

Sept. 2, 1958

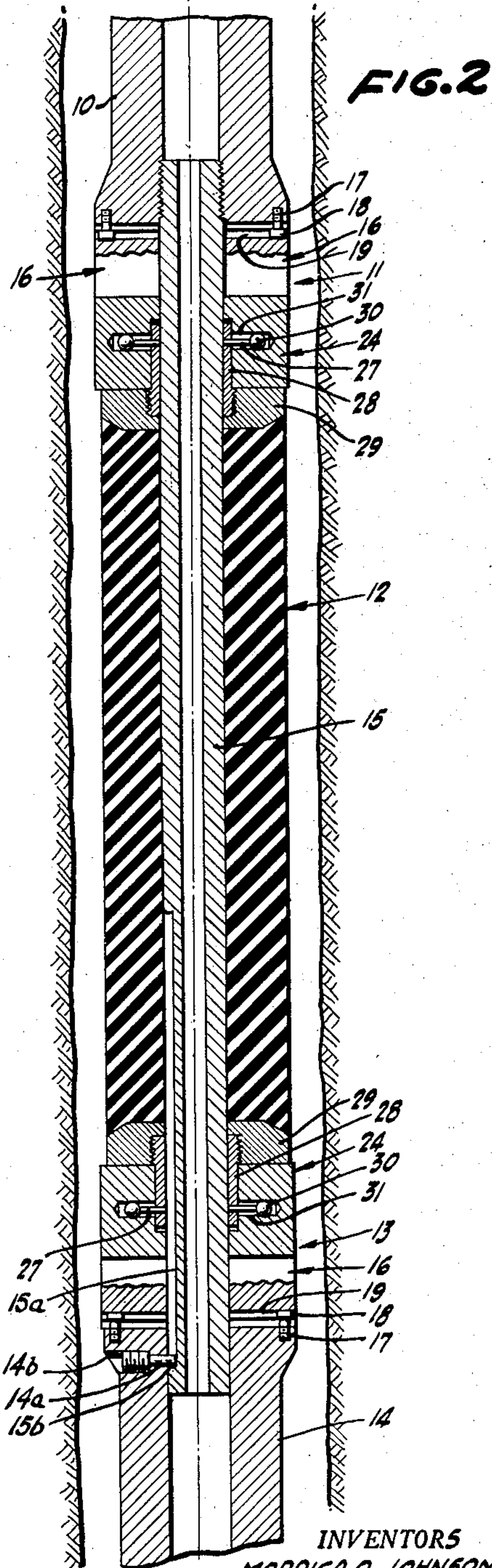
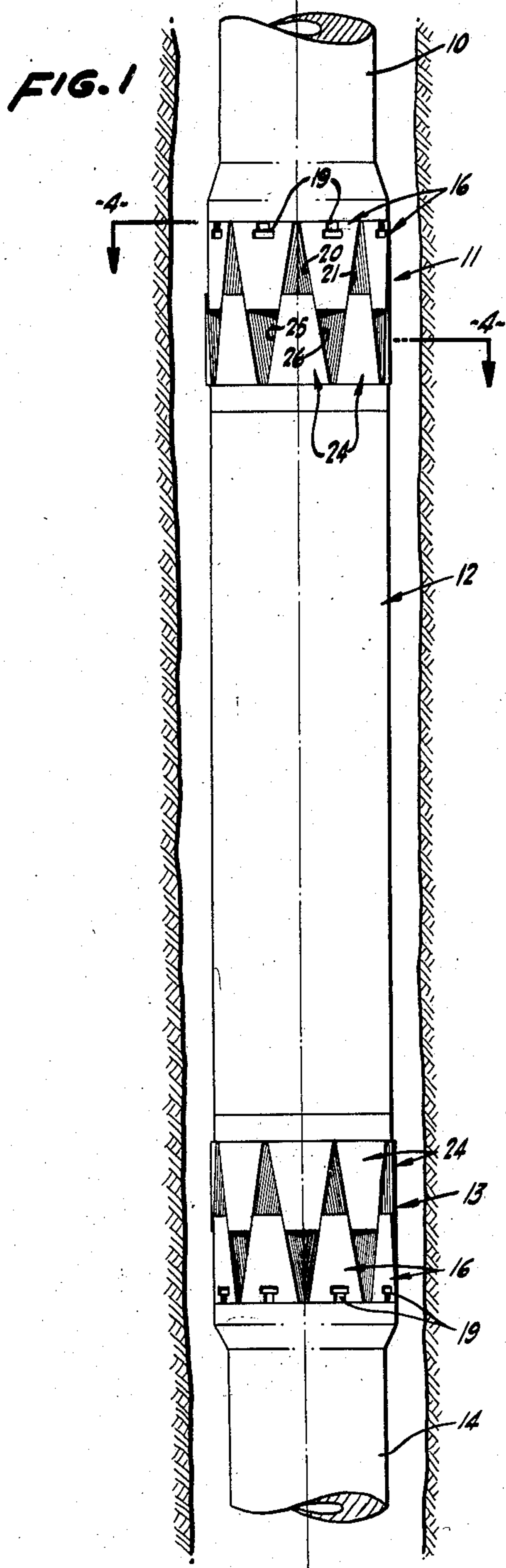
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2,850,101

