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Kühn

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[54] **ROTARY PNEUMATIC STARTER DISTRIBUTOR FOR INTERNAL COMBUSTION ENGINE**

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[58] **Field of Search** ....123/179 F; 60/6, 14, 16

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[57] **ABSTRACT**

An automatic rotary distributor for compressed air starting of a multicylinder internal combustion in particular Diesel engine with a cam shaft-driven rotary distributor disk receiving compressed air on one side while being in sliding tight pressure contact by its opposite side with the complementary side of a stationary distributor body, said disk being so shaped that the incoming compressed air acts only upon a circular annular concentric portion of said disk which is thereby applied with a reduced resulting total pressure force against said body.

10 Claims, 4 Drawing Figures

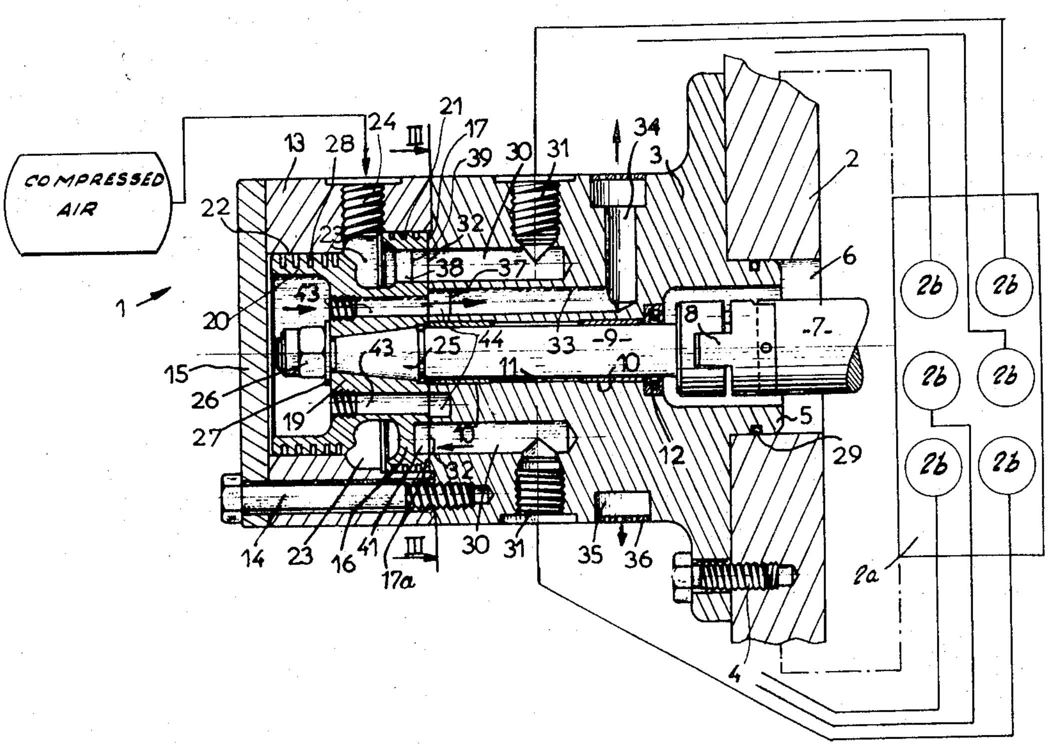


Fig. 1.

