Sept. 1, 1964 J. E. HALL, SR 3,147,029

STOP DEVICE FOR USE WITH WELL CASING

Filed July 20, 1962 3 Sheets-Sheet 1

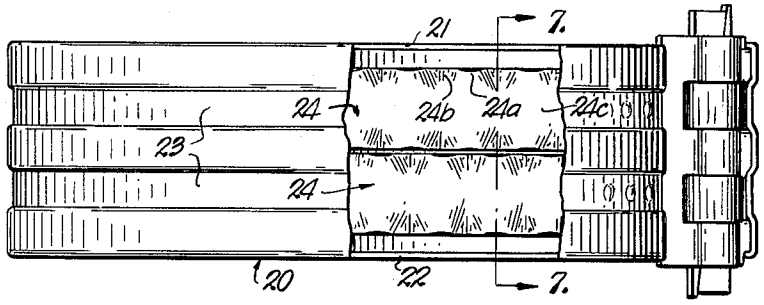

Fig. 1.

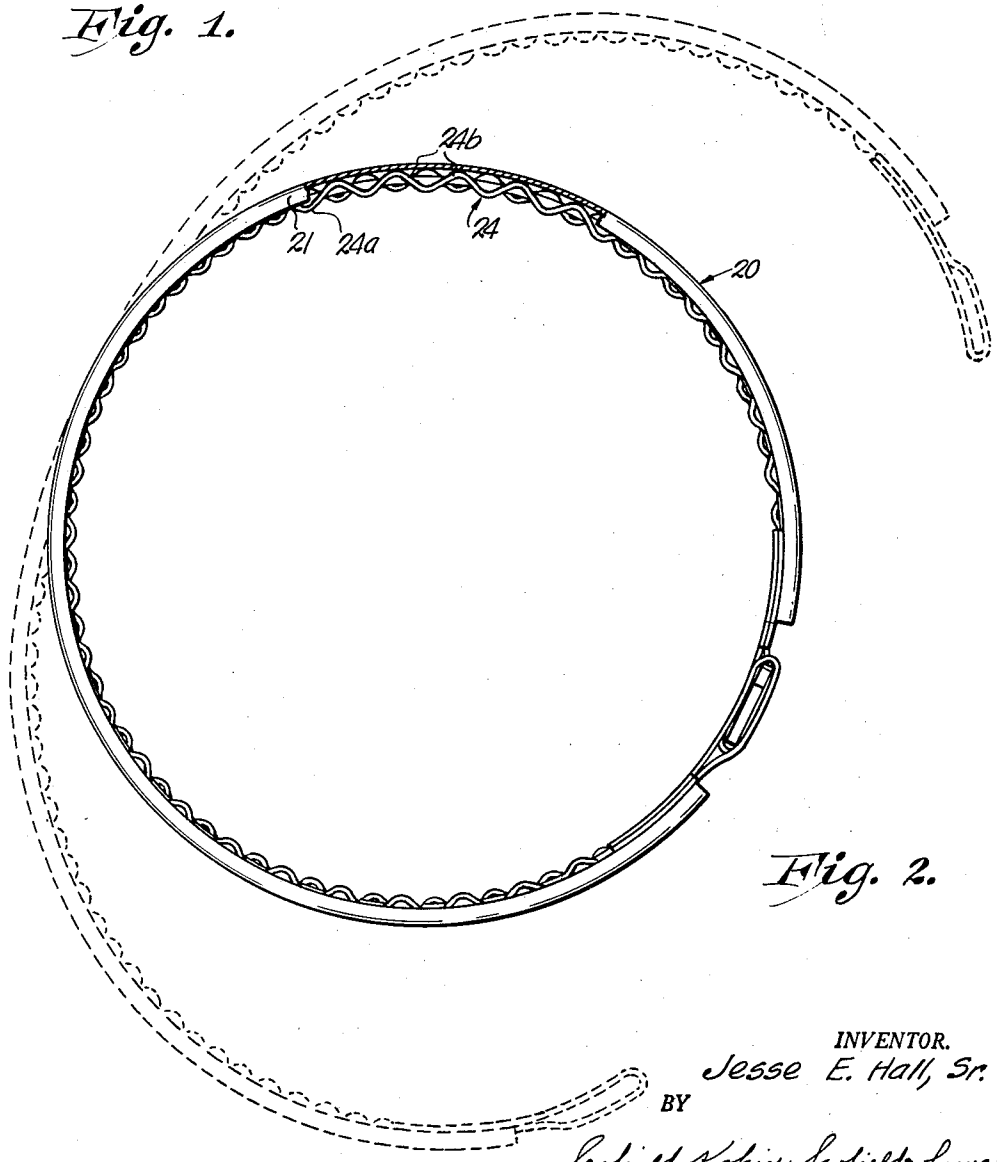

Fig. 2.