DEVICE TO PREVENT PLASTIC END FLOW OF PACKERS

Filed Oct. 18, 1954

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

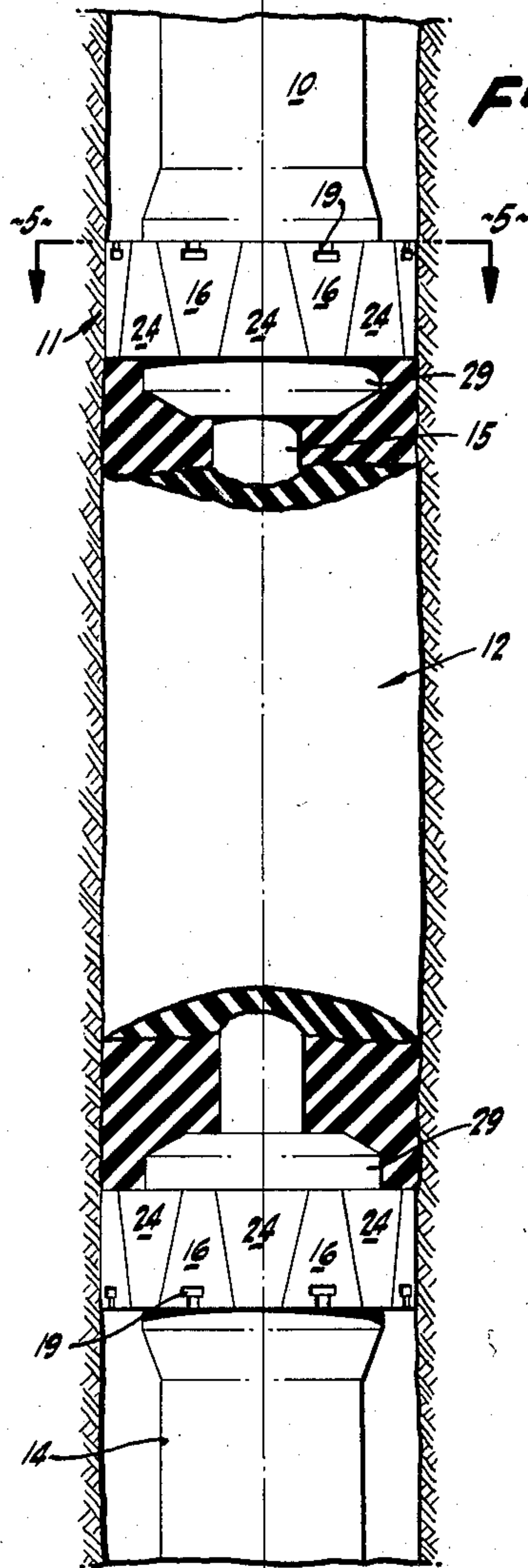


FIG. 3

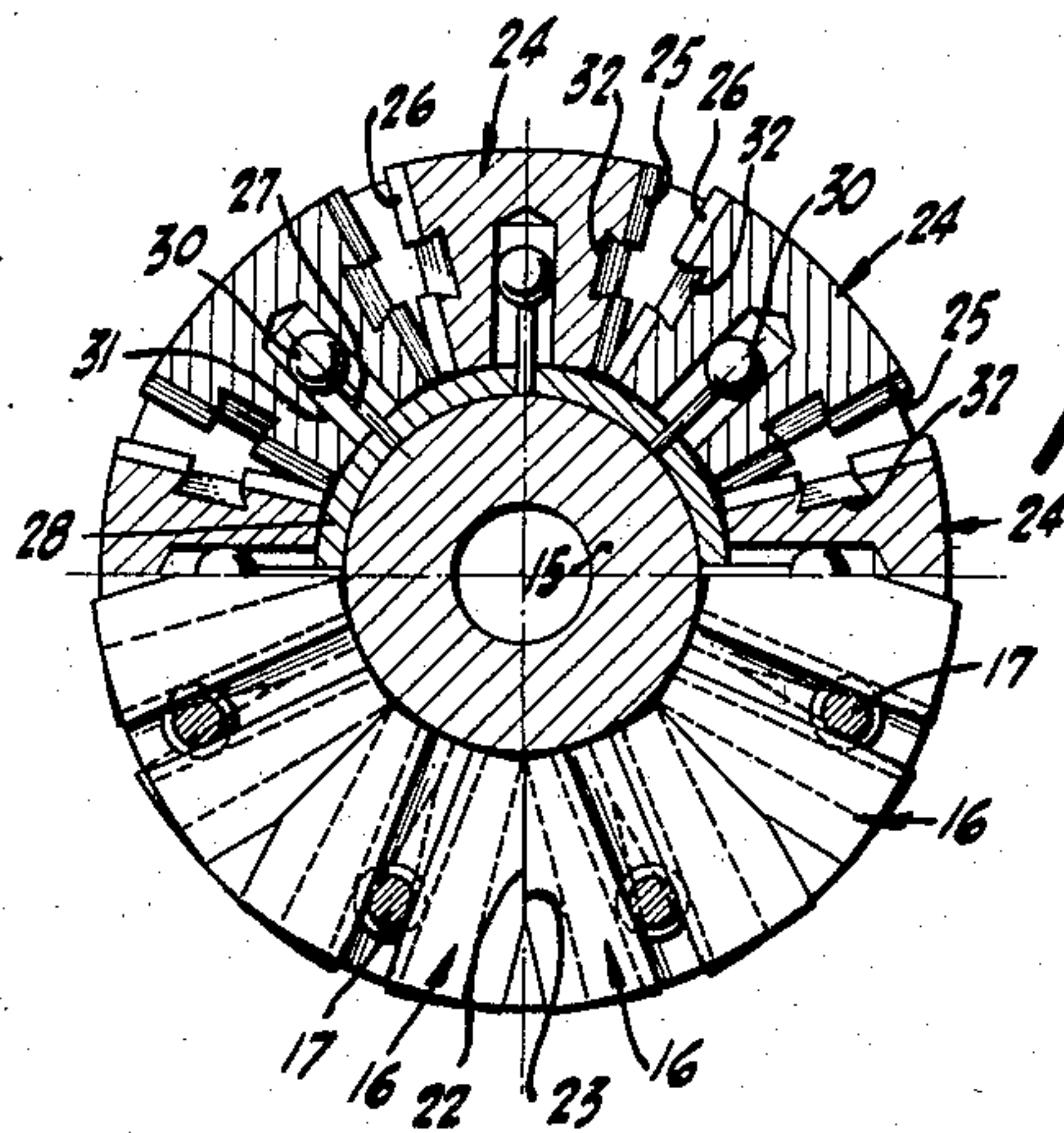


FIG. 4

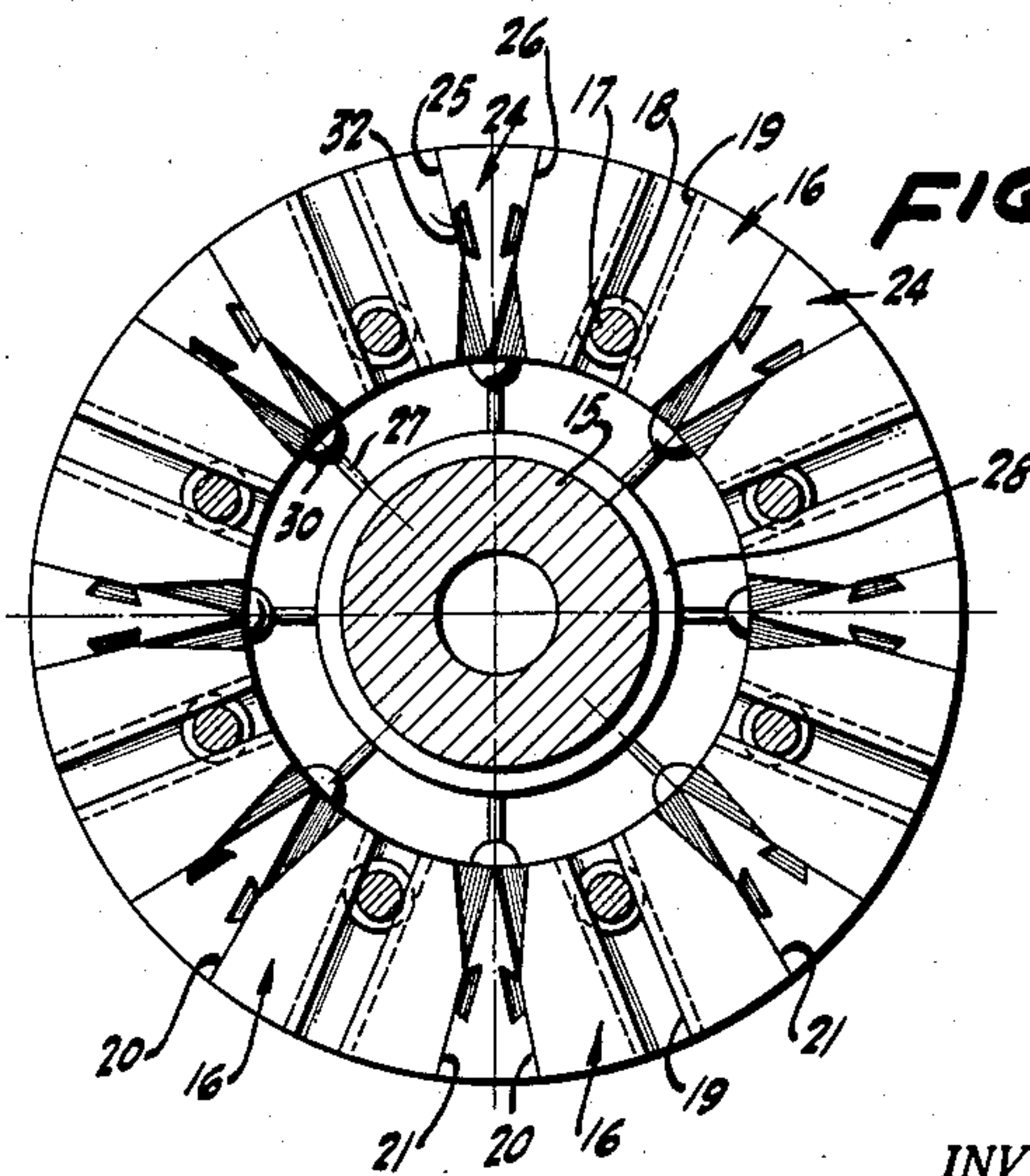


FIG. 5

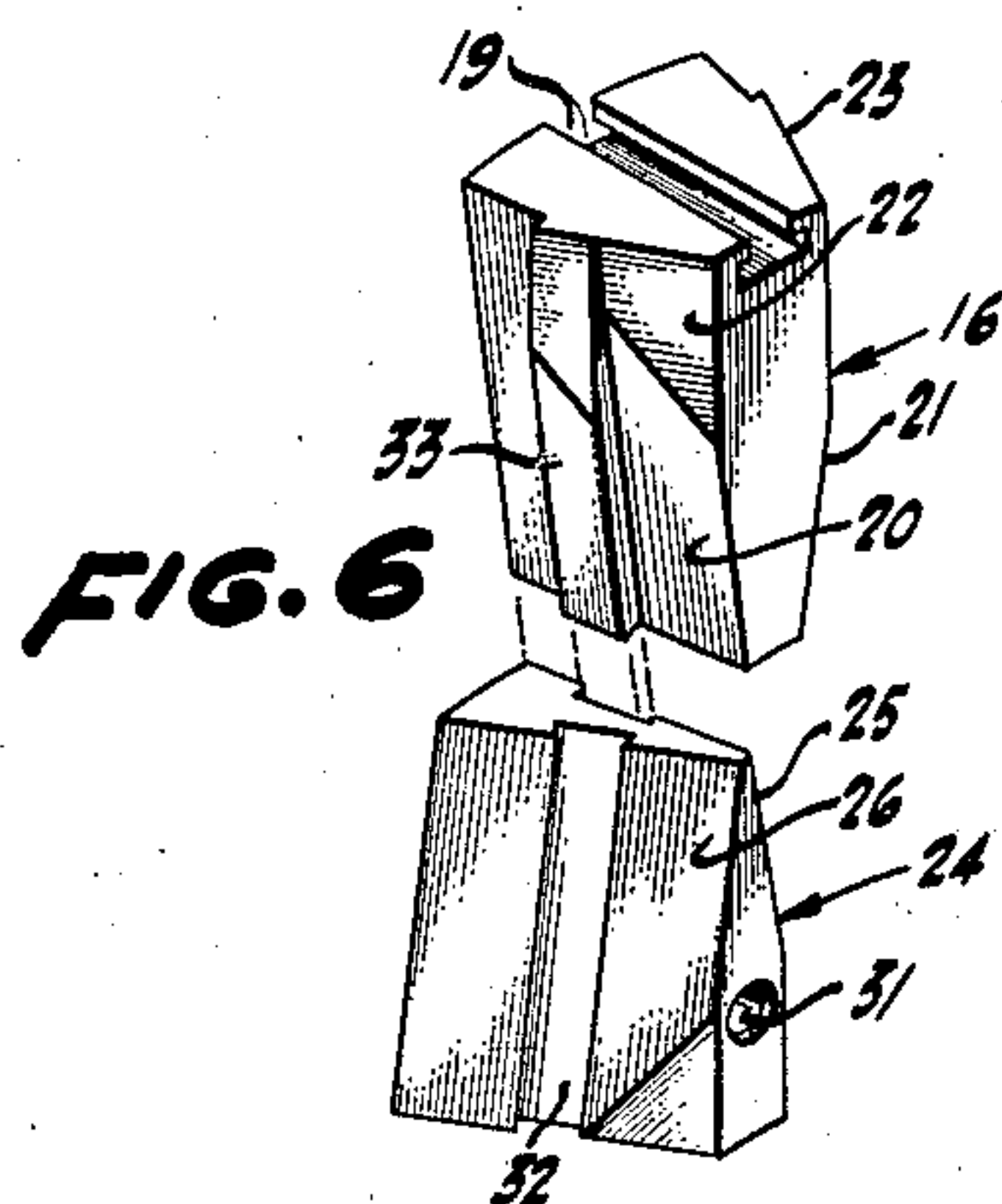


FIG. 6

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2,850,101

DEVICE TO PREVENT PLASTIC END FLOW
OF PACKERS

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Application October 18, 1954, Serial No. 462,709

9 Claims. (Cl. 166—204)

This invention relates generally to the art of packers
for use in deep wells. More particularly, the invention
is directed to a means for preventing the plastic flow of
