June 6, 1944. F. B. STULEN ET AL 2,350,541

BREECH MECHANISM FOR PROPELLER BLADES

Filed Oct. 28, 1942 3 Sheets-Sheet 1

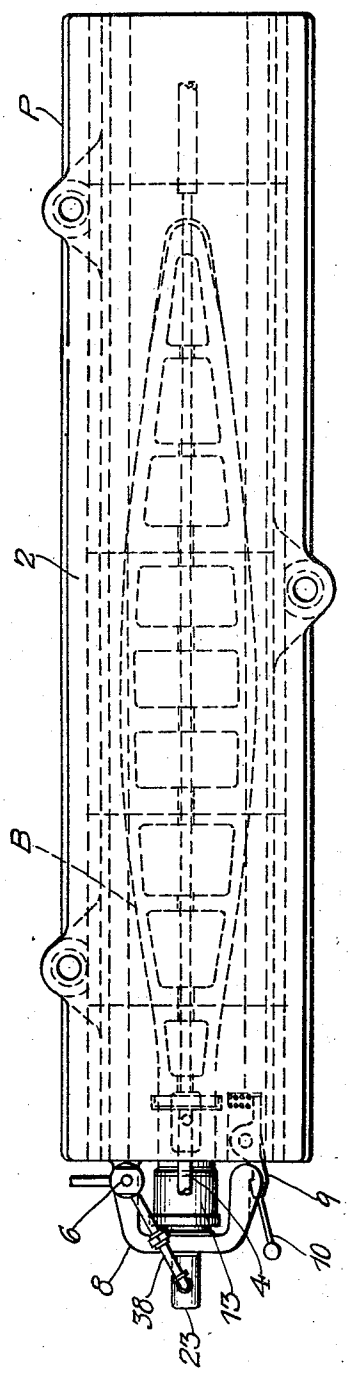


FIG. 1

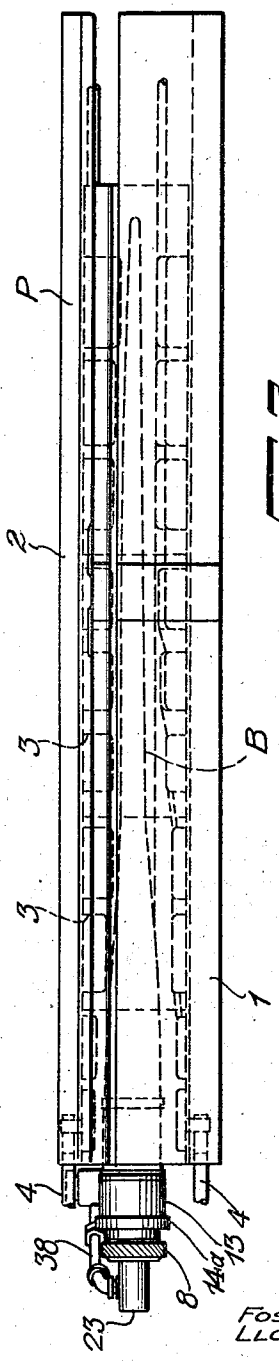


FIG. 2

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Filed Oct. 28, 1942 3 Sheets-Sheet 2

