

964,639.

2 SHEETS—SHEET 1.



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964,639.

Patented July 19, 1910.

2 SHEETS—SHEET 2.

FIG. 4.

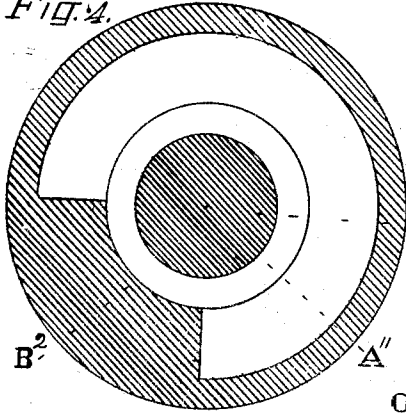


FIG. 2.

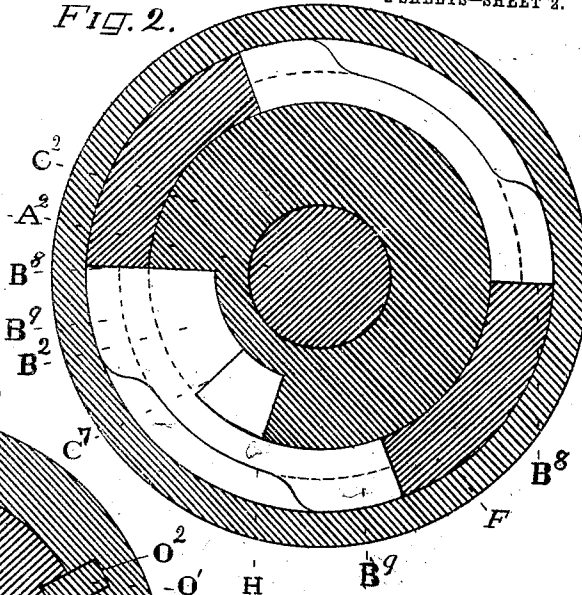


FIG. 5.

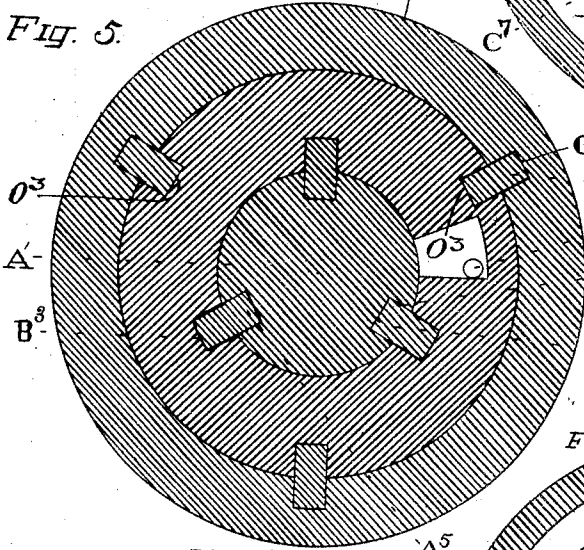


FIG. 3.

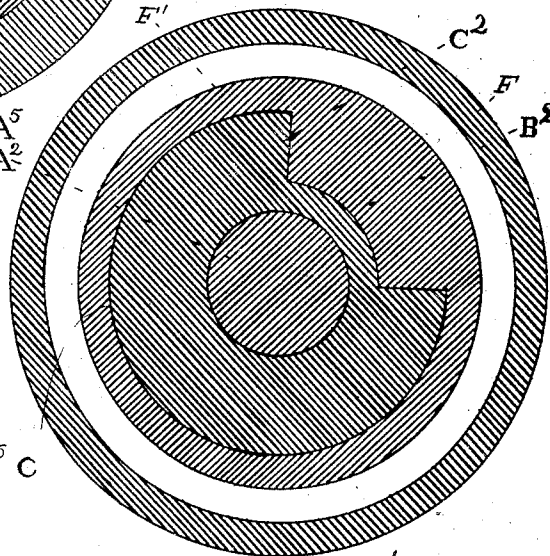
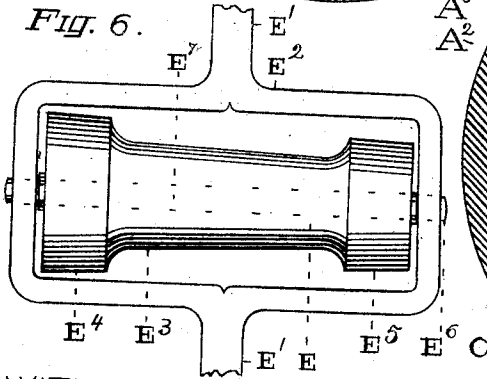


FIG. 6.



