

March 1, 1966

R. D. BECK ETAL

3,237,644

ROTARY VALVING MECHANISM

Filed Sept. 7, 1962

2 Sheets-Sheet 1

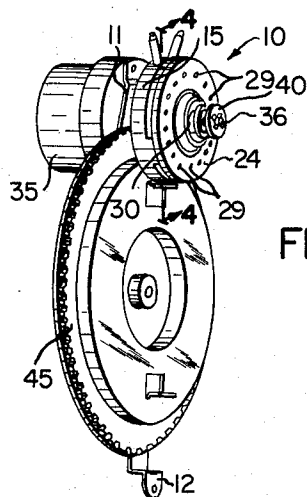


FIG-1

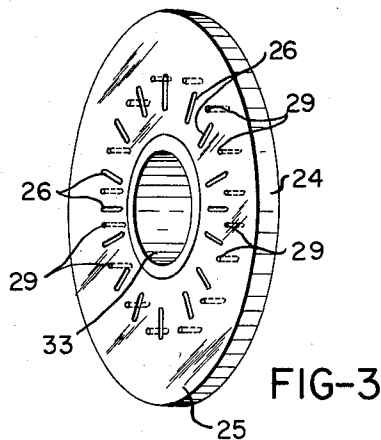


FIG-3

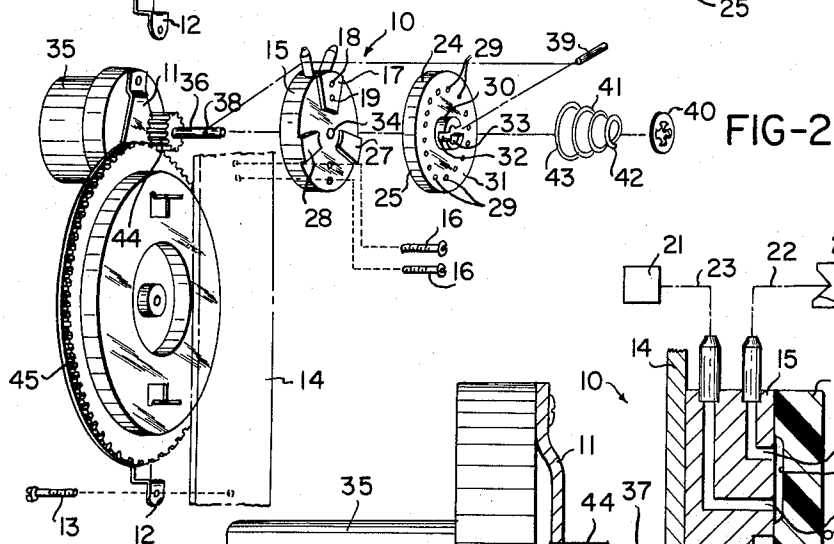


FIG-2

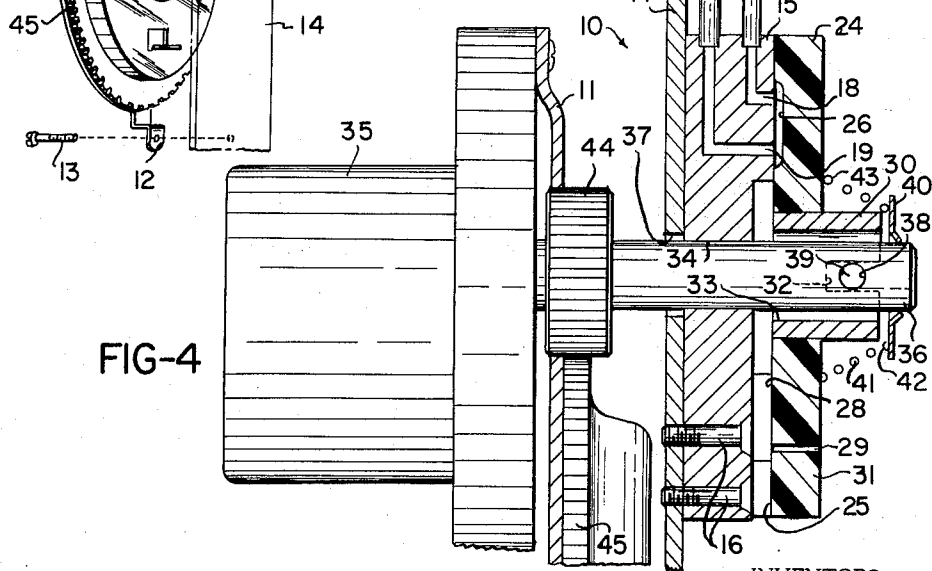


FIG-4

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2 Sheets-Sheet 2

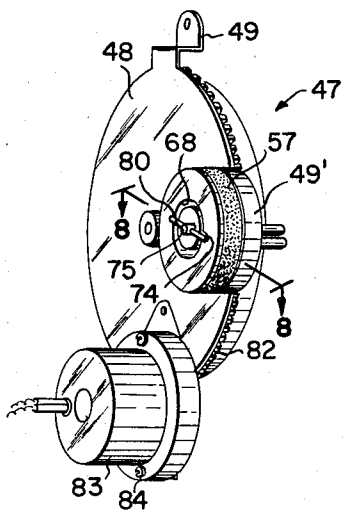


FIG-5