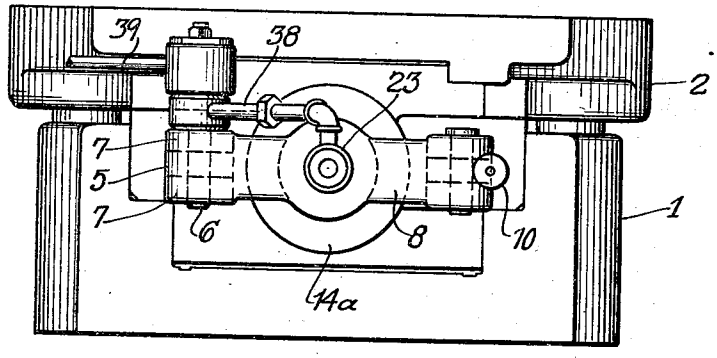


Fig. 3

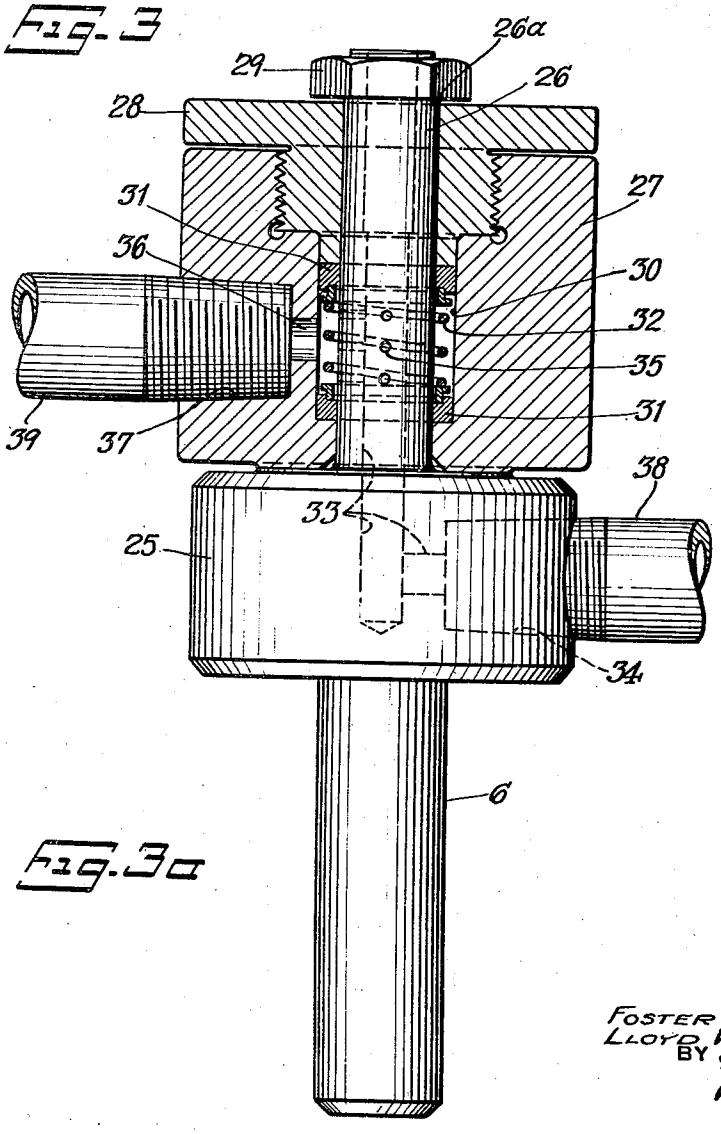


Fig. 3a

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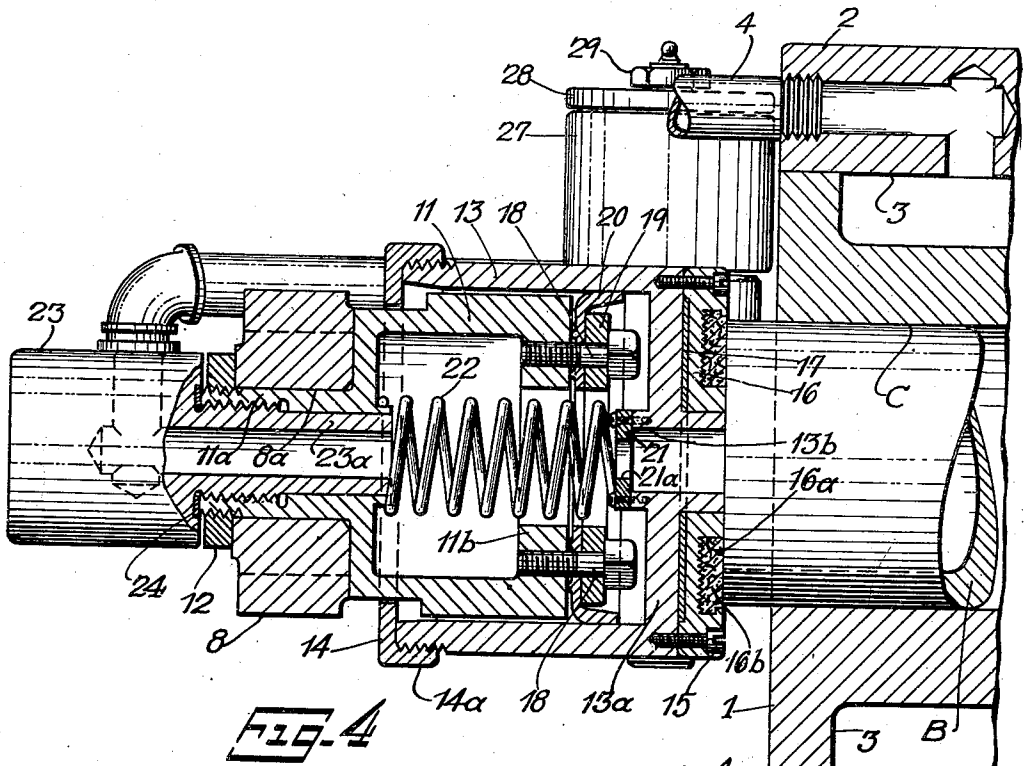


