Aug. 17, 1965

E. F. PETERSON

3,200,479

METHOD OF MAKING A SAND RETAINING BLOW TUBE

Filed Aug. 5, 1963

Fig. 1.

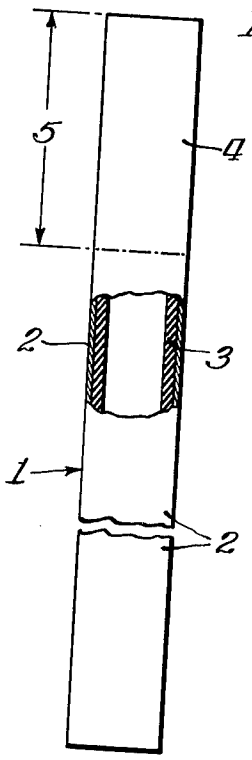


Fig. 2.

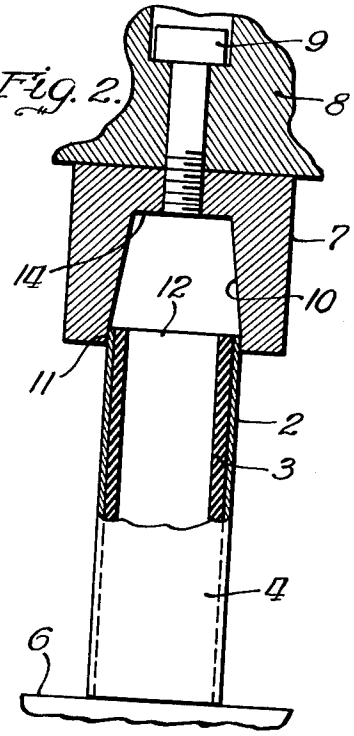


Fig. 3.

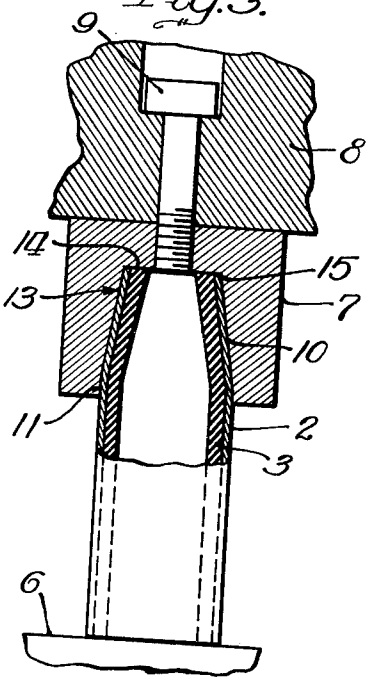


Fig. 6.

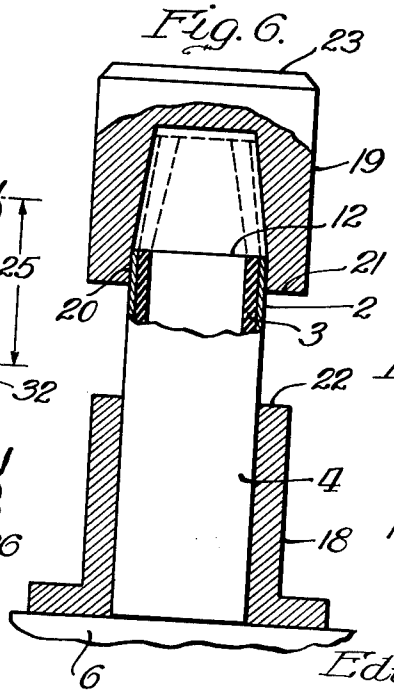


Fig. 4.

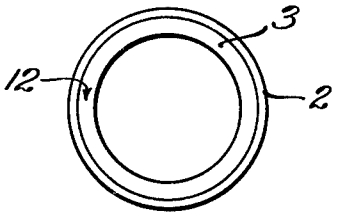


Fig. 7.