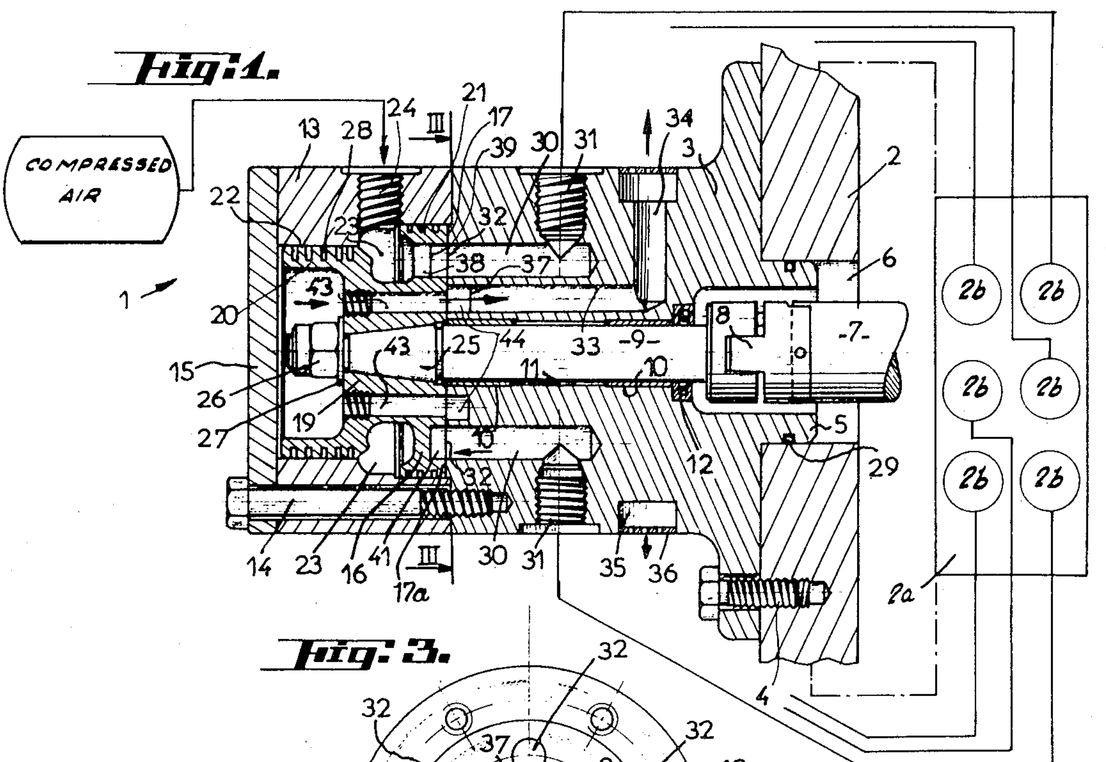


Fig. 3.

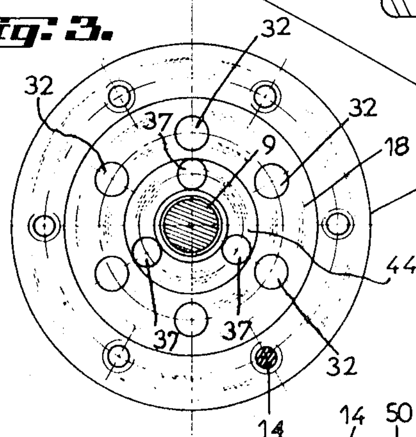


Fig. 2.

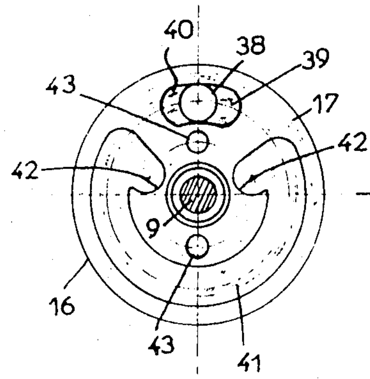
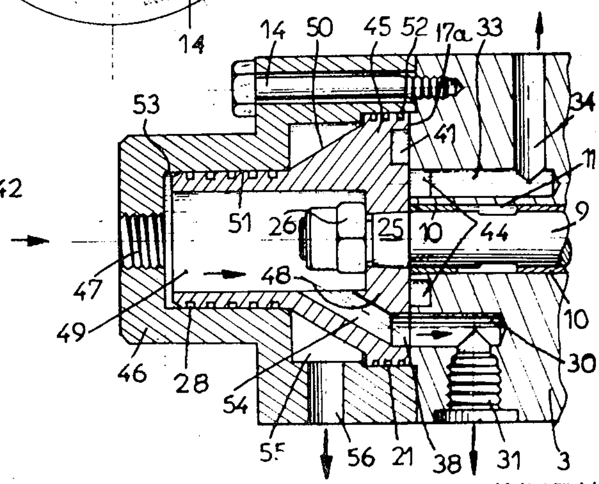


Fig. 4.