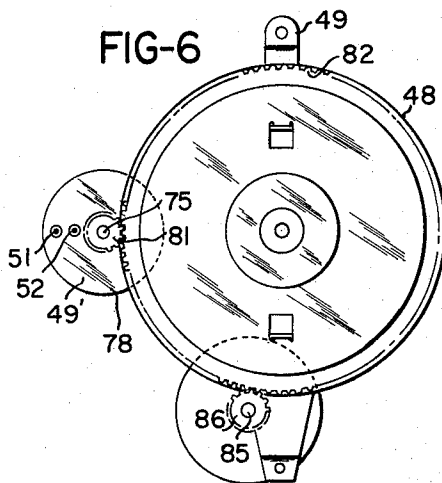


FIG-6

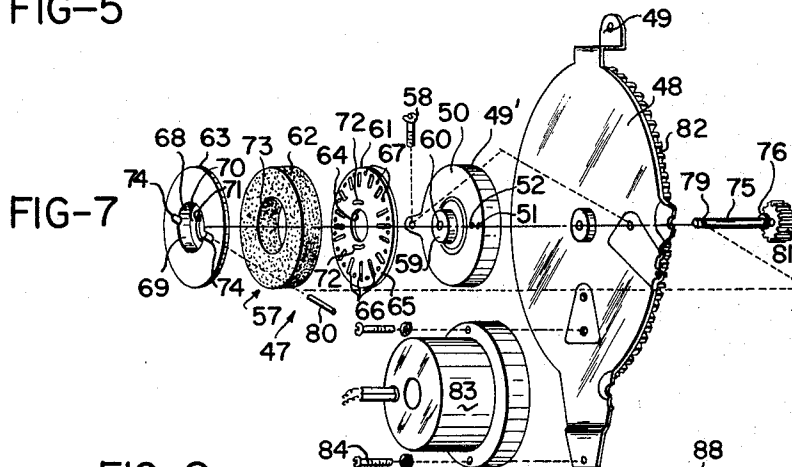


FIG-7

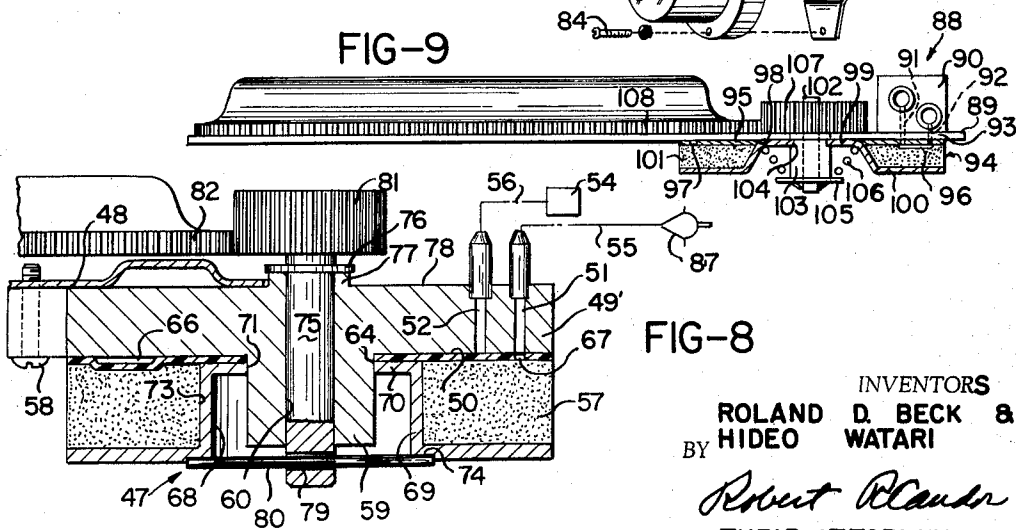


FIG-9

FIG-8

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ROTARY VALVING MECHANISM

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2 Claims. (Cl. 137-624.18)

This invention relates to improved valving mechanism and to improved driving means for such valving mechanism or the like.