FIG. 4

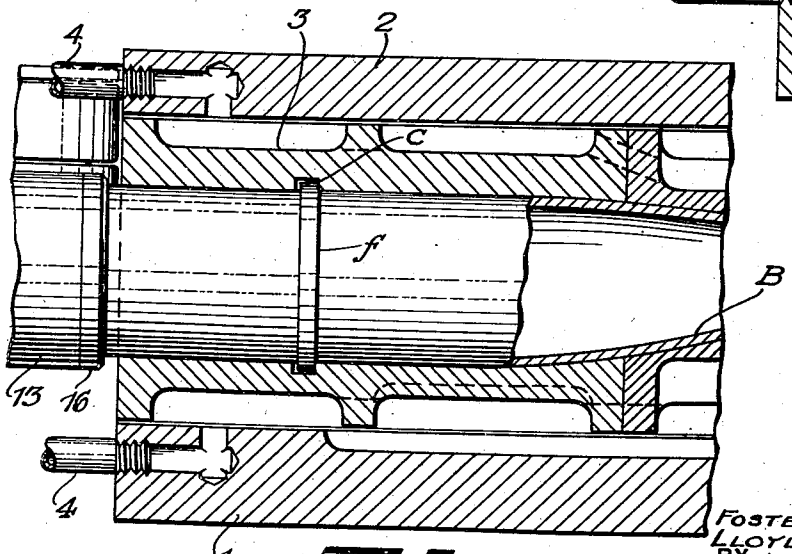


FIG. 5

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BREECH MECHANISM FOR PROPELLER BLADES

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14 Claims. (Cl. 113—44)

This invention relates to breech mechanism utilizable for sealing the end of a hollow propeller blade or blank into which air or any other suitable gas is admitted under pressure as hereinafter particularly described.

In accordance with the invention, there is provided breech mechanism which is readily movable into and from operative relation with respect to the open end of a hollow propeller blank, said breech mechanism comprising novel means for sealing said end of the blank under high pressure conditions.

Various other objects, advantages and features of the invention will become apparent from the following detailed description.

The invention resides in the novel breech mechanism, combinations and arrangements of the character hereinafter described and claimed.

For an understanding of the invention and for an illustration of one of the forms thereof, reference is to be had to the accompanying drawings, in which:

Figure 1 is a plan view of a press having associated therewith a breech mechanism constructed in accordance with the invention;

Fig. 2 is an elevational view of the arrangement shown in Fig. 1;

Fig. 3 is an end view of the arrangement shown in Figs. 1 and 2;

Fig. 3*a* is a vertical sectional view, partly in elevation, showing a detailed feature of the invention;

Fig. 4 is an enlarged vertical sectional view, partly in elevation, showing the breech mechanism of the invention; and

Fig. 5 is an enlarged vertical sectional view, partly in elevation, showing a propeller blank seated between cooperating die surfaces.

Referring to the drawings, there is shown a suitable press P utilizable for imparting a desired exterior configuration to a hollow blank B destined to be a hollow propeller blade, the blank B, in the example shown, being formed from two sections of material peripherally welded together. The blank B, as it comes to the press P, is partially completed in the sense that, to some extent, it has received its ultimate shape. In said press P, the blank B is given its final shape and irregularities such as depressions, raised portions and the like are eliminated.

