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(54) **PNEUMATIC PERFORATOR WITH INDEPENDENT ROTATION OF THE DRILL**

MIT PRESSLUFT BETRIEBENE BOHRMASCHINE MIT UNABHÄNGIGEM ROTATION DES BOHRWERKZEUGES

PERFORATEUR PNEUMATIQUE DOTE D'UN TREPAN A ROTATION INDEPENDANTE

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Description

[0001] The invention is referring to a pneumatic perforator with independent rotation of the drill, meant for rock perforation in the mining activity.

[0002] Are known perforators with dependent rotation of the drill and rotating perforators to which the rotating pneumatic engine is placed near by the percussion machinery, lateral and above of it or in front of this machinery. The reducer operated by this engine is usually equipped with 6 gears with external teeth, the out-going steering wheel rotating the train bush of the drill. Are known rotating perforators with rotation machinery placed on the back of percussion machinery with lateral and front transmission of the rotation movement. Disadvantages of the presented technical solutions are the weight and high complexity of the constructions. The percussion machinery used to some types of perforators is having distribution by valve. Disadvantage is the high specific consumption of compressed air. Other perforator types are having the distribution realized by the tail of the piston. Their disadvantage is consisting in the fact that is having lowest resultant middle force which is operating on the piston so the mechanical work produced by it, including the perforation speed are lower.

A disadvantage of all mentioned distribution systems is that in the final part of the active course in front of the piston is generated an air bag (the counter-pressure) which value is attempting to equal the value of the air pressure compressed in the network before the moment of percussion. The counter-pressure is having a negative effect of damping of the piston blow decreasing in this way the perforation speed.. **A perforator for rock mining with simultaneously rotation and percussion with the distribution realized by the tail of the piston is known for example from the** US4429752A**.**

[0003] The problem solved by invention is to realize a pneumatic perforator with independent rotation of the drill, having a small specific consumption of compressed air, increased perforation speed, simplified construction with an easier maintenance in exploitation.

[0004] The perforator, as per the invention eliminate disadvantages of the known solutions and solve the problem raised by the box distribution system through the piston described by that the extremity of the pistons tail, in the back, is on tubular shape with equidistant holes (foreseen in a transversal section) which during the active course are blocked and during the retiring course of the piston are let free by a floating bushing disposed in the respective area; distinguished from the classical constructions as follows in the moment of percussion the circular duct from the valve box ream which is ensuring the compressed air admission for the retiring course of the piston is only partial open by the back extremity of the pistons tail; The counter- pressure in front of the piston by not having an important value, the damping of the blow is less important than at the classical constructions, so the blowing energy of the piston increase, implicit increasing the effect of the percussion, only after the percussion moment when the floating bushing is opening the holes from the pistons tail, is starling the massive alimentation with compressed air for realization of the retiring course of the piston; alimentation with compressed air during the retiring course of the piston is realized in time and space in a larger interval than the classical constructions; the resultant middle force operating on the piston in the retiring course is increasing; by construction is realized the increase in time and space of the interval of compressed air feeding for the active course of the piston for the same course of the piston like to a classical construction; it's increasing the resultant middle penetrating force which is operating in the active force of the piston so is increasing the energy of the piston implicit the effect of the percussion. The motor of independent rotation machinery of the drill **ma be** positioned at the front extremity of the perforator, being a pneumatic motor with gears located under the driving bushing of the drill and in parallel with this one, the attach pinion of the steering gear of the motor, oriented to the back side of the perforator, constituting the entrance in the 2nd steps reducer, in the first step the attach pinion is gearing with a internal teeth gear located on the same spindle with the attach pinion of the second step of reducer (their axle being located in the axial vertical plan of the perforator); the second steps pinion is driving the out-going reducers gear, coupled with liner driving bushing which is rotating the plug or the drill.

[0005] **As alternative, the pneumatic motor equipped with gears may be located above** the liner driving bushing of the drill and parallel to this one, construction of the independent rotation machinery being identical with the one from the first option proposed for realization of the invention, practical the rotation machinery is positioned rotated with 180° around the axle of driving bushing of the plug or the drill.

[0006] Pneumatic perforator as per the invention is showing the following advantages:

- high perforating energy;
- reduction of the complexity and weight of the perforator;
- simplified maintenance in exploitation.