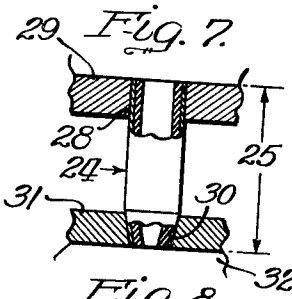


Fig. 5.

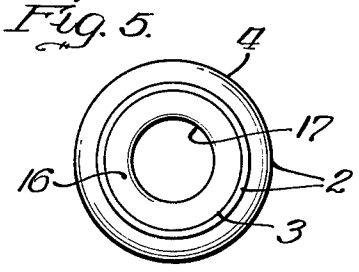
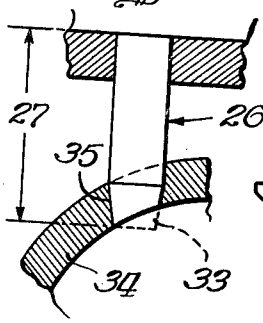


Fig. 8.



INVENTOR:
Edwin F. Peterson
BY
Eberhard E. Wettey
Atty.

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METHOD OF MAKING A SAND RETAINING BLOW TUBE

Edwin F. Peterson, P.O. Box 151, Neponset, Ill.

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9 Claims. (Cl. 29—157)

The present application is a continuation-in-part of my copending application, Serial No. 57,542, filed September 21, 1960, and relating to a Blow Tube and Method of Making Same, now Patent No. 3,104,432, issued September 24, 1963.

This invention relates to blow tubes for use in foundry practice which have become known as flow resisting blow tubes provided with restricted discharge throats that have the facility of pinching off the tube retained core forming material from the blown and completed material constituted core in a core box served by said tubes.

The tubes of this invention are constructed with composite tubular materials adhered to provide an outer metal case and an internal resilient liner that extends the full length of the metal tube to counteract the abrasive wear of sand or other material movement under pressure and in contact with the tube case or in contact with any other hard material that may be employed to form the outer cover or casing of the tube. In this connection, the outer tube casing or cover is made from a malleable, swedgeable material lending itself to the deformation to which the tubes are subjected in the process herein depicted in making given lengths of such dual component blow tubes. The same tube casing or outer material is constructed of any type of material to which suitable resilient liner materials can be joined or adhered by molding, cementing or by lining with tubular elastomers to supply the tube length throughout its extent with the resilient protective liner.

The sand holding tubes herein are provided with a uniform thickness liner in the metal casing and the discharge core box end of the tube is tapered a given amount by tapering the exterior metal tube radially inwardly from the full diameter of the normal tube diameter to a constricted smaller diameter at the sand discharge end of the tube. Such inward deformation of the tube casing reduces the resilient liner diametrically in gradually increasing amounts toward the discharge end of the tube causing radial diametral wall thickening of the liner at the tapered section which is subjected to the greatest amount of wear. It is this same thickened section of liner that provides the facility of expanding under presusre during the sand blow function to develop the reactive sand pinching operation to nip off the tube retained sand from the formed sand core formed in the core box to carry out the sand retention function of this character of tube.

It is another attribute of the present sand pinching tubes to be able to seat such tubes in correspondingly tapered openings in the core box walls which arrangement counteracts all possible endwise motion of the tubes under presure when they are assembled for operative use between the blow plate of the sand box and the wall of the core box to which they are connected.

These lined blow tubes are further adapted for the protection of the blow plate of the sand box and for the protection of the blow tube aperture wall of the core box section thus extending the useful life of both of these units. The tube case is protected by its own internal lining and the metal about the tube aperture in the blow plate as well as the metal about the tube aperture in the core box wall are further areas that are also protected by the inserted blow tube ends that completely shield such areas.