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ROTARY PNEUMATIC STARTER DISTRIBUTOR FOR INTERNAL COMBUSTION ENGINE

The present invention relates generally to a common, automatic, rotary distributor device for starting with compressed air a multicylinder heat engine or internal combustion engine and in particular but not exclusively a Diesel engine or the like, as well as the various applications and uses resulting from operating same and the systems, assemblies, arrangements, appliances, machines, mechanisms, automotive vehicles, equipments and installations provided with such devices.

It is known in the prior state of the art that the starting in particular of Diesel engines may be effected in various known manners. In any case, all the cylinders of the Diesel engine or only some thereof comprise each one an auxiliary so-called pneumatic starter valve which directly receives the main starting compressed air and which is operated to open through a pilot or control air pressure fed separately to the valve by an auxiliary supply duct serving also to drain or exaust the control air of the valve after automatic closure thereof in particular through the combined additive action of a return spring and of the main starting air pressure. The pilot or control air pressure is supplied to each starting valve through an air distributor which, in particular in the case of large Diesel engines comprises a series of slide or spool valves or the like equal in number to that of the cylinders to be fed with compressed air and associated each one with a starting valve, respectively, that is with a cylinder. Each slide valve comprises a compressed air inlet and a pilot air pressure outlet leading to the associated starting valve, said air draining being effected through said slide valve. The slide valves may be individually mounted adjacent to each one of the cylinders they are feeding or arranged in radial or star-like configuration and accommodated at the end of the engine. In the former case, each valve is operated in a given sequence by an individual cam secured to the cam shaft of the engine or driven by the same and in the latter case, all the slide valves are operated in a given sequence by a single or common control cam mounted on the cam shaft of the engine or driven by the same. Such an arrangement exhibits the drawback of requiring one slide valve for each starting valve thereby rendering the construction intricate and increasing the manufacturing cost of the engine.

It is also known that in the case of small Diesel engines, the pneumatic starting compressed air is distributed by a rotary apertured disk to each starting valve which is then a usual air intake valve opening through the main air pressure and letting the compressed air enter the cylinder for expanding same. Such a revolving distributor disk, which is common to all of the starting valves, is generally driven by the cam shaft or the like of the engine and mounted for instance endwise of said shaft ; it receives the compressed air at one side, most frequently axially and over the whole face, while it is in tight sliding pressure contact through its opposite runner side having a mirror polish generally, with the complementary or mating face of a stationary distributor stator or body. Compressed air starting systems of this general type are, for example, disclosed in Swiss Pat. No. 347,041 and U.S. Pat. No. 3,572,306. Such a known arrangement exhibits several drawbacks. At first, if such a device has to be applied to large engines, it is necessary to provide a revolving disk and

pressure air supply ducts of large cross-section for conveying the required pressure air flow rate at the starting of the engine. Another inconvenience which is more serious is that the pressure air delivered to the distributor disk acts throughout the front surface thereof so that the disk is very strongly pressed against the stationary distributor body thereby resulting in a high friction causing a fast mutual wear of the moving contact surfaces as well as an increased required power for rotating the distributor disk.

The object of the invention is to remove the aforesaid drawbacks by providing a distributor device with a rotary disk wherein the pressure force with which the distributor disk is applied against the stationary distributor body is lower for an equal air pressure than that exerted on the distributor disk in said known devices. For this purpose the device according to the invention is characterized by such a configuration of the distributor disk that the incoming compressed air acts only upon a circular for example annular and preferably substantially concentric portion of said disk which is thus applied with a reduced resulting total pressure force against the associated stationary distributor body. Such an arrangement exhibits the advantage of decreasing the wear of the disk and/or stationary distributor body to a significant extent as well as the power required for rotating the disk.

The device according to the invention is therefore outstanding by the simplicity and effectiveness of the means used to cope with the drawbacks of the prior state of the art.

The invention will be better understood and further objects, characterizing features, details and advantages thereof will appear more clearly as the following explanatory description proceeds with reference to the accompanying diagrammatic drawings given by way of example only and illustrating two different forms of embodiment of the invention and wherein:

FIG. 1 is a longitudinal or axial cross-sectional view of a starting distributor with a rotary disk for a Diesel engine having six cylinders ;

FIG. 2 is a separate front view from the runner face side of said distributor disk ;

FIG. 3 is a view of the complementary or mating bearing side of the stationary distributor body taken substantially upon the cross-sectional line III—III of FIG. 1 ; and

FIG. 4 shows a fragmentary view in longitudinal cross-section of an alternative embodiment or modification of the device according to the invention.