[0007] Are given in sequel two examples of realization of the invention in connection to fig. 1... 3 which are presenting as follows:

- fig. 1 - longitudinal section in vertical plan through the pneumatic motor with independent rotation of the drill;
- fig. 2 - longitudinal section in horizontal plan through the pneumatic rotating motor and partial through reducer (first step of the reducer);
- fig. 3 - front view of the perforator.

[0008] The pneumatic perforator with independent ro-

tation of the drill, as per the invention, in a first option of realization is equipped with a back-cover **A** in conformity with the figure 1, to which is conducted the compressed air through a orifice a; in the back -cover **A** is fixed the water tube **1** through which is circulating water for washing the perfored hole; in front of the back -cover **A** is located the repartition valve box **B,** known itself, having the distribution valve box **2** foreseen with an axial ream; from the back through some ducts **b** is realized the compressed air feeding in a circular duct c disposed to the front in the distribution box ream **2;** the axial ream of the distribution box **2** is communicating to the exterior by the centering portion from the front of the distribution box **2** through ducts **d;** in the ream of the distribution box **2** is pressed the distribution bushing **3** foresee with a collar on the back; in the bushing ream **3** there is a circular duct oriented to the front, communicating by windows with the duct **c;** to the back in the bushing ream **3** there is a circular channel **f** communicating through windows with the ducts **d;** at the back side the bushing **3** is ensured by an clastic ring **4;** the distribution box **B** is centered in the back side of the cylinder **5** of the percussion machinery **C;** at the back the cylinder **5,** is having some evolving g communicating with the ducts **d;** on the front side the cylinder **5** is having evolving **h** in communication with evolving **g** through the channels **i;** the cylinder **5** is equipped with evacuation windows **j** connected to the exhaust collector box **k** to the atmosphere; in the cylinder **5** is working the piston **6** equipped to the front with a rod, in the middle with a bowl and having to the back side a tail ended in a collar **I**, a threaded area m, running into the collar **I**, a bushing **7** longer having in the back side conic holes **o** (with a bigger diameter to the exterior) placed equidistant in a transversal section of the bushing **7** who's ream is ending in the back side with an internal collar **p** (placed in the back of the holes **o**) in the internal side of bushing **7** there is a floating bushing **8** equipped with an ream ended in the back with an internal collar; bushing **8** is stopping or opening to the internal side the conic holes **o** from the bushing **7;** the small course of the floating bush **8** is limited in the back by the collar **p** of the bushing **7** and to the front is limited by the front head of n area of the pistons back-head **6;** a very weak compression spring **9** is maintaining the floating bush **8** in the back stage limited position in contact with collar p when the perforator is stopped, the cylinder **5** is closed in front side by the front cover **10** which is having a flange followed to the front an area of cylindrical centering portion **r** provided with a plane milling cutting on the surface **s;** in the cover **10** is assembled the liner bushing **11;** in the front side of the cover **10** in its ream is pressed the centering bushing **12** which ring collar **t** at the external side is forming the race way for the pin cage **13** on which is centered the out -going gear **14** of the reducer **D** belonging to the rotating machinery; the gear**14** is having a tubular hub foreseen at the external side with oil groves and an external collar **u,** the front extremity of the hub is ended in frontal coupling jaws **v;** in the steps ream of the tubular hub of the gear **14** is pressed the drill-bushing **15** in which is entering the back of the perforators tap; frontal jaws v of the gear **14**,are coupled liner driving bushed jaws 16 which is rotating the perforators tap; in the front of liner driving bushing **16** is positioned pressure washer **17;** in front of this one is the damping washer **18** from rubber and clamp **19,** provided with a centering area **w**; the pieces **14,16,17,18,** are having journal bearing (there are also centered) in bushing with collar **20;** penetrating power transmitted to the drill bushing **15** any the gears hub **14** is take over by the axial bearing **21**(axial support of the wheel**14**) axial bearing **21** being assembled in the internal side of the ring collar **t** of the centering bushing **12**; the gear **14** is drive by the pinion **22** (of the second step of D reducer) assembled with peen on the shaft **23** foreseen with rolling bearing and drive by the gear **24** with internal teeth , the gear is fixed on the shaft **23** by a peen **25;** pieces **14, 22, 23, 24** are placed in the reducers case **26** positioned in the centering area r of the cover **10** and closed by an inferior cover **27** milled plan in the area of contact with the surface s of the cover **10**; the inferior cover **27** is fixed also on the cover **10** by pegs and screws (not drawn);in front side of reducer **26,** under the driving bushing **16** and parallel to this one is placed the pneumatic motor with gears **E** through which case **28** in upper side is passing to the collar bushing **20** this one having the role of centering and positioning between the cases **26** and **28;** in the case **28** is foreseen a vertical transversal duct **x** (in vertical axial section **28** the duct **x** is intersecting with a circular duct **y** forescen in the ream through which is passing the collar bushing **20** in the case **28** there are ducts **z** through which a part of the compressed air loaded with oil, after working in the pneumatic motor **E** is drive to external channels from the tubular hub of the gear **14,** having role of lubricator (known itself) at the front extremity the case **28** is closed by the frontal cover **29.** The pneumatic rotating motor **E** as per the figure 2 is equipped with two gears with the axis parallel to collar bushing spindle **20**, the driving gear **30** of the motor **E** having the out going, axis notched, oriented to the back of the perforator, to the reducer **D,** the notched axis of the gear **30** gearing to the interior with the gear equipped with internal teeth **24** (first step of the reducer **D**); gears bearing of the motor **D** is made by rolling bearings for their lubrication is used ball lubricator device **31**. Fastening of the elements **A,B, 5, 10**, **26, 28, 19** is made in conformity with figure 3, with two tightening lifting rods 32 and some nuts**33.**

