

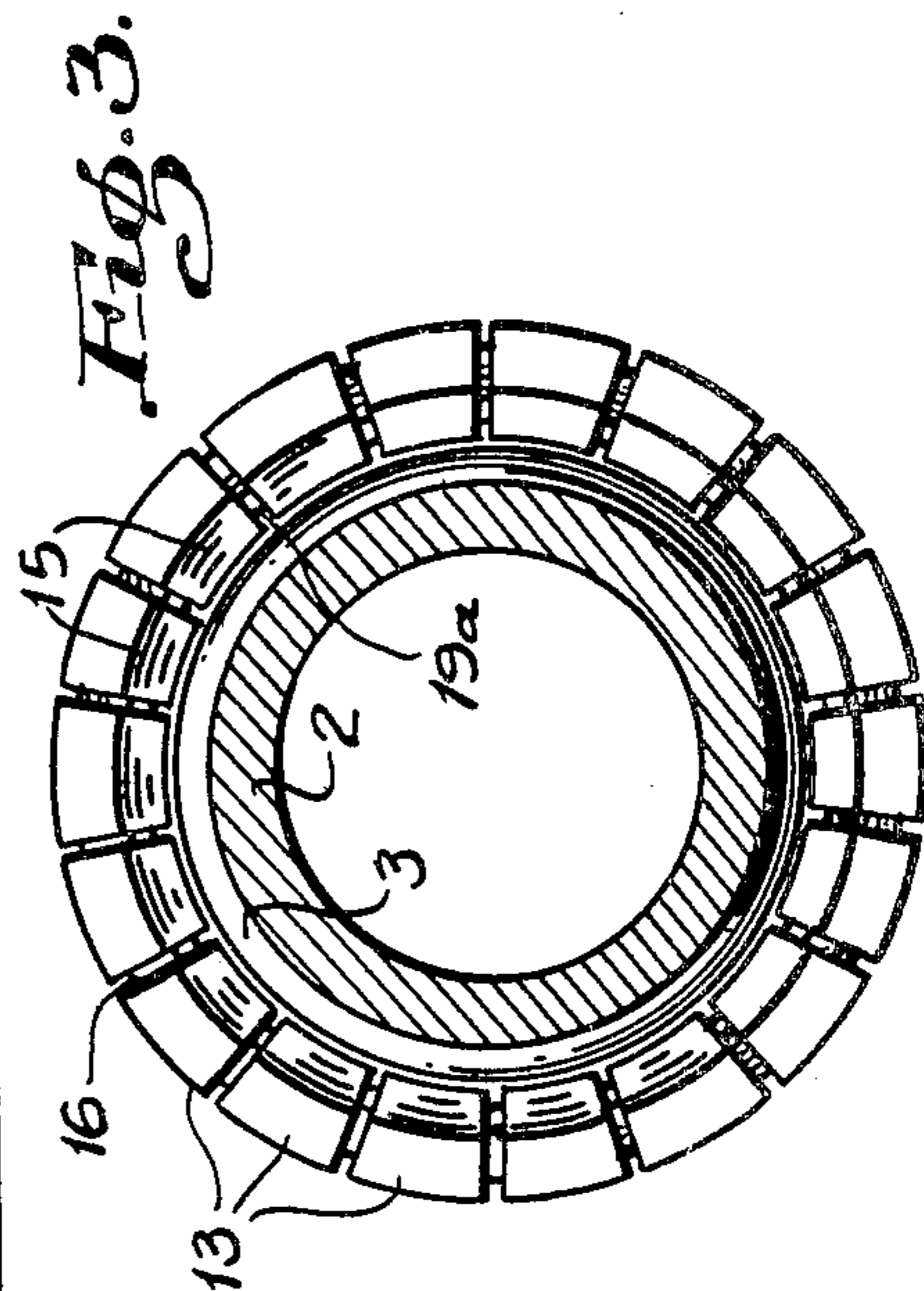
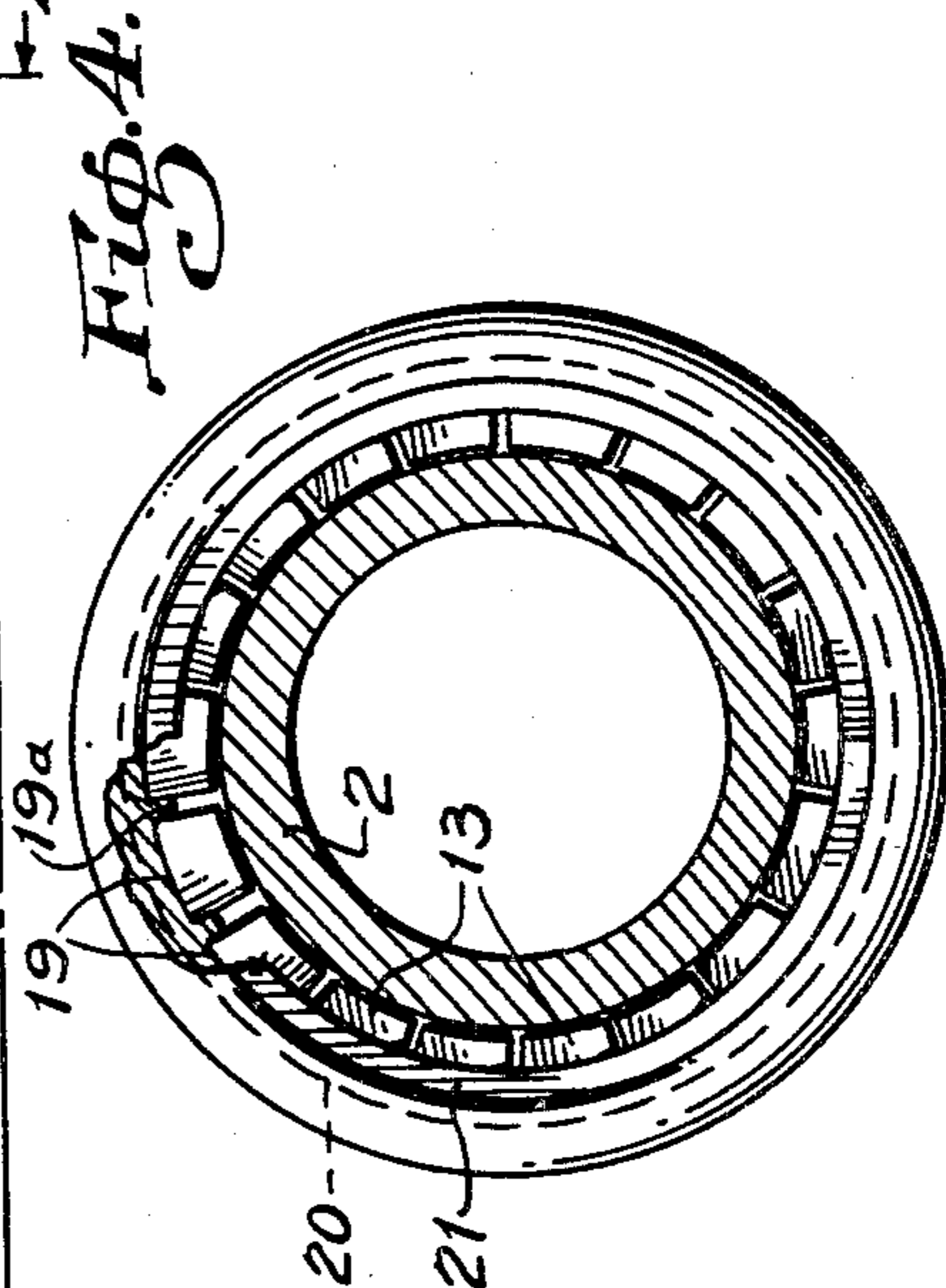