WITNESSES

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PNEUMATIC CLUTCH.

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To all whom it may concern:

Be it known that I, JAMES C. GARRETT, a citizen of the United States, and a resident of Jersey City, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Pneumatic Clutches, of which the following is a specification, accompanied by drawings.

My present invention relates to pneumatic impact cushioning clutches, and has for its object to improve that type of pneumatic cushioning clutches shown and described in my application for Letters Patent in the United States Patent Office, dated Oct. 28, 1902, Serial No. 129,113. In the construction described in the above entitled application imprisoned air was interposed between the impelling and the driven members upon which to cushion the impact resulting from their connection, but owing to the structural formation of the mechanism employed to imprison said air, only a part of one revolution of the impelling member, could be cushioned before direct and unyielding contact would take place between the said impelling and driven members, and to relieve the suddenness of this transmission of motion from inertia to full speed in so limited a movement of the impelling member, is one of the objects of my present invention.

Further objects are to remedy the inherent structural weakness in the pressure resisting parts of pneumatic clutches, to reduce the multiplicity of component parts to the least possible number, and to lower the cost of construction to the minimum.

In Figure 1 of the drawings, my invention is shown in its precushioning position, and is drawn to show one and a half revolutions of cushioning distance, but it is obvious that by reason of its structural formation, the members B and C, may be increased in length and diameter, and consequently the number of cushioning revolutions can be multiplied to conform to the requirements of the mechanism to which it is to be applied.

I attain these objects by the arrangement and formation of the mechanism illustrated in the accompanying drawings, in which,

Fig. 1 is a horizontal section of my entire device showing the spiral air inclosing channel, and the spiral air impinging rib in operative connection therewith, the driven member D and the differential speed resetting device and air passage. Fig. 2 is a vertical cross section on the line X-X Fig. 1 look-

ing from the left showing the position of the contacting members, the end of the wall B² of the air inclosing member, the dust shielding or protecting cover, and the power transmitting shaft. Fig. 3 is a vertical cross section on the line X¹ Fig. 1, looking from the left showing the diameter of the driving shaft, the inwardly projecting rib connected to the air imprisoning member, the sleeve and spiral rib connected to said sleeve. Fig. 4 is a vertical cross section on the line X² Fig. 1 looking from the left showing the enlarged and reduced diameters of the power transmitting shafts, the shoulder against which the sleeve is abutted and the inwardly projecting rib separating each circuit of the spiral channel in the air inclosing members. Fig. 5 is a vertical cross section on the line X³ Fig. 1, looking from the left, showing the enlarged diameter of the shaft, the splines inserted therein, the terminal of the air channel, the passage way for the escape and admission of said air and the surrounding band O. Fig. 6 is a differential speed appliance adapted to restore the co-

active air inclosing member B and the impinging member C to their precushioning position as shown in Fig. 1, after the driving and driven members have been disconnected.

For convenience in describing my invention I will call the member C the impelling or impinging member, the member B the air inclosing member and the loose pulley D the driven member.

Broadly my invention consists of a revolvable shaft having a diametrically enlarged portion with a cylindrical member having a spiral air inclosing channel rotatively engaged and movable axially thereon, and an axially fixed and rotatable member mounted on a less enlarged portion of said shaft and having a sleeve of equal diameter with said enlarged portion and a spiral rib projecting outwardly therefrom and in operative engagement with said spiral channel and stops to arrest their contraction, acting to cushion rotal resistance thereto, and rotate them with said shaft.

The shaft A Fig. 1 is shown to be constructed with a diametrically enlarged portion A' extending from the shoulder A² to the vertical cross section X² at which point there is a diametrical diminution extending to the extremity of the collar A³ which is sufficiently greater than the main diameter of the shaft A to provide means for secur-

ing the said collar A³ on the shaft without encroaching on its main portion. Longitudinally upon the enlarged portion A' of the shaft A, channels A⁴ are cut and splines A⁵ are fastened firmly therein, as shown in Figs. 1 and 5 with the collar A' operating as a fastening to maintain them in position, longitudinally, in the separating direction.

