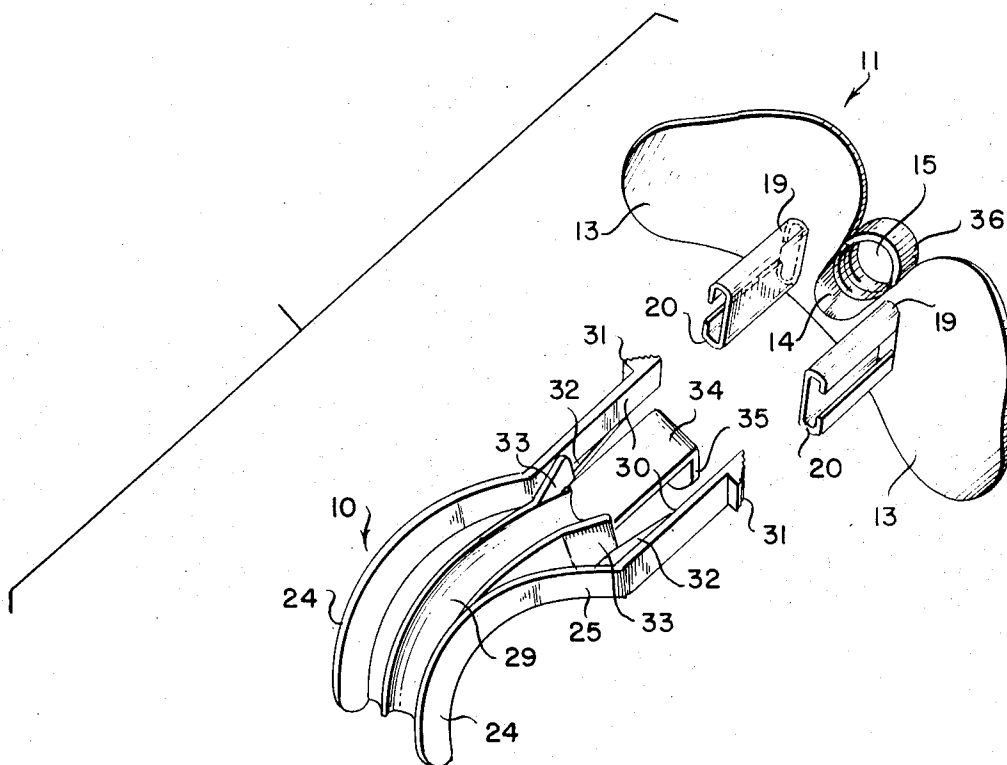


Fig. 1

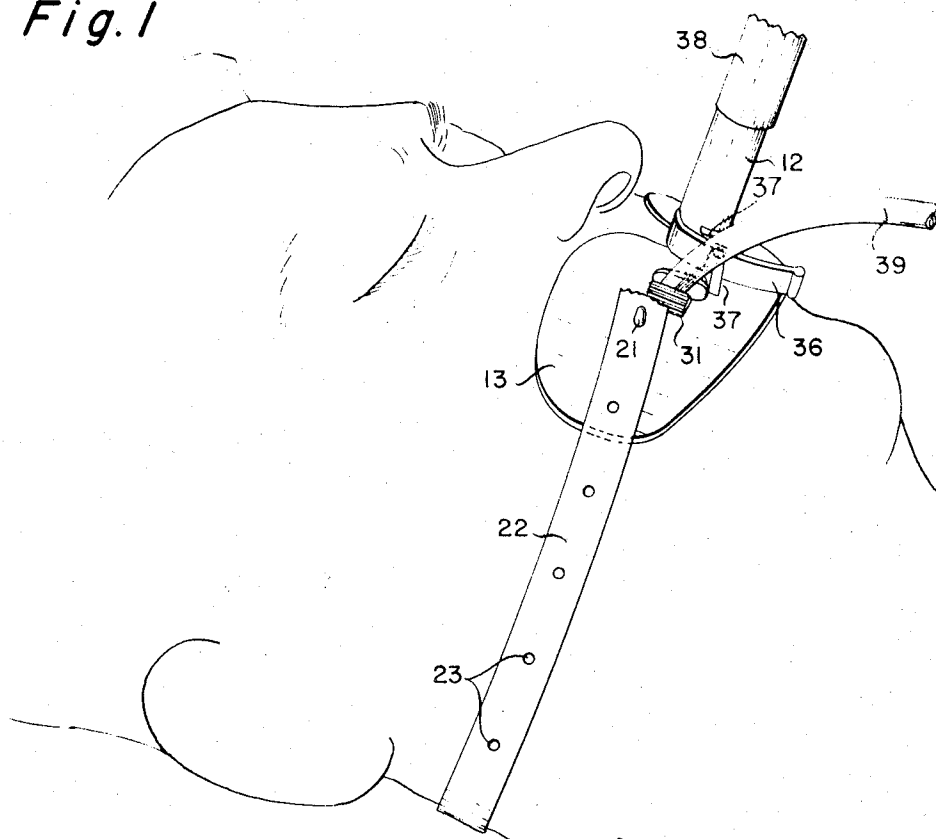


Fig. 2

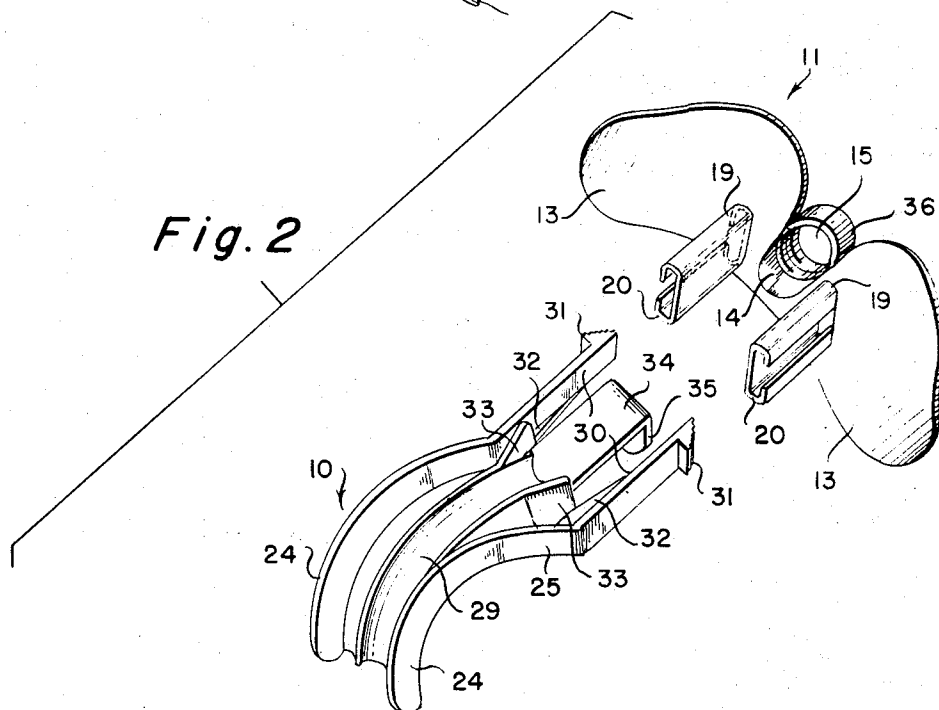


Fig. 3

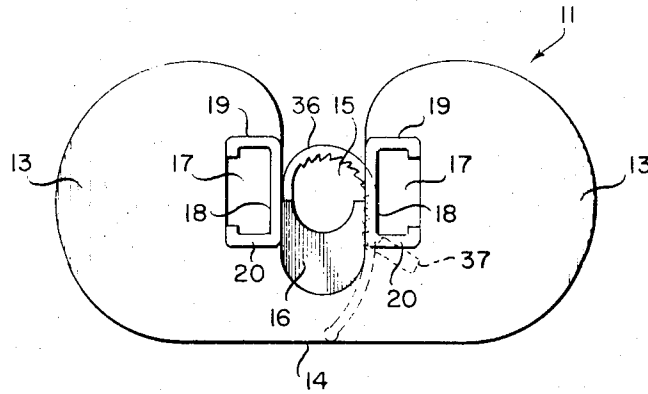


Fig. 4

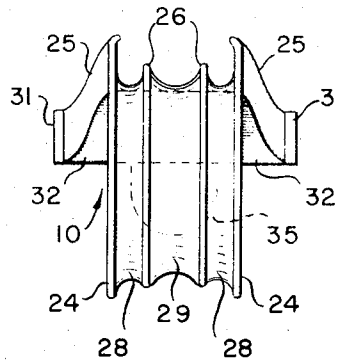
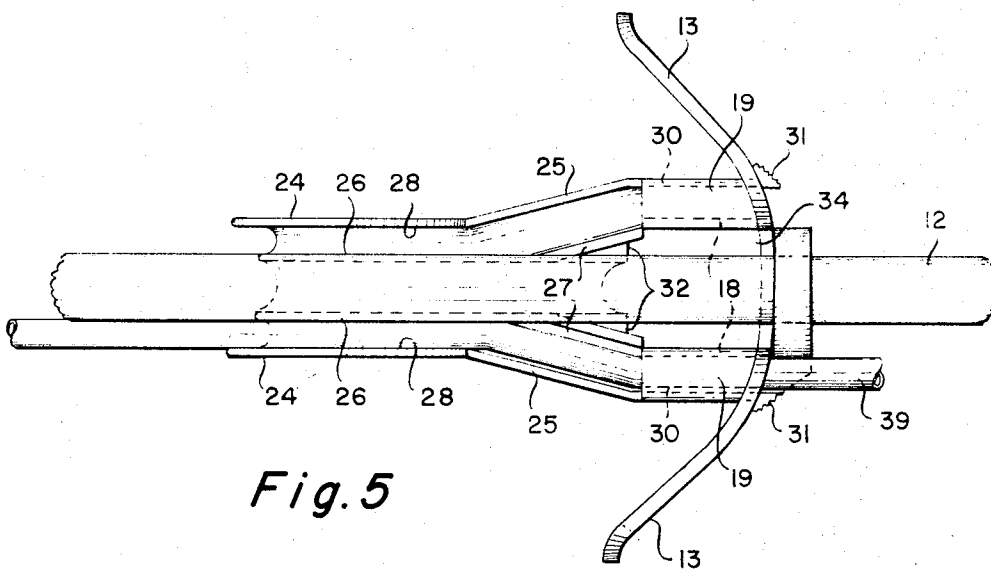


Fig. 5



ENDOTRACHEAL TUBE HOLDER AND AIRWAY BACKGROUND

1. Field of the Invention

The present invention relates to the art of endotracheal intubation and extubation, and in particular to airways, face plates, and means for holding intubated tubular conduits against axial movement from a selected service position relative to an airway and face plate with which they are associated.

2. Prior Art

Airways and their uses are well known in the field of surgical appliances. Typical of these is the airway disclosed in U.S. Pat. No. 3,306,298. Face plates equipped with bite blocks and tube holder means are equally well known in the art of intubation and extubation. Typical of these is the tube holder and bite block disclosed in U.S. Pat. No. 2,908,269. Another example is the holder disclosed in U.S. Pat. No. 2,820,457. However, so far as the present inventors are aware, the prior art does not teach the combination of an airway with a