It is well known from the co-pending patent application, S.N. 148,322, filed October 30, 1961, now Patent No. 3,177,898 issued April 13, 1965, and entitled Apparatus and Method of Sequential Control, that a valving mechanism can be provided for controlling the operation of a pneumatic operated device in any desired sequence.

In particular, such valving mechanism generally comprises a reading head having a reading surface interrupted by a plurality of passage means spaced from one another, one such passage means being interconnected to a source of vacuum and the other passage means being interconnected to a vacuum operated device or the like.

A reading means is disposed against the reading surface of the reading head and has one or more inverted channels provided therein, each channel being adapted to be aligned with the two passage means in the reading head and bridge the space therebetween to interconnect the vacuum source to the vacuum operated device when the reading means has been moved to the desired position relative to the reading head.

To terminate operation of the vacuum operated device, the reading means has an aperture passing there-through and being adapted to be aligned with the passage means leading to the vacuum operated device to permit air to return to the vacuum operated device and terminate the operation thereof.

According to the teachings of this invention, improved driving means are provided for moving the reading means relative to the reading head.

Therefore, it is an object of this invention to provide improved valve mechanism or the like having one or more of the novel features of this invention set forth above or hereinafter shown or described.

Other objects, uses and advantages of this invention are apparent from a reading of this description, which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIGURE 1 is a perspective view of one valve mechanism of this invention.

FIGURE 2 is an exploded perspective view of the valve mechanism illustrated in FIGURE 1.

FIGURE 3 is an enlarged perspective view of the other side of one of the parts of the valve mechanism illustrated in FIGURE 2.

FIGURE 4 is an enlarged, fragmentary, partial cross-sectional view of the valve mechanism illustrated in FIGURE 1 and is taken on line 4-4 thereof.

FIGURE 5 is a view similar to FIGURE 1, illustrating another valving mechanism of this invention.

FIGURE 6 is a rear view of the valving mechanism illustrated in FIGURE 5.

FIGURE 7 is an exploded perspective view of the valving mechanism illustrated in FIGURE 5.

FIGURE 8 is an enlarged, fragmentary, partial cross-sectional view of the valving mechanism illustrated in FIGURE 5 and is taken on line 8-8 thereof.

FIGURE 9 is a partial cross-sectional view of another valving mechanism of this invention.

While the various features of this invention are hereinafter described and illustrated as being particularly adaptable for operating vacuum operated devices, it is

to be understood that the various features of this invention can be utilized singly or in any combination thereof to operate other pneumatic devices as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

Referring now to FIGURES 1-4, an improved valving mechanism of this invention is generally indicated by the reference numeral 10 and comprises a frame means 11 adapted to be secured to any supporting structure 14 by a bracket portion 12 and a fastening means 13, a reading head 15 secured to the supporting structure 14 by a plurality of fastening means 16 and having a segmental reading surface 17 interrupted by a plurality of passage means 18 and 19 adapted to be respectively interconnected to a vacuum operated device 20 and a vacuum source 21 by conduit means 22 and 23, and a reading means 24 adapted to selectively interconnect the vacuum source 21 to the vacuum operated device 20 in a manner hereinafter described.

While the reading means 24 can be formed in any suitable manner, the embodiment thereof illustrated in the drawings comprises a relatively thick disc formed of plastic material or the like having the surface 25 thereof interrupted by a plurality of indentations or inverted channels 26 each being adapted to register with and bridge the spacing between the passage means 18 and 19 of the reading head 15 for a purpose hereinafter described. The side 25 of the reading means 24 is adapted to be disposed in sliding engagement with the segmental reading surface 17 of the reading head 15 as well as in sliding engagement with like and symmetrically disposed segmental surfaces 27 and 28 thereof.

A plurality of apertures 29 pass completely through the reading means 24 with each aperture 29 adapted to be aligned with the passage means 18 in the reading head for a purpose hereinafter described.

The reading means 24 has a substantially cylindrical tubular extension 30 projecting centrally outwardly from the other side 31 of the reading means 24, the extension 30 having a transversely disposed slot means 32 formed therein for a purpose hereinafter described.