From the above it becomes further apparent that the overall lengths of the individual blow tubes used in

variously spaced assemblies and to accommodate to variously shaped core boxes are of importance in the practice of this particular foundry art, namely, of blowing cores. Tubes are commercially demanded for service in many lengths which do not vary in many cases over more than a 32nd of an inch and even, in some cases, the variation demanded is no larger than a 64th of an inch. These demands and requirements for tubes of certain lengths are not limited to any one outside diameter tube and the demand extends to other diameter tubes of given overall lengths. The tubes are normally ordered by both outside and inside diameters and by required lengths to serve the exact assemblies to which the tubes are applied or adapted. Tubes, for example, may be requested by O.D. and I.D. plus certain specified lengths such as 5/8" x 1/2" x 1" continuing with the same diameters but specifying other lengths such as 1 3/8", 1 1/2", 3 1/4" and 4". Another group may specify 7/8" x 3/4" and in lengths of 1 3/8", 1 3/4", 3 1/4" and 4".

In view of the unlimited need of tubes of many specified lengths which in certain adaptations may be requested in 1/32" and 1/64" increments in various lengths, it is an object of this invention to provide a method to supply blow tubes of the stem pinching type named in specified overall lengths in quick, easy and efficient operations with a correspondent reduction of waste of tube material to a minimum.

Another object of this invention is to provide tubular stock material by "the foot" and to provide further means to reduce such stock material to multiple given lengths each provided with a sand retention end to establish the means or apparatus that will serve the function of individual sand holding blow tubes of the character described which are each applied to specified predetermined sand blowing assemblies.

Other objects and advantages shall hereinafter appear in or become evident from the following detailed description of the invention having reference to the accompanying drawing forming a part of this specification.

In the drawing:

FIG. 1 is a side elevational view of a long piece of stock tube;

FIG. 2 is a side elevational view of the workable orientation of a piece of stock tube cut from the initial tube shown in FIG. 1 and illustrating apparatus employed in forming such tube length into its usable configuration, parts of the illustration being broken away and shown in section;

FIG. 3 is a view similar to FIG. 2 but with the sand retaining tube developed by the forming apparatus into its final usable shape and to an exact specified overall length;

FIG. 4 is an end elevational view of the stock tube;

FIG. 5 is an end elevational view of the tube after forming and shaping as it appears from the box cavity discharge end thereof or from the top as seen in FIG. 3;

FIG. 6 is a view similar to FIG. 2 of a somewhat modified arrangement for stock tube forming;

FIG. 7 is a cross sectional view of one typical installation of a specified length of the sand control tube of the type developed by the present method;

FIG. 8 is another cross sectional view of another typical installation of a specified length of sand retaining tube.

Referring to the drawing, a length of stock tube 1 is shown in FIG. 1 comprising a long composite dual sleeve tube with a hard outer casing 2 and a liner 3 of resilient material secured to the inner wall of the hard tube casing 2. One mating stock tube structure, for example, would be to construct the casing 2 of cold drawn steel or aluminum and to use a liner made from polyurethane, with the liner molded, cemented or otherwise firmly secured to the casing in any suitable manner. Both casing

and liner are continuous and of uniform inner and outer diameters along the entire extent of the stock tube.

To provide a core box sand retaining blow tube of a given specified length, a piece 4 of such length 5 is cut from the stock tube 1 and placed with one end (either end) on a support or base 6 to receive a forming die 7 upon the outer end of the tube piece 4.

Die 7 is secured to a power head or ram 8 by means of a bolt 9 or other means adapted for moving the die 7 toward the base 6. The die 7 has a forming cavity 10 of a given height and a tube fitting and orienting bore 11 is made to accommodate the upper unformed tube end 12. By causing the head 8 to move toward the base 6, the die forms the tube end 12 into a tapered shape 13 of the general contour as shown in FIG. 3. This operation is completed when the upper die wall 14 is brought to rest upon the restricted tube end 15.

During the processing of a tube piece 4 as described, a given length of blow tube is formed to a specified overall dimension governed by the length of the initially selected stock tube piece that was cut to the control length 5 in FIG. 1. The tube end 12 first appears as in FIG. 4 and after processing as in FIGS. 2 and 3, the tube end 12 appears as shown in FIG. 5. In the latter view, the liner 3 has been greatly thickened as at 16 due to the circumferential constriction leaving the sand control and pinching opening 17 to retain core sand under use and to nip off such tube retained sand from the formed core upon relief of pressure in the core sand delivery system as is well understood in the core blowing art.