the packing material when subjected to high pressures.

It is the principal object of this invention to provide
an expandable device to prevent the plastic flow of the
packing element of a packer when set in a well bore.

Another object of this invention is to provide an ex-
pandable member for preventing the plastic flow of the
packing element which may be fully expanded prior to
the setting of the packer.

A preferred form of our invention is described in the
following detailed specification and illustrated by way of
example in the accompanying drawings, wherein:

Fig. 1 is an elevational view of a packer construction
embodying the principles of our invention.

Fig. 2 is a sectional view of the packer shown in Fig.
1 and shows the packer elements in the unset or running-
in position.

Fig. 3 is a partial section view showing the packer set
in a well bore.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is a perspective schematic view illustrating the
relationship between one of the upper and one of the
lower wedge elements.

Referring to the drawings, wherein the same reference
numerals are used to designate the same elements
throughout the various views shown, 10 indicates an up-
per tubular member adapted to be connected to a well
string (not shown) extending upwardly to the top of the
well bore. An expandable packer, generally indicated
at 12, is retained between the lower end of the tubular
element 10 and the upper end of a lower tubular member
14. The lower tubular member 14 is adapted to be con-
nected to a tail pipe (not shown) which either extends
to the bottom of the well bore or is provided with setting
slips in a manner well known in the art. A pin 14a is
threaded into a transverse opening 14b in an upper wall
portion of tubular member 14 and its free end is received
by a longitudinal slot 15a cut into the outer wall of man-
drel 15. The lower end 15b of slot 15a terminates short
of the bottom of mandrel 15 so as to maintain elements
14 and 15 in their respective positions shown in Fig. 2
when the apparatus is lowered into the well bore.