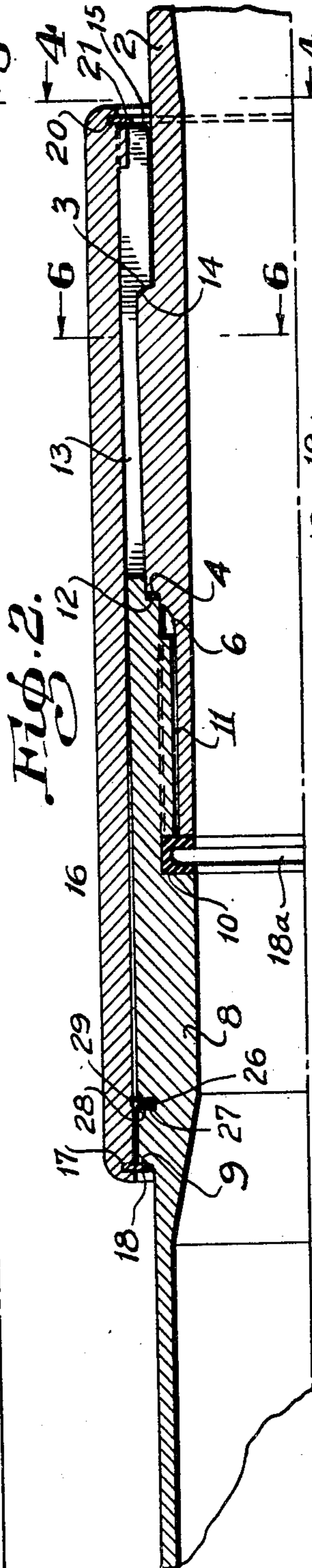
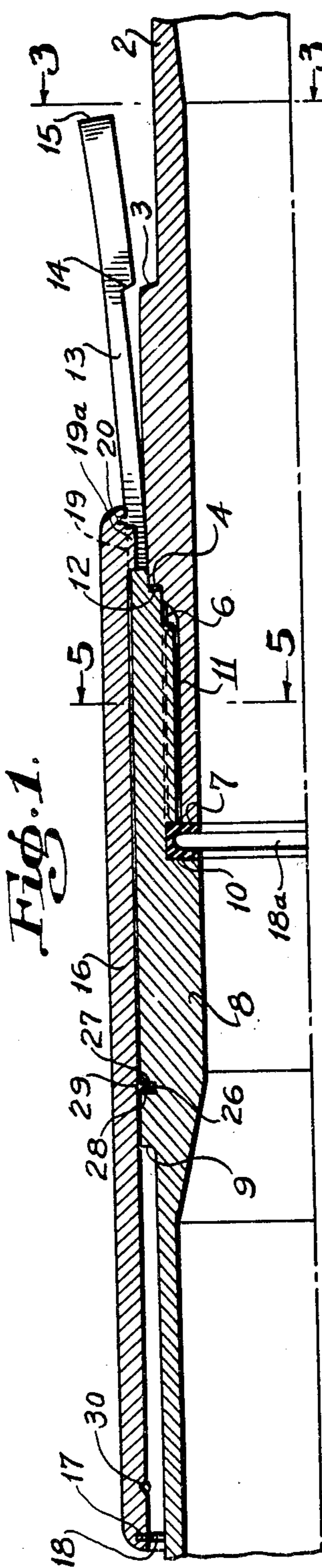
Oct. 25, 1949.

