

663815

The Commissioner of Patents
PO Box 200
WODEN ACT 2606

F B RICE & CO
SYDNEY NSW
Speed Dial 511

PATENTS

Our Ref: 62507

AUSTRALIA
Patents Act 1990
PATENT REQUEST: STANDARD PATENT

We, HOERBIGER VENTILWERKE AKTIENGESELLSCHAFT being the person(s) identified below as the Applicant, request the grant of a standard patent to the person identified below as the Nominated Person, for an invention described in the accompanying complete specification.

Full application details follow.

Applicant and
Nominated Person:

HOERBIGER VENTILWERKE
AKTIENGESELLSCHAFT
An Austrian joint stock company

Address:

23 Braunhubergasse, A-1110 Vienna
Austria

Invention Title:

Plate valve, particularly for
compressors

Name(s) of Actual Inventor(s): Gerald PAVLU

Address for service in Australia:

F B RICE & CO
Patent Attorneys
28A Montague St
BALMAIN NSW 2041

Attorney Code: RI

BASIC CONVENTION APPLICATION(S) DETAILS

<u>Application No</u>	<u>Country</u>	<u>Country Code</u>	<u>Date of Application</u>
A 270/93	Austria	AT	15 February 1993
<u>Applicant(s):</u> HOERBIGER VENTILWERKE AKTIENGESELLSCHAFT			

We are not an eligible person described in Section 33 - 36 of the Act.

Drawing number recommended to accompany the abstract Fig. 5.
Dated this 11th day of August 1995

HOERBIGER VENTILWERKE
AKTIENGESELLSCHAFT

By:

FRED SCHILLING
Registered Patent Attorney

62507/TJB/awc/h9



AUSTRALIA
Patents Act 1990

469 AU

NOTICE OF ENTITLEMENT

I(We) Dr. Erich MACHU and Dr. Friedrich Bauer
authorised by HOERBIGER VENTILWERKE AKTIENGESELLSCHAFT
of Braunhubergasse 23, A-1110 Vienna, Austria

the applicant and nominated person in respect of an application for a patent for an invention
entitled Plate valve, particularly for compressors

filed under Australian Application No. 53173/94, state the following:

PART 1 - Must be completed for all applications.

The person(s) nominated for the grant of the patent

☐ is (are) the actual inventor(s)

or

☒ has, for the following reasons, gained entitlement from the actual inventor(s)

the nominated person would, on the grant of a patent for
the invention, be entitled to have the patent assigned
to the nominated person.

PART 2 - Must be completed if the application is a Convention application.

The person(s) nominated for the grant of the patent is (are)

☒ the applicant(s) of the basic application(s) listed on the patent request form

or

☐ entitled to rely on the basic application(s) listed on the patent request form by reason of the following:

The basic application(s) listed on the request form is (are) the first application(s) made in a Convention country in respect of the invention.

PART 3 - Must be completed if the application was made under the PCT and claims priority.

The person(s) nominated for the grant of the patent is (are):

☐ the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT

or

☐ entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following:

The basic application(s) listed in the declaration made under Article 8 of the PCT is (are) the first application(s) made in a Convention country in respect of the invention.

fourteenth

Dated this HOERBIGER VENTILWERKE day of January 19 1994
AKTIENGESELLSCHAFT

Signed AUSTRIA - EUROPE Status head clerks (both)

Signatory's Name Dr. Erich MACHU, Dr. Friedrich BAUER

F.B. RICE & CO PATENT ATTORNEYS



AU9453173

(12) PATENT ABRIDGMENT (11) Document No. AU-B-53173/94
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 663815

(54) Title
PLATE VALVE, PARTICULARLY FOR COMPRESSORS

International Patent Classification(s)
(51)⁵ **F16K 015/10**

(21) Application No. : **53173/94**

(22) Application Date : **13.01.94**

(30) Priority Data

(31) Number	(32) Date	(33) Country
270/93	15.02.93	AT AUSTRIA

(43) Publication Date : **22.06.95**

(44) Publication Date of Accepted Application : **19.10.95**

(71) Applicant(s)
HOERBIGER VENTILWERKE AKTIENGESELLSCHAFT

(72) Inventor(s)
GERALD PAVLU

(74) Attorney or Agent
F B RICE & CO , 28A Montague Street, BALMAIN NSW 2041

(56) Prior Art Documents
AU 622183 35848/89 F16K 15/08 F04B 21/02
AU 612107 67714/87 F16K 15/08 F04B 21/02 39/10
GB 1017035