A bore 33 passes completely through the reading means 24 and the tubular extension 30 thereof and is adapted to be coaxially aligned with a bore 34 passing completely and centrally through the reading head 15.

A timer motor 35, such as an electrical timer motor or the like, is secured to the frame means 11 and has a drive shaft 36 projecting outwardly therefrom and adapted to pass through a bore 37 in the support means 14 as well as through the bores 34 and 33 of the reading head 15 and reading means 24.

The rotatable drive shaft 36 has a transverse bore 38 passing therethrough to receive a drive pin 39, the drive pin 39 being received in the slot means 32 of the reading means 24 to spline the drive shaft 36 to the reading means 24, whereby the reading means 24 rotates relative to the reading surface 17 of the reading head 15 upon rotation of the drive shaft 36 by the timer motor 35. The drive pin 39 causes such rotational movement of the reading means 24 while permitting the reading means 24 to move axially relative to the drive shaft 36.

A retainer 40 is fixedly secured to the free end of the drive shaft 36 in any suitable manner whereby a helical compression spring 41 is adapted to be disposed about the tubular extension 30 of the reading means 24 and the drive shaft 36 and have one end 42 thereof engage the retainer 40 and the other end 43 thereof engage the reading means 24.

In this manner, the compression spring 41 continually urges the reading means 24 axially to the left on the

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drive shaft 36 in the manner illustrated in FIGURE 4 to place the side 25 of the reading means 24 in sealing relation with the reading surface 17 of the reading head 15.

If desired, the drive shaft 36 can have a pinion gear 44 fixedly secured thereon and disposed in meshing relation with a ring gear 45 or the like rotatably carried by the frame means 11, the ring gear 45 being adapted to control the operation of another valving mechanism, if desired.

In this manner, the timer motor 35 is not only adapted to control the operation of the valving mechanism 10 of this invention but also the valving mechanisms operatively interconnected to the ring gear 45.

The operation of the valving mechanism 10 of this invention will now be described.

Upon actuation of the timer motor 35, the drive shaft 36 is rotated in the proper direction to cause like rotation of the reading means 24 relative to the reading surface 17 of the reading head 15.

As the reading means 24 rotates, one of the channels 26 thereof comes into alignment with the passage means 18 and 19 in the reading head 15 in the manner illustrated in FIGURE 4, whereby that particular channel 26 bridges the spacing between the passage means 18 and 19 to interconnect the vacuum source 21 to the vacuum operated device 20 whereby the imposed vacuum causes a flexible diaphragm 46 of the vacuum operated device 20 to move to the right, as illustrated in the drawings, to operate suitable mechanism, such as a switch, lever and the like.

Further rotation of the reading means 24 relative to the reading head 15 causes an aperture 29 in the reading means 24 to be subsequently aligned with the passage means 18 in the reading head 15, whereby air is adapted to pass through the reading means 24 and into the passage means 18 to permit the diaphragm 46 of the vacuum operated device 20 to move back to the left under spring pressure or atmospheric conditions or both to terminate the operation of the vacuum operated device 20.

In this manner, it can be seen that by arranging a desired pattern of channels 26 and apertures 29 in the reading means 24, the reading means 24 can operate the vacuum operated device 20 in any sequence of operation thereof at desired time intervals as controlled by the timer motor 35.

Thus, it can be seen that this invention provides improved drive means for the valving mechanism 10 wherein the reading means 24 is adapted to be moved relative to the reading surface 17 of the reading head 15 while still permitting the surface 25 of the reading means 24 to be placed in sealing relation with the reading surface 17 of the reading head 15.

Another valving mechanism of this invention is generally indicated by the reference numeral 47 in FIGURES 5-8 and comprises a frame means 48 having a bracket portion 49 adapted to be secured to any suitable supporting structure, a reading head 49' having a reading surface 50 interrupted by a pair of passage means 51 and 52 respectively interconnected to a vacuum operated device 53 and a vacuum source 54 by conduit means 55 and 56, and a reading means 57.

As illustrated in FIGURE 7, the reading head 49' is adapted to be secured to the frame means 48 by fastening means 58 and has a cylindrical extension 59 projecting centrally from the reading surface 50 thereof, the reading head 49' having a bore 60 passing centrally therethrough.

The reading means 57 includes a substantially flexible sheet 61, a porous and compressible material 62 and a rigid backing member 63.

The flexible reading sheet 61 has a bore 64 passing centrally therethrough and adapted to receive the tubular extension 59 of the reading head 49', the side 65 of the reading sheet 61 having a plurality of indentations or

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channels 66 formed therein in any desired pattern in a manner similar to the channels 26 previously described. Also, the reading sheet 61 has a plurality of apertures 67 passing therethrough for the same purpose as the apertures 29 previously described.