J. MOON
TOOL JOINT

2,485,763

Filed July 16, 1946

2 Sheets-Sheet 1



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Fig. 6.

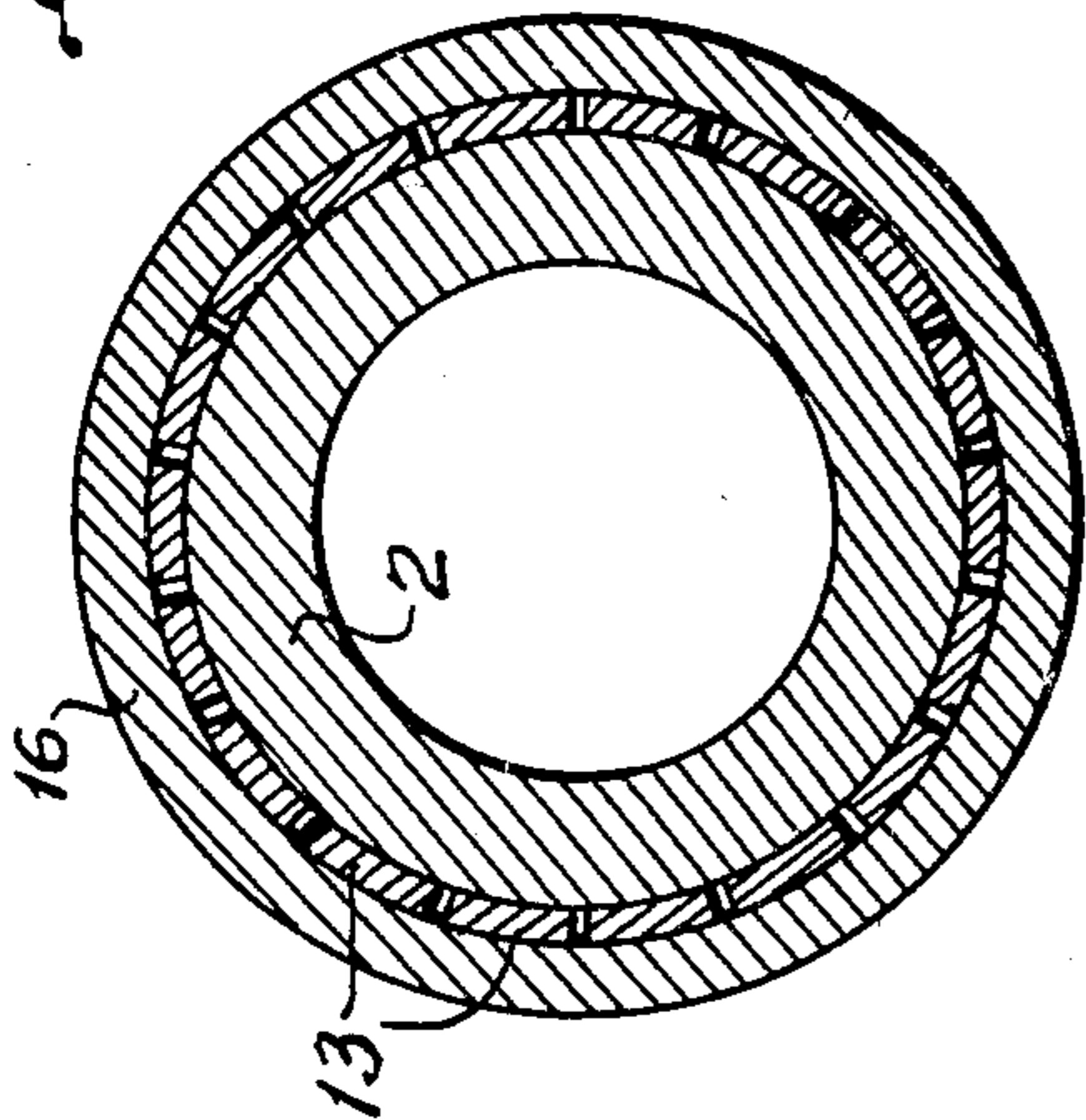


Fig. 5.