A mechanism 11, for preventing plastic flow of the
packer 12, is interposed between the upper tubular mem-
ber 10 and the upper end of the packer 12. A similar
mechanism 13 is interposed between the lower end of the
packer 12 and the lower tubular member 14. A mandrel
15 is screwed into the lower end of the tubular member
10 and extends downwardly therefrom through the
packer 12 and the mechanisms 11 and 13. The lower
end of the mandrel 15 is slidably received within the up-
per end of the tubular member 14.

The upper mechanism for preventing plastic end flow
comprises a plurality of upper wedge members 16 sur-
rounding the mandrel 15. Each of the wedges 16 has its
base slidably secured adjacent the lower end surface of
the member 10 by a stud 17 threaded into the lower end
of the member 10 and having an enlarged head 18 slid-

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ably received in a dovetail slot 19 formed in the base
of the wedge.

As best seen in Figs. 4, 5 and 6, the outer surface of
each of the upper wedges 16 is arcuate, and as shown in
Figs. 1, 3 and 6, the side surfaces 20 and 21 thereof con-
verge downwardly. The side surfaces 20 and 21 also
converge inwardly in the manner seen in Fig. 5. Re-
ferring now to Figs. 4 and 6, the upper inner corners 22
and 23 of each of the upper wedges 16 are chamfered
along a radial plane to permit said wedges to lie close-
ly adjacent each other when in their retracted position.

A plurality of lower wedge members 24 surround the
mandrel 15 with the upper end of each interposed be-
tween the lower ends of adjacent upper wedge members
16. Each of the lower wedge members 24 is formed with
upwardly converging side surfaces 25 and 26. A plu-
rality of pins 27 are each fixed to a sleeve 28 threaded
into a flange 29 bonded to the upper end of the packer
12. The pins 27 extend radially outwardly from the
sleeve 28 and each terminates in a spherical ball 30 slid-
ably received in a bore 31 in one of the lower wedges
24. The side surfaces 25 and 26 of the lower wedges 24
are each provided with a longitudinally extending dove-
tail slot 32 which slidably receives a dovetail key 33 pro-
jecting from the side surfaces 20 and 21 of each of the
upper wedges 16. The lower plastic flow preventing as-
sembly 13 is generally a duplicate of the upper assembly
11 but is inverted with respect thereto.

In the operation of the device, the parts are assem-
bled in the relationship shown in Fig. 2 and the device
is lowered into the well. When the desired location is
reached, the slips (not shown) on the tail pipe connected
to tubular member 14 are set in a manner well known
in the art and downward pressure is exerted on the well
string 10. Referring now to the upper assembly 11 for
preventing plastic flow (the action of the lower assembly
13 being identical), the tubular member 10 is forced
downwardly relative to the flange 29, thus forcing the
upper wedge members 16 downwardly between the lower
wedge members 24. Since a greater circumferential dis-
tance is required to contain the wedge members 16 and
24 when thus intermeshed, each of the wedge members
is moved radially outwardly to the position illustrated in
Figs. 3 and 5. When the wedges 16 and 24 are extended
as shown in Figs. 3 and 5, the outer surfaces thereof form
a continuous circle filling the bore to its full diameter
and the upper and lower surfaces thereof lie in a com-
mon plane to provide a solid abutment against which the
elastomer packing element is adapted to seat in the man-
ner shown in Fig. 3. After the assemblies 11 and 13
have been extended, additional downward pressure on
the tubular member 10 will move the assembly 11 down-
wardly relative to the assembly 13 to expand the packer
12 to the position illustrated in Fig. 3.

When it is desired to remove the packer from the well,
it is merely necessary to pull up on the tubular member
10 and the parts will again assume the positions illus-
trated in Fig. 2.

While we have shown and described a construction
showing a plastic flow preventing device at both the upper
and lower ends of the expandable packer, it is within the
scope of the invention that only one such device may be
necessary at either the upper or lower end of the packer
depending on the type of service for which the packer is
designed.