(57) Claim

1. Plate valve, particularly for compressors, having:
a valve seat;
a guard provided at a distance from the valve seat;
and

two or more plates provided between the valve seat and the guard including a closing plate which controls flow-through channels of the valve seat, and at least one auxiliary plate assigned to the closing plate which is fixed relative to the guard;

wherein the guard has a guard boss which projects against the valve seat, and which is provided with at least one radial recess;

wherein the auxiliary plate has a cut-out in its centre which is larger than the cross-section of the guard boss and has at least two brackets which project past the auxiliary plate's inner edge; and

wherein the brackets can be snapped into a recess of the guard boss by placing the auxiliary plate with its central cut-out onto the guard boss and by a relative movement between the guard and the auxiliary plate.

- 1 -

663815

AUSTRALIA

Patents Act 1990

HOERBIGER VENTILWERKE AKTIENGESELLSCHAFT

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

"Plate valve particularly for compressors"

The following statement is a full description of this invention including the best method of performing it known to us:-

Plate valve, particularly for compressors

The invention concerns a plate valve, particularly for compressors, with a valve seat, a guard provided at a distance from the latter and plates provided between the valve seat and the guard, in fact a closing plate which controls the flow-through channels of the valve seat, as well as at least one auxiliary plate assigned to the closing plate, e.g. a spring, attenuating or guiding plate which is fixed relative to the guard.

Plate valves of this type are known with different constructions. During the operation of such a valve the closing plate carries out a reciprocating movement between the valve seat and the guard, closing and opening alternatively the flow-through channels of the valve seat. The task of the auxiliary plates is to exert a flexible load on the closing plate relative to the valve seat, so that the valve would be closed in the unpressurised state also, to attenuate the impacts of the closing plate on the guard and to absorb them, if necessary, during the reciprocating movement.

To carry out correctly these tasks and to avoid as far as possible the sliding frictions on the guiding surfaces, in the known constructions the auxiliary plates are, as a rule, fixed in the valve, in most cases by means of their central boss clamped between the guard and a distance ring provided between the guard and the valve seat. Other constructions are also known, wherein the auxiliary plates are simply screwed on the guard radially outside of the boss.

In the known constructions the fixing of the auxiliary plates in the valve is relatively complicated. The use of a distance ring means a component of its own, which not only makes the production of the valve more expensive, but also complicates the assembly. The space requirement of a distance or guide ring in the centre of the valve is also relatively big, due to which the potential flow-through cross-section of the valve is

reduced. In case of auxiliary plates directly screwed onto the guard's surface the expense is even greater, as more screws must be provided and fitted, which, in addition, may be in the way when attaching the closing plate on the guard.

It would be desirable to improve and simplify the known plate valves of the type of construction mentioned above, so that the auxiliary plates provided can be simply and rapidly fastened in the valve by using only a few components.

The present invention provides plate valve, particularly for compressors, having:

a valve seat;

a guard provided at a distance from the valve seat;

and

two or more plates provided between the valve seat and the guard including a closing plate which controls flow-through channels of the valve seat, and at least one auxiliary plate assigned to the closing plate which is fixed relative to the guard;

wherein the guard has a guard boss which projects against the valve seat, and which is provided with at least one radial recess;

wherein the auxiliary plate has a cut-out in its centre which is larger than the cross-section of the guard boss and has at least two brackets which project past the auxiliary plate's inner edge; and

wherein the brackets can be snapped into a recess of the guard boss by placing the auxiliary plate with its central cut-out onto the guard boss and by a relative movement between the guard and the auxiliary plate.

Thus the guard in the valve construction is provided with a boss, which may be integral with it, so that not a single distance or guide ring between the valve seat and guard is necessary. During assembly the auxiliary plate constructed accordingly needs only to be placed onto this



guard boss and anchored by a relative movement to achieve a secure fixing in the valve and to enable a friction-free movement of this plate. Just one or several recesses are required in the guard boss, their width corresponding to the number of the to-be-accommodated auxiliary plates, which recesses can be easily produced. Thus the construction according to the invention is characterised by its simplicity, its easy assembly without tools and only few components.

