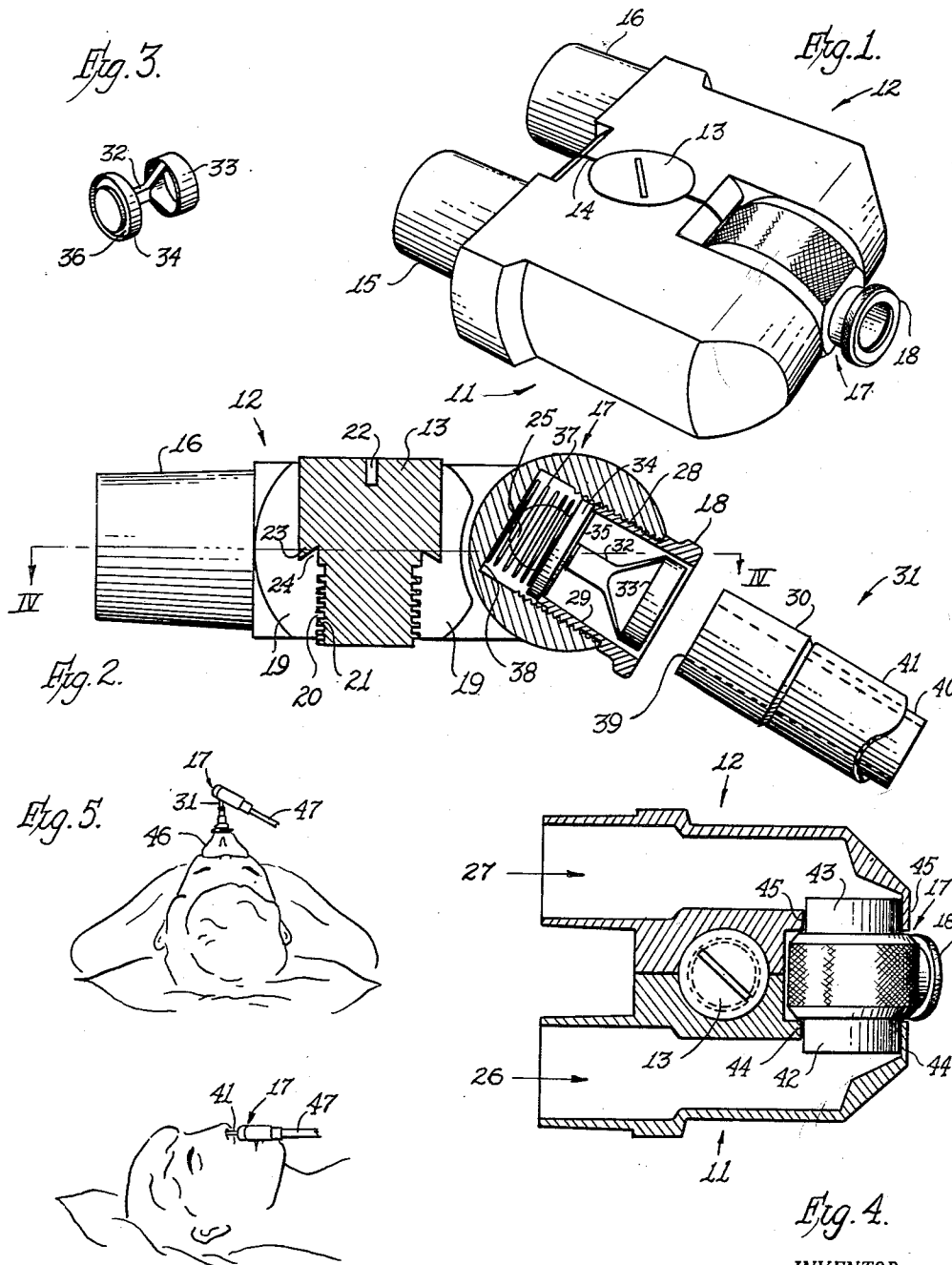


Jan. 21, 1958

J. W. PHILLIPS
COMPOUND SWIVEL ADAPTER
Filed Sept. 28, 1953

2,820,651



INVENTOR.
JOHN W. PHILLIPS
BY R. W. Hodgson

1

2,820,651

COMPOUND SWIVEL ADAPTER

John W. Phillips, Olive View, Calif.

Application September 28, 1953, Serial No. 382,517

1 Claim. (Cl. 285—151)

Generally speaking, the present invention relates to the anesthesia art and, more particularly, it pertains to a compound swivel adapter for coupling the breather tubes of a circle-absorption type of anesthetic machine to either a face mask or an endo-tracheal tube used in surgical anesthesia.

It should be noted that this application is a continuation of and substitute for my co-pending application entitled, "Compound Swivel Adapter," Serial No. 301,403, filed July 28, 1952, now abandoned.