The liner 3 increases in thickness from the full tube normal diameter to the discharge end 12 of the tube to supply added wear resistant lining to protect the metal walls of the inwardly tapered casing 2. This same thickened liner body reacts to the sand under pressure to automatically resist sand flow out of the tube end when rendered inoperative.

Another method to form a precise cut length of stock tube into a sand retaining tube is shown in FIG. 6. This arrangement comprises an equivalent tube length 4, as an example, which is placed in an orientation sleeve or socket 18 mounted on base 6 and a free die 19 is placed over the upper tube end 12.

Die 19 has an orientation bore 20 for the tube 4 end formation which may be of a given depth to meet the tube end when completely formed as in FIG. 3 or the die motion can be limited by the die face 21 meeting the top face 22 of the orientation sleeve 18 as another example where other external means are supplied to govern die motion instead of the end of the formed tube itself.

Die 19 is provided with a flat upper head 23 which can be struck with a mallet or by any suitable percussion means to bring about the tube end deformation into the finished sand retention tube product.

Certain exemplary tube installations are shown in FIGS. 7 and 8 with a tube 24 of length 25 used in FIG. 7 while a tube 26 of a length 27 is employed in the assembly shown in FIG. 8.

In FIG. 7 tube 24 lines aperture 28 in blow plate 29 and aperture 30 in wall 31 of a core box 32. In FIG. 8 a somewhat different arrangement is portrayed wherein a portion 33 of the sand retention end of tube 26 is ground away to have the tube end conform with the interior contour of the core box wall 34 and still fully line the box wall aperture 35.

The foregoing description is directed to one process or method to develop controlled material flow tubes of the type defined to cover all installations as dimensionally specified from stock material. Certain modifications in this method are deemed possible and contemplated without departing from the fundamental concept of this invention. The extent of such modifications shall be governed, however, by the breadth and scope of the language of the following claimed subject matter directed to the method of providing the sand retaining tubes of the present invention.

What I claim is:

1. The method of producing a sand pinching and sand flow control blow tube comprising providing a random length of stock tube having a casing of uniform diameter and thickness with a resilient liner of uniform diameter and thickness secured therein, severing a given length stock piece from said stock tube for a predetermined installation, then forming one end of said stock piece into a tapered sand discharge end by constricting the casing of said stock piece radially inwardly and correspondingly reducing the adjacent circumferential portion of the resilient liner to build up the thickness of said liner at the restricted tapered discharge end of said stock piece and maintaining said resilient liner in said built up thickened form with said constricted casing.

2. The method of producing a sand retaining blow tube comprising providing a random length of stock tube having a uniform diameter sleeve of malleable deformable hard material carrying a resilient sleeve liner of uniform diameter completely secured along the interior wall of the malleable sleeve, cutting a stock piece from said stock tube to produce a sand retaining tube of a predetermined length, then tapering one end of said malleable sleeve radially inwardly to circumferentially upset said sleeve liner adjacent said tapered portion to increase the thickness of said resilient liner adjacent the one end of the selected length of blow tube and retaining said resilient sleeve liner in its circumferentially thickened upset form with the deformed tapered sleeve of malleable hard material.

3. The method of producing sand holding blow tubes comprising providing a length of stock tube having a uniform outside diameter metallic sleeve of nonelastic material as an outer casing and an elastic sleeve liner adhered to the interior of the casing and having a uniform internal diameter throughout its length, dividing the said stock tube into multiple pieces of predetermined lengths each having right angle ends in relation to the lengths of said respective pieces, and subjecting each individual stock piece to the construction of one end portion of the outer metallic casing to develop a given taper on said end thereof thereby correspondingly constricting and enlarging the body thickness of the elastic liner by uniformly increasing increments from the normal full metallic sleeve diameter to the tapered terminal end of said sleeve to provide the resilient restriction for each length of sand holding tube.