The member B shown to be mounted on the enlarged portion A' of the shaft is circular in cross sections as shown in Figs. 4 and 5 and is bored out longitudinally through the center of a diameter that will neatly fit and move axially on said enlarged portion A' of the shaft A, and from the concave surface of this bore, grooves B² Fig. 5 are cut outwardly and longitudinally therein of a size to register with and move freely in said splines A⁵ within fixed limits, in the longitudinal direction, on said shaft A. At the end of the enlarged portion A' of the shaft A, the diameter of said enlarged portion is decreased forming a shoulder A⁶, upon which a thread A⁷ is cut, and a collar A⁸ having a corresponding thread is screwed thereon, contacting with the shoulder A⁶ and the end of the member B, thus limiting the longitudinal movement of said member B, in the separating direction. Then from the concave surface of this bore, contacting with the enlarged portion A' of the shaft A, a spiral channel B' is cut outwardly through its entire length, of such dimensions in width and depth in cross sections as may be required to contain a sufficient volume of air, taken in connection with the spiral length of the said channel B', to overcome the inertia of the driven member D, on the compressibility and decreasing volume of said air, when it is connected to the cushioning and impelling mechanism, before direct and unyielding contact has taken place between the impelling and driven members. Between each circuit of the spiral channel B' a spiral wall B² is left during the process of cutting out the spiral channel. This wall is of sufficient structural strength to resist the pressure resulting from connecting the member D with the cushioning and impelling members B and C.

As before stated the spiral channel B' is cut out advancing longitudinally through the entire length of the member B and at a point terminating with the number of spiral cushioning revolutions for which the device is constructed, the end B'' of the filling B⁴ is located. This filling B⁴ is made to fit in the channel B' neatly and is rigidly secured therein with a smooth surface contacting with the enlarged portion A' of the shaft A thus forming an end to the spiral air inclosing channel B'.

In close proximity to the end B'' of the filling B⁴ an air passage B⁵ is bored longitudinally leading from the end of the air in-

closing channel B' to the end of the member B, as shown in Fig. 1. This air passage is intersected by a threaded hole B⁶ leading diametrically from the convex surface of the member B. Into this hole B⁶ a threaded bolt B⁷ is inserted and is provided with means by which it may be screwed in one direction and projected into the air passage B⁵ or reversed as the case may require, acting to regulate the ingress and egress of air to and from the air inclosing channel B' and to adjust its resistance to the impact transmitted from the member D when it is connected to the member C.

The opposite end of the member B is provided with an outwardly turned flange B⁸ which is interlocked with an inwardly turned flange F' connected to the cylindrical member F thus limiting the longitudinal movement of the members B and C in the separating direction. As shown in Fig. 2 portions of the periphery of this outwardly turned flange B⁸ are cut away, the reason for which will be hereinafter explained. The intact portions of said periphery are adapted to contact, revolve and move longitudinally within the concave surface of said cylindrical member F.

On the vertical end of the member B contacting members B⁸ are connected thereto, one only of which is shown, the diametrically opposite member being connected to the removed portion of the member B. As shown in Fig. 2, the faces of these contacting members B⁸ are on a line with the diameter of the said member B, and from the projected end of said contacting members B⁸ their outlines recede to the face of the outwardly turned flange B⁸, at an angle in line with the pitch of the rib C² as shown on cross section line X.

The member C is composed of the disk C³ the sleeve C', the rib C², the contacting member C⁴ and the clutch members C⁵ and is constructed out of one piece. The sleeve C' is bored out longitudinally through its center at a diameter adapted to fit and rotate on the decreased diameter of the shaft A as shown by dotted lines A² in Fig. 1 and by cross section Figs. 2, 3 and 4. Grooves C⁶ are cut spirally and inwardly from the convex surface of the member C, of a dimension to fit and register with the spiral wall B² connected to the member B and of even depth with the convex surface of the enlarged portion A' of the shaft A, and in such dimensions that the rib C² thus formed will fill all the space in the channel B² and move freely therein. The end of the sleeve C' is buttressed against the shoulder A'' Fig. 4, formed by the reduction A² Fig. 1 of the enlarged portion A' of the shaft A, on the line X², acting to maintain the member C, in a fixed position axially during the cushioning movement of the members B and C when the member D is connected to the member C.

The terminal of the rib C^2 , connected to the disk C^3 , is encroached upon the side of said disk C^3 in line with the pitch of the said rib, thus forming two flat contacting surfaces C^4 , in diametrically opposite positions on the side of said disk C^3 , one of which is in plane view and the other of which is indicated by dotted lines as shown in Fig. 1. These two contacting surfaces operate to contact simultaneously with the opposing contacting surfaces B^3 connected to the member B, when the member D is connected to the member C.