It has long been a problem in the prior art to obtain proper positioning of the tube or tubes leading from the anesthetic machine to the patient, who is usually lying prone upon an operating table. Often it has been found necessary to move the anesthetic machine itself into a variety of inconvenient and awkward positions relative to the table and to use a large number of sizes and shapes of both straight and angular connectors, depending upon the position of the patient upon the table and upon whether or not the surgeon is employing a face mask or an endo-tracheal tube inserted through the patient's mouth or nostril. In addition to the difficulties initially encountered in making connections between the patient and the anesthetic machine, great difficulties of technique and hazards in emergencies frequently occur during the administration of the anesthetic when it is desired to move the patient or discontinue the application of the anesthetic for a short period.

My invention comprises two symmetrical main members having passage means adapted to be connected in communication with the breather tubes of an anesthetic machine at one end and presenting holes in opposition to each other at the other end, a longitudinally bored rotary cylinder having axial sleeves adapted to fit into said holes of said passage means and having socket means in lateral communication through said cylinder with the passage means of the symmetrical members and adapted to receive a nipple connector of a face mask or tracheal tube, and screw means effectively adapted to couple the two symmetrical main members together with the cylinder rotatably secured between said main members.

In one preferred embodiment of the present invention, the rotary bored cylinder is provided with an automatic obturator valve within the lateral socket means whereby the socket's reception of the nipple at the end of the tracheal tube or face mask causes opening of the valve, with resultant communication between the tracheal tube or face mask and the bore means of the main members, and withdrawal of the nipple causes closing of the valve, thus permitting control of the application of the anesthetic by simply inserting or removing the nipple from the socket without turning off the anesthesia machine. In this preferred embodiment, the socket means is internally tapered for the quick connection and disconnection of a tapered nipple. Thus, by combining rotary movement of the rotatable cylinder around a first axis with respect to the main members, and quick disconnection and turning

2

(around a second axis perpendicular to said first axis) and reconnection of the nipple to the socket, movement of the patient, the tracheal tube and/or the face mask with respect to the main members and the anesthesia machine can be simply and easily accomplished with little or no interruption of the flow of the anesthetic to the patient.

In one preferred embodiment of the present invention, the screw means is provided with acme or square threads and a downwardly projecting inclined annular lip, and the two symmetrical main members are provided with opposing faces having acme or square threads and an upwardly projecting inclined annular lip adapted to abuttingly engage the lip of said screw means, each of the main members having one-half of the portions forming the receptacle for the screw means. Thus, the screw means is in tangential coupling engagement with both main members, the threads preventing relative vertical movement and the engaged inclined annular lips preventing relative lateral movement. Rapid assembly and disassembly of the main members and their engaged rotary cylinder is accomplished by simple rotation of the screw means.

From the above description of the basic form and several generic aspects of the present invention, it will be apparent to those skilled in the art that virtually all of the hereinabove-mentioned prior art disadvantages are virtually entirely eliminated and overcome in and through the use of the present invention.

With the above points in mind, it is an object of the present invention to provide a novel compound swivel adapted to rapidly and easily connect the breather tubes of an anesthesia machine to a face mask or tracheal tube.

It is another object of this invention to provide a compact and functionally foolproof compound swivel effectively adapted to be rapidly and simply assembled and disassembled.

Another object of the present invention is the provision of a novel compound swivel with an automatic obturator valve effectively adapted to automatically open and close the passage from the breather tubes of an anesthesia machine to a face mask or tracheal tube upon the insertion and withdrawal, respectively, of the nipple from said face mask or tracheal tube.

Other and allied objects will be apparent to those skilled in the art after a careful perusal, examination and study of the accompanying illustrations, the present specification, and the appended claim.

To facilitate understanding, reference will be made to the hereinbelow described drawings, in which:

Fig. 1 is a perspective view of one preferred embodiment of the invention;

Fig. 2 is a side, partly sectional, enlarged elevational view of the embodiment illustrated in Fig. 1, with a fragment of a tracheal tube and its nipple in exploded juxtaposition to the socket receptacle therefor;

Fig. 3 is a perspective view of the obturator valve plug shown in Fig. 2, more clearly illustrating the coil spring seat and the Y-construction of the opening;

Fig. 4 is a partly sectional, top plan view of the embodiment as seen substantially along line IV—IV in Fig. 2 (but with the screw 13 and the rotary cylinder 17 shown in unsectioned form for reasons of clarity);

Fig. 5 is an elevational view of the clinical application of the previously illustrated preferred embodiment as connected to a face mask on a prone patient; and

Fig. 6 is an elevational view of the clinical application of the previously illustrated preferred embodiment as connected to a tracheal tube inserted into a patient's nostril.