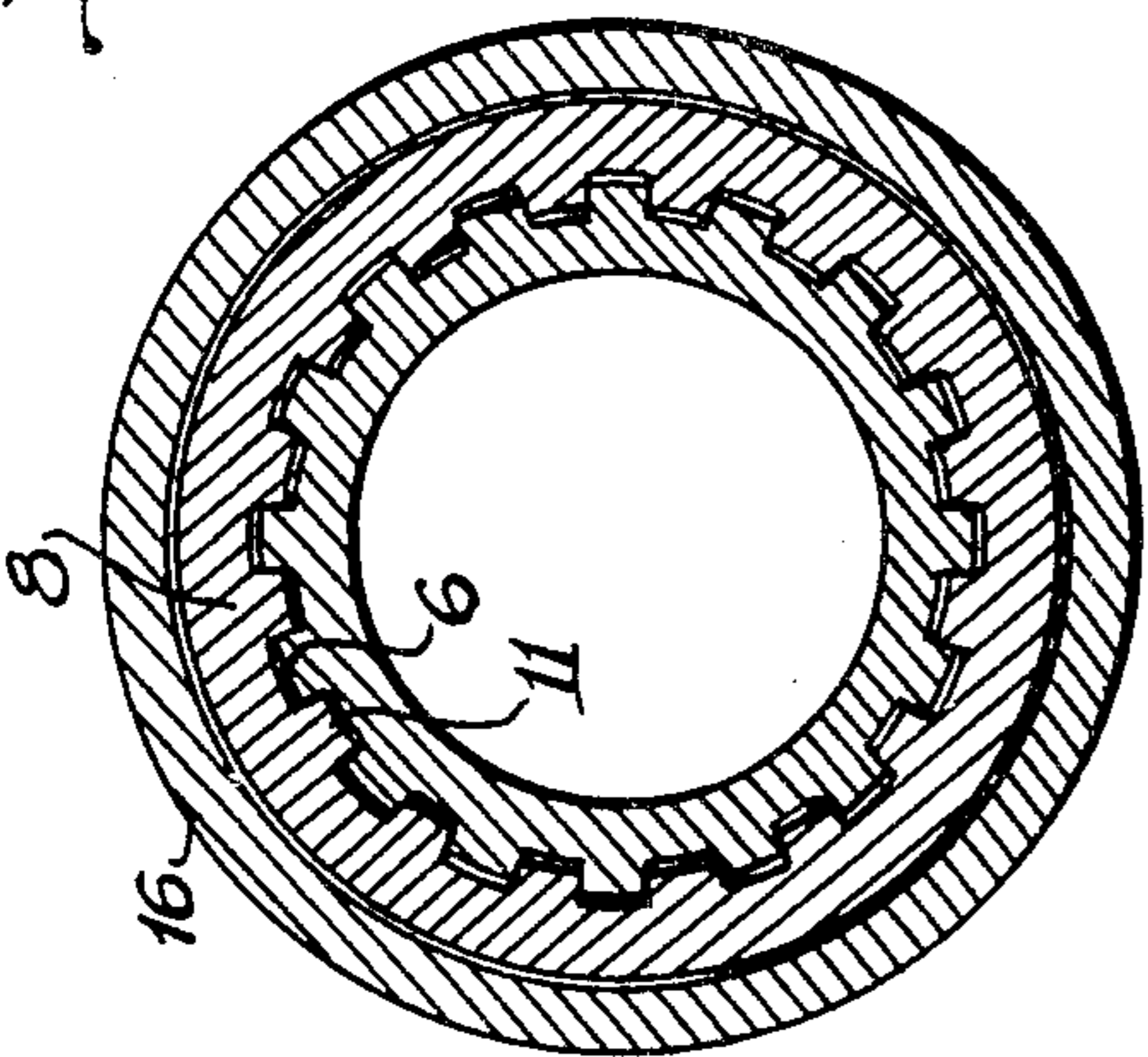


Fig. 7.