10 In a preferred embodiment of the invention the guard boss is constructed with a non-circular cross-section and in the axial direction it has flattenings of the circular shape or recesses



which fit the brackets of the associated auxiliary plates,
while the auxiliary plate can be placed in the axial direction
onto the guard boss and through rotation can be snapped into
the recesses of the guard boss. ^{With this construction,} ~~In case of this construction~~
5 ~~the~~ the guard boss can be easily produced as only relatively
small flattenings or recesses are necessary, which can be
easily produced by milling or grinding.

10 A further advantageous embodiment of the invention is that the
guard boss has two diametrically opposed recesses and the
recess provided in the centre of the auxiliary plate fits the
guard boss eccentrically, while after placing the auxiliary
plate onto the guard boss the brackets can be snapped into the
15 recesses of the guard boss by moving the auxiliary plate in its
plane. In this case the guard boss can retain its cylindrical
cross-section; it must be provided only with recesses to accept
the brackets. In any case the recess in the centre of the
auxiliary plate must be somewhat larger, so that this
20 construction requires a somewhat larger space.

25 In a further development of the invention the brackets of the
auxiliary plate can be domed at least in the region engaging
the recesses of the guard boss, generated preferably with a
line which is parallel to a radius of the guard boss and
flexibly pretensioned snap into the recesses of the guard boss.
At the same time the brackets are elastically deformed when
pushed into the recesses of the guard boss, so that they fill
the recesses flexibly and are anchored in these without any
play. The frictional forces arising on this occasion prevent an
30 unintentional release of the brackets from the recesses and
consequently also a disadvantageous loosening of the auxiliary
plate fixed in the valve.

35 Within the framework of the invention a further improvement of
the fixing can be achieved by that at least one axial bore is
provided in the guard boss, which bore intersects at least one
of the recesses serving to accommodate one bracket of the
auxiliary plate and into which a pin can be inserted, which



after the snapping in of the bracket in the respective recess engages the bracket. Consequently the brackets are secured in the respective recess of the guard boss by a simple pin, so that the auxiliary plate can neither snap out nor rotate from its fixed position.

An appropriate ^{preferred} construction is that the pins inserted in the axial bores have grooves in the region of the recesses of the guard boss which grooves and recesses are aligned with each other, into which grooves the brackets can be pushed in, while in the brackets roughly semi-circular recesses are provided with which, when rotated, the pins engage with their side averted from the groove. In this conjunction the pins do not need to be pushed into the guard boss only after the brackets have been inserted into the recesses of the guard boss. The grooves in the pins make the insertion of the brackets feasible even with the pins inserted. Thus the final anchoring is carried out just by rotating the pins.

According to the invention the pins may sit in blind holes, which originate from the side of the valve seat, are covered by these against falling out and for the purpose of rotation are provided on their end face with an application profile for a tool, e.g. a transversal slot for a screwdriver.

Finally, one ^{preferred} version of the fixing according to the invention is that the pins protrude from the blind holes in the guard towards the valve seat and engage the blind holes provided in the valve seat. Consequently, these pins also serve the purpose of positioning the valve seat relative to the guard plate, due to which additional devices like pins or markings may be omitted. At the same time the pins projecting from the guard boss can be simply grasped and rotated. Although this facilitates the assembly, additional, even if short, blind holes are necessary in the valve seat.



Further details and advantages of the invention become apparent from the following description of the embodiments, which are illustrated in the drawings.

5 They show the following:

Fig.1 - a central cross-section through an embodiment of the valve according to the invention,

10 Fig.2 - a central cross-section through the guard,

Fig.3 - a top view on the guard,

Fig.4 - an axial cross-section of a detail on a larger scale,

15 Fig.5 - a section along line V-V of Fig.4,

Fig.6 - an axial cross-section of a detail of a further embodiment on a larger scale,

20 Fig.7 - a section along line VII-VII of Fig.6,

Fig.8 - a cross-section across a bracket of an auxiliary plate.