As shown, the press P comprises a lower die structure suitably anchored in fixed position and an upper die structure 2 connected to suitable hydraulic mechanism, not shown, utilizable for raising and lowering the same. As illustrated, the die structures 1 and 2 comprise suitable chambers 3 into and through which cooling water is circulated by pipes 4. The die structures 1 and 2 cooperate, when closed, to form an interior chamber C having the shape which is to be imparted to the blank B while in the press P.

As shown in Fig. 3, the lower die structure 1 comprises a projecting lug 5 to which, by a vertical pin 6, are pivoted the upper and lower ears 7 of a U-shaped supporting member 8 which, at the end thereof opposite the pin 6, comprises a notch with which is coactable a spring-controlled latch 9 having an actuating handle 10. In Fig. 1, the supporting member 8 is shown in closed position. As will be obvious, the latch 7 may be released to swing said supporting member 8 to open position by moving the same in a clockwise direction, Fig. 1.

As illustrated in Fig. 4, the supporting member 8 comprises a central passage 8*a* longitudinally alined with the aforesaid chamber C. The neck 11*a* of a circular, chamber-forming structure 11 extends through the passage 8*a* and is engaged by a nut 12 whereby said structure 11 is secured to the supporting member 8.

A tubular member 13 is disposed on the structure 11 for free slidable movement. The circular flanged section 14*a* of a cap member 14 is threaded to one end of the member 13, said cap member 14 being slidable in a channel formed at one end of the structure 11 to the extent permitted by spaced stop surfaces formed on said structure 11 and the supporting member 8, Fig. 4. The other end of the member 13 comprises an integral, inwardly directed flanged section 13*a* having a centrally disposed tubular section 13*b* disposed at both sides of said flanged section 13*a*, said tubular section being alined longitudinally with the aforesaid passage 8*a* of the supporting member 8. Suitably secured, as by the screws 15, to the exterior surface of the flanged section 13 is a plate 16 having a central passage in which one end of said tubular section 13*b* is snugly received. As shown in Fig. 4, a gasket 17 is disposed between adjacent surfaces of said flanged section 13 and the plate 16. Further as shown in Fig. 4, the plate 16 comprises a circular channel 16*a* concentrically disposed with respect to the tubular section 13*b*, the channel 16*a* being adapted to receive a suitable gasket 16*b* formed from asbestos or the like.

The aforesaid structure 11 comprises an inwardly directed flanged section 11*b* defining an opening which is longitudinally alined with the aforesaid passage 8*a* of the member 8. Suitably

secured, as by screws 18, to said flanged section 11b is a clamping ring 19 and the base of a sealing cup 20 formed from suitable packing material, the flange of said sealing cup 20 slidably engaging the interior surface of the member 13 in sealing relation as will be understood from Fig. 4.

Secured to one end of the aforesaid tubular section 13b is a disk 21 having a central passage 21a. Seated on the disk 21 is one end of a spiral spring 22, the other end of which seats on an extension of the neck 11a of the structure 11. As will be obvious, the spring 22 biases the tubular member 13 and all parts carried thereby in a direction from left to right, Fig. 4.

Associated interiorly and in threaded relation with the aforesaid neck 11a of the structure 11 is the conduit extension 23a of a chamber-forming structure 23, a gasket 24 being disposed between said structure 23 and the adjacent end of said neck 11a.

Referring to Fig. 3a, the pin 6, hereinbefore referred to as forming the pivotal support for the supporting member 8, is shown as comprising a head 25 and an upper vertical extension 26, the longitudinal axis of the pin 6, the head 25 and the extension 26 being in coincidence. Loosely mounted on the extension 26 is a body 27 having a top member 28 supported by said extension 26, a nut member 29 being threaded to said extension 26 and seating against a flange 26a thereof to maintain the parts in assembled relation.

The body 27 is shaped to form an interior chamber 30 which contains the upper and lower packing rings 31 held at opposite ends of said chamber 30 by a spiral spring 32.