detachable face plate tube holder and bite block assembly, either of which may be used separately or connected in combination. Tube holder face plates with bite blocks, and airways, have always been accepted in the prior art as separate appliances having different uses, different advantages, and different disadvantages. The prior art had no appreciation of the fact, discovered by the present inventors, that the disadvantages of each could be avoided by their synergistic combination as taught by the present invention.

SUMMARY OF THE INVENTION

The present invention is an assembly comprising an airway in detachable connection with an endotracheal intubation face plate that has means for holding an endotracheal tube in a selected position and which has also bite block means for preventing constriction of closure of the tube by biting pressure exerted by a patient. Connection is established automatically by moving the airway and the face plate together in telescoping relation, and disconnection is accomplished simply by manual depression of resilient biased detents carried by the airway and projecting from the front face of the face plate when the airway and the face plate are connected in service relation. With reference to FIG. 5, and assuming the assembly to be in service position in the patient's mouth and trachea, the face plate may easily be disconnected and removed by an anesthetist or surgeon simply by inserting the index fingers behind the extremities of the face plate wing panels 13 and exerting an output pull causing the face plate to be slightly distorted while simultaneously placing the thumbs on the detents 31 and moving them towards each other until they are free to pass through the face plate openings 17. As soon as the detents 31 are freed from engagement against the front face of the face plate, the resilient bias of the face plate forces it to resume its initial, undistorted shape, thereby automatically moving its outward a distance sufficient to clear the detents and thus permit the face plate and the airway to be separated simply by pulling them apart.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view depicting the apparatus of the present invention as applied in service position.

FIG. 2 is an exploded perspective of the airway and the face plate of the present invention as positioned for connection.

FIG. 3 is an inner face elevation of the face plate.

FIG. 4 is a posterior elevation of the airway.