[0009] The elements **26,28,29** are tightened by the bolts **34** and nuts **35.** Through the air outlet **a,** the compressed air is bring inside the back cover **A;** considering the piston **6** pull back at the beginning of the active course, the collar 1 of the back side of the piston **6** is positioned between the ducts **e** and **f** of the bushing **3**; The holes **o** from the bushing **7** are locked by the floating bushing **8** being in contact with collar **p;** the compressed air penetrating in ducts **b, c, e** and near by the back side of the piston **6** through the space between the body of

distribution valve box **2** and piston **6** impel this one in the active course; as per the construction, the compressed air feeding in the space between body **2** and piston **6** on the line **b, c, e,** is during a longer period of time and bigger space than at the classical constructions (the neck of the pistons tail **6** being longer), taking into consideration the same course of the piston; after the frontal edge of the tails collar **1** is passing near by the duct **e,** compressed air feeding in the space between the body **2** and piston **6** is breaking off, in this space is having place an ease process and because the length of the course corresponding to the relaxation process is shorter than at the classical constructions, middle pressure of the compressed air which is working on the piston till the moment of opening the evacuation window **j** (from the cylinder **5**) is increased comparing to the classical constructions, so the mechanical work and blowing energy of the piston are bigger; at the opening of the evacuation window **j** the pressure in the back side of the piston **6** begin to decrease, the compressed air which was working on the piston **6** during the active course, being exhausted through the window **j** in the collector **k** and than in the atmosphere; in the moment of percussion the back extremity of the bushing **7** was opening only partial the duct **f** and the pressure of the compressed air in front of the piston **6** (the space between the piston **6** and cover **10**) have not so big value as at the classical constructions, so the blow damping is lower, the effect of the pistons **6** blow is bigger; between the opening of the duct **f** and the percussion moment, the compressed air incoming in the internal space of the cover **A** through the ream of bushing **3** is penetrating the direction **f, d, g, i, h,** in front of the piston **6,** but the pressure there will increase slowcr, attempting in the moment of percussion the maximum value lower than in the classical constructions that's why blow damping of the piston **6** is lower, and the effect of the blow is increased; in the moment of percussion piston **6** is stopping and the floating bushing **8** is moving instant forward (because of inertia)is running into the frontal of the area **n;** in this way is opening the holes **o;** the compressed air is penetrating through the ream of the internal collar **p** of the bushing **7,** than through the holes **o** is feeding massive the duct **f** (in parallel with the feeding through the gap positioned between the back extremity of the bushing **7** and back edge of the duct **f**); the pressure in from of the piston **6** is quickly increasing and the piston **6** is propelled in return course; feeding in terms of time and space of the space between the piston **6** and cover **10** is realized in a longer time than at the classical constructions because after the back edge of the bushing **7** is shutting the duct **f,** feeding the duct **f** with compressed air is realized on through the ream of the collar **p** and through the conic holes **o** left opened by the floating bushing **8** which during the return course of the piston **6** is running into the front side of arca **n** of the Pistons tail **6;** after between the holes o and duct **f** is interrupt the connection, is beginning the relaxation of the compressed air in the space between the piston **6** and the cover **10;** the length of the returning course corresponding to this relaxation is lower than at the classical constructions so the middle value of compressed air pressure which is working on the piston **6** is bigger, mechanical work is more important, that's why the duct e from the bushing **3** can be opened (as per construction) quicker by the tail collar 1 of the piston **6;** air compressed feeding of the space between the piston **6** and the distribution valve box **2** is starting in advance and during more (till the end of the returning course) than the classical constructions; the piston **6** is braked and then stopped; the floating bushing **8** is passing again in the limit in the back position, running into the collar **p** and closing the holes **o;** than starts again the active course of the piston **6** and the cycle is repeating; the spring **9** has no any role after the piston started to realize the alternatives courses this spring **9** remaining in the compressed stage having no time to relax ; the reducer **D** scaling the pneumatic motors **E** revolution with the value corresponding to the motor turning moment, the tubular hub of the gear 14 rotating the driving bushing 16 of the perforators plug; the pneumatic motor **E** is feed with compressed air by one of the extremities of the duct **x,** the worn air being jumped to the other extremity of the duct **x;** the duct **y** is making up the devious line of the bushing **20;** The damping washer **18** is taking and buffing the blows transmitted by the drillers tap on the driving bushing **16,** decreasing the tension load on the supports **32** and screws **33.**