The aforesaid extension 26 and head 25 comprises a passage 33 which communicates with an enlarged, interiorly threaded passage 34 formed in said head 25. The extension 26 further comprises a plurality of angularly related passages 35 by which the aforesaid passage 33 is placed in communication with the chamber 30, the latter, through a passage 36 formed in said member 27, communicating with an enlarged, interiorly threaded passage 37 likewise formed in said member 27.

As shown in Figs. 1 and 3, a pipe 38 extends from the aforesaid chamber-forming structure 23 and is associated, in threaded relation, with the aforesaid passage 34. Further, as illustrated, a pipe 39 is associated, in threaded relation, with the aforesaid passage 37 of the member 27, the pipe 39 leading to a suitable source of air under pressure, not shown.

Referring to Fig. 5, the blank B herein illustrated, at the shank end thereof, is shown as comprising a circular flange *f* which seats in a circular channel *c* formed on the cooperating die surfaces. With the upper die structure 2 in elevated position, the blank B is positioned on the lower die structure 1 with the lower part of the flange *f* occupying that part of the channel *c* which is formed in the lower die surface. Thereupon, the upper die structure 1 is moved to its lower operative position and, in so doing, the upper part of the flange *f* is caused to occupy that part of the channel *c* which is formed in the upper die surface. When thus positioned, the extreme end section of the blank B projects beyond the cooperating die structures to slight extent as illustrated in Figs. 3 and 4.

Prior to the time that the partially completed blank B is thus disposed in the press P, the temperature thereof should be elevated in suitable manner into a range from 1600° F. to 1700° F., more or less. Furthermore, at this time, a source of air under pressure of approximately 900 pounds per square inch should be available in the pipe 39.

With the supporting member 8 in open position and after a gasket 17, which preferably has been coated with suitable asphaltic liquid material, has been placed in the channel 16a of the plate 16, the supporting member 8 is swung on the pivot pin 6 to its closed position and the latch 9 engaged with its coacting notch. In so doing, the otherwise open end of the blank B is engaged by the gasket 17 under some pressure. At this time, by operation of a suitable valve, not shown, air under pressure is caused to flow into the chamber defined by the blank B along a path which extends from the pipe 39, by way of the passage 36, chamber 30, passages 35, passage 33, pipe 38, the chamber formed interiorly of the structure 23 including the conduit extension 23a thereof, the passage defined by the structure 11, the flanged section 11b thereof, the base section of the sealing cup 20 and the ring 19, the air under pressure finally entering the chamber defined in part by the member 13 and the flanged section 13a thereof, and the air passing from said last named chamber to the interior of the blank B by way of the disk passage 21a and the passage defined by the tubular section 13b of the member 13.

It is a feature of the invention that the area of the flanged section 13a and the disk 21 is substantially greater than the area of the surfaces facing the chamber defined by the blank B and, therefore, a force differential is created which causes the gasket 17 to be maintained in effective sealing relation with respect to the end surface of said blank B. This action becomes possible by reason of the fact that the member 13 is movable with respect to the structure 11 which, as stated, is fixed to the supporting member 8. Even though the member 13 is thus movable, leakage of air along the interior surface thereof is prevented in an effective manner by the sealing cup 20.

The spring 22, hereinbefore described, is important in connection with the sealing operation. This spring constantly biases the member 13 together with all parts carried thereby from left to right, Fig. 4. Therefore, when the gasket 17 is engaged initially with the end surface of the blank B, said spring 22 is compressed to some extent and, in so doing, applies force to the gasket 17 to effect the initial sealing operation. A tight joint at the gasket is thereby insured before creation of the described air pressure.

After completion of the shaping operation on the blank B by die and air pressure action, the supply of air under pressure is discontinued. Thereupon, the latch 9 may be actuated and the supporting member 8 swung in a clockwise direction, Fig. 1, to move the breech mechanism aside preparatory to the removal of the shaped blank B from the press P.