According to the exemplary embodiment shown on FIG. 1, the starting distributor 1 is mounted on the engine base, casing or housing 2 of a Diesel engine 2*a* having for instance six cylinders 2*b*, substantially in coaxial extension of the cam shaft of the engine. This device comprises a distributor stator or stationary body 3 secured for instance by a suitable connecting flange to the casing 2 in particular by means of screws, bolts or the like 4. Towards the side where it is fastened to the engine casing, the distributor body 3 comprises an axially projecting cylindrical centering portion or the like 5 fitted into a corresponding opening 6 extending through the casing 2 of the engine and arranged in substantially coaxial relation to the cam shaft thereof. The cam shaft is extended by a shaft end portion for driving the coupled auxiliary devices 7 of which only the drive end is seen in FIG. 1. This shaft end portion 7 is connected through a suitable coupling joint 8 with a drive shaft 9 for the rotary distributor substantially in alignment with the shaft end portion 7 and mounted for rotation through suitable journal bushings, bearings or shells 10 preferably of the self-lubricating type within a corresponding bore 11 extending longitudinally through the body 3, the tightness of the shaft passage towards the coupling being provided by a sealing ring or like suitable ring-shaped packing or gland 12 mounted within a corresponding recess of the body 3.

The free end portion 13 of the body 3 is detachable and forms a kind of housing removably secured to the body 3 by screws, bolts or the like 14 extending through a removable end cover or cap 15 closing off the element 13 on the side opposite to or remote from the body 3. The housing 13 is centered onto the body 3 through a shouldered central projecting bearing of the body 3 fitted into the adjacent end of the housing 13. In this housing 13 is rotatably mounted the distributor disk 16 applied with its side 17 facing the body 3 through sliding contact against the mating end face 18 of said center bearing of the body 3.

The disk 16 forms the larger flange or disk of a sleeve 19 having a pair of substantially coaxial, longitudinally spaced disks 16 and 20 of differing diameters, rotatably mounted in sealing relationship by their periphery within corresponding bores 21, 22, respectively, of the housing 13 thereby defining therebetween an annular space 23 communicating through at least one for example substantially radial port 24 with the duct or piping delivering the compressed air which thereby exerts a differential action upon the disk 16.

The sleeve 19 is desirably force-fitted through a tapered bore onto a mating end tapered bearing portion 25 of the shaft 9 on which the sleeve is tightly clamped by means of a nut 26 locked by a suitable check nut or self-locking nut threaded onto the screw-threaded end of the shaft 9 with a suitable bearing washer 27 being interposed therebetween. Such an arrangement has the advantage of enabling an easy adjustment of the sleeve 19 when mounting the assembly.

The disk 20 is possibly longer than the disk 16 and comprises an open central recess for accommodating the free end of the shaft 9 together with its fastening nuts. The peripheral bearings of the disk 20 and of the disk 16, which are in rotating contact with the side wall of the corresponding bores 22 and 21, respectively, of the housing, are desirably sealed off by a dummy or labyrinth seal 28 known per se. According to an alternative embodiment not shown, such a tightness may be provided by an annular sealing gasket with a thinned lip which thinned lip engages said side wall of the bores 21, 22 only under the action of the compressed air and during the application time thereof, so that it discontinues to be applied against the wall of the bore at the end of the starting period so as not to brake through a possible frictional contact the rotary motion of the revolving assembly of the device after the engine has been started.