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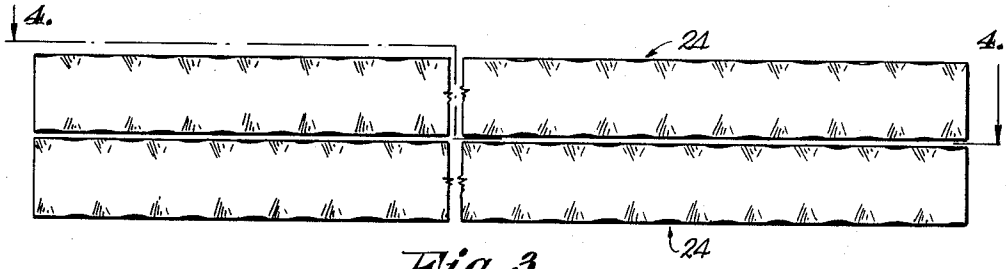

Fig. 3.

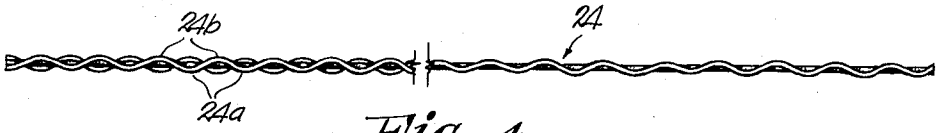

Fig. 4.

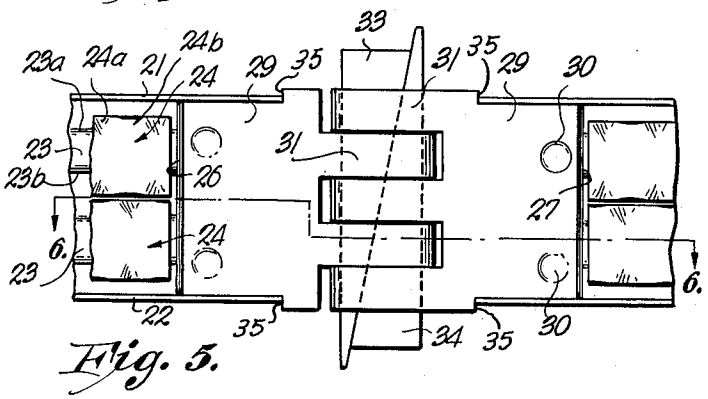

Fig. 5.

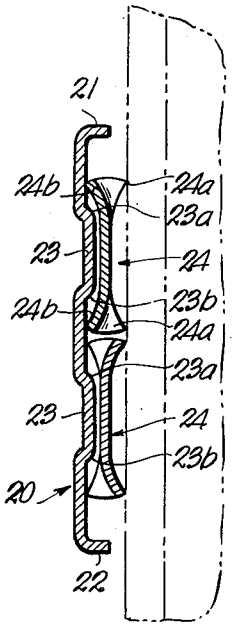

Fig. 7.

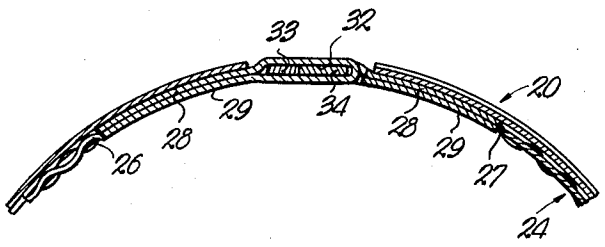

Fig. 6.

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STOP DEVICE FOR USE WITH WELL CASING

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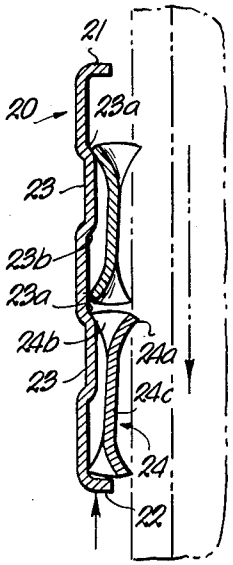

Fig. 8.