The pipes 38 and 39 hereinbefore referred to are of non-flexible character and, by reason of the fact that one end of the pipe 38 is connected to and movable with the chamber-forming structure 23, it becomes necessary to provide an arrangement permitting movement of this pipe when the supporting member 8 for said structure 23 is moved in a pivotal manner as described above. The arrangement illustrated in Fig. 3a is provided for this purpose. In this arrange-

ment, the head 25 and the member 27 are readily movable with respect to each other on a common pivotal axis, i. e., the pivot 6 of said supporting member 8. Therefore, when the supporting member 8 is moved either to open or closed position, such movement is accompanied by oscillatory movement of the pipe 38, the head 25 and the pin 6 about the longitudinal axis of the latter. Accordingly, in the pipe connection between the source of air pressure and the swingable structure 23, there is incorporated a "movable joint" for the two pipes 38 and 39.

As will be obvious from a consideration of Fig. 3a, the chamber 30 constitutes an important part of the arrangement referred to above. This chamber, it will be noted, is sealed, except for its inlet and outlet passages, by the rings 31 which are held in sealing position by the spring 32. The aforesaid movable joint, then, is sealed except for its inlet and outlet passages.

Although a particular arrangement has been described in detail for permitting movement of the pipes 38 and 39 with respect to each other, it is to be understood that other aspects of the invention are not to be limited thereto. Also, other equivalent arrangements may be utilized for supplying air under pressure to the structure 23, or equivalent. Under some circumstances, the pipes 38, 39 and the arrangement illustrated in Fig. 3a for movably connecting them together may be eliminated in favor of a flexible conduit which extends from the chamber-forming structure 23 to some non-flexible conduit leading to the source of air pressure.

While the invention has been described with respect to a certain particular preferred example which gives satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent is:

1. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising members relatively movable with respect to each other, said members defining chambers, respectively, which communicate with each other to form a main chamber, means forming a sealed joint between said members, a gasket carried by one of said members for sealing engagement with the end of said propeller blank, and means for passing air under pressure into said main chamber and into said propeller blank.

2. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising members relatively movable with respect to each other, said members defining chambers, respectively, which communicate with each other to form a main chamber, means forming a sealed joint between said members, a gasket carried by one of said members for sealing engagement with the end of said propeller blank, biasing means effective between said members for increasing the area of said main chamber, and means for passing air under pressure into said main chamber and into said propeller blank.

3. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising members relatively movable with respect to each other, said members defining chambers, respectively, which communicate with each other to form a main chamber, means forming a sealed joint between said members, a gasket carried by one of said members for sealing engagement with the end of said propeller blank, means for passing air under pressure into said main chamber and into said propeller blank, and a pivotally mounted member forming a fixed support for the other of said members.

4. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising a fixed structure adapted to form a chamber, a tubular member slidable with respect to said structure and adapted to form a chamber, said chambers communicating with each other to form a main chamber, means forming a sealed joint between said structure and said tubular member, a gasket carried by said tubular member for sealing engagement with the end of said propeller blank, and means for passing air under pressure into said main chamber and into said propeller blank.

5. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising a fixed structure adapted to form a chamber, a tubular member slidable with respect to said structure and adapted to form a chamber, said chambers communicating with each other to form a main chamber, means forming a sealed joint between said structure and said tubular member, a gasket carried by said tubular member for sealing engagement with the end of said propeller blank, means for biasing said tubular member toward said end of said propeller blank, and means for passing air under pressure into said main chamber and into said propeller blank.

6. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising a fixed structure adapted to form a chamber, a tubular member slidable on said structure and adapted to form a chamber, said chambers communicating with each other to form a main chamber, means forming a sealed joint between said structure and said tubular member, said tubular member comprising a flanged section disposed at right angles to the longitudinal axis of said hollow propeller blank, a gasket carried by said flanged section for sealing engagement with the end of said propeller blank, and means for passing air under pressure into said main chamber and into said propeller blank.

7. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising a fixed structure adapted to form a chamber, a tubular member slidable on said structure, means forming a sealed joint between said structure and said tubular member, said tubular member comprising a flanged section disposed at right angles to the longitudinal axis of said hollow propeller blank, a gasket carried by said flanged section for sealing engagement with the end of said propeller blank, and means for passing air under pressure into said chamber and into said propeller blank whereby air under pressure effectively engages said flanged section, the area of said flanged section being larger than the surface area facing the chamber defined by said propeller blank whereby a force differential is created to cause said gasket to be maintained in effective sealing relation with respect to the end of said blank.