FIG. 5 is a top plan view of the airway and the face plate connected in service position, with an endotracheal tube and a suction catheter installed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is a combination of detachably connected components comprising an airway 10 and a face plate 11 for use with an endotracheal tube 12. The face plate is fashioned somewhat in the pattern of a butterfly, having a pair of wing panels 13 connected at their bottom portions by an integral bridge 14 recessed in its top edge to provide a semicircular passage 15 for reception of the tube 12 when the face plate is applied thereto.

As best shown in FIG. 3, the inner face of the face plate 11 is formed with a shallow socket 16 extending between the bridge 14 and the bottom edge of the passage 15. Passage 15 is open from its top and is flanked on each side by an auxiliary aperture 17 through which latch elements of the airway 10 are passed for detachable connection between the airway and the face plate. The apertures 17 are preferably rectangular and are bordered by a pair of bite block tubes that project inwardly from the face plate integral therewith and in parallel spaced relation at opposite sides of the passage 15. Each tube comprises an inside wall 18, a top wall 19, and a bottom wall 20. The outside ends of the top and bottom walls are intumed to provide short flanges parallel to the side wall 18. The front face of each wing panel 13 is formed with a projecting anchor pin 21, one of which is shown in FIG. 1 for connection with the ends of a strap 22 passed around the back of a patient's neck and having a longitudinal series of holes 23 for selective engagement with the anchor pin of the face plate to secure it in place. The entire face plate is a one-piece integral structure of a suitable thermoplastic having slight resilience. It may be sterilized for reuse if desired or made as an expendable item. Preferably the face plate and airway are injection molded from an olefinic material such as polyethylene copolymer.

The airway 10 of the present invention is a one-piece body of plastic material identical with or similar to the plastic material of the face plate. The general configuration of the airway is conventional in that it is shaped to engage over and hold a patient's tongue against swallowing. Side walls 24 extend upwardly from the side edges of the body, merging at their forward ends with outwardly divergent portions 25. As best shown in FIG. 4, the top edges of the side walls 24 arch slightly inwardly towards each other to partially overhang the airway floor. A pair of inner walls 26 extend longitudinally of the airway between the side walls in parallel spaced relation thereto and to each other. The forward ends of these walls 26 merge with divergent portions 27 that parallel the divergent side wall portions 25 of the side walls 24 and terminate in a plane normal to the longitudinal axis of the airway body, which plane coincides with the inner ends of the bite block tubes and provide abutments against which the inner ends of the bite block tube walls 18 and the intumed flanges of the top and bottom walls 19 and 20 engage in full face contact

when the airway and face plate are connected in service relation.

The height of the inner walls 26 - 27 is less than the height of the outer side walls 24 - 25 with which they cooperate to define open top channels 28 parallel to and at each outer side of a central main channel 29, all of semicircular cross section. The width of the main channel 29, which receives the endotracheal tube 12, is greater than the width of the auxiliary side channels 28.

A salient feature of the invention is the means by which the airway and face plate are detachably connected in service relation. This means includes a tongue 30 extended forwardly from the outer or front end of each side wall portion 25 parallel to the side wall 18 of the adjacent bite block tube. The height of each extension 30 is such that, when the airway and face plate are connected, it fills completely the space between the opposed flanges of the tube top and bottom walls 19 and 20. These flanges provide rails on which the tongues 30 ride in registry therewith, thus forming together with the flanges an outer side wall for each bite tube and parallel to its inside wall 18. When the airway and the face plate are connected in service relation the auxiliary passages 17 are completely enclosed in their respective bite tubes and are in full axial registry with the outer ends of the side channels 28.

Each tongue 30 is formed with a barb detent 31 on its outer end for latching engagement with the face plate when the outer end of the tongue is passed through its adjacent face plate opening 17. The anterior face of the detent is serrated to facilitate thumb or finger engagement, and it is constituted as a cam which engages the body of the face plate to move the tongue ends towards each other and permit the detents to pass freely through the face plate, after which the inherent resilience of the tongues causes them to snap back to their original positions with the detents engaged against the face plate as shown in FIG. 5, thus providing a manually releasable spring latch connection between the airway and the face plate.

It is apparent in FIG. 2 that the bottoms of the side channels 28 in the airway merge with small triangular forward extensions 32 which, in turn, merge with the bottom edges of the latch tongues 30 forwardly from the abutments 33 constituted by the outer ends of the airway channel walls 26. The bottom of the central channel 29 merges at its forward end with a flat floor plate 34 which lies in a plane common to the floor sections 32. The width of the floor plate 34 is the same as the width of the front end of the channel 29 with which it merges, thus leaving along each side of the floor plate a slot for accommodation of the inside wall 18 of the adjacent bite tube when the airway and the face plate are connected. As its forward end the floor plate 34 carries a depending apron 35 complementary to the shallow socket 16 in the inner face of the face plate and adapted to seat therein when the airway and the face plate are connected.