25 According to Fig.1 the valve according to the invention, illustrated as an example, consists of a valve seat 1 and a guard plate 2, which is held together with the valve seat 1 by means of a central bolt 3. Between the valve seat 1 and the guard 2 a closing plate 4, which may be made of plastics, and
30 one or more auxiliary plates 5, e.g. spring, attenuating or guiding plates are situated. In the valve seat 1 flow-through channels 6 are provided, which are controlled by the closing plate 4, and in the guard 2 flow channels 7 are provided. In the centre of the valve a pin 8 and a guard boss 9 can be seen.

35

It can be seen from Fig.2 that the guard 2 has an integral guard boss 9, which is provided with an axial bore 10, into which the pin designated by 8 in Fig.1, can be inserted. In

Fig.3 two pins 8 can be recognised in the guard boss 9, which are situated diametrically opposite each other. On the outer edge of the guard boss 9 an annular recess 11 is provided shaped as a radially outwards open groove and shown in a dotted line and between the two pins 8 at an angle of approx. 90° flattenings 12 are formed on the guard boss 9 by milling or grinding.

Figs.4 and 5 show more exactly the construction of the illustrated valve in the region of the guard boss 9. In Fig.4 the central part of the valve seat 1 and of the guard 2, the closing plate 4 and the two auxiliary plates 5 are shown. Furthermore, the guard boss 9 and two pins 8 can be recognised. Both auxiliary plates 5 protrude with their inner edge into the recess 11, which is provided in the guard boss 9.

It can be further seen in Fig.5, that the guard boss 9 has a non-circular cross-section in this case also. The two flattenings 12 are situated diametrically opposite each other. The auxiliary plate 5 illustrated here is placed on the guard boss 9 so, that with the projecting brackets 13 it lies against the flattenings 12. By rotating the auxiliary plate 5, slightly in the direction of the arrow 14, but also in the opposite direction, the short arms 13 engage the recesses 11 of the boss 9, and after being rotated by approx. 90° reach the region of the pins 8. Roughly in the centre of the brackets 13 a semi-circular recess 15 each is provided, with which the pins 8 engage.

During the rotation of the auxiliary plate 5 the pins 8 are slightly lifted. As soon as they are aligned with the semi-circular recesses 15, they are inserted into these. According to Fig.4 the top ends of the pins 8 engage the blind-holes 16 of the valve seat 1, their falling out thus prevented. These pins 8 thus prevent an unintentional rotation of the auxiliary plate 5, so that these will be held firmly in their predetermined positions.

The embodiment according to Figs.6 and 7 differs from the above described embodiment mainly by that the auxiliary plate 5 is placed eccentrically on the guard boss 9, while this can have a circular cross-section. It can be seen from Fig.7, that the guard boss 9 has two diametrically opposed recesses 11, each of which is penetrated by a pin 8. According to Fig.6 the pins 8 themselves have grooves 17, which are aligned with the recesses 11 when the pins 8 are inserted.

It can be further seen from Fig.7, that the auxiliary plate 5 with its cut-out fits eccentrically the guard boss 9. It is, therefore, pushed onto the guard boss 9 in the position illustrated in Fig.7, whereupon the auxiliary plate 5 is moved in its plane in direction of arrow 14, resulting in both brackets 13 engaging the recesses 11 of the guard boss 9 and penetrating the grooves 17 of the pins 8. As soon as the brackets 13 with their semi-circular recesses 15 reach the region of the pins 8, the pins can be rotated by approx. 180°, due to which the full half of the pins 8 passes through the region of the semi-circular recesses 15. The auxiliary plates 5 will be fixed by this relative to the guard boss 9.

To rotate the pins 8 they are provided on their end faces with an application section for a tool, in the case of the embodiment with a transversal slot 18, like it is shown, for example, in Fig.6, the purpose of which is to accept a screwdriver. The pins 8, which sit in a blind hole of the guard boss 9, are covered by the valve seat 1 and thus are secured against falling out.

Fig.8 shows a view of a version of the bracket 13. As this can be seen from the illustration, the brackets 13 can be constructed slightly domed, so that they are pushed together flexibly when they are pushed into the recesses 11 of the guard boss 9. In this manner the auxiliary plates 5 are held firmly without any play. In case of adequate spring force the pins 8 as a safety feature may be omitted.