8. Breech block mechanism for sealing the end

of a hollow propeller blank while held in a die press, said mechanism comprising a fixed structure adapted to form a chamber, a tubular member slidable on said structure, a sealing cup having a flanged surface coactable with the interior surface of said tubular member, means for securing the base of said sealing cup to said fixed structure, said tubular member comprising a flanged section disposed at right angles to the longitudinal axis of said hollow propeller blank, a gasket associated with said flanged section for sealing engagement with the end of said propeller blank, and a spring disposed in said chamber and having its respective opposite ends seated on said fixed structure and on said flanged section, said mechanism comprising passages through which air passes under pressure into said chamber for effective engagement with said flanged section, the air passing under pressure into said propeller blank.

9. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising a fixed structure adapted to form a chamber, a tubular member slidable on said structure, a sealing cup having a flanged surface coactable with the interior surface of said tubular member, means comprising a clamping ring for securing the base of said sealing cup to said fixed structure, said tubular member comprising a flanged section disposed at right angles to the longitudinal axis of said hollow propeller blank, a plate secured to said flanged section, a gasket associated with said plate for sealing engagement with the end of said propeller blank, and a spring disposed in said chamber and having its respective opposite ends seated on said fixed structure and on said flanged section, said mechanism comprising passages through which air passes under pressure into said chamber and from thence into said propeller blank.

10. Breech block mechanism for sealing the end of a hollow propeller blank while held in a die press, said mechanism comprising a supporting member mounted for pivotal movement, a structure having a tubular neck which extends through and is fixed to said supporting member, a tubular member slidable on said structure, a sealing cup having a flanged surface coactable with the interior surface of said tubular member, means comprising a clamping ring for securing the base of said sealing cup to said fixed structure, said tubular member comprising a flanged section disposed at right angles to the longitudinal axis of said hollow propeller blank, a plate secured to said flanged section, a gasket associated with said plate for sealing engagement with the end of said propeller blank, and a spring disposed in said chamber and having its respective opposite ends seated on said fixed structure and on said flanged section, said mechanism comprising passages through which air passes under pressure into said chamber and from thence into said propeller blank.

11. In combination, a supporting member for breech block mechanism adapted to seal the end of a hollow propeller blank while held in a die press, means forming a pivotal support for said supporting member, a pipe having one end secured to said mechanism for delivering air to the interior thereof under pressure, and means for pivoting the other end of said pipe on the longitudinal axis of said pivotal support.

12. In combination, a supporting member for breech block mechanism adapted to seal the end of a hollow propeller blank while held in a die press, means forming a pivotal support for said supporting member, a pipe having one end secured to said mechanism for delivering air to the interior thereof under pressure, means for pivoting the other end of said pipe on the longitudinal axis of said pivotal support, a pipe for delivering air under pressure to said other end of said first named pipe, and means forming a sealed joint between said pipes.

13. In combination, a supporting member for breech block mechanism adapted to seal the end of a hollow propeller blank while held in a die press, means forming a pivotal support for said supporting member, a pipe having one end secured to said mechanism for delivering air to the interior thereof under pressure, means for pivoting the other end of said pipe on the longitudinal axis of said pivotal support, a pipe for delivering air under pressure to said other end of said first named pipe, and means forming a sealed joint between said pipes, said last named means comprising a head to which said first named pipe is secured and a chamber-forming body to which said second named pipe is secured, said head and said body being movable relative to each other on said longitudinal axis.

14. In combination, a supporting member for breech block mechanism adapted to seal the end of a hollow propeller blank while held in a die press, means forming a pivotal support for said supporting member, a pipe having one end secured to said mechanism for delivering air to the interior thereof under pressure, means for pivoting the other end of said pipe on the longitudinal axis of said pivotal support, a pipe for delivering air under pressure to said other end of said first named pipe, and means forming a sealed joint between said pipes, said last named means comprising a head to which said first named pipe is secured and a chamber-forming body to which said second named pipe is secured, said head and said body being movable relative to each other on said longitudinal axis, the chamber in said body being traversed by air under pressure and comprising inlet and outlet passages therefor.

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