As seen generally in Fig. 1, the main body of the device

is composed of two symmetrical main members, a left half 11 and a right half 12. The tangential screw 13 couples the members 11 and 12 together in smooth abutment along the central plane seen as line 14. The tapered sleeves 15 and 16 are adapted to connect to the ends of the breather tubes (not shown) of the anesthesia machine (not shown). A rotary bored cylinder, indicated generally at 17, is provided with a lateral socket 18.

Fig. 2 illustrates the construction of the preferred embodiment of my invention in the greatest detail, the left half main member 11 in Fig. 1 having been removed and some parts sectioned for clarity. The main member 12 is provided with smooth lateral surfaces 19, 19 for abutment against similar surfaces of the opposing member 11 (not shown), and is appropriately recessed therebetween for reception of half of the tangential screw 13. The main member halves are provided with acme or square threads 20 adapted to threadably engage the acme or square threads 21 of the tangential screw 13. The top of the screw 13 is provided with a recess 22 for insertion of a screw-driver or similar device whereby the screw 13 may be rotatably driven into vertical engagement with the main member halves. The screw 13 is provided with a downwardly projecting inclined annular lip 23 and the main members are provided with an upwardly projecting inclined annular lip 24 adapted to abut against the screw's annular lip 23 in lateral engagement therewith. Thus, when the screw 13 is fully inserted, as shown, the threads 20 and 21 prevent relative vertical movement of the screw 13 and the main member halves, and the annular lips 23 and 24 couple the main member halves together against relative lateral movement. The use of square threads rather than the conventional V-threads eliminates the outward component of force which would be caused by the insertion of a V-threaded screw; such a force would have the undesirable tendency to separate the main member halves from each other during the insertion of said screw. The construction illustrated has the additional advantage of eliminating the necessity for a nut on the bottom end of the screw to prevent relative vertical (or transverse) movement of the screw with respect to the main members, the split threaded main members themselves providing the means for the prevention of relative vertical (or transverse) movement of the screw.

In Fig. 2, the rotary cylinder 17 is provided throughout its entire length with a longitudinal eccentric hole 25 for constant communication with the breather tube passages 26 and 27 in the left and right half main members 11 and 12, respectively, the latter as seen in Fig. 4. The lateral socket 18 is rotatably inserted into and secured to the cylinder 17 by means of threads 28. The internal surface 29 of the socket 18 is tapered to receive the tapered surface 30 of the nipple 31 which is inserted into the socket 18 with a slight twisting motion for frictional engagement therewith. The automatic obturator valve comprises a valve plug, as seen in Fig. 3, having a Y-shaped central member 32 connected to a ring 33 and to a plug base 34 having a lateral annular recess 35 and an internal annular recess 36; a compressed coil spring 37 is in forcible abutment against a cylinder wall 38 and the internal annular recess 36 whereby the valve plug's lateral annular recess 35 is normally biased into abutment against the base of the socket 18, thereby preventing passage of the anesthetic in the hole 25 into the socket 18. The diameter of the ring 33 is approximately that of the mean diameter of the nipple end 39 so that the insertion of the nipple end 39 into the socket 18 causes movement of the valve plug through the socket 18, compressing the coil spring 37. When the nipple 31 is fully inserted into the socket 18, the plug base 34 abuts against the cylinder wall 38 (or very nearly does) and the cylinder hole 25 is in communication with the passage through the nipple 31, the anesthetic passing between the Y-arms of the central member 32 and through the ring

33. The Y-shaped construction of the central member 32 has the advantage of avoiding obstruction to the flow of the anesthetic through the ring 33 as would be the case with a T-shaped construction, since a T-shaped central member would decrease the area of the opening in the ring 33 and prevent the proper flow of anesthetic to an infant or other patient having weak respiration. The nipple 31 has a stub 40 upon which the end of a tracheal tube 41 may be secured.

In Fig. 4, the screw 13 and the rotary cylinder 17 are not sectioned for greater clarity in bringing out their relationships to the symmetrical main members 11 and 12. The cylinder ends 42 and 43 fit snugly but rotatably into the sleeves 44 and 45, respectively, of the main members 11 and 12, respectively, the area of contact between said ends and sleeves being sufficient to insure a relatively air-tight seal against the leakage of the atmosphere into or the anesthetic out of the anesthetic passages because there is almost no pressure differential between normal atmospheric pressure and normal anesthetic pressure; anesthetics are usually administered at a pressure only slightly less than atmospheric pressure (or at pressures close thereto) in order to insure relatively normal functioning of the patient's respiratory system.

Fig. 5 illustrates the application of the above-described preferred embodiment to a face mask 46 of a type well-known in the art. The breather tubes 47 of an anesthesia machine (not shown) are connected to the main members of the device, and a nipple 31 provides direct connection between the face mask 46 and the rotary cylinder 17 without use of a tube, such as tube 41 in Fig. 2.

Fig. 6 illustrates the application of the above-described device to a tube 41 inserted into the nostril of the patient.