The auxiliary plates 5 may be, as has already been explained, spring, attenuating or guiding plates. Most frequently the spring plate is being used, because practically all modern plate valves have springs. For this purpose both the classic
5 spring plates with arms curving out of their plane can be used, as well as the so called wavy ring springs, which are made of closed rings, whose annular section is curved from the plane of the plate in both directions of the spring plate. Otherwise
10 formed spring plates are also conceivable, e.g. so called sinus springs with cylindrical dome or disk springs. It is also feasible according to the invention to fix different types of plates in the same valve, e.g. spring and attenuating plates, if necessary, at different distances from the guard.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Plate valve, particularly for compressors, having:
 - a valve seat;
 - a guard provided at a distance from the valve seat;
- 5 and
 - two or more plates provided between the valve seat and the guard including a closing plate which controls flow-through channels of the valve seat, and at least one auxiliary plate assigned to the closing plate which is
 - 10 fixed relative to the guard;
 - wherein the guard has a guard boss which projects against the valve seat, and which is provided with at least one radial recess;
 - wherein the auxiliary plate has a cut-out in its
 - 15 centre which is larger than the cross-section of the guard boss and has at least two brackets which project past the auxiliary plate's inner edge; and
 - wherein the brackets can be snapped into a recess of the guard boss by placing the auxiliary plate with its
 - 20 central cut-out onto the guard boss and by a relative movement between the guard and the auxiliary plate.
2. Plate valve according to claim 1 wherein the relative movement between the guard and the auxiliary plate is by rotating or moving the auxiliary plate in its
- 25 plane.
3. Plate valve according to claim 1, characterised in that the guard boss is constructed with a non-circular cross-section in that it has flattenings or recesses in an otherwise generally circular shape which extend in its
- 30 axial direction and which fit the brackets of the associated auxiliary plates, while the auxiliary plate can be placed in the axial direction onto the guard boss and through rotation can be snapped into the recesses of the guard boss.
- 35 4. Plate valve according to claim 1, characterised in that the guard boss has two diametrically opposed recesses



and the recess provided in the centre of the auxiliary plate fits the guard boss eccentrically, while after placing the auxiliary plate onto the guard boss the brackets can be snapped into the recesses of the guard boss by moving the auxiliary plate in its plane.

5 5. Plate valve according to any one of claims 1 to 4, characterised in that the brackets of the auxiliary plate are domed at least in the region engaging the recesses of the guard boss, generated preferably with a line which is
10 parallel to a radius of the guard boss and flexibly pretensioned snap into the recesses of the guard boss.

6. Plate valve according to any one of the claims 1 to 5, characterised in that at least one axial bore is provided in the guard boss, which bore intersects at least
15 one of the recesses serving to accommodate one bracket of the auxiliary plate and into which a pin can be inserted, which after the snapping in of the bracket in the respective recess engages the bracket.

7. Plate valve according to claim 6, characterised in
20 that the pins inserted in the axial bores have grooves in the region of the recesses of the guard boss which grooves and recesses are aligned with each other, into which grooves the brackets can be pushed in, while in the brackets roughly semi-circular recesses are provided with
25 which, when rotated, the pins engage with their side averted from the groove.

8. Plate valve according to claim 6 or 7, characterised in that the pins sit in and are retained by blind holes which originate from the side of the valve seat, and for
30 the purpose of rotation are provided on their end face with an application profile for a tool, e.g. a transversal slot for a screwdriver.

9. Plate valve according to claim 6 or 7, characterised in that the pins protrude from the blind holes in the
35 guard towards the valve seat and engage the blind holes provided in the valve seat.