[0010] An other achievement option of this invention, in connection with the first one but different of this one is equipment with the pneumatic motor **E** located upper the driving bushing **16** and parallel to this one, independent rotation gear construction (assembly **D** and **E**) being identical to the same from the first constructive option of the invention, practical the rotation machinery being rotated with 180° around the axle of driving bushing **16,**

Claims

1. Pneumatic perforator with independent rotation of the drill to perforate rocks in mining, the perforator comprising a back cover (A), a repartition box (B), a percussion machinery (C) provided with a cylinder (5), a reducer (D) for the rotation machinery, a pneumatic motor (E) and driving bushed jaws (16) rotating the perforator tap, wherein, a water tube (1) is fixed to the back- cover (A) for circulating water for washing the perforated hole, in front of the back-cover (A) being located the repartition box (B) centered in the back side of the cylinder (5) of the percussion machinery (C), the reducer (D) being located in front of the percussion machinery (C) and the pneumatic motor (E) being located in front of the reducer (D), wherein the cylinder (5) is provided with a piston (6) on which tail is centered a bushing (7), *provided with an axial ream ended in the back with an internal collar (p) placed in the back of conical holes (o)*

placed equidistant in a transversal section of bushing (7), in internal side of bushing (7) existing a floating bushing (8) foreseen with a ream ended in the back side with an internal collar (P), and wherein, in use, the floating bushing (8) is closing or opening the conic holes (o) on the internal side, the small course of the floating bushing (8) being limited at the back side by the collar (p) of the bushing (7), and to the front side, by the frontal side of area (n) of the piston tail (6), the floating bushing (8) being maintained in the limit back position, in contact with the collar (p), when the perforator is stopped, by a very low compression spring (9).

2. Pneumatic perforator according to claim 1, wherein the pneumatic motor with gears (E) is placed under the driving bushed jaws and parallel with these.

3. Pneumatic perforator according to claim 1, wherein the pneumatic motor with gears (E) is placed above the driving bushed jaws (16) and parallel with these.