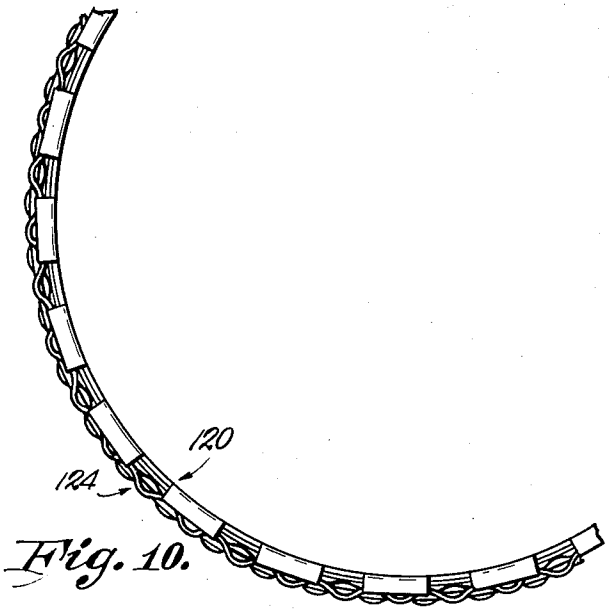

Fig. 10.

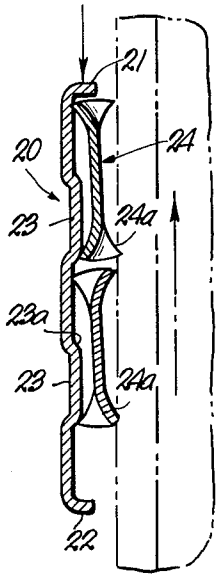

Fig. 9.

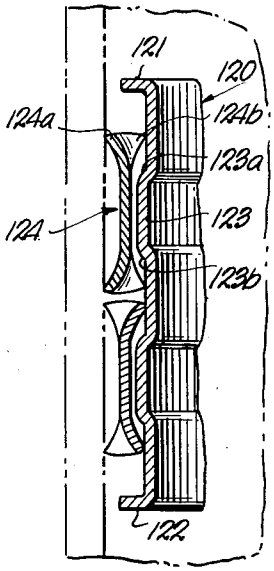

Fig. 11.

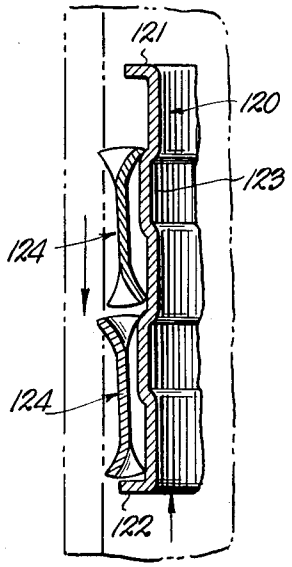

Fig. 12.

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United States Patent Office 3,147,029 Patented Sept. 1, 1964

3,147,029

STOP DEVICE FOR USE WITH WELL CASING

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Filed July 20, 1962, Ser. No. 211,185
9 Claims. (Cl. 287—52)

This invention relates generally to devices adapted to be mounted on or within well casings, and refers more particularly to devices operable to provide an abutment on the wall of the casing operable to limit the movement of appliances, such as scratchers, centralizers, and like tools, along the casing.

One of the main objects of the invention is to provide a stop collar having features of construction and operation which permit its use in extremely close tolerance wells, and yet which has great holding strength. The device according to the invention has an outer shell which can be constructed of light gauge metal and is provided with a thrust actuated locking means which has a construction such that it requires but little space between the inside of the shell and casing, thus reducing the over-all thickness of the collar.

Another object of the invention is to provide a stop collar which is so constructed that it requires no more than its application to the casing to render it effective as a stop device. In other words, no additional steps of driving, wedging pins, turning set screws or other manipulations are required in order to place it in operating condition on the casing.

Still another object of the invention is to provide a stop collar which is capable of being mounted on the casing with speed and facility, and which has novel means for drawing it tightly about the casing and maintaining it in such condition during use.

A further object of the invention is to provide a stop collar of the character described which has a small number of components, is relatively light in weight and is capable of withstanding rugged use.