Since the outside diameter of the distributor disk 16 is larger than the outside diameter of the disk 20 of the sleeve 19, the compressed air which is coming through the port 24 and exerts its pressure onto the disk 16 as well as onto the disk 20, subjects the disk 16 to a resulting differential pressure force tending to apply the disk against the body 3 and resulting from the difference between the respective cross-sectional areas of the disk 16 and the disk 20. This thrust action is indeed equivalent to the force produced by the air pressure applied onto the annular surface of the ring-shaped portion of the disk 16 the width of which is equal to the difference between the respective radii of the disk 16 and the disk 20. This resulting total pressure force is therefore lower than the pressure force which would have been produced by the compressed air acting exclusively onto the total exposed or free surface of the disk 16. In other words, as the compressed air acts simultaneously in the two opposite axial directions of the system, that is on the one hand onto the apparent inner front surface of the disk 20 defined by the outside diameter thereof and on the other hand onto the apparent front surface of the disk 16 located in confronting relation to that of the disk 20 and defined by the outside diameter of the disk 16 which is larger than the outside diameter of the disk 20, the sleeve 19 hence the disk 16 is subjected to a resulting pressure force acting axially from left to right in FIG. 1 (therefore tending to press the disk against the distributor body 3) and equal to the difference between the total pressure forces exerted by the compressed air on the disk 16 and on the disk 20, respectively, said resulting pressure force being therefore lower than the total pressure force exerted by the compressed air upon the disk 16. It should be pointed out that the distributor disk 16 should always be applied during the starting period with some at least residual pressure against the stationary distributor body 3 so that a sufficient fluid-tightness is provided through pressure contact in the plane of the joint or interface between the mutually engaging front sides 17 and 18 of the disk 16 and the stationary body 3 respectively.

The peripheral fluid-tightness between the centering bearings 5 of the body 3 and the bore 6 extending through the wall 2 of the engine casing is desirably provided by at least one sealing ring or annular gasket 29 mounted within a corresponding peripheral groove of the centering bearing 5.

To reduce even more the friction between the contacting surfaces of the distributor disk 16 and the stationary distributor body 3 so as to still more reduce the mutual wear through abrasion of both of its surfaces as well as the power taken by the rotary assembly for overcoming the passive resistances opposed in particular by the sliding friction between said contacting surfaces, at least one of the sides 17 or 18 of the disk 16 and the body 3, respectively, which are in mutual engagement with each other and preferably the side 17 of the disk 16 is desirably provided with a coating or lining 17a, shown for example in FIGS. 1, 4 of a material having a low coefficient of friction (for example of a plastics material commercially known under the trademark "Teflon") or a layer of dry self-lubricating substance (such as molybdenum disulphide).

The distribution of compressed air within the body 3 for feeding the various cylinders is carried out by the feed ducts 30 the number of which is equal to that of the cylinders of the engine, i.e. to six in the example shown. These ducts open sidewise to the outside of the body 3 preferably through substantially radial ports or pipings 31 which are each one connected through a piping to a separate cylinder of the engine. Each duct 30 desirably comprises a substantially straight portion the longitudinal direction of which is substantially parallel with the axis of rotation of the movable assembly and which opens into the front face 18 of the body 3 through an orifice 32. The six orifices 32 are substantially equally spaced from said axis of rotation and uniformly distributed hence according to equal angular spacings of 60° along a same circumference concentric with said axis of rotation as illustrated in FIG. 3 which shows the end face of the body 3, assuming the housing 13 and the sleeve 19 are removed. These feed ducts 30 serve also to drain the air from the respective cylinders of the engine and for this purpose there is preferably provided a plurality of drain ducts 33 within the body 3 the number of which is for instance equal to one half of the number of cylinders of the engine, so that there is provided three drain ducts 33 in the present example opening sidewise to the outside of the body 3 through preferably radial ports 34 which open or terminate desirably into a common peripheral groove 35 forming a circular drain duct open to the outside and providing communicating between the various drain ports 34. This duct 35 is desirably covered by a strip of perforated metal sheet, perforated strip steel, wire gauze, mesh, lattice or like grating 36 forming a strainer or the like.

Each drain duct 33 desirably comprises a substantially straight portion with a longitudinal direction substantially parallel to the axis of rotation of the revolving assembly and opening through a corresponding bore 37 into a circular duct 44 coaxial with said axis of rotation and opening into the front face 18 of the body 3. These bores 37 which are three in number in FIG. 3 and are thus interconnected by the common annular duct 44 are desirably equally spaced from said axis of rotation and uniformly distributed at equal angular spacings of 120° along a same circumference concentric with said axis, which is substantially the circumferential center line of the duct 44 and has a diameter for example lower than the diameter of the circumference passing through the centers of the orifices 32.