In both Figs. 5 and 6, it can be seen that relative positioning and movement of the patient and the device can be compensated for by rotation of the cylinder 17 within the main members of the device and/or repositioning of the nipple 31 in the socket of the cylinder 17, as previously described and explained.

Numerous modifications and variations of the present invention will occur to those skilled in the art after a careful study hereof. All such properly within the basic spirit and scope of the present invention are intended to be included and comprehended herein as fully as if specifically described, illustrated and claimed herein.

For example, the lower portion of the screw 13 need not be threaded but may be eliminated entirely and the upper portion of the screw may be threaded instead, with the split main members having corresponding threads in the upper portions of their tangential recesses. The abutting annular lips 23 and 24 could also be transposed from their central position to a higher or lower position. The top of the screw could be provided with a wing-like projection instead of a recess, so that the screw could be turned with the fingers instead of by a screw-driver or other inserted tool.

It should be noted that the obturator valve and the threadably inserted socket could be eliminated entirely, in which case the rotary cylinder could be provided with an internally tapered lateral hole instead of a threaded receptacle for the socket. The tapered nipple could then be inserted directly into the lateral hole instead of into the socket. However, the elimination of the obturator valve would necessitate direct control at the anesthesia machine of the stopping and starting of the flow of the anesthetic.

Since most anesthetics are highly combustible and are usually administered with a quantity of oxygen, which supports combustion, it is desirable to make the device of an electrically conducting material, such as aluminum, or the like, in order to avoid electrostatic spark-caused ignition (and/or explosion) of the anesthetic. However, when the danger of a spark caused by an electrostatic charge is of no concern, various other materials or com-

5

binations of materials may be employed, such as "Lucite" (acrylic resin) or other "plastics."

The exact compositions, configurations, constructions, relative positionings and cooperative relationships of the various component parts of the present invention are not critical, and can be modified substantially within the spirit of the present invention.

The embodiment of the present invention specifically described and illustrated herein is exemplary only, and is not intended to limit the scope of the present invention, which is to be interpreted in the light of the prior art and the appended claim only, with due consideration for the doctrine of equivalences.

I claim:

A compound swivel effectively cooperable to couple the single air passage of the human respiratory system to the double passage circulatory system of an anesthesia machine, comprising: two selectively separable longitudinal body members in side-by-side juxtaposition and including two substantially tubular and substantially completely hollow longitudinal passage means each having a similarly positioned first end and each having a second end longitudinally displaced from said first end and transversely directed with respect to said first end, said second ends being spatially opposed and each being provided with a similar cylindrical recess therein oppositely inwardly directed with respect to each other; said similar first ends being cooperable to be connected in communication with corresponding double passages of an anesthesia machine; rotary transverse cylinder means provided with transverse bore means extending therethrough and provided with opposed round cylinder ends selectively removably rotatably secured between said spatially opposed second ends of said two passage means and within said opposed inwardly directed similar cylindrical recesses, thus communicating said transverse bore means with each of said passage means; inwardly constricting screw means threadedly cooperable with the side-by-side juxtaposed portions of the two selectively separable longitudinal body members, said screw means being selectively threadedly downwardly advanceable with respect to said two body members in a direction similar to the plane

6

of juxtaposition of said two body members and in a direction across and between the longitudinal direction of each of the longitudinal passage means to secure said two longitudinal body members in immovable side-by-side relationship with respect to each other; said screw means including a shaft having square threads and having a downwardly projecting concavely inclined annular lip, and said side-by-side juxtaposed portions of the two longitudinal body members being provided with opposing tangential recesses having continuously mating square threads cooperable for engagement with the threaded shaft and having an upwardly projecting convexly inclined annular lip cooperable to abut against said downwardly projecting concavely inclined annular lip in cooperable wedging engagement therewith inwardly constricting said two body members, whereby engagement of the threaded shaft and the threaded recesses of the two body members will effectively prevent relative vertical movement of said shaft and said two body members with respect to each other and whereby the cooperable wedging constricting engagement of said inclined annular lips with respect to each other will effectively prevent transverse movement of said shaft and said two body members with respect to each other and will effectively immovably couple said two body members with respect to each other in side-by-side relationship; and lateral socket means in lateral communication with the transverse bore means and cooperable to receive and engage a tube nipple.

References Cited in the file of this patent

UNITED STATES PATENTS

135,388	Tucker	Jan. 28, 1873
671,274	Fischer	Apr. 2, 1901
1,064,105	Steitz	June 10, 1913
1,138,093	Diners	May 4, 1915
1,588,898	Martocello	June 15, 1926
1,921,629	McKee	Aug. 8, 1933
2,245,658	Erickson	June 17, 1941

FOREIGN PATENTS

346,274	Germany	Dec. 27, 1921
126,726	Austria	Feb. 10, 1932