4. The method of producing a sand holding blow tube by providing a given length of tube cut from a long stock tube having a metal casing and an inner elastic sleeve secured to the interior surface of the casing, placing said tube with one end on a support surface, placing a die on the free upper end of the tube with said die having a tapered socket therein and a contiguous exit bore to fit over the outer diameter of said tube to orient the die on said tube, forcing said die toward said support surface to cause the metal casing to taper radially inwardly an amount as determined by the limits of the die cavity, said die action on said metal casing correspondingly forcing said adjacently situated inner elastic sleeve to circumferentially constrict through the casing deformation thereby upsetting the inner sleeve circumferentially into a thicker bodied unit at the sand holding tapered tube end and maintaining said elastic sleeve in said constricted thickened form with said die shaped metal casing.

5. The method of producing a sand pinching and sand control blow tube which comprises selecting a piece of tube of predetermined length adapted to a given tube installation in a blow plate and core box assembly, said tube having a hard deformable outer casing and an elastic interior liner therein, placing said tube on one end thereof upon a support surface, placing a forming die on the other end of said tube with said die being pro-

vided with an inwardly tapered socket to accept the adjacent tube end, forcing said die longitudinally of the tube toward the supporting surface to develop a taper radially inwardly of said tube an amount as determined by the size of the die cavity, said deformation of said casing by said die providing means to force the adjacent portion of the elastic interior sleeve into circumferentially constricted shape to simultaneously upset the inner lines to assume a reformed increased body thickness at the sand discharge tube end to provide the sand pinching and sand control means for the tapered end of said tube as determined and shape controlled by said die deformed casing.

6. In the method of claim 5 to further provide the control of the desired increased body thickness of the inner liner by the amount of motion imparted to said inwardly tapered socket of said die in relation to the piece of tube and through the resultant amount of taper imparted to the end of said tube longitudinally thereof by means of the motion of said die.

7. In the method of claim 5 wherein to further control the desired final thickness of the body of said inner liner by limiting the amount of relative motion of said die toward said support surface to thereby introduce the necessary amount of tube end taper on the adjacent longitudinal portion of the tube surrounding the reformed portion of the inner liner.

8. The method of producing a sand flow control blow tube by providing a dual sleeve tube assembly having a hard sleeve and an elastic sleeve secured to each other, and causing deformation of a portion of the hard sleeve into a circumferentially constricted section to simultaneously impart a compressive circumferential upsetting deformation within said body of said adjacent elastic sleeve to cause said latter sleeve to thicken and to thereby establish a sand withholding facility on said hard sleeve for said flow control blow tube at the circumferentially constricted end of said hard tube.

9. The method of shaping and forming a selected length of wear resistant core box blow tube into a sand core blowing tube having a sand flow control tapered end to seat into a tapered opening in a core box wall and functioning to permit free sand flow out of the mouth of said tube under operative sand flow pressure conditions and to interrupt sand flow out of the mouth of said tube when said operative sand flow ceases, which comprises providing a long piece of uniform diameter tube stock of random length having a tubular casing of deformable hard material with an internal sleeve of a resilient protective lining material of uniform diameter and with uniform wall thickness throughout its length, severing a piece of said tube stock to the selected length required, and deforming an end of said tubular casing of hard material radially inwardly into a tapered shape extending from the full original tube diameter to a reduced diameter terminal end and simultaneously forcing said resilient lining material radially inwardly to assume a new shape to establish a resilient core sand cutoff throat in said deformed casing end, said liner shape varying in body thickness and in diameter from the original liner diameter toward the restricted exit end of said tube, said liner being operatively maintained in said new shape by the fixed deformation of the hard material casing.

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WHITMORE A. WILTZ, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,200,479 August 17, 1965

Edwin F. Peterson

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 40, for "construction" read -- constriction --; column 5, line 9, for "lines" read -- liner --.

Signed and sealed this 29th day of March 1966.

EAL)
ttest:

RNEST W. SWIDER
ttesting Officer

EDWARD J. BRENNER
Commissioner of Patents