1
 2
 3
 4
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28
 29
 30
 31
 32
 33
 34
 35
 36
 37
 38
 39
 40
 41
 42
 43
 44
 45
 46
 47
 48
 49
 50
 51
 52
 53
 54
 55
 56
 57
 58
 59
 60
 61
 62
 63
 64
 65
 66
 67
 68
 69
 70
 71
 72
 73
 74
 75
 76
 77
 78
 79
 80
 81
 82
 83
 84
 85
 86
 87
 88
 89
 90
 91
 92
 93
 94
 95
 96
 97
 98
 99
 100
 101
 102
 103
 104
 105
 106
 107
 108
 109
 110
 111
 112
 113
 114
 115
 116
 117
 118
 119
 120
 121
 122
 123
 124
 125
 126
 127
 128
 129
 130
 131
 132
 133
 134
 135
 136
 137
 138
 139
 140
 141
 142
 143
 144
 145
 146
 147
 148
 149
 150
 151
 152
 153
 154
 155
 156
 157
 158
 159
 160
 161
 162
 163
 164
 165
 166
 167
 168
 169
 170
 171
 172
 173
 174
 175
 176
 177
 178
 179
 180
 181
 182
 183
 184
 185
 186
 187
 188
 189
 190
 191
 192
 193
 194
 195
 196
 197
 198
 199
 200
 201
 202
 203
 204
 205
 206
 207
 208
 209
 210
 211
 212
 213
 214
 215
 216
 217
 218
 219
 220
 221
 222
 223
 224
 225
 226
 227
 228
 229
 230
 231
 232
 233
 234
 235
 236
 237
 238
 239
 240
 241
 242
 243
 244
 245
 246
 247
 248
 249
 250
 251
 252
 253
 254
 255
 256
 257
 258
 259
 260
 261
 262
 263
 264
 265
 266
 267
 268
 269
 270
 271
 272
 273
 274
 275
 276
 277
 278
 279
 280
 281
 282
 283
 284
 285
 286
 287
 288
 289
 290
 291
 292
 293
 294
 295
 296
 297
 298
 299
 300
 301
 302
 303
 304
 305
 306
 307
 308
 309
 310
 311
 312
 313
 314
 315
 316
 317
 318
 319
 320
 321
 322
 323
 324
 325
 326
 327
 328
 329
 330
 331
 332
 333
 334
 335
 336
 337
 338
 339
 340
 341
 342
 343
 344
 345
 346
 347
 348
 349
 350
 351
 352
 353
 354
 355
 356
 357
 358
 359
 360
 361
 362
 363
 364
 365
 366
 367
 368
 369
 370
 371
 372
 373
 374
 375
 376
 377
 378
 379
 380
 381
 382
 383
 384
 385
 386
 387
 388
 389
 390
 391
 392
 393
 394
 395
 396
 397
 398
 399
 400
 401
 402
 403
 404
 405
 406
 407
 408
 409
 410
 411
 412
 413
 414
 415
 416
 417
 418
 419
 420
 421
 422
 423
 424
 425
 426
 427
 428
 429
 430
 431
 432
 433
 434
 435
 436
 437
 438
 439
 440
 441
 442
 443
 444
 445
 446
 447
 448
 449
 450
 451
 452
 453
 454
 455
 456
 457
 458
 459
 460
 461
 462
 463
 464
 465
 466
 467
 468
 469
 470
 471
 472
 473
 474
 475
 476
 477
 478
 479
 480
 481
 482
 483
 484
 485
 486
 487
 488
 489
 490
 491
 492
 493
 494
 495
 496
 497
 498
 499
 500
 501
 502
 503
 504
 505
 506
 507
 508
 509
 510
 511
 512
 513
 514
 515
 516
 517
 518
 519
 520
 521
 522
 523
 524
 525

[illegible][illegible]

F. B. RICE & CO.

Abstract

A plate valve, which is suitable particularly for compressors, consists of a valve seat (1), a guard (2) provided at a distance from the latter and plates provided between them, in fact a closing plate (4) and at least one auxiliary plate (5). To simplify the fixing of the auxiliary plates (5) in the valve, the guard (2) with a guard boss (9) projects against the valve seat (1) and in the guard boss (9) at least one recess (11) is provided. The auxiliary plates (5) are provided with brackets (13) and have a cut-out in their centre. They are placed onto the guard boss (9) following which the brackets (13) can be snapped into the recesses (11) of the guard boss (9) by a relative movement between the guard (2) and the auxiliary plane (5).