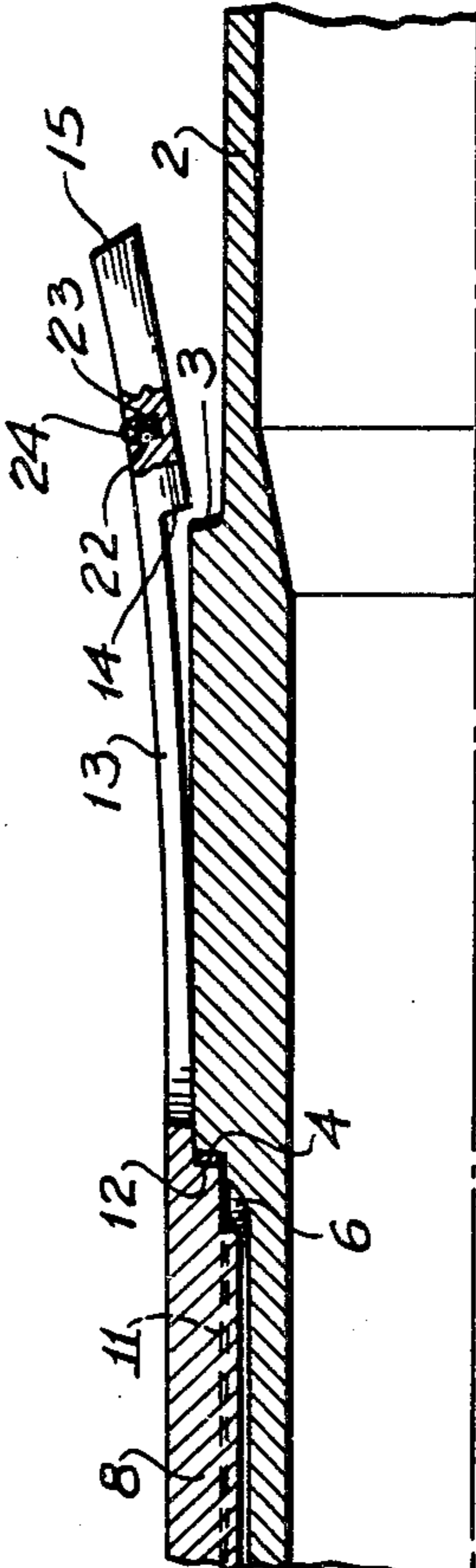
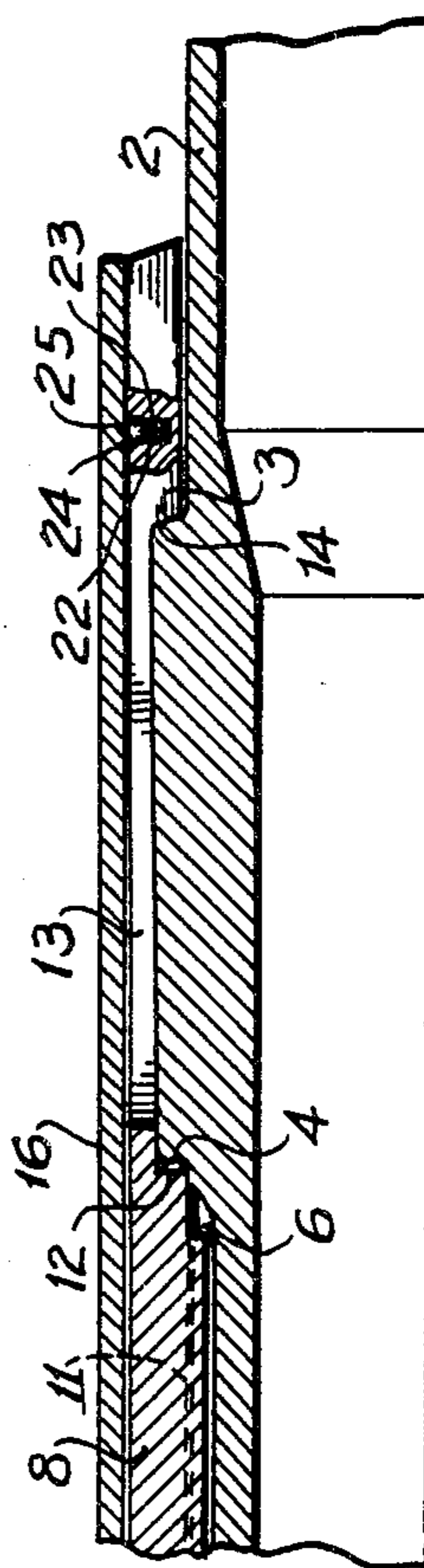