The distributor disk 16 the front side of which is shown on FIG. 2 with its runner face having a mirror polish, comprises an air pressure passageway 38 extending through the disk 16 to open into one side within the annular space 23 and into the other side within the recessed wall 39 of an arcuate groove 40 extending in concentric relation to the shaft 9 and sunk into the side face 17 of the disk 16 so as to open into that face. This recess 40 has approximatively a lunular or bean-like shape with rounded ends the radial width of which is equal to the diameter of the passageway 38 and the arcuate center line of which passes through the center of said passageway 38. This passageway 38 has the same diameter as said orifices 32 and the radial distance from the center of the passageway 38 to the geometrical axis of rotation of the shaft 9 is equal to that of the orifices 32, so that the passageway 38 may be accurately brought in registration with each one of the successive orifices 32 upon rotation of the disk 16. The recess 40 is defined by a pair or arcs of circumference concentric with the axis 9 and bounded at the ends by a pair of arcs of circumference having a radius substantially equal to that of the passageway 38. The curvilinear length of the recess 40 along its arcuate center line corresponds to an angle at the center smaller than the angular spacing (of 60° herein) of any two successive orifices 32, that is smaller than the circumferential spacing between their centers but larger than the circumferential spacing of any two successive orifices 32 that is the curvilinear length of the solid face portion separating same. Thus the recess 40 may simultaneously cover in part any two successive orifices 32, i.e. the feeding of an orifice 32 begins before the recess 40 leaves the next preceding orifice 32 in the direction of rotation of the disk so as to provide the continuity of the pressure air supply when passing from any one cylinder to the following cylinder to be fed, one single cylinder being supplied at a time in the present example.

In the face 17 of the disk 16 is also provided an arcuate groove 42 with a solid rear wall, which opens into the face 17 and is substantially symmetrical with respect to the axis passing through the center of rotation of the disk 16 and the center of the passageway 38, the recess 40 also being symmetrical with respect to said axis. The groove 40 is concentric with the axis of rotation of the disk 16 and the radius of its central arc of circumference is equal to the distance of the center of each orifice 32 from said axis of rotation. The radial width of this groove 41 is substantially equal to the diameter of each orifice 32 and its circumferential length along its center line is long enough so that when the passageway 38 is located in confronting relation to one orifice 32 the other orifices 32 are altogether in confronting relation with the groove 41 so as to communicate all together with the latter.

At each end of the groove 41 the latter is laterally indented or channeled radially inwards along an at least approximately semi-circular recess 42 the radius of which is at least equal to that of each one of the orifices 37 or to the radial width of the annular passageway 44. Both recesses 42 are symmetrical with respect to the axis passing through the center of rotation of the disk 16 and the center of the passageway 38 and the circumference extending through the centers of curvature of both recesses 42 is concentric with the axis of rotation 9 and has a radius at least equal to the mean radius of the duct 44 or to the radial distance of the center of each orifice 37 from said axis of rotation. Thus irrespective of the angular position of the disk 16 the groove 41 communicates always through the recesses 42 with the annular duct 44 of the body 3 hence with the drain orifices 37 thereof. The circumferential length of the arcuate groove 41 is such that when the passageway 38 of the disk registers with any one orifice 32 of the body 3, all the other orifices 32 are exhausted, drained or vented to the open air through the groove 41, the recesses 42, the duct 44 and the corresponding orifices 37. When the recess 40 overlaps any two successive orifices 32 to provide continuity of the pressure air delivery when passing from one supplied cylinder to the next cylinder to be fed, both of these orifices 32 do not communicate with the groove 41 and are therefore not vented.

Moreover through the disk 16 extend for example a pair of diametrally opposed holes 43 the centers of which are for example aligned with the center of the passageway 38. The axis of each hole 43 is at such a radial distance from said axis of rotation that each hole **43** is always in front of the vent or drain duct **44** and communicates therefore constantly with the vent orifices **37** during the rotation of the disk **16**. Each hole **43** actually is a duct extending through the hub of the sleeve **19** in parallel relation to the axis of rotation to open within the end recess inside the disk **20**. These ducts **43** are adapted to drain the pressure air leakages passing between the contacting surfaces of said sleeve and housing **13**, respectively and in particular through the sealing joint **28**, so that the spaces or cavities receiving said leakages thus communicate with the outside through the body **3**.