The rigid backing member 63 has a cup-shaped central portion 68 formed therein and defined by a tubular wall 69 integrally interconnected to a transverse wall 70 having a bore 71 passing centrally therethrough and being adapted to receive the tubular extension 59 of the reading head 49' in the manner illustrated in FIGURE 8.

If desired, the end wall 70 of the backing member 63 can have a pair of pushed out tab means (not shown) which are adapted to register with slots 72 formed in the reading sheet 61 whereby rotational movement of the backing member 63 in a manner hereinafter described causes like rotational movement of the reading sheet 61 because the backing member 63 and reading sheet 61 are splined together.

The porous and compressible material 62 can comprise any suitable material, such as foam plastic or the like and has a bore 73 passing therethrough and adapted to receive the tubular extension 69 of the backing member 63 in the manner illustrated in FIGURE 8.

The backing member 63 is provided with slot means 74 for a purpose hereinafter described.

A drive shaft 75 is adapted to project through the bores 60, 64, 73 and 71 of the reading head 49', reading sheet 61, compressible material 62 and backing member 63 in the manner illustrated in FIGURE 8 and has a collar 76 adapted to abut a tubular extension 77 projecting centrally from the rear surface 78 of the reading head 49 in the manner illustrated in FIGURE 8.

The free end of the drive shaft 75 has a transverse bore 79 passing therethrough to receive a drive pin 80 adapted to be received in the slot means 74 of the backing member 63 to cause rotation of the backing member 63 upon rotation of the drive shaft 75.

The drive pin 80 and the drive shaft 75 are so constructed and arranged that the drive pin 80 causes the backing member 63 to have the end wall 70 thereof pressed into engagement with the reading sheet 61 in a manner illustrated in FIGURE 8, whereby the compressible material 62 is placed under compression between the backing member 63 and the reading sheet 61.

In this manner, the compressed material 62 forces the side 65 of the reading sheet 61 into sealing engagement with the reading surface 50 of the reading head 49'.

Thus, upon rotation of the drive shaft 75 in the desired direction, the drive pin 80 causes like rotational movement of the backing member 63, whereby the backing member 63 through the tab means (not shown) engaging in the slots 72 of the reading sheet 61 causes the reading sheet 61 to rotate in unison therewith relative to the reading surface 50 of the reading head 49'.

However, if such tab means and slot means 72 were not provided, the friction created between the material 62 and the reading sheet 61 would cause the reading sheet 61 to rotate in unison with the backing member 63, if desired.

While the drive shaft 75 can be rotated in any suitable manner, the embodiment illustrated in the drawings includes a pinion gear 81 carried on the drive shaft 75 and disposed in meshing relation with a ring gear of 82 rotatably mounted to the frame means 48 in any suitable manner.

A timer motor 83 is secured to the frame means 48 by fastening means 84 and has a drive shaft 85, FIGURE 6, carrying a pinion gear 86 disposed in meshing relation with the ring gear 82.

Thus, upon actuation of the timer motor 83, the timer motor 83 drives the ring gear 82, which, through the pinion gear 81 causes rotation of the drive shaft 75 to move the reading means 57 relative to the reading head 49'.

The operation of the valving mechanism 47 will now be described.

When the drive shaft 75 is rotated in the above manner, the reading means 57 is rotated relative to the reading surface 50 of the reading head 49' whereby a channel 66 of the reading seat 61 eventually comes into alignment with the passage means 51 and 52 of the reading head 49' to interconnect the vacuum source 54 to the vacuum operated device 53 to cause the diaphragm 87 thereof to move to the right to actuate any desired structure.

Upon further rotation of the reading means 57, an aperture 67 in the reading sheet 61 eventually comes into alignment with the passage means 51 to permit air to enter the passage means 51 and permit the diaphragm 87 of the vacuum operated device to move back to the left in the manner illustrated in FIGURE 8 to terminate the operation of the vacuum operated device 53.

However, since the porous and compressible material 62 of the reading means 57 is disposed against the reading sheet 61 in the manner illustrated in FIGURE 8, air must first pass through the porous material 62 before the same can enter the aperture 67 into the passage means 51 whereby the compressible material 62 acts as a filter for such air to prevent dust and the like from entering the passage means 51 of the reading head 49 and adversely affecting the operation of the vacuum operated device 53.

