April 7, 1964 J. RABINOW 3,127,972

CODE WHEEL

Filed July 17, 1961

Fig. 1

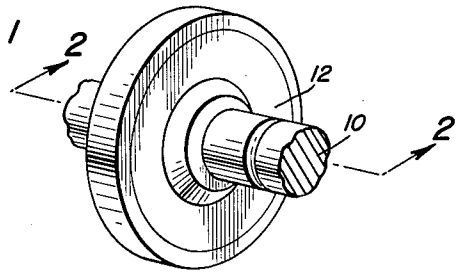


Fig. 4

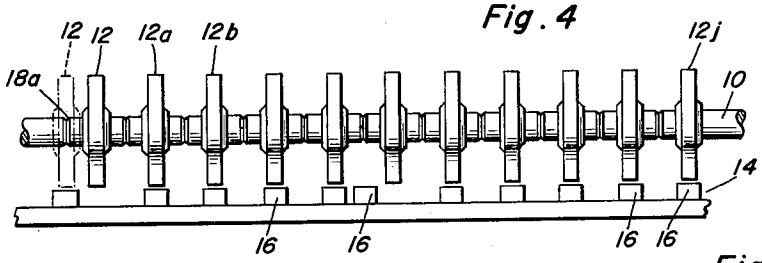


Fig. 2

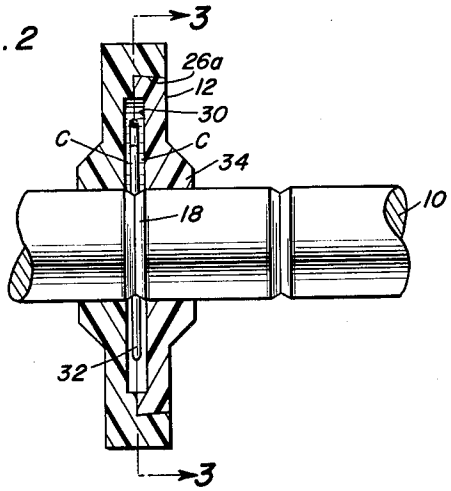


Fig. 3

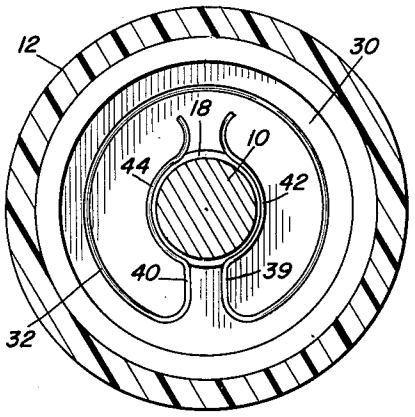
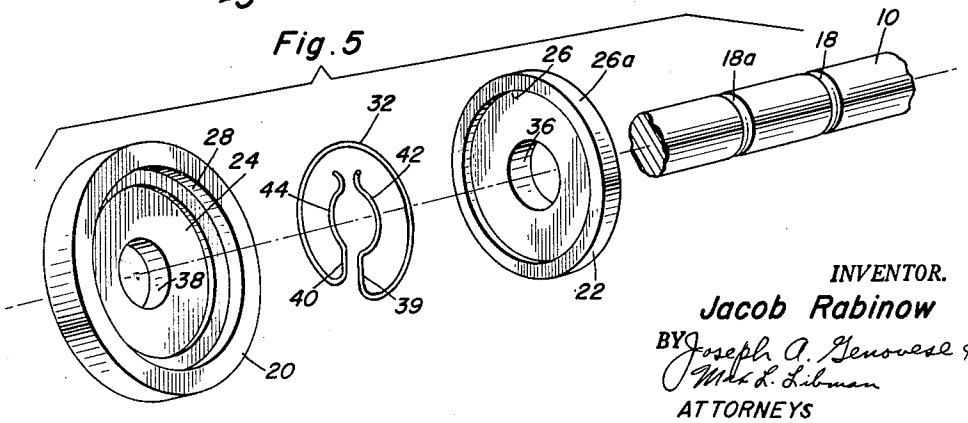


Fig. 5



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CODE WHEEL

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This invention relates to code devices and particularly to improvements in mechanical code devices such as disclosed in the Rabinow et al. U.S. Patent No. 2,901,089.