Patentansprüche

1. Pneumatischer Durchbohrer mit unabhängiger Drehung des Bohrers zum Durchbohren des Gesteines in der Bergbauindustrie, enthaltend eine Hinterabdeckung (A), einen Verteilungskasten (B), eine Aufschlagmaschine (C) die mit einem Zylinder (5) vorgesehen ist, ein Untersetzungsgetriebe (D) für die Drehmaschinenanlagen, ein pneumatisches Motor (E), und Buchse enthaltend entreibende Backen (16), die das Auslaufventil des Durchbohrers drehen, wo ein Wasserrohr (1) an die Hinterabdeckung (A) befestigt wird, für das umlaufende Wasser um das durchbohrte Loch zu waschen, an der Vorderseite der Hinterabdeckung (A) wo sich der Verteilungskasten (B) befindet, zentriert an der Hinterseite des Zylinders (5) der Aufschlagmaschine (C), das Untersetzungsgetriebe (D) befindet sich an der Vorderseite der Aufschlagmaschine (C) und der pneumatische Motor (E) befindet sich an der Vorderseite des Untersetzungsgetriebe (D), wo der Zylinder (5) mit einem Kolben (6) vorgesehen ist, auf wessen Schaft eine Buchse (7) die mit einem axialen Ausbohrer vorgesehen ist zentriert wird, der an der Hinterseite mit einem Innenkragen (p) endet, Kragen der sich in der Hinterseite des konischen Loches (o) befindet, der geichweit entfert gestellt wird in einem querlaufenden Absatz der Buchse (7), in der Innenseite der Buchse (7) gibt es eine fließende Buchse (8) vorgesehen mit einem Ausbohren der in der Hinterseite mit einem Innenkragen (p) endet und wo, im Benutz, die fließende Buchse (8) öffnet oder schließt die konische Locher (o) auf der Innenseite, wo der kleine Arbeitsweg der fließenden Buchse (8) von dem Kragen (p) der Buchse (7) an der Hinterseite und von der Vorderseite des Bereiches (n) des Kolbenschaft (6) an der Vorderseite begrenzt wird, die fließende Buchse (8) wird an den Endanschlag behalten in Kontakt mit dem Kragen (p) wenn der Durchbohrer von einer sehr schwach Druckfeder (9) gestoppt ist.

2. Pneumatischer Durchbohrer nach Anspruch 1, wo der pneumatische Motor mit Zahnradgetriebe (E) unter den Buchse enthaltend antreibende Backen (16) und parallel mit diesen gestellt wird.

3. Pneumatischer Durchbohrer nach Anspruch 1, wo der pneumatische Motor mit Zahnradgetriebe (E) über den Buchse enthaltend antreibende Backen (16) und parallel mit diesen gestellt wird.

Revendications

1. Perforateur pneumatique à rotation indépendente du foret, pour perforer des roches dans les exploitations minières, ledit perforateur comportant un couvercle posterieur (A), une bôite de répartition (B), un mechanism de percussion (C) prevu d'un cylindre (5), un reducteur (D) pour le mechanism de rotation, un moteur pneumatique (E) et des mâchoires d'actionnement à douilles (16), tournant le tenon du perforateur, où un tuyau d'eau (1) este attaché au couvercle posterieur (A) pour la circulation de l'eau destiné au lavage du trou perçé, devant le couvercle posterieur (A) étant positioné la bôite de repartition (B) centrée derrière le cylindre (5) du mechanism de percussion (C), le reducteur (D) étant situé devant le mechanism de percussion (C) et le moteur pneumatique (E) étant situé devant le reducteur (D), où le cylindre (5) este prevu d'un piston (6) sur la tige duquel est centrée une douille (7) prevue d'un alesage axial terminé au coté posterieur avec un coller intérieur (p) placé derrière les trous coniques (o) dans des positions équidistantes dans une section transversale de la douille (7), à l'intérieur de la douille (7) il y a une douille flottante (8) prevue d'un alesage terminé au coté postérieur avec un collette intérieur (p) et où, pendant l'utilisation, la douille flottant (8) ferme ou ouvre les trous coniques (o) sur la coté intérieur, la petite course de la douille flottante (8) étant limitée au coté posterieur par le colet (p) de la douille (7), et au coté anterieur par la coté frontale de la région (n) de la tije de piston (6), la douille flottant (8) étant maintenu dans la position limit posterieur, en contact avec le collet (p), quand le perforateur est arrêté par un ressort de compression très faible (9).

2. Perforateur pneumatic selon la revendication 1, où le moteur pneumatique à roues dentées (E) est placé au-dessous les mâchoires d'actionnement à douille

(16) et parallèlement au eux.

3. Perforateur pneumatique selon la revendication 1, où le moteur pneumatique à roues dentées (E) est placé au-dessus les mâchoires d'actionnement à douille (16) et parallèlement au eux.