The front face of the face plate 11 has thereon a means for holding the tube 12 in a position of adjustment fixed against axial movement relative to the face plate. As here shown, this means comprises an arrangement of a flexible plastic strap 36 anchored at one end on the front face of one of the face plate wings 13 and disposed so that it may be trained over and across the endotracheal tube 12 when it is seated on the top edge

of the bridge 14 at the bottom of the central face plate passage 15. The face of strap 36 which engages tube 12 is serrated for engagement with a complementary tooth on one of a pair of anchor blocks 37 formed integral with and projecting forwardly of the front face of the face plate arranged in slightly spaced apart relation just sufficient to provide a passageway into which the securing strap 36 may be slid edgewise in the nature of a ratchet to interlock its serrations with the tooth on one of the anchor blocks 37 in a selected position of adjustment, whereby the tube 12 is gripped between the top edge of the face plate bridge 14 and the overlying securing strap 36, thus effectively preventing axial movement of the tube relative to the face plate and the airway.

MODE OF OPERATION

When the above described apparatus is to be used in service, the airway 10 and the face plate 11 are connected by inserting the tongues 30 between the rails provided by the intumed flanges of the bite tube top and bottom walls 19 and 20 and sliding the airway and the face plate together along the longitudinal axis of the airway until the detents 31 on the tongues pass through the face plate apertures 17 and snap into latched engagement with the outer face of the face plate. At this point, further telescoping movement between the airway tongues 30 and the bite tubes of the face plate is arrested by contact of the inner ends of the bite tubes against the front end abutments 33 on the channel wall portions 27, as best shown in FIGS. 2 and 5.

Because the primary function of the aforesaid unitary assembly is to hold securely in place an already intubated endotracheal tube, one that has been selectively positioned with the aid of a laryngoscope in a manner well known to those skilled in the art, the assembly is not positioned in a patient's mouth until the tube 12 is fully intubated. After the tube is in place, the assembly is inserted in the patient's mouth beneath the tube and with the curved posterior portion of the airway engaged over and holding down the patient's tongue in the conventional manner of airways. During insertion of the airway the intubated tube 12 is accommodated in the open top recess 15 of the face plate. This recess permits the face plate to be shifted vertically into engagement with the tube so that the tube is seated firmly on the upper edge of the face plate bridge 14 at the bottom of the recess.

The face plate seats against and covers the front of the patient's mouth with the upper teeth seating on the top walls 19 of the bite tubes and with the lower teeth bearing against the lower walls 20 just behind the apron 35, which apron seats on the upper edges of the patient's lower jaw teeth and engages their fronts, thus providing a means entirely on the body of the airway for holding it secured against backward movement over the patient's tongue.

The height of each inside wall 18 of the face plate bite tubes is greater than the outside diameter of the endotracheal tube 12. This tube is made of plastic or rubber and is curved on an arc subtending an angle of substantially ninety degrees. When the tube is fully seated in the bottom of the face plate passage 15 it cannot be constricted or closed by biting action of the patient's teeth. In such action the patient's upper teeth will engage the bite tube top walls 19 and the lower teeth will engage the bottom walls 20, and will be held

out of contact with the endotracheal tube. In like manner, the height of each latch tongue 30 of the airway body is slightly greater than the outside diameter of the endotracheal tube 12, so that, when the face plate is disconnected and removed without removal of the airway, the top edges of the tongues 30 in cooperation with the under face of the airway floor section 34 will constitute a bite block that will prevent contact of the patient's teeth against the surface of the tube 12 or any tube of lesser outside diameter. The upper teeth of the patient will seat against the top edges of the tongues 30 and the lower teeth will seat against the flat under face of the airway floor section 34 just behind the apron 35. The symmetry of the face plate wing panels 13 relative to the central passage 15 assures that the body of the endotracheal tube 12 will seat in and on the central airway channel 29 and be held centrally in the patient's trachea.

After the airway and face plate are in position the securing strap 36 is manipulated to clamp the tube against the bottom of the passage 15 and thus hold the tube firmly against axial movement either outwardly or inwardly. The free outer end of the tube 12 is then connected to a conduit 38 through which air and/or anesthetic fluid are supplied to the patient's lungs from a pressurized source, not shown. While the apparatus is in service, saliva and phlegm collecting in the patient's trachea are removed through a conventional suction catheter 39 intubated through one of the auxiliary apertures 17 of the face plate and trained along its associated side channel 28 of the airway. The other aperture 17 and its associated airway side channel 28 may be used for intubation and extubation of other instruments as desired.