In the position of the disk **16** shown in FIG. **1**, the passageway **38** of the revolving disk is coaxially in front of an orifice **32** of the stationary body **3**, so that the pressure air delivered through the port **24** and the annular space **23** into the housing **13** on the upstream side of the disk flows therethrough to feed one cylinder of the engine by flowing through the duct **30** and the associated orifice **31** of the body **3** whereas the other cylinders are vented or drained through the other ports **31** and ducts **30** the orifices **32** of which are registering with the groove **41** of the disk the recesses **42** of which are registering with the circular discharge duct **44** of the body **3**.

Merely by way of example, the respective outside diameters of the distributor disk **16** and the disk **20** may be selected in such a manner that the resulting pressure force through which the disk **16** is actually pressed against the body **3** amounts but to 30 percent of the total pressure force effectively applied throughout the apparent front surface of the disk by the pressure air discharged into the annular space **23**, thereby achieving a 70 percent reduction of the effective contact pressure and this residual operative pressure force of 30 percent is adequate to provide fluid-tightness in the joint between the surfaces **17** and **18** being in sliding contact with each other.

FIG. **4** shows an alternative embodiment of said rotary pneumatic distributor wherein the supply of pressure air is effected along a substantially axial delivery direction as known per se. The distributor disk **45** which is here also force-fitted on the tapered end portion or tip **25** of the shaft **9** for being rigidly connected for rotation therewith is rotatably mounted within a housing **46** forming a closure cap or cover of the stationary body **3** and through the end wall face of which extends a pressure air inlet port **47** substantially in coaxial relationship with the axis of rotation **9**. The disk **45** is here the end disk of a sleeve or the like **48** provided with a single disk and forming a kind of socket or bushing with a cylindrical inner cavity **49** comprising at its inner end a transverse rear wall through which extends a tapered bore fitted on the bearing portion **25** ; said wall is formed with an outer radially projecting flange forming the distributor disk **45**. This disk or plate **45** merges coaxially preferably through a substantially tapered portion **50** having the shape of a frustum of a cone, with a cylindrical portion **51** having an outside diameter smaller than that of the disk **45**. The sleeve **48** is thus rotatably mounted in sealing relationship through the respective peripheries of its disk **45** and of its cylindrical portion **51**, respectively, within corresponding bores **52**, **53** of the housing **46**, which bores are connected to each other by suitable shoulders or counter-bores. The hollow cylindrical portion **51** has its inner cavity **49** opening at its outer end in front of the pressure air inlet port **47**. The fluid-tightness between the contacting cylindrical surfaces of the sleeve **48** and the inner wall of the housing **46**, respectively, may be achieved either by labyrinth joints such as **21**, **28** or by sealing gaskets or packings formed with a thinned lip of the kind previously described. The cavity **49** communicates directly with the distributing passageway **38** of the disk **45** through an inclined duct or passageway **54** which is inclined with respect to the axis of rotation of the movable assembly and which is located in said tapering portion **50**. During the rotation of the disk **45**, the passageway **38** moves successively past the successive various ducts **30** provided in the body **3**, the mode of operation of the disk being substantially identical with that of the previously described embodiment.

The pressure air leakages possibly flowing through the sealing joint **28** and collecting within the closed annular space **55** are discharged by at least one vent or drain port **56** extending for instance substantially radially through the side wall of the housing **46**.

In this second embodiment, it is seen that the pressure of the compressed air delivered through the port **47** is exerted only upon the front or free end face of the cylindrical portion **51** the outside diameter of which is substantially smaller than that of the disk **45**, so that the total pressure force by which the disk is pressed against the body **3** is substantially lower than that which would have been produced if the air pressure had been applied onto the effective exposed or apparent front section of the disk **45** i.e. corresponding to the outside diameter thereof. Merely by way of example, said resulting pressure force through which the disk **45** is actually pressed against the body **3** may be about 22 percent only of the total pressure force achieved if the compressed air had been applied over the whole exposed front surface of the disk **45**.

It should be understood that the invention should not be construed as being limited to the forms of embodiment described and shown herein which have been given by way of examples only. In particular it comprises all the means forming technical equivalents to the means described as well as their combinations when the latter are carried out according to the gist of the invention within the scope defined by the appended claims.

What is claimed is:

1. A common rotary automatic distributor device for starting with compressed air an internal combustion engine having a cam shaft, said device including a stationary distributor body and a revolving distributor disk driven by said cam shaft and receiving compressed air on one side whereas it is in fluid-tight sliding pressure contact at its opposite side with the mating face of said stationary distributor body and wherein the improvement consists in such a configuration of said disk that the compressed air delivered acts only upon a circular annular and substantially concentric portion of said disk which is thus applied with a reduced resulting total pressure force against said body.