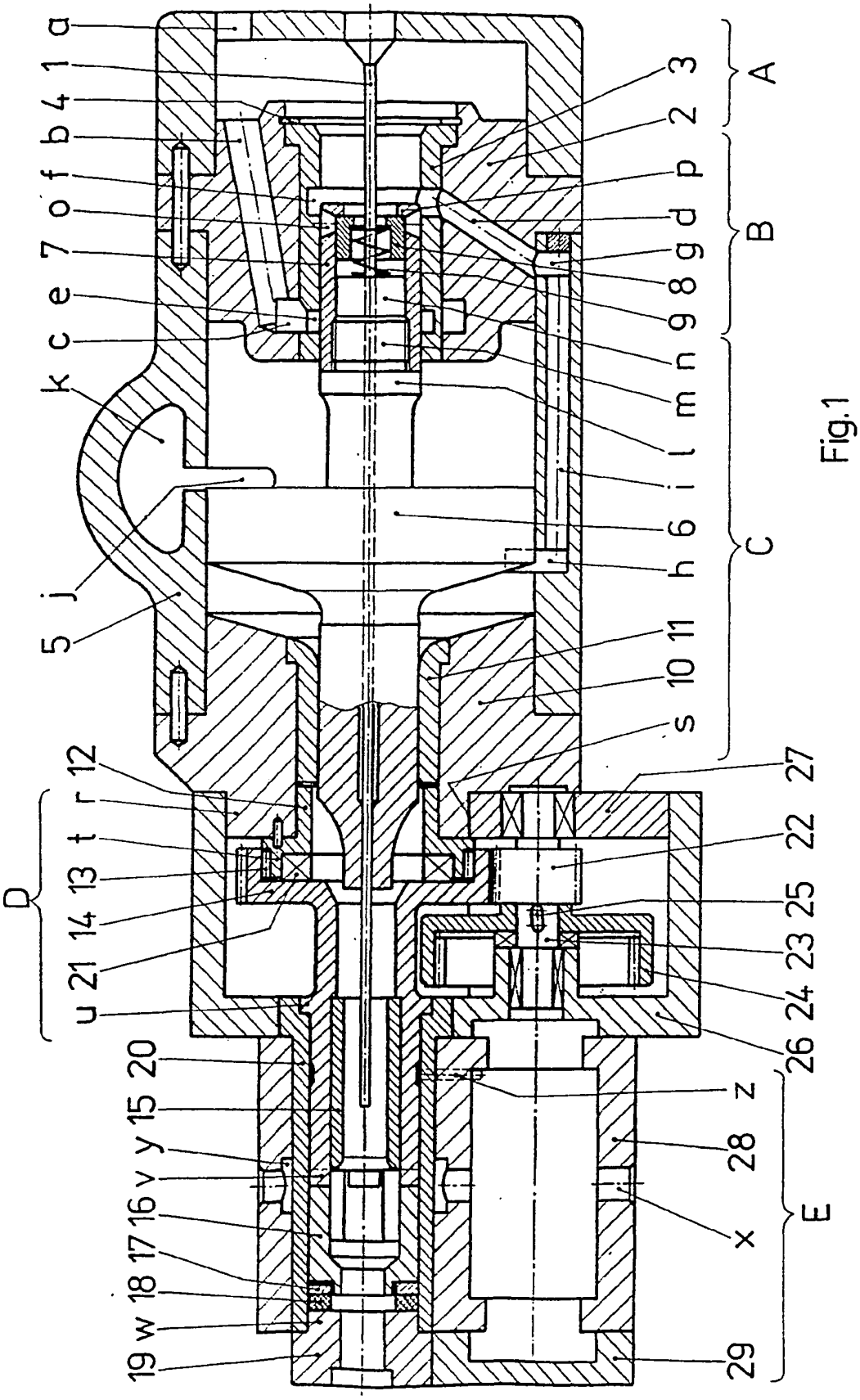
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Fig.1