Other and further objects of the invention together with features of novelty appurtenant thereto will appear in the course of the following description.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals indicate like parts in the various views;

FIG. 1 is a side elevational view of a preferred device embodying the features of the invention, a portion of the outer shell being broken away for purposes of illustration;

FIG. 2 is a plan view of same, part of the shell wall being broken away and shown in section for purposes of illustration;

FIG. 3 is a side elevational view of a pair of the wedging or locking strips disassociated from the shell;

FIG. 4 is an edge-on view of a wedging or locking strip;

FIG. 5 is an enlarged fragmentary elevational view, looking from the inside of the collar at the securing means for joining the ends of the shell;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 5 in the direction of the arrows;

FIG. 7 is a fragmentary sectional view illustrating the normal unstressed condition of the collar after application of the collar to the exterior of a casing;

FIG. 8 is a view similar to FIG. 7, but showing the relationship of the components as thrust loads in one direction are applied to the collar;

FIG. 9 is a view similar to FIG. 8, but showing the results of opposite thrust loads on the collar;

FIG. 10 is a fragmentary plan view of a modified form of the device for use on the interior of a casing;

FIG. 11 is a fragmentary sectional view illustrating the normal unstressed condition of the modified form after positioning in the casing; and

FIG. 12 is a view similar to FIG. 11, but showing the results of the imposition of a thrust load on the device.

Referring to the drawings and initially to the collar shown in FIGS. 1 through 9, the main body of the collar comprises a band-like shell 20 formed from good quality, relatively light gauge metal sheet. The shell is sufficiently flexible that it can be bent to and from the open arcuate configuration shown in broken lines in FIG. 2, to the closed circular configuration shown in solid lines.

The shell 20 is formed with inturned upper and lower flanges 21, 22, respectively (FIG. 7) and with two inwardly depressed parallel ribs 23, each of which defines upper and lower annular shoulders 23*a*, 23*b* on the inside wall of the shell. These shoulders are preferably of long radius whereby to provide a gradual wedging surface, the reasons for which will later become more apparent.

Disposed on the inside of the shell and extending circumferentially thereof is a pair of similar wedging or locking strips 24, each of which is associated with and overlies a rib 23 of the shell. These strips are preferably formed from high quality hardened spring steel having sufficient flexibility as to be deformable with the shell as previously described.

Each strip 24 has its opposed margins formed into a scalloped configuration providing alternating inwardly and outwardly directed projections 24*a* and 24*b*, respectively, which lie on opposite sides of the major plane of the strip. As is best seen in FIG. 7, the scallops are such that the maximum depth occurs at the extreme edge of the strip. The central portion 24*c* of the strip is flat and of substantially the same width as the associated inner face of the rib 23, and the scalloped projections 24*a*, 24*b* flare inwardly and outwardly therefrom with the outwardly directed projections 24*b* overlapping the shoulders 23*a*, 23*b*. The inwardly directed projections 24*a* thus provide sharp edged spaced arcuate segments which lie adjacent and contact the casing.

Each wedging strip 24, rather than being secured to the shell 20, is preferably seated therein under flexural stress. This is accomplished by initially forming the strip in such fashion that it must be resiliently flexed to bring it within the shell, after which it is released. The tendency of the strip to again return to a straighter configuration causes it to center itself on the associated rib and to maintain it in operative condition within the shell.

The opposite ends of the respective wedging strips 24 lie adjacent end abutments 26, 27 which serve to prevent circumferential shifting of the strips in the shell. The abutments are formed as the registering end edges of plies of metal sheet 28, 29, spot welded to the collar ribs 23 on the inside thereof as at 30. The plies 28, 29 are extended beyond the end of the shell to form inter-engaging loop-like portions 31 which define together a central thin slot 32 through which can be inserted the pintle elements 33, 34 to connect the ends of the shell together. It will be noted that the plies 28, 29 are cut to provide shoulders 35 which overlie the ends of flanges 21, 22. This assists materially in manufacture, providing a means of accurately positioning the plate-like elements formed of the plies 28, 29 on the shell during the welding operation.

The pintle elements 33, 34 are right triangular pieces adapted to be inserted from opposite ends of the slot 32 and firmly driven in opposed directions to draw or constrict the collar and wedging strips about the casing with

the projections on the latter in firm initial contact with the casing. The diagonal abutting surfaces of the pintle elements serve to effect a constricting force on the shell, the opposite edges of the pintle elements benig separated further and further as one element proceeds longitudinally of the other, and thus drawing the loops **31** relatively together.