A portion of the wedge point of the wall B^2 connected to the member B is cut away at the point where the rib C^2 enters the channel B' as shown in Fig. 2 to prevent wedging of the angle part of the wall B^2 between the side of the disk D and the converging pitch of the rib C^2 as shown in Fig. 1. Connected to the vertical side of the disk C^3 clutch members C^5 are provided for the purpose of connecting with the driven member D opposite to them. Secured to the shaft A and contacting with the side of the disk C^3 a collar A^3 is provided acting to maintain the end of the sleeve C' in permanent contact with the shoulder A'' , formed by the decreased diameter of the enlarged portion A' of the shaft A as shown in Fig. 1.

The pulley D represents the driven member and is provided with clutch members D' and is adapted to be moved axially into operative connection with the opposing clutch member C^5 on the disk C^3 of the member C. In the drawings means to move the member D into and out of connection with the member C is omitted, as it is obvious that any of the well known means used for that purpose may be applied. Having hereinbefore referred to the functions of the inwardly and outwardly turned flanges B^3 and F' connected to the members B and C, it will be observed by referring to Fig. 1 that in the above described operation the member F' is firmly secured to the periphery of the disk C^3 and its inwardly turned flange F' contacts with the entire circumference of the member B. As shown in Fig. 1, the contracting movement of the members B and C would be obstructed by the air inclosed between the side of the disk C^3 and the flange B' connected to the member B. To obviate contingency portions of the edge of the inwardly turned flange B^3 contacting with the concave surface of the member F' , is cut away at H as shown in Fig. 2, permitting the air to flow freely from one side of the flange to the other.

The cylindrical inclosure F surrounding and inclosing the spiral rib C^2 and contacting members C^4 and B^3 , is mounted on the periphery of the disk C^3 and firmly secured thereon by the tap bolts F^2 , its opposite end being turned inwardly at right angles with its edge F' Fig. 1 contacting with the con-

vex surface of the member B, and adapted to move freely thereon. This cylindrical inclosure is installed for the purpose of protecting the mechanism inclosed therein from injury by violent contact, excluding dust and grit, insuring clean lubrication and to limit the movement of the members B and C in the separating direction to the position shown in Fig. 1.

Now assume the shaft A to be revolving in the direction indicated by the arrow in Fig. 1 and the members B and C revolving with shaft A. When the driven member D is moved into connection with the member C their respective clutch members D' and C^5 will contact and the inertia of the driven member D, will temporarily hold the member C from rotation, and as the member B is not revoluble on the shaft A, it will be automatically moved axially in the splines A^5 into cushioning resistance to the retarding force of inertia of the driven member D. This retarding force will be impinged upon the air inclosed in the channel and will be cushioned on its compressibility and decreasing volume, until the resistance of said retarding force is neutralized and nearly uniform motion is transmitted to the driven member D, when owing to the continued escape of the air through the air passage B^3 the member B will continue to move until the contacting member B^3 , connected to the member B, and the contacting members C^4 connected to the member C contact and rotate the members D, and C, in unison with the shaft A.

As shown in Fig. 1 the cooperating members B and C, are always in operative connection, and to return them to their set or precushioning position, after the driven member D has been disconnected from the member C the differential speed appliance shown in Fig. 6 is provided, both ends of which are broken away as shown at E' and in operative connection with the members B and C in Fig. 1, and consists of a lever having one end pivoted to a suitable support, preferably above the clutch mechanism, and its lower end extending downward to a position convenient for use by the operator. And at a location in the radius of said lever, extending from the point of pivot, that will intersect the periphery of said members B and C, an elongated frame E^2 is constructed, and the roller E having a reduced diameter E^3 leaving two contacting disks E^4 and E^5 respectively, the greater E^4 of which contacts with the member C, and the one of least diameter E^5 contacting with the member B. A hole E^7 indicated by dotted lines in Fig. 6 is bored longitudinally through the center of the roller E, and through the ends of the frame E^2 and a bolt E^6 is inserted therethrough and secured therein as shown in Fig. 1.