2. A device according to claim **1**, comprising a sleeve formed with a pair of substantially coaxial, longitudinally spaced disks of differing diameters of which the larger one forms said distributor disk and which are rotatably mounted in sealing relationship by their peripheries in corresponding bores, respectively, of said body so as to define therebetween an annular space communicating through at least one substantially radial port with a duct supplying pressure air which thereby exerts a differential action upon said distributor disk.

3. A device according to claim **1** with a substantially axial direction of incoming flow of compressed air and comprising a sleeve formed with an end disk constituting said distributor disk which merges coaxially through a substantially tapered portion with a cylindrical portion of smaller diameter, said sleeve being rotatably mounted in sealing relationship by the respective peripheries of its disk and cylindrical portion within corresponding bores of said stationary body ; said cylindrical portion being hollow and open at its outer end to form an inlet for the axial flow of pressure air whereas at least one inclined duct located within said tapered portion connects the inner cavity of said cylindrical portion with each distributing passageway of said distributor disk.

4. A device according to claim **2**, wherein the fluid-tightness of those bearing portions of said sleeve which are in rotating contact with the side wall of the corresponding bores of said stationary body is achieved by means of a labyrinth joint, said sleeve being formed with a tapered bore force-fitted onto the end of said cam shaft.

5. A device according to claim **3**, wherein the fluid-tightness of those bearing portions of said sleeve which are in rotating contact with the side wall of the corresponding bores of said stationary body is achieved by means of a labyrinth joint, said sleeve being formed with a tapered bore force-fitted onto the end of said cam shaft.

6. A device according to claim **2**, comprising corresponding drain ducts provided in said sleeve and stationary body, respectively, for discharging the pressure air leakages passing between the contacting surfaces of said sleeve and body, respectively, said ducts venting the leakage receiving spaces and cavities to the outside through said stationary body.

7. A device according to claim **3**, comprising corresponding drain ducts provided in said sleeve and stationary body, respectively, for discharging the pressure air leakages passing between the contacting surfaces of said sleeve and body, respectively, said ducts venting the leakage receiving spaces and cavities to the outside through said stationary body.

8. A device according to claim **1**, wherein at least one of those mutually confronting faces of said distributor disk and body which are in sliding contact with each other are provided with a lining having a low coefficient of friction.

9. A device according to claim **1**, wherein at least one of those mutually confronting faces of said disk and body, respectively, which are in sliding contact with each other is provided with a coating of dry self-lubricating material.

10. A rotary automatic distributor device for starting with compressed air a multi-cylinder internal combustion engine having a cam shaft, said device including a stationary distributor body formed endwise with a flat rotary valve seating face, a hollow housing forming part and located endwise of said distributor body about and in coaxial relation to said seating face, said housing defining with said seating face an inner chamber and being formed with a compressed air inlet port opening into said chamber, a revolving distributor valve disk member formed with opposite first and second sides and provided centrally with a hub portion whereby it is mounted within said chamber on a rotary spindle extending coaxially through said distributor body and driven by said cam shaft, said disk member receiving compressed air on its first side which is opposite from said valve seating face whereby it is pressed with its other second mating side against said valve seating face in fluid-tight sliding engagement therewith, said distributor body being formed with ports opening at one end through said valve seating face and connectable with their other ends to said engine cylinders, respectively, whereas said disk member is formed with control passageways for making said ports communicate cyclicly with said compressed air inlet port, wherein the improvement consists in that said hub portion of said disk member projects with an axially extending integral portion into said chamber from said first side of said disk member, said housing being formed coaxially with a pair of mutually adjacent bores whereas said disk member and its axially extending portion are rotatably mounted in sealing relationship with their peripheries in said bores, respectively, either of said disk member and its axially extending portion being provided with means whereby the incoming compressed air produces an operative unbalanced pressure force component acting on a circular annular concentric portion only of said first side of said disk member which is therefore applied with a reduced total pressure force against said valve seating face, the surface area of said annular portion being smaller than the total projected free surface area of said first side of said disk member surrounding said axially extending portion.

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