Therefore, it can be seen that the valving mechanism 47 of this invention is adapted to operate the vacuum operated device 53 in any kind of sequence thereof in the manner previously described.

Accordingly, it can be seen that another improved valving mechanism and drive means therefor is provided by the embodiment 47 of this invention.

Another valving mechanism of this invention is generally indicated by the reference numeral 88 in FIGURE 9 and comprises a frame means 89, a reading head 90 carried by the frame means 89 in any suitable manner and having a pair of passages 91 and 92 formed therein and interrupting the reading surface 93 thereof, the passages 91 and 92 being adapted to be respectively interconnected to a vacuum source and a vacuum operated device in the manner previously described, and a reading means 94.

The reading means 94 includes a flexible reading sheet 95 having a plurality of indentations or channels 96 formed therein and a plurality of apertures 97 passing therethrough for the purposes previously described, the reading sheet 95 having a bore 98 passing centrally therethrough and adapted to receive a cup-shaped portion 99 of a backing member 100 forming part of the reading means 94.

The backing member 100 is adapted to have the cup-shaped portion 99 thereof disposed against the frame means 89 and sandwich an annular porous and compressible material 101 between the backing member 100 and the reading sheet 95 for the purpose previously described.

A drive shaft 102 is rotatably carried by the frame means 89 and is adapted to be interconnected to the reading means 94 in any manner previously described or in any other suitable manner to permit the reading means 94 to be rotated relative to the reading head 90 for the purpose previously described.

For example, the drive shaft 102 can have a sleeve 103 or the like fixedly secured thereto and suitably splined in a bore 104 passing through the cup-shaped portion 99 of the backing member 100 whereby the backing member 100 is splined to the sleeve 103 to cause the backing member 100 to rotate in unison with rotational movement of the drive shaft 102 but permitting the backing member 100 to be axially movable relative thereto.

A retaining member 105 is carried on the free end of the drive shaft 102, whereby a compression spring 106 is adapted to be disposed between the retaining member 105 and the backing member 100 to urge the backing member 100 toward the frame means 89 in the manner illustrated in FIGURE 9.

Because the compressible material 101 is placed under compression between the backing member 100 and the reading sheet 95 by the compression spring 106, the compressed material 101 drives the reading sheet 95 in unison with rotational movement of the backing member 100 in the manner previously described.

The drive shaft 102 has a pinion gear 107 fixedly secured thereto and disposed in meshing relation with a ring gear 108 rotatably carried by the frame means 89, the ring gear 108 being driven in any suitable manner, such as by a timer motor (not shown), whereby rotational movement of the ring gear 108 causes rotation of the drive shaft 102 in the proper direction to permit the reading means 94 to rotate relative to the reading head 90 in the manner previously described for the purposes previously described.

Therefore, it can be seen that this invention provides improved valving mechanism as well as improved means for driving the valve mechanism or the like.

Therefore, it can be seen that this invention provides improved valving mechanism as well as improved means for driving the valve mechanism or the like.

While the form of the invention now preferred has been disclosed as required by the statutes, other forms may be used, all coming within the scope of the claims which follow.

What is claimed is:

1. In combination, a reading head having a reading surface interrupted by a plurality of passage means, a reading member having one opposed side thereof disposed against said reading surface and having a channel means adapted to interconnect two of said passage means together, a compressible material having one opposed side thereof disposed against the other side of said reading member, a backing member disposed against the other side of said compressible material and having slot means, a drive shaft passing through said reading head, said reading member, said compressible material and said backing member, and a pin carried by said drive shaft and disposed in said slot means to cause rotation of said reading member relative to said reading surface upon rotation of said drive shaft, said pin pressing said compressible material between said backing member and said reading member whereby said compressed compressible material urges said reading member into sealing engagement with said reading surface.

2. A combination as set forth in claim 1 wherein said reading member has an aperture passing therethrough to be aligned with one of said passage means and wherein said compressible material acts as a filter means for air entering said one passage means through said aperture.

References Cited by the Examiner

UNITED STATES PATENTS

1,427,256	8/1922	Blanchard	251—180
1,758,552	5/1930	Allen	137—625.11 X
2,302,061	11/1942	Schirm	137—625.11 X
2,352,120	6/1944	Rappl	251—180 X
2,530,622	11/1950	Maris	137—624.15
2,734,674	2/1956	Ray	137—625.21 X
2,780,833	2/1957	Braunlich	137—624.13 X
3,029,841	4/1962	Bitzer	137—625.21
3,074,431	1/1963	Schwartz	137—625.11

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