1/2

53173/94

Fig. 1

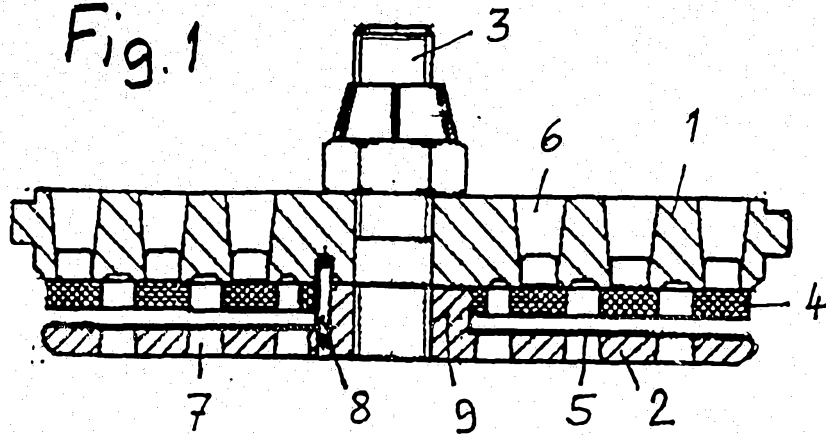


Fig. 2

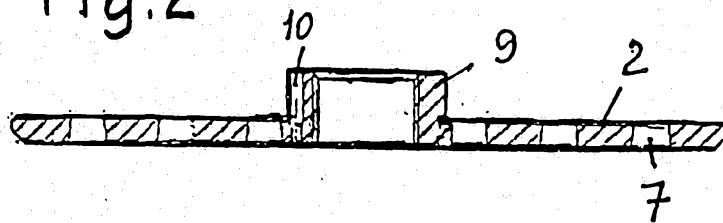
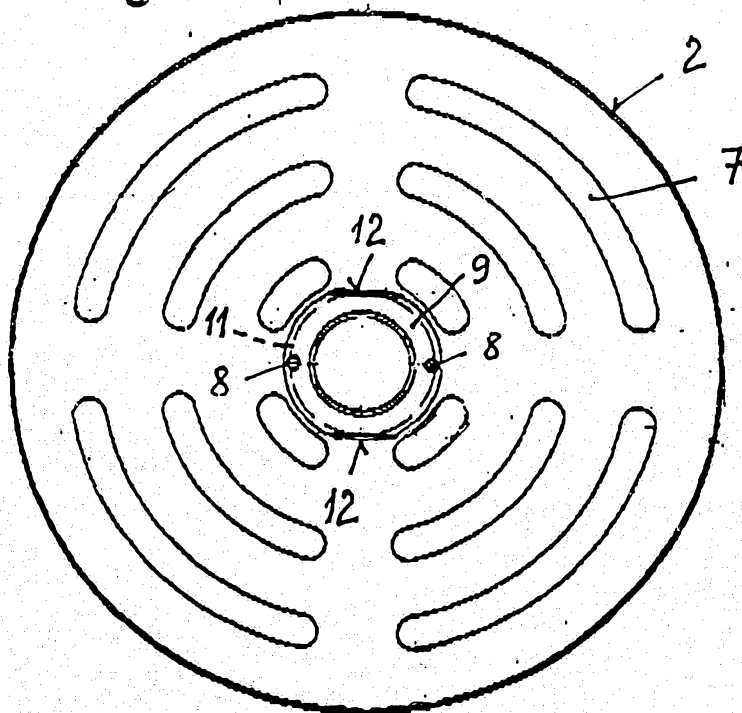