Fig. 8.



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UNITED STATES PATENT OFFICE

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TOOL JOINT

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4 Claims. (Cl. 285—174)

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This invention relates to a tool joint and collar assembly which permits of ready assembly of strings of drill pipe employed in drilling of bore holes in the earth for the production of water, oil, gas, and other fluids.

In prior drilling practice the drill string formed of sections of pipe screwed together by means of tool joints, the pipe could be rotated in a clockwise direction only. Reversal of rotation could not be effected. In order to permit of this reversal in rotation, it is necessary that the screwed joints employed between the kelly, tubing sections, drill collars, and bits do not unscrew on reversal of rotation. In present practice all screwed joints are either left or right-handed, that is, they tighten when the cutting part into the screwed joint is rotated clockwise. With such screwed joints reversal of rotation of the drill pipe is impractical and dangerous, since there is a danger that the joints will become unscrewed. This results from the fact that the frictional resistance of the earth against the bit and the side walls of the bore hole against the side of the tubing is very large in drilling. In fact, substantially the entire drilling load, running up to 100 horsepower and more, is employed in overcoming the frictional resistance. For this reason the conventional threaded couplings are made up with considerable tension and are all of a hand to be tightened during rotation.

I have devised a tool joint which will be just as tightly assembled whether the string is rotated clockwise or counter-clockwise. By so doing, the forces which result from the rotation of the drill pipe which cause drift and spiralling of the bore are cancelled out, since by reversing the direction of rotation the direction of the forces is reversed, and thus the net result is to neutralize them and the bore hole may traverse its predetermined course whether vertical, horizontal, or deviated.

I may, therefore, also employ the more flexible drill pipe and shorter drill collar assemblies required for drilling of deviated bore holes of high angle and large degrees of curvatures and maintain the drill pipe on the whipstock. By reversing direction of rotation, the forces, which on rotating in one direction cause the drill pipe to ride off the sides of the whipstock, will be neutralized and the drill pipe be maintained in the whipstock and the drill pipe will feed off the end of the whipstock. The reversal of rotation will also permit wear on both sides of the teeth so that the bit life is prolonged and a greater amount of drilling between bit changes permitted.

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This invention will be further described in connection with the drawings, in which

Fig. 1 is a quarter section of a drill pipe and tool joint showing the joint before make-up;

Fig. 2 is a quarter section showing the joint made up;

Fig. 3 is a full section taken on the line 3—3 of Fig. 1;

Fig. 4 is a full section partly broken away, taken on the line 4—4 of Fig. 2;

Fig. 5 is a full section taken on the line 5—5 of Fig. 1;

Fig. 6 is a full section taken on the line 6—6 of Fig. 2;

Fig. 7 is a fragmentary quarter section of the joint showing an alternative locking means with the sleeve excluded; and

Fig. 8 is similar to Fig. 7 showing the sleeve in locked position.

The pin end 2 of the tool joint is suitably secured to the drill pipe by welding the joint to the drill string. Such connection of tool joints and drill strings is quite conventional. Any other suitable means for connecting the joint and the pipe may be employed. The pin 2 is formed with circumferential shoulders 3 and 4. The shoulder 3 is positioned near the external ends of the pin 2. The outer surface of the pin between the shoulder 4 and the end 7 carries splines 6.

The box end 8 of the tool joint is connected to the drill pipe in a manner similar to the connection of the pin end 2. The box has formed therein an external shoulder 9 and shoulder 12, and internal groove 10. Between groove 10 and shoulder 12 are splines 11 complementary to the splines 6.

The box 8, beyond the shoulder 12, is formed integrally with or joined by welding to a series of spring fingers 13 which are circumferentially spaced from each other, as shown in Figs. 3, 4, and 6, and placed at the end of the solid section of the box. In their normal position the fingers stand away from the box, i. e., are bowed away from the axis of said box, as shown in Fig. 1. Each finger 13 is formed with an internal shoulder 14 which forms an overhanging lip at the free end of the fingers. These lips are complementary to the external shoulder 3.

An outer sleeve 16 is slidably positioned on the outside of the box 8 and carries an internal groove 17 into which a split lock washer 18 may be placed. The sleeve is formed with a series of grooves 19 which fit slidably over the fingers 13 and with lips 19a which fit between the spaced fingers, as shown in Figs. 1, 2, and 4. A groove 20

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is positioned near the end of the sleeve 16 to receive a split washer 21 similar to 18. The collar 16 is retracted to the position shown in Fig. 1.

The tool joint may be assembled as follows: With the pin end removed, a U-shaped circular packer 18a is placed in the groove 10. The packing ring 5 is placed in the shoulder 4. The pin is inserted into the box with the splines 6 mating with the splines 11. The sleeve 16 is then pushed over the fingers 13, compressing them so that the sloping shoulder 14 engages the sloping shoulder 3. When the sleeve has been pushed home the ring 18 abuts the shoulder 9 and the groove 20 overhangs the end 15. The split ring 21 is then introduced into the groove 20 and the sleeve is thus locked in place.

In order to hold the sleeve in unlocked position, as shown in Fig. 1, I may provide a lock such as shown. The ball 28 positioned in the bore 27 on spring 26 may engage a detent 29 to hold the sleeve in such open position.

A second detent 30 may also be provided so that when the pin is disengaged from the box, the sleeve may be slid over the finger 15 and locked in place by engagement of detent 30 with ball 29 to cover and guard the spring fingers against damage. This will permit of placing the box on a floor such as is usual when stacking drill pipe.

Figs. 7 and 8 show a sleeve locking means which is alternative to the split ring 21. Certain or all of the fingers carry a bore 22 in which is positioned a spring 23 and a ball 24. The sleeve 16 has formed therein a complementary detent 25. When the sleeve is pushed into locking position the ball 24 enters the detent 25 to lock the sleeve against displacement by any force to be encountered in the use of the drill string. By exerting a larger force, the sleeve may be slid over the ball which was forced into the bore 23 against the spring 22. The detents 30 and 29 and the ball 28 may also be employed in this form. When the box is disengaged from the pin the sleeve may also, in this form, be slid over the spring fingers and locked in place by means of the ball 24 or ball 29.

As will be seen this tool joint has no threads for locking the joints and may be assembled simply by sliding the box over the pin and pushing the locking sleeve into position. No rotation of the drill string is thus necessary to make up the drill string, thus avoiding an operation now generally employed and which has caused numerous accidents. Additionally, the drill string may be rotated either clockwise or counter-clockwise or rotation may be reversed periodically during drilling without danger of separation of the drill string at the tool joints. When the sleeve 16 is slid over the spring fingers, as shown in Fig. 2, the lateral displacement of the sleeve is prevented by the lock washers 18 and 21 or the lock 25. The lateral separation of the box and pin is prevented by the engagement of the shoulder 14 of the spring fingers with the shoulder 3 on the pin 2.