Following initial clamping engagement of the securing strap 36 on the tube 12, a tighter engagement may be effected simply by pressing down upon the portion of the strap which overlies the tube. The serrations on the strap are arranged as a ratchet rack and the serrations on the guide blocks 37 serve as pawls. The strap may be released simply by sliding it frontally from between the blocks 37.

We claim:

1. An endotracheal intubation apparatus comprising, in combination, an airway, a face plate engageable over the mouth of a patient and having therein a central aperture for passage of an endotracheal tube therethrough, the face plate having also therein at least one auxiliary aperture at one side of the central aperture and adapted for passage therethrough of at least one special purpose tube, said airway having a curved body portion adapted to engage over a patient's tongue, a pair of outer side walls and at least one inner wall extending upwardly from said body portion to define an open top central channel and at least one open top auxiliary side channel, said central and side channel extending longitudinally of said airway, said central channel communicating with said face plate central aperture to receive the endotracheal tube and said auxiliary side channel communicating with the auxiliary face plate aperture to guidingly receive said selective purpose tube passing through said auxiliary aperture, said means readily detachably connected the airway and the face plate in service relation as a unitary assembly.

2. In the apparatus of claim 1, means on the face plate operative to engage an endotracheal tube disposed in the central aperture of the face plate for hold-

ing the tube secured against axial movement in either direction.

3. In the apparatus of claim 1, said detachable connecting means including a resilient latch tongue carried by the airway at each side thereof for projecting through said face plate auxiliary apertures, the latch tongues being in parallel spaced relation such that their passage through the face plate is blocked by the face plate body at an edge of each auxiliary aperture, a detent on the outer end of each tongue and engageable with the outer face of the face plate in a manner preventing separation of the airway and the face plate while the detent is in holding engagement with the plate, said detents being constituted as cams slidably engageable by an adjacent auxiliary aperture edge of the face plate body to move the tongues laterally towards each other against their resilience bias and thereby move the outer ends of the tongues into registry with the auxiliary passages for free passage there-through.

4. In the apparatus of claim 3, said detents being operative manually from the exterior of the face plate to release them from holding engagement with the face plate and thereby permit removal of the face plate from the airway without removal of the airway from a position of service.

5. In the apparatus of claim 3, tubular bite block members carried by the face plate and extending inwardly from its inner face, said tubular bite block members being in axial registry with the auxiliary apertures in the face plate, each member having a wall longitudinally apertured to provide top and bottom track rails for receiving said guiding therebetween the top and bottom edges of one of the latch tongues when the face plate and the airway are moved axially together in effecting their connection.

6. In the apparatus of claim 5, the latch tongues providing a portion of the bite tube walls in which they are guided when the airway and the face plate are being connected.

7. In the apparatus of claim 6, the body of the airway at its forward end having therein at each side a longitudinal slot open at its outer end to receive the bottom portion of the adjacent bite tube in slidable relation.

8. In the apparatus of claim 7, the floor of the outer end portion of the airway at the inner end of each slot having a section extending at an angle between the front end of each side channel and its adjacent latch tongue.

9. In the apparatus of claim 8, the floor of the airway between said slots being flat and of a width to fill the space between the inside walls of the bite tubes in sliding engagement therewith when the airway and the face plate are connected.

10. In the apparatus of claim 9, said flat portion of the airway floor lying in a plane common to the bottom edges of the latch tongues and having at its outer end a depending portion for seating over and in front of the lower teeth of a patient.

11. An endotracheal tube holder comprising a face plate having a rear face and a front face with the rear face adapted to cover the mouth of a patient, said face plate having formed substantially centrally thereof a notch-like opening for receiving an endotracheal tube and an auxiliary opening at each side of the notch-like opening, a pair of bite block tubes projecting from the rear face of the plate each in open communication with

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a respective auxiliary opening of said face plate and each adapted to receive a special purpose tube, said face plate notch-like opening extending through one edge of the face plate at a point midway between the bite block tubes, and being closed at the opposite edge at the central portion of the face plate body to provide

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a seat for an endotracheal tube when disposed in said opening, whereby the face plate may be slid into supporting engagement with an endotracheal tube inserted in the mouth of a patient without shifting the face plate laterally in the direction of either bite block tube.

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