Fig. 3



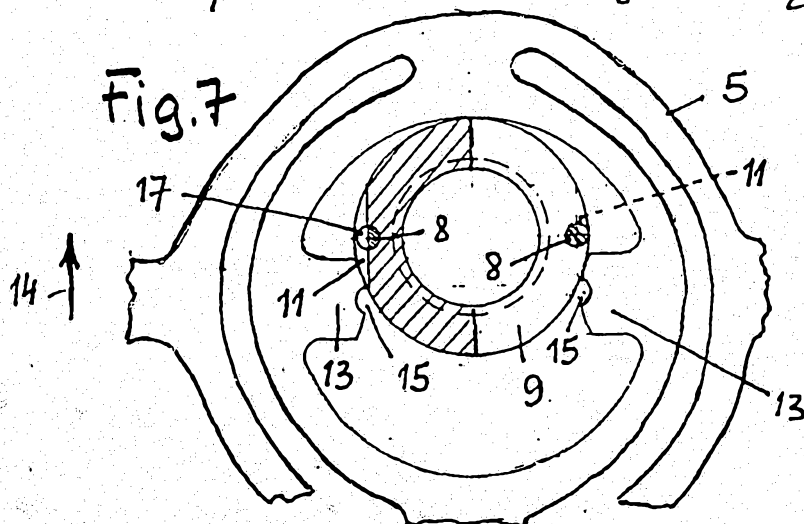
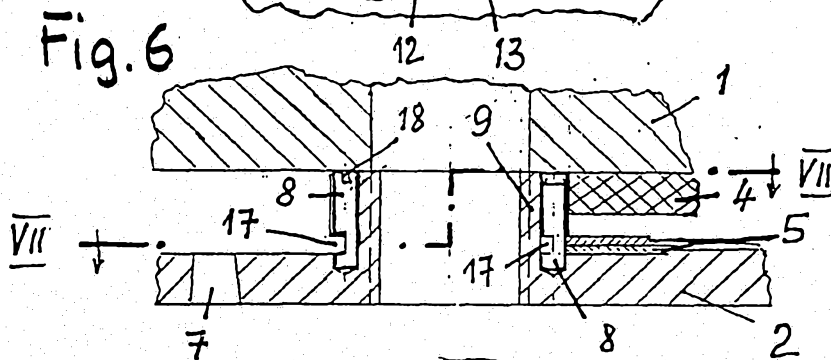
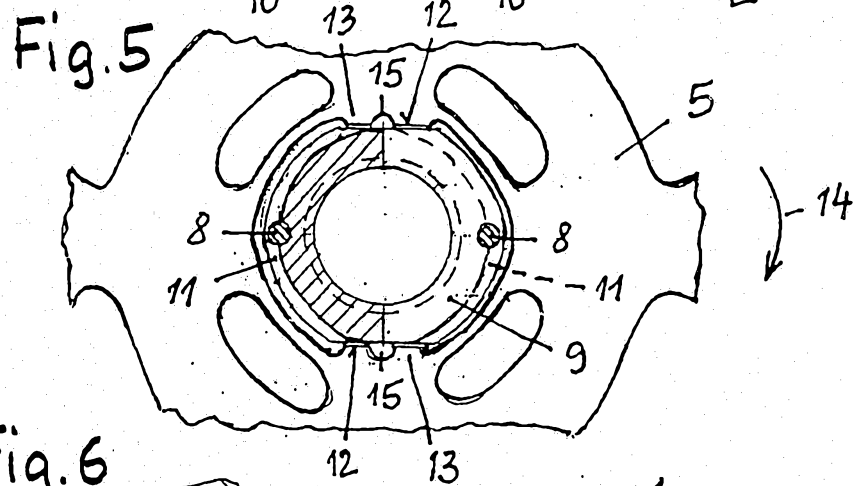
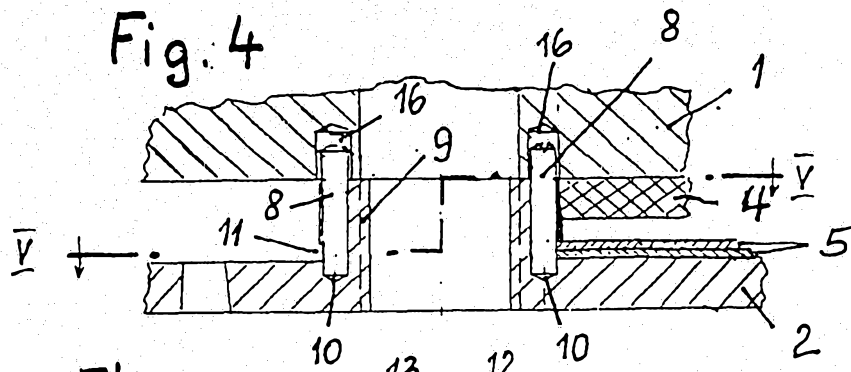


Fig. 8