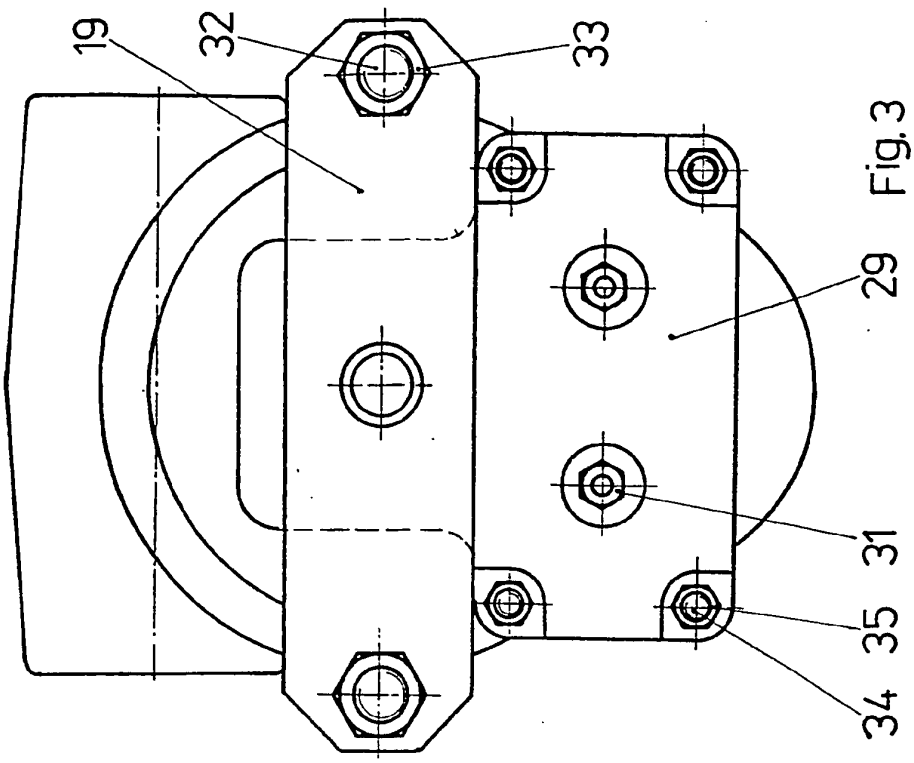

Fig.3

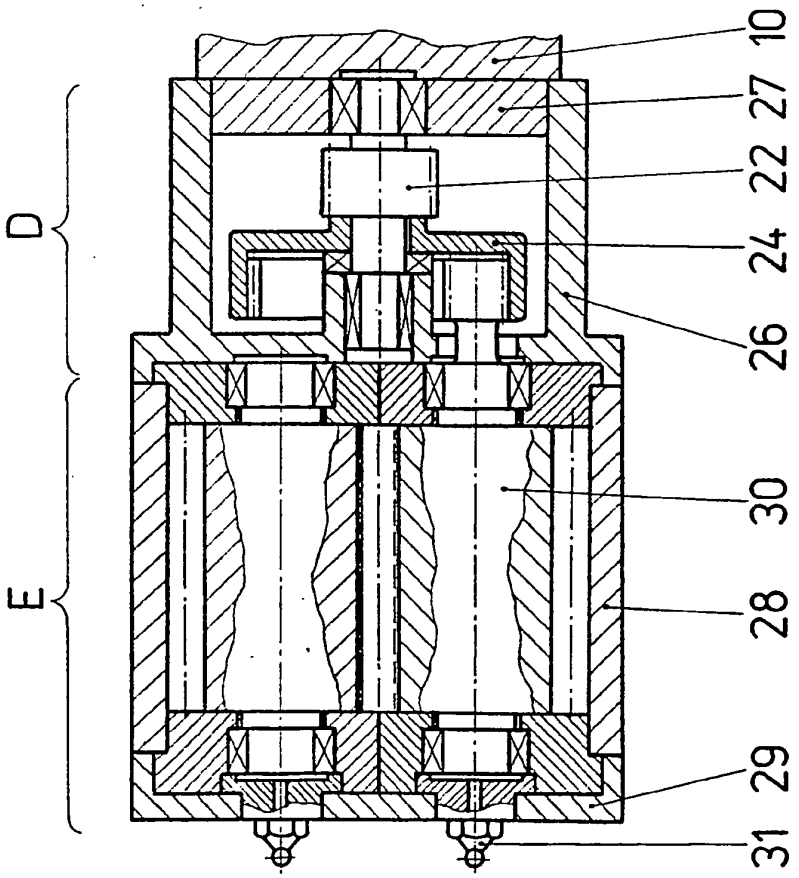

Fig.2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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