While we have shown and described the preferred form
of our invention, it is obvious that various changes may
be made therein by those skilled in the art, without de-
parting from the spirit of the invention as defined in the
appended claims.

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Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a well packer, an elastomer packing element, an assembly for preventing plastic end flow at one end of said packing element comprising a first member fixed to one end surface of said packing element and having a first horizontal abutment surface formed thereon, a second member spaced vertically from said first member and having a second horizontal abutment surface formed thereon in opposed relation to said first abutment surface, a first set of arcuate wedge members mounted with their wide ends in sliding engagement with said first abutment surface, a second set of arcuate wedge members mounted with their wide ends in sliding engagement with said second abutment surface and their narrow ends interposed between the narrow ends of said first arcuate wedge members, and means for moving said first and second members vertically relative to one another, whereby movement of said first and second abutment surfaces toward one another moves said wedge members together longitudinally to thereby force said wedge members radially outwardly.

2. In a well packer for insertion into a well string and including an elastomer packing element adapted to be compressed and laterally expanded, an assembly for preventing plastic end flow at one end of said packing element comprising a first flange member adapted to be fixed to an end surface of said packing element, said first member having a first flat surface, a second member spaced longitudinally from said first member and having a second flat surface formed thereon opposing and in parallelism with said first surface, a first set of arcuate wedge members having longitudinally converging side faces mounted with their wide ends in sliding engagement with said first surface, a second set of arcuate wedge members having longitudinally converging side faces mounted with their wide ends in sliding engagement with said second surface and their narrow ends slidably interposed between the narrow ends of said first arcuate wedge members, and means for moving said first member and second members toward one another to move said wedge members together longitudinally to thereby force said wedge members radially outwardly.

3. In a well packer, an elastomer packing element, an assembly for preventing plastic end flow at one end of said packing element comprising a first member fixed to one end surface of said packing element and having a first horizontal abutment surface formed thereon, a second member spaced vertically from said first member and having a second horizontal abutment surface formed thereon in opposed relation to said first abutment surface, a first set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said first abutment surface, a second set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said second abutment surface and their narrow ends interposed between the narrow ends of said first arcuate wedge members, and means for moving said first and second members vertically relative to one another, whereby movement of said second abutment surface and first abutment surface toward one another will move said wedge members together longitudinally and thereby force said wedge members radially outwardly into close proximity with the bore wall.

4. In a well packer, an elastomer packing element, an assembly for preventing plastic end flow at one end of said packing element comprising a first member fixed to one end surface of said packing element and having a first horizontal abutment surface formed thereon, a second member spaced vertically from said first member and having a second horizontal abutment surface formed there-

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on in opposed relation to said first abutment surface, a first set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said first abutment surface, guide means for maintaining said first set of wedges in sliding engagement with said first abutment surface, a second set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said second abutment surface and their narrow ends interposed between the narrow ends of said first arcuate wedge members, guide means for maintaining said second set of wedges in sliding relation with said second abutment surface, and means for moving said first and second members vertically relative to one another, whereby movement of said second abutment surface toward said first abutment surface moving said wedge members together longitudinally will force said wedge members radially outwardly into close proximity with the bore wall.

5. In a well packer, an elastomer packing element, an assembly for preventing plastic end flow at one end of said packing element comprising a first member fixed to one end surface of said packing element and having a first horizontal abutment surface formed thereon, a second member spaced vertically from said first member and having a second horizontal abutment surface formed thereon in opposed relation to said first abutment surface, a first set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said first abutment surface, guide means for maintaining said first set of wedges in sliding engagement with said first abutment surface, a second set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said second abutment surface and their narrow ends interposed between the narrow ends of said first arcuate wedge members, guide means for maintaining said second set of wedges in sliding relation with said second abutment surface, longitudinally extending dovetail slots in the side faces of each of said first set of wedge members, and a dovetail key extending outwardly from the side faces of each of said second set of wedges, each of said keys being slidably received in one of said slots, and means for moving said first and second members vertically relative to one another, whereby movement of said second abutment surface toward said first abutment surface moving said wedge members together longitudinally will force said wedge members radially outwardly into close proximity with the bore wall.