The above patent discloses a sorting machine which has a mechanical code device composed of a stationary code assembly and movable code assemblies which interrogate the stationary code by moving thereover. The movable code assemblies each consist of a shaft which supports a plurality of wheels. The wheels are adjustable axially on the shaft, with each wheel capable of being moved to one of two possible positions on the shaft. The stationary code assembly is made of groups of bars, with the bars of each group laterally spaced to provide slot or no-slot conditions in predetermined positions. Thus, when a shaft supporting a plurality of code wheels constituting a set is moved along the stationary code assembly, the wheel-supporting shaft drops a short distance when all of the wheels, as positioned on the shaft, match slots as defined by the spacing (or presence or absence) of code bars. If even a single wheel of the set fails to match a slot, that wheel will hold the entire shaft elevated, i.e prevent it from dropping down the slight distance. The downward movement of the shaft is used as a mechanical output to perform a function, for instance, operate a switch, release a toggle, operate a latch, etc.

Accordingly, the code wheels in such a mechanical code device, are required to perform several functions. They must rotate on their shaft to keep friction low and prevent premature wear of the wheels themselves and the surfaces on which the wheels roll. The wheels must also be comparatively easily adjustable to one of two possible positions axially on their supporting shaft. Yet, since a sorting machine having a reasonably large number of sorts, requires a very large number of wheels, the cost of the individual wheels must be small. Accordingly, an object of my invention is to provide an improved code wheel which is inherently more inexpensive than the code wheels disclosed in the Rabinow et al. patent.

Another object of the invention is to provide the code wheel which is very freely rotatable on its supporting shaft.

A further object of the invention is to provide a code wheel with resilient means to releasably retain the wheel in a selected axial position on its shaft, the means being so constructed that the wheel is comparatively easily moved between its two possible positions but offers little or no resistance to wheel-rotation.

Other objects and features of importance will become apparent in following the description of the illustrated form of the invention.

FIGURE 1 is a perspective view of a code wheel mounted on a typical code wheel supporting shaft.

FIGURE 2 is an enlarged sectional view taken on line 2—2 of FIGURE 1.

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 2.

FIGURE 4 is a typical shaft supporting a group of code wheels constituting a single movable code device, this view also diagrammatically showing a part of the stationary code device which the code wheels interrogate in their path of travel.

FIGURE 5 is an exploded perspective view of the wheel and shaft shown in FIGURE 1.

The Rabinow-Kamm Patent No. 2,901,089 fully describes the operation of a mechanical code device consisting of a movable code assembly and a stationary code assembly, where the movable code assembly has a plurality of shafts, each provided with a group of code wheels. FIGURE 4, herein, shows a shaft **10** provided with code wheels **12**, **12***a*, **12***b*–**12***j* mounted for rotation on the shaft **10**. Each code wheel is adjustable to one of two possible positions, as shown in dotted lines for wheel **12**. The stationary code device **14** is made of a number of parallel bars **16**. The positions of the bars **16** and/or the positions of the wheels on shaft **10** may be shifted laterally to have a large number of possible codes, depending on the number of wheels and code bars involved. When the codes match, i.e. when wheels **12**–**12***j* inclusive interrogate a code device **14** and find no bars **16** beneath the wheels, shaft **10** drops slightly (by gravity or otherwise), and the vertical movement of the shaft **10** is used as an output to perform a function.

My improved wheels, as exemplified by wheel **12** shown in FIGURES 1, 2, and 3 and 5, overcome certain difficulties which have been encountered in the wheels disclosed in the Rabinow-Kamm patent. The principal difficulty is that of initial costs, it being estimated that my wheel **12** may be manufactured at approximately 1/10 the cost of the wheels disclosed in the Rabinow-Kamm patent. Another difficulty is that although the Rabinow-Kamm wheels are in general, satisfactory, once in a while the wheels do not rotate sufficiently freely on the shaft, causing the wheels and the code bars **16** to wear prematurely.

My wheel **12** is made of two sections **20** and **22**, having a recess **24** and **26** respectively, at the center thereof. The recess **24** of section **20** defines an undercut cup, and section **20** is relieved as at **28** to provide a pocket within which section **22** fits when the sections are assembled. When the wheel sections are assembled, the recesses **24** and **26** confront each other to define a cavity **30** (FIGURE 2) for a spring-retainer **32**.

As in the Rabinow-Kamm wheels, the central portion of the wheel is thickened to provide a hub **34** (FIGURE 2) which forms a large axial bearing surface to prevent the wheels from becoming cocked when they are adjusted axially on their supporting shaft **10**. Sections **22** and **20** have central apertures **36** and **38** in the hub portions thereof so that when the sections are nested, the apertures align with each other to form the central bearing of the wheel. It is preferred that the wheel be made of a durable plastic material, for instance nylon, and the sections may be frictionally held assembled and/or cemented together when they are nested. The rim **26***a* of section **22** may be slightly sloped and the mating surface of section **20** slightly undercut to match, so that when the sections are snapped together, they interlock.

Spring retainer **32** is preferably made of a single piece, convoluted metal wire having a large loop (FIGURE 3) of almost 360°, and a pair of spaced sides **39** and **40** provided with arcuate sections **42** and **44** intermediate their ends. The extremities of sides **39** and **40** are preferably directed outwardly as shown. The elasticity of the spring retainer is such that the arcuate portions **42** and **44** fit in grooves **18** or **18***a* (FIGURES 2 and 4) depending upon the position of the wheel on shaft **10**. The thickness of the wire from which the retainer is made is such that there is clearance C (FIGURE 2) on both sides of the retainer between the walls of cavity **30**. The diameter of the retainer is smaller than the diameter of cavity **30**. Thus, wheel **12** is free to rotate with respect to the retainer **32**, but has only a small amount of axial play on shaft **10**.

When it is necessary to adjust a typical wheel **10**, for

instance the wheel shown in FIGURE 2, axially on its shaft, the wheel is pushed (or pulled) on the shaft, causing sides 39 and 40 of the retainer to spring outwardly slightly due to the inclination of the side walls of groove 18. Further force in a direction tending to move the wheel axially on the shaft, will slide the wheel thereon until the sides 39 and 40 of the retainer snap into the next groove 18*a*. Thus, the wheel will then be free to rotate as described above. During the rotation of the wheel 12, the only frictional resistance to turning is that between the shaft and the bearing surface of the central opening of the wheel, and from time to time, friction that may be generated by the inner side surface of the cavity contacting a face of the spring retainer. This friction is considerably less than that generated by other code wheels of which I am aware. By keeping the friction low, resistance to turning is less with the accompanying advantage of keeping wear at a low level.

It is understood that various changes, modifications and alterations may be made herein without departing from the protection of the following claims.

I claim:

1. In a code device which includes a shaft provided with circumferential grooves spaced along the length of said shaft, code wheels mounted on said shaft, at least one of said wheels having a central aperture forming a bearing through which said shaft extends, and means defining a cavity within said wheel, a flat spring member being loosely captive within said cavity and having a loop, sides at the ends of said loop which extend across the edges of said aperture to engage one of said grooves thereby coupling said spring member to the shaft until said wheel is moved axially of said shaft in response to which said spring member loop flexes and said sides climb out of said groove and flex radially outwardly toward the inner reaches of said cavity thereby disengaging from said groove and permitting said wheel to be adjusted to an adjacent groove position on said shaft, said flat spring member having clearance between its outer surfaces and the surfaces of said cavity when said member is engaged with one of said grooves so that the wheel rotates free from said spring member.

2. A code wheel adapted to be supported on a code shaft which has a plurality of grooves spaced longitudinally along said shaft, said code wheel comprising a first section having a central aperture and a recess, a second section having a central aperture and a recess, said apertures becoming aligned when said sections are superimposed and said recesses confronting each other to form a cavity that opens into said aperture, means retaining said wheel sections superimposed, a substantially flat spring member loosely captive within said cavity and having sides which extend along the edges of said apertures to engage one of said grooves and retain the wheel in one position on said shaft, said spring sides being flexible toward the periphery of said cavity in response to axial movement to said wheel on said shaft toward the adjacent groove tending to slide said sides out of said groove for thereby decoupling said spring member from the groove which it occupies, said substantially flat spring member having faces which are normally spaced from the confronting surfaces of said cavity to provide clearances therebetween so that the wheel is freely rotatable with respect to said spring member with said spring member offering no resistance to turning except when said cavity surfaces touch the faces of said spring member.

3. In a code device having a shaft provided with spaced grooves, code wheels on said shaft and adapted to ride on said surfaces, each wheel being adjustable axially on said shaft and including a central bearing, each wheel having a central cavity opening into said bearing, a single flat spring retainer loosely captive in said cavity with clearance space between each cavity surface and retainer surface, said retainer having portions which resiliently grip on one of said grooves, the clearance space between said cavity surfaces and said spring retainer in said cavity allowing the wheel to axially float on its shaft and to turn freely on said shaft, and the resilience of said portions allowing said portions to flex out of said groove in response to a sufficient side force applied to said wheel to adjust it to the adjacent groove-position on said shaft.

4. A code wheel for a support which has axially spaced grooves and wherein the wheel is adapted to rotate about an axis established by said support and to be axially adjusted to select groove-positions, said wheel having a body composed of two joined sections, each section provided with a central aperture forming a bearing through which the support extends to thereby mount the wheel for rotation, each section also having a recess to provide a cavity concentric with said bearing when said sections are joined, a spring retainer loosely confined in said cavity with clearance space between the surfaces of said cavity and retainer, said retainer having means to engage one of said grooves thereby axially fixing the position of the retainer on said support, the wheel freely axially floating on said support through a distance corresponding to said clearance space between the confronting surfaces of the cavity and retainer perpendicular to the axis of rotation of the wheel so that as the wheel rotates it is free to axially float on said support.

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