As before stated the member B, moves longitudinally in splines, within fixed limits, on the shaft A and is prevented by said splines to move in the rotating direction. The member C is fixed longitudinally but rotates freely within fixed limits on said shaft A. The driven member D being a loose pulley, is adapted to be connected and disconnected to and from the member C. When the driven member D has been disconnected from the member C the members C and B must be restored to their precushioning position as shown in Fig. 1, to be prepared for the next connection, and to do this, greater speed must be transmitted to the member C than to the member B, and the diameter of that portion of the roller E which is applied to the member C being greater than that applied to the member B a greater velocity will be transmitted to the member C than to the member B, and when the roller E is forced into frictional contact with the members B and C, the spiral rib C² by reason of the contact of the side of the rib C² against the wall B² will move the member B axially back into its set or precushioning position as shown in Fig. 1.

On the periphery of the member B, a band O is mounted and secured thereon by splines O' set in grooves O² cut outwardly from the concave surface of the said band O, and in grooves O³ cut inwardly from the convex surface of the member B. This band O serves the purpose of equalizing the circumference of the members B and C, to the end that the disks E⁴ and E⁵ may transmit greater velocity to the revoluble member C, than longitudinally moving member B.

Should it be deemed necessary to change the location of the contacting members C⁴ and B³ connected to the members B and C or to reinforce them, substitutes may be constructed on the adjacent end of the cylindrical member B, and the band O, and their operation would be similar to the means herein shown in the drawings.

I claim and desire to obtain by Letters Patent the following:—

1. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, means for so moving said members as to contract the length of the air channel, and thus cause the air to be compressed, a driven member, and means for rotating the driven member.

2. A pneumatic clutch comprising a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, said shaft having a diametrically enlarged portion coöperat-

ing with said air inclosure to imprison air therein.

3. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, said shaft having a diametrically enlarged portion with splines connected longitudinally thereto acting to prevent rotary and permit longitudinal movement of said axially movable member.

4. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, a driven member, said axially movable member mounted on said shaft having grooves cut longitudinally therein registering with splines connected to said shaft acting with the rotatable member to transmit motion to said driven member.

5. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, said axially movable member mounted on an enlarged portion of said shaft and having a spiral channel cut outwardly from its bearing thereon acting to circumscribe air therein.

6. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming a continuous spiral compressor and an air inclosing channel, and a filling inserted in said channel forming an end thereto and located at a point terminating the cushioning distance of said members and acting to circumscribe said air.

7. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosing channel, said channel having a continuous spiral wall projecting inwardly dividing each circuit and with said shaft acting to segregate said air in a continuous spiral direction and resist its pressure.

8. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosing channel, said channel having an orifice leading out therefrom for the egress and ingress of air and an adjustable bolt intersecting said orifice to control the volume of air pressing therethrough.

9. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, said shaft having an enlarged portion, said axially movable member mounted thereon, a rotatable member, a less enlarged portion on said shaft acting as a bearing therefor, and a collar against which said member is braced longitudinally.

10. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosing channel, said rotatable member having a sleeve abutting against a shoulder on said shaft, an enlarged portion on said shaft, said sleeve being of equal peripheral circumference with said enlarged portion, upon which said axially movable member is mounted and acting as a bearing therefor in its movements.

11. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming a continuous spiral compressor and air inclosing channel, said rotatable member having a sleeve with a continuous spiral groove cut therein of even pitch and dimensions to register with and move conjointly with a spiral wall connected to said axially movable member.

12. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, said members having contacting abutments located in the path of their movement acting to arrest their independent motion, and splines operatively connecting said axially movable member to said shaft.

13. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, having an adjustable passage for the escape of air, which air acts to cushion the resistance impinged on its compressibility and decreasing volume.

14. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, one of said members having a continuous spiral rib and another a continuous spiral channel.

15. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, and means connected to said shaft to prevent rotary and permit longitudinal movement of one member and means to permit rotary and prevent longitudinal movement of another member, said first means acting when contraction is arrested to revolve said operatively connected members in unison with said shaft.

16. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members mounted thereon, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, one of said members having a disk with a cylindrical shield mounted thereon and inclosing an outwardly turned flange connected to another of said members acting to shield their movable parts and limit their expansion.

17. A pneumatic clutch composed of a revoluble shaft, operatively connected rotatable members of equal peripheral circumferences mounted on said revoluble shaft, one being axially movable, said members jointly forming with said shaft a continuous spiral compressor and air inclosure, a lever and a roller mounted in said lever and having disks of unequal circumferences one near each end operating when applied to the periphery of said operatively connected members to transmit greater velocity to said rotatable member than to the axially movable member acting to move said axially movable member into its expanded position.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAMES C. GARRETT.

Witnesses.

E. P. LA GAY,
E. VAN ZANDT.