6. In a well packer, an elastomer packing element, an assembly for preventing plastic end flow at one end of said packing element comprising a first member fixed to one end surface of said packing element and having a first horizontal abutment surface formed thereon, a second member spaced vertically from said first member and having a second horizontal abutment surface formed thereon in opposed relation to said first abutment surface, a first set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said first abutment surface, guide means for maintaining said first set of arcuate wedge members in sliding relation with said first abutment surface, a second set of arcuate wedge members having side faces which converge both longitudinally and radially inwardly mounted with their wide ends in sliding engagement with said second abutment surface and their narrow ends interposed between the narrow ends of said first arcuate wedge members, a plurality of studs threaded into said second abutment surface, a radially extending dovetail slot formed in the base of each of said second set of wedges for slidably receiving the head of one of said studs to maintain

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said second set of wedges in sliding relation with said second abutment surface, longitudinally extending dovetail slots in the slide faces of each of said first set of wedge members, a dovetail key extending outwardly from the side faces of each of said second set of wedges, each of said keys being slidably received in one of said slots, and means for moving said first and second members vertically relative to one another, whereby movement of said second abutment surface toward said first abutment surface moving said wedge members together longitudinally will force said wedge members radially outwardly into close proximity with the bore wall.

7. In a well packer for insertion into a well string, an annular elastomer packing element adapted to be compressed and expanded laterally, a tubular member at either end of said packing element axially aligned therewith, and a pair of assemblies for preventing plastic end flow of said packing element when compressed each received between one of said tubular members and the adjacent end surface of said packing element, said assemblies each including a pair of opposing parallel flat surfaces carried by said packing element and respective tubular member, a first set of arcuate wedge members having axially converging side faces mounted with their wide ends in sliding engagement with one of said flat surfaces, a second set of arcuate wedge members having axially converging side faces mounted with their wide ends in sliding engagement with the other of said flat surfaces and their narrow ends slidably interposed between the narrow ends of said first arcuate wedge members, and means for moving said tubular members relative to one another whereby movement of said tubular members toward one another moves said wedge members together axially to thereby force said wedge members radially outwardly.

8. In a well packer for insertion into a well string, an annular elastomer packing element adapted to be compressed and expanded laterally, a tubular member at either end of said packing element axially aligned therewith, and a pair of assemblies for preventing plastic end flow of said packing element when compressed each received between one of said tubular members and the adjacent end surface of said packing element, said assemblies each including an annular flange secured to said packing element and providing a first flat surface and an opposing parallel flat surface provided by the adjacent

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tubular member, a first set of arcuate wedge members having side faces which converge both axially and radially inwardly mounted with the wide ends thereof in sliding engagement with one of said flat surfaces, a second set of arcuate wedge members having side faces which converge both axially and radially inwardly mounted with the wide ends thereof in sliding engagement with the other of said flat surfaces and the narrow ends thereof slidably interposed between the narrow ends of said first arcuate wedge members, and means for moving said tubular members relative to one another whereby movement toward one another moves said wedge members together axially and forces said wedge members radially outwardly.

9. In a well packer, an annular elastomer packing element adapted to be compressed into engagement with a bore wall, a tubular member at either end of said packing element axially aligned therewith, and a pair of assemblies for preventing plastic end flow of said packing element when compressed each received between one of said tubular members and the adjacent end surface of said packing element, said assemblies each including an annular flange fixed to said packing element and providing a first flat surface, and an opposing parallel flat surface provided by the adjacent tubular member, a first set of arcuate wedge members having side faces which converge both axially and radially inwardly mounted with the wide ends thereof in sliding engagement with one of said flat surfaces, a second set of arcuate wedge members having side faces which converge both axially and radially inwardly mounted with the wide ends thereof in sliding engagement with the other of said flat surfaces and the narrow ends thereof slidably interposed between the narrow ends of said first arcuate wedge members, means for guiding the motion of said wedge members in radial paths, and means for moving said tubular members axially relative to one another whereby movement toward one another forces said wedge members radially outwardly into close proximity with the bore wall.

References Cited in the file of this patent

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2,382,455	Turechek	Aug. 14, 1945
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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

September 2, 1958

Patent No. 2,850,101

Mordica O. Johnston et al.

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

Column 5, line 3, for "slide faces" read -- side faces --; column 6, line 22, for "ncludng" read -- including --.

Signed and sealed this 16th day of December 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents