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Brockhaus

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[54] **COMBINED DOOR STOPPER AND HINGE ASSEMBLY**

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[51] **Int. Cl.²** **E05D 11/10**

[58] **Field of Search** 16/145, 146, 180, 181, 16/182, 192, 147, 82, 85

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[57] **ABSTRACT**

A combined assembly operating as both a hinge and a door stop is provided with a pair of hinge leaves having a torsion spring interposed therebetween. The hinge leaves rotate relative to each other and the torsion spring is mounted in one of the hinge leaves and has thereon a roller which engages a stop mechanism supported by the other hinge leaf. The mounting of the torsion spring upon its associated hinge leaf is effected by an elongated groove formed in the body of the hinge leaf within which a portion of the torsion spring is fitted. Protuberances extending from the body of the hinge leaf extend transversely of the groove and operate to fixedly hold the torsion spring in place. The stop member is generally in the form of a cam which is engaged by the roller operating as a cam follower. Each of the leaves of the assembly may be formed of molded or cast pieces with one of the leaves preferably being cut from elongated bar stock.

7 Claims, 5 Drawing Figures

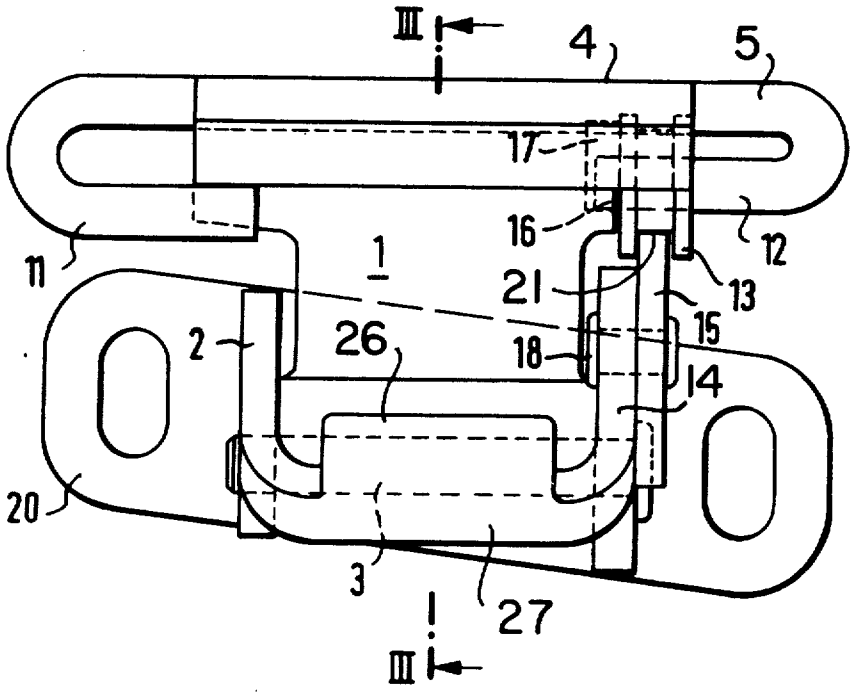


Fig.1

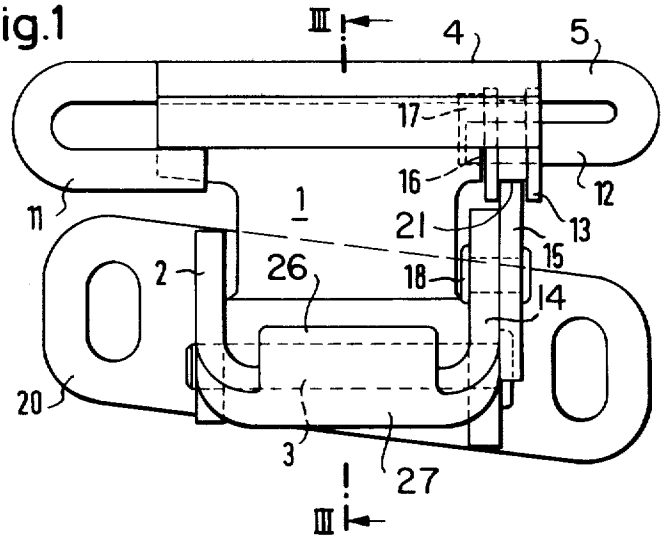

III
4
5
17
16
12
11
1
21
13
15
2
26
18
14
20
3
27
III

Fig.2

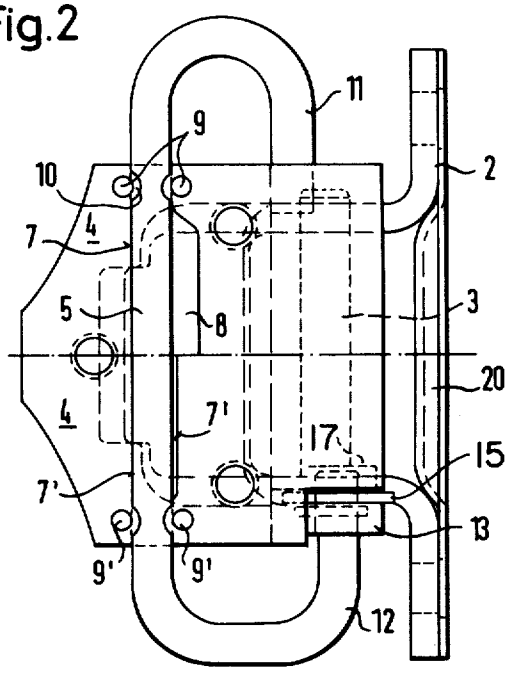

11
9
10
2
7
4
5
8
3
20
4
7'
17
15
7'
13
9'
9'
12

Fig.3

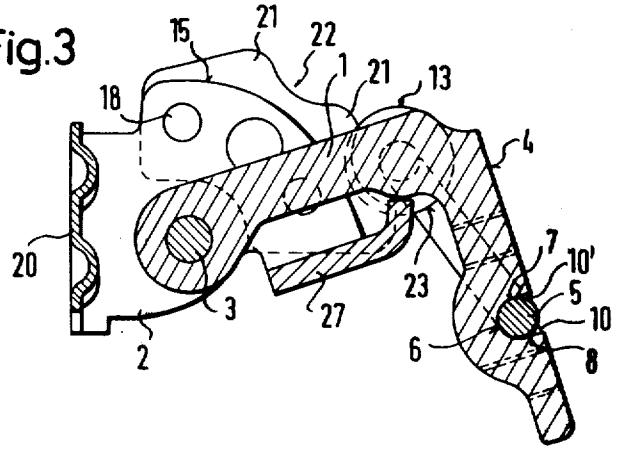


Fig.4

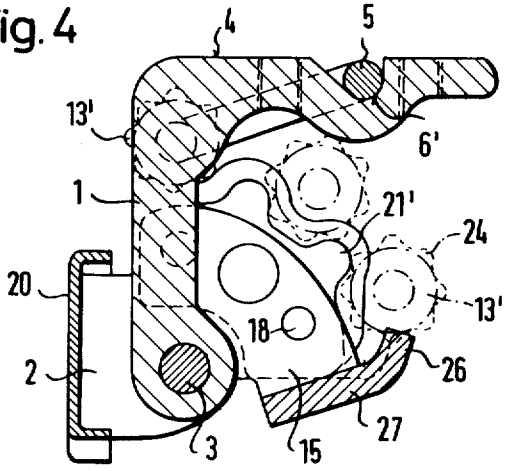
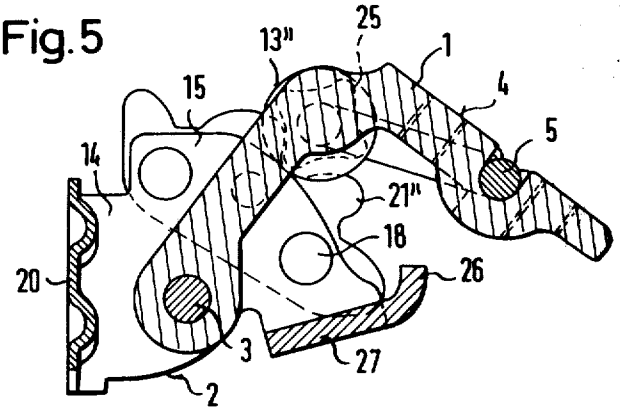


Fig.5



COMBINED DOOR STOPPER AND HINGE ASSEMBLY

BACKGROUND OF THE INVENTION

The present invention relates generally to door mounting structures and more particularly to a combined assembly operating both as a door hinge and stopper. More particularly the present invention relates to a construction wherein a combined hinge and stopper may be formed with a pair of hinge leaves having a torsion bar spring operatively interposed therebetween. The spring is formed as a generally rod-like member which is bent to have its ends configured as a pair of spring arms. The torsion spring is fixedly mounted upon one of the hinge leaves and a roller which operates as a cam follower is mounted upon one of its spring ends. The other hinge leaf includes a stop member generally formed with a cam surface which is engageable by the roller to perform the stopping function of the assembly. The torsion bar spring is so mounted and arranged in a front slotted recess of one of the hinge leaves that the two leaves may be turned freely relative to each other about a hinge pin through a certain opening angle before the roller engages the first of the stop cam surfaces. The force of the torsion bar spring resists further relative rotation of the hinge leaves in both directions thereby requiring additional force to be applied lifting the roller from engagement with a portion of the cam stop surface against the load of the torsion bar spring when the hinges are to be rotated further.

Door stoppers of the aforementioned type structurely combined with a hinge member have been heretofore known as, for example, disclosed in German Pat. Nos. **1,584,039** and **2,041,017.** In such known assemblies, a torsion bar spring is held in a block of one of the hinge leaves extending transversely to the hinge axle within bores or similar recesses. However, in such known assemblies the construction thereof is limited in application to hinges comprising at least one hinge leaf formed as a drawn metal part and having a U-shaped cross-sectional profile. For many applications the use of a hinge leaf designed as a drawn metal part introduces an undesirable increase in the cost of the hinge. Furthermore, the stop member associated with the stop arm of the torsion spring mounted on one of the hinge leaves in the type of door stopper above described is formed by a corresponding block of the hinge leaf extending transversely to the hinge axle. In practice, this requires that the hinge leaf be designed as a drawn metal plate. Apart from the fact that hinge leaves designed as pressed metal parts are not always desirable for the reasons mentioned above, they have the additional disadvantage that the stops consist of drawn metallic material which is relatively easily deformable and which is subject to considerable wear when in use. Thus, tolerance increases gradually appear in the hinge thereby leading in operation to the occurrence of a relatively loud cracking noise in the door stopper.

In view of the state of the art herein before discussed, the present invention is directed to the problem of providing a door stopper of the above mentioned type which is structurally combined with a hinge member and which permits, on the one hand, the use of conventional hinge profiles for the production of the hinge leaves and, on the other hand, provision of hard bearing surfaces in the range of the stop members formed on the other hinge leaf cooperating with the stop arm of the torsion spring irregardless of the material which is used for the production of the hinge leaf. The invention is further aimed at a design of the stop arm of the torsion spring and of the stops on the hinge leaf member cooperating therewith which will eliminate the cracking noises which occur even after prolonged use of the hinge, thereby giving rise to more desirable operating features of the assembly.

SUMMARY OF THE INVENTION

In accordance with the present invention, both of the hinge leaves of the assembly are formed in a known manner from molded pieces, with the hinge leaf having the torsion bar spring mounted thereon being cut to length from elongated stock having a desired rolled hinge section and being provided with a groove extending parallel to the hinge axis to receive the torsion spring therein. The shaft of the torsion bar spring may be locked within the groove by means of forged protuberances which extend from at least one of the edges of the groove in a direction transversely of the groove axis.

Since one of the hinge leaves may be cut from elongated rolled stock having the cross-sectional configuration of the hinge leaf, the groove which receives the torsion bar spring may be arranged in the stop side of the hinge section with one of its sides arranged at an angle of about **43°** relative to the surface of the leaf with the other wall of the groove extending substantially perpendicularly to the stop face of the hinge leaf. The locking of the shaft of the torsion bar spring in the groove is effected in accordance with a special feature of the invention by stamped protuberances provided in the hinge leaf wall adjoining the groove and inclined toward the stop face of the hinge leaf in such a way that a nose-type projection partly overlapping the shaft of the torsion bar spring is formed. These projections overlapping the torsion spring are produced in accordance with the present invention in the range of two opposite edge zones of the hinge leaf so that, in this manner, the hinge leaf is reshaped while in the cold condition. This approach to mounting of the torsion bar spring in the hinge leaf which is produced by being cut from rolled elongated stock, gives rise to a further advantage, in addition to permitting use of hinge sections formed from rolled stock, inasmuch as the fastening of the torsion bar spring may be effected in a simple manner with minimum cost and without requiring additional parts. Since the torsion bar spring is inserted into the stop face of the hinge leaf, the fastening points are required merely to prevent the torsion bar spring from moving in a longitudinal direction with this effect being positively achieved even without great care being exerted with regard to manufacturing tolerances.

By a further feature of the present invention one of the hinge leaves is designed with a single eye or bearing hole through which the hinge can extend and the torsion bar spring is mounted or associated with this single-eye hinge leaf while the other hinge leaf is designed as a double-eye member made of cast iron, particularly a malleable cast iron member. In order to provide stops exhibiting sufficient wear resistance for the stop arm of the torsion bar spring, the assembly of the invention is arranged, in accordance with an additional feature thereof, so that the stops are configured in the form of a cam disk made from steel plate and attached on a

block of the hinge leaf extending transversely to the hinge axis. The cam disk is preferably connected to the hinge leaf block by riveting and comprises at least one, but preferably several, cam nodules defining cam recesses therebetween.

In accordance with an additional feature of the invention, the roller which is arranged on the stop arm of the torsion bar spring and which cooperates with the cam disk arranged on the other hinge leaf is provided with a collar which engages the underside of the cam disk. The roller collar engaging the underside of the cam disk prevents the roller from moving in an axial direction along the arm of the torsion bar spring during operation of the door stopper, thus preventing disengagement of the cam disk therefrom.

According to another feature of the invention, the roller which is arranged on the stop arm of the torsion bar spring comprises circumferential gear-like teeth and is adapted to the shape of the cam surfaces on the cam disk such that both of these elements cooperate in a form-fitting manner and they are thereby substantially free of slippage or play when in an engagement. In order to prevent the teeth of the roller from skipping the cam nodules of the cam disk and to avoid the resulting cracking noises which could occur during the operation of the door stopper, the roller may be formed with larger intervals between the teeth thereof and particularly in a star-like configuration in order to dimension the size and the intervals of the cam nodules on the cam disk such that the roller is constantly in engagement therewith thereby to avoid skipping of cam nodules which are not properly arranged opposite the tooth troughs of the roller.

Finally, by an additional feature of the invention, there is provided a stop member which limits the maximum opening which can be achieved between the two hinge leaves with the stop member being formed by an inwardly directed bent portion of the outer hinge leaf designed with a double-eye configuration, which stop member cooperates by abutment with the other hinge leaf. Compared with other known structures for door stoppers of this type, this configuration has the advantage that the door stopper operates in a manner which eliminates the necessity of utilizing the torsion bar spring stop arm as a limit stop, thereby avoiding this additional load from being placed upon the torsion bar spring and at the same time achieving a more stable limit stop effect.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

THE DESCRIPTION OF THE DRAWINGS

In the drawings, FIG. 1 is a side elevation of a hinge and door stopper in accordance with the present invention;

FIG. 2 is a rear view of the combined hinge and door stopper;

FIG. 3 is a sectional view taken along the line III—III of FIG. 1;

FIG. 4 is a sectional view corresponding to the sectional view of FIG. 3 taken through a combined hinge and door stopper assembly depicting a second embodiment of the invention wherein the roller cooperating with the cam disk is formed with circumferential teeth; and

FIG. 5 is a sectional view of a combined hinge and door stopper assembly according to the invention corresponding to FIG. 3 depicting a third embodiment wherein a more widely spaced configuration for the teeth on the roller which cooperates with the cam disk is shown.

DETAIL DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, the combined door stopper and hinge assembly of the present invention is shown as comprising a pair of articulated hinge leaves **1** and **2** rotatably mounted together by a hinge pin **3** forming the hinge axis of the assembly. The hinge leaf **1** is shaped with an angular, preferably L-shaped cross-sectional profile and comprises a member which is formed by cutting an appropriate length from a rolled elongated member having the desired cross-sectional configuration. The hinge leaf **1** comprises a stop face **4** which is rolled to have formed therein a groove **6** adapted to receive a shaft **5** of a torsion bar spring. The groove **6** is configured with a wall **7** which extends substantially perpendicularly to the stop face **4** of the hinge leaf **1** and with another wall **8** which is inclined at an angle of approximately **43°**relative to the plane of the stop face **4.** During manufacture of the assembly, the torsion bar spring is first inserted with its shaft portion **5** into the groove **6** and is subsequently secured therein by the provision of stamped portions **9** formed on the stop face **4** adjacent the wall **8** of the groove **6** with protuberances **10** which partly overlap the shaft **5** of the torsion bar spring.

As will be seen from the lower half of the view of FIG. **2** and the corresponding portions of FIG. **4,** the grooves can be formed in the manner of grooves **6'** having parallel walls **7'** extending perpendicularly to the stop face **4** with the shaft **5** of the torsion bar spring being locked in place by stampings **9'** which are provided in the stop face **4** directly adjacent the wall **7** forming the noses or protuberances **10'** partly overlapping the shaft **5** of the torsion bar spring.

The torsion bar spring comprises a pair of bent ends forming arms **11** and **12** with one of the arms **11** being supported within the hinge leaf **1** and with the other arm **12,** which forms a stop or abutment arm, cooperating with a cam disk **15** which is secured on a block **14** extending transversely to the hinge axis by means of a section of the arm **12** which extends parallel to the shaft **5.** The stop arm **12** is guided with its free end **16** in a front slotted recess **17** of the hinge leaf **1.** A roller **13** has at least one radial flange or collar **19,** as best seen particularly from the bottom half of the view of FIG. **2,** which engages the underside of the cam disk **15.** The cam disk **15** consists of a steel plate secured by means of a riveted joint **18** on the block **14** of the hinge leaf **2.**

In the embodiment represented herein, the hinge leaf **2** is formed of a cast iron part, particularly a malleable cast iron part, and is provided with a fastening plate **20** consisting of sheet steel for fastening upon a door part (not shown).

The cam disk **15** is provided along its circumferential edge with radially projecting cam nodules **21,** having

stop recesses 22 defined therebetween, with the nodules 21 being so spaced that they may receive therebetween for engagement with the cam disk 15 a portion of the peripheral surface of the roller 13.

In its simplest form, the roller 13 is configured with a smooth circumferential surface 23 which cooperates with the cam surface of the cam disk 15, as shown in FIGS. 1 and 3.

By a further embodiment of the invention shown in FIG. 4, the roller may be formed as a roller 13' having circumferential teeth 24, with the spacing or arrangement of the teeth 24 on the roller 13' being adapted to the design of a cam disk such as the disk 15 having cam nodules 21' with the nodules 21' engaging, at least partially, the tooth troughs formed between the circumferential teeth 24 of the roller 13'.

In accordance with a further embodiment of the present invention represented in FIG. 5, a wider spacing can be provided between the teeth of the roller and, more particularly, a star-shaped roller 13'' may be formed with cam nodules 25 which are so arranged and designed that they may be correspondingly associated with radial cam projections 21'' of the cam disk 15 in such a manner that the roller 13'' will be in constant engagement with the cam projections 21'' over its circumferential toothing 25. As shown in FIG. 5, the cam projections 21'' are preferably formed with a profile having a gently rising slope on the back sides and a more steeply rising slope on their forward sides.

In addition, as shown in FIGS. 3–5, the assembly may be provided with a limit stop member 27 extending in a direction parallel to the hinge axle 3 and having a bent portion 26. The stop member 27 is formed on the hinge leaf 2 and is located so that the bent portion 26 may be engaged by the hinge leaf 1 to limit further rotation thereof in the clockwise direction as seen in FIG. 3.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. In a combined door stopper and hinge assembly including a first and a second hinge leaf, a hinge pin pivotally interconnecting said hinge leaves for relative rotation about a hinge axis, a torsion spring having a body portion affixed to said first hinge leaf and a pair of bent ends forming spring arms, means connecting one of said spring arms with said first hinge leaf, a stop member formed upon said second hinge leaf, and a roller mounted upon the other of said spring arms in a position to operatively engage said stop member during pivotal movement of said hinge leaves relative to each other, said torsion spring being carried in said first hinge leaf in such a manner that said hinge leaves may be swung to turn freely relative to each other over a predetermined angle of rotation prior to engagement of said stop means by said roller, said torsion spring operating to create a spring force resisting further relative rotation between said hinge leaves when said roller engages said stop means, said stop means being configured to permit further relative rotation between said hinge leaves upon application to one of said hinge leaves of a force tending to overcome the stopping force created by engagement between said roller and said stop means, the improvement wherein:

at least one of said hinge leaves is formed as a segment of a continuous rolled hinge section;

said first hinge is formed with a stop surface having defined therein a longitudinal groove extending parallel to said hinge axis, said groove being defined between a pair of sides extending generally transversely to said stop surface with one of said sides extending at an angle of about 43° relative to said stop surface;

said body portion of said torsion spring is securely mounted upon said first hinge leaf to extend within said longitudinal groove; and

locking protuberances in the form of stamped portions of said first hinge leaf are formed in the stop surface of said first hinge leaf to extend transversely of said groove to partially overlap said torsion spring for locking said torsion spring in position within said groove to secure said torsion spring against movement in an axial direction relative to said first hinge leaf.

2. An assembly according to claim 1 wherein said locking protuberances are formed from stamped portions of said first hinge leaf provided along both sides of said groove to partially extend from both said sides over said torsion spring located within said groove.

3. An assembly according to claim 2 wherein said roller mounted upon said arm of said torsion spring is configured with at least one radially extending collar arranged to engage along one side of said cam disk.

4. An assembly according to claim 1 wherein said stop means comprise a cam disk mounted upon said second hinge leaf and shaped to define a cam surface formed with a plurality of radially extending cam nodules and wherein said roller mounted upon said arm of said torsion spring comprises circumferential teeth configured and arranged to correspond with the shape of said cam surface of said cam disk in a manner whereby said disk and said roller may be brought into engagement to cooperate with each other substantially free of slippage therebetween.

5. An assembly according to claim 4 wherein said teeth of said roller are provided with a relatively wide spacing therebetween with said roller being shaped in the form of a star and wherein the form and arrangement of the cam nodules of said cam disk are so adapted to the division of the circumferential teeth of said roller that said roller and said cam disk may be maintained with their cooperating surfaces constantly in engagement with each other.

6. An assembly according to claim 1 wherein said second hinge leaf comprises a limit stop member extending generally parallel to the axis of said pivotal connection and including a bent end portion adapted to be abutted by said first hinge leaf to prevent further relative rotation between said leaves beyond said point of abutment.

7. An assembly according to claim 1 wherein said stop means comprise a cam disk made from sheet steel and secured by means of a riveted joint on a portion of said second hinge leaf to project transversely of the axis of said pivotal connection, said cam disk being provided along a portion thereof extending beyond said second hinge leaf with at least one radially projecting cam nodule located to be operatively engaged by said roller.

* * * * *