This same construction may also be used not only between the drill pipe sections, but to connect the drill pipe to the kelly, or to the drill collars, or to connect drill collars together, or to connect the drill collar to the drill, or connect the kelly to the swivel to make up an entire drill string which could be rotated either clockwise or counter-clockwise.

While I have described a particular embodiment of my invention for the purpose of illustration, it should be understood that various modifications and adaptations thereof may be made

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within the spirit of the invention as set forth in the appended claims.

I claim:

1. A drill collar, comprising a pin portion, external splines at the end of the pin, external splines on said pin, a box portion, internal splines on said box portion complementary to the external splines on said pin portion, a plurality of spring fingers mounted on said box, a sleeve slidably mounted over the exterior surfaces of said box and said spring fingers, and means for engaging said spring fingers with said pin to lock said box and pin when said sleeve is slid over said spring fingers to prevent lateral separation of said box and pin, said means including means for locking said sleeve in position over said spring fingers, said locking means also including circumferential locking means to lock said sleeve in position irrespective of the angular position of said sleeve with respect to said fingers, said locking means being operative to prevent lateral displacement of said sleeve.

2. A drill collar, comprising a pin portion, external splines at the end of the pin, external splines on said pin, an internal shoulder near the end of said pin, a box portion, internal splines on said box portion complementary to the external splines on said pin portion, a plurality of spring fingers mounted on said box, said spring fingers being normally bowed away from the axis of said box, an overhanging lip formed at the free end of said spring fingers complementary to said external shoulder on said pin, a sleeve slidably mounted over the exterior surfaces of said box and said spring fingers, said spring fingers being forced into a position along the exterior surface of said pin and engaging the lip of said spring fingers with said external shoulder, and means for locking said sleeve in position to hold said spring fingers in said last-named position and to hold said lips in engagement with said exterior shoulders to prevent lateral separation of said box and pin.

3. A drill collar, comprising a pin portion and a box portion, an external shoulder on said pin portion, a second external shoulder mounted on said pin portion longitudinally spaced from said first mentioned external shoulder on said pin portion, an internal seal positioned on the wall of said box section and abutting the end of said pin, an internal shoulder on said box section, a seal between said last-named shoulder on the box and the first-named shoulder on said pin section, a plurality of spring fingers mounted on said box, said spring fingers being normally bowed away from the axis of said box, an overhanging lip formed at the free end of said spring fingers complementary to said second external shoulder on said pin, a sleeve slidably mounted over the exterior surfaces of said box and said spring fingers, said spring fingers being forced into a position along the exterior surface of said pin and engaging the lip of said spring fingers with said external shoulder, and means for locking said sleeve in position to hold said spring fingers in said last-named position and to hold said lip in engagement with said exterior shoulders to prevent lateral separation of said box and pin.

4. A drill collar, comprising a pin portion and a box portion, an external shoulder on said pin portion, a second external shoulder mounted on said pin portion longitudinally spaced from said first mentioned external shoulder on said pin portion, an internal seal positioned on the wall of said box section and abutting the end of said

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pin, an internal shoulder on said box section, a seal between said last-named shoulder on the box and the first-named shoulder on said pin section, mating splines positioned on the walls of said pin and box sections between said seals, a plurality of spring fingers mounted on said box, said spring fingers being normally bowed away from the axis of said box, an overhanging lip formed at the free end of said spring fingers complementary to said second external shoulder on said pin, a sleeve slidably mounted over the exterior surfaces of said box and said spring fingers, said spring fingers being forced into a position along the exterior surface of said pin and engaging the lip of said spring fingers with said external shoulder, and means for locking said sleeve in position to hold said spring fingers in said last-named position and to hold said lip in engagement with said exterior shoulders to prevent lateral separation of said box and pin, said means including means for locking said sleeve in position over said spring fingers, said locking means also including circumferential locking means to lock said sleeve in position irrespective of the angular position of said sleeve with respect to said fingers, said locking means being operative to prevent lateral displacement of said sleeve.

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tion of said box and pin, said means including means for locking said sleeve in position over said spring fingers, said locking means also including circumferential locking means to lock said sleeve in position irrespective of the angular position of said sleeve with respect to said fingers, said locking means being operative to prevent lateral displacement of said sleeve.

JAMES MOON.

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