In operation, the device as thus far described is prepared for installation by removing the pintle elements **33**, **34**, if present, and opening up the collar sufficiently (see FIG. 2) to permit it to be moved into encircling position on a casing. Thereupon the ends are brought together to conform the collar to the casing and to inter-engage the loop portions **31** sufficiently to permit insertion of the pintle elements, as previously described. The pintle elements are driven home sufficiently as to insure that the collar has a firm grip on the casing through the inter-engagement therewith of the projections **24***a* on the wedging strips.

The ordinary function of stop collars and similar devices on the casing is to provide a limiting abutment operable to define the limits of movement to be provided certain other appliances, such as scratchers and centralizers. When such appliances engage or are engaged by the collar, a thrust is applied to the collar tending to shift the collar on the casing.

As shown in FIG. 8, if the thrust force is imposed on the lower flange **22** of the shell **20**, the shell tends to be shifted upwardly on the casing. This, however, causes the shoulders **23***a* to engage the outwardly projecting scallops **24***b* on the upper edges of the wedging strips and apply an inward force causing the associated inwardly projecting scallops **24***b* to bite into the casing. The large number of scallops forced into engagement with the casing insures of relatively uniform inward pressure and gripping around the casing. The greater the force, the deeper the tendency of the scallops to bite into the casing, with the result that the collar holds firm under very heavy loads.

FIG. 9 illustrates the result when the thrust is imposed against the top flange **21** of the collar. The situation is the reverse of that just described, the lower shoulders **23***b* now acting on the scalloped projections at the lower edges of the strips.

While the shell is put under substantial circumferential tension under high thrust loads, the special end connection provided by the diagonally abutting pintle elements provides a high degree of safety against accidental disconnection of the ends. The angle of abutment is sufficiently shallow that the resultant forces tending to cause the pintle elements to slip are insufficient to overcome the high frictional resistance to slippage.

The curved scalloped character of the casing engaging projections **24***a* assists in preventing penetration to the point where the collar could slip up over the strips. The greater the depth to which the edges of the scallops penetrate, the more the surface area of the scallop brought into contact with the casing, with the result that there is an inhibiting tendency once the penetration has been effected.

As shown in FIGS. 10 through 12, inclusive, the principles of the invention are equally applicable to stop devices for mounting on the interior rather than the exterior of a casing. As shown in FIG. 10, in this case the collar is formed so that the wedging strips **124** are located on the exterior of the collar. The ribs **123** and flanges **121**, **122** are directed outwardly rather than inwardly. In order to facilitate the circular conformation the upper and lower flanges **121**, **122** are segmented, as is best seen in FIG. 10. The ribs are provided, as in the preceding embodiment, with upper and lower shoulders **123***a*, **123***b*, respectively. The wedging strips **124** are constructed much the same as those in the preceding embodiment, having the alternating projections **124***a* and **124***b* along the opposed marginal edges.

As shown in FIG. 12, thrust against the end flange of the collar **120**, in this case the lower end flange **122**, will cause inward compression of the scalloped projections and cause them to bite into the casing to inhibit movement. Obviously, thrust in the opposite direction works in the reverse direction, causing the lower shoulders **123***b* to operate against the scallops at the lower edge of the strip.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. In a stop collar for use with a well casing, the combination of a flexible interrupted circular band having confronting end portions and at least one circumferential rib formed on a face thereof to provide spaced parallel annular shoulders, a flexible wedging strip disposed adjacent said face and extending substantially from one end of said band to the other, said wedging strip having a central portion overlying said rib along the length thereof, the marginal edges of said strip on opposite sides of said central portion being scalloped to provide alternately directed projections along said marginal edges directed toward and away from said face, those projections directed toward said face adapted to cooperate with their respectively adjacent shoulders upon relative axial movement between said band and strip and apply a force tending to move the strip radially away from said face, and releasable means for connecting said ends of said band.

2. In a stop collar for mounting on a well casing, the combination of a flexible interrupted circular band having confronting end portions and at least one circumferentially extending rib formed on the inside face thereof and presenting spaced parallel annular shoulders on the inside face of the band, a flexible wedging strip extending substantially from one end of the band to the other and having a central portion overlying said rib along the length thereof, the marginal edges of said strip on opposite sides of said central portion being scalloped to provide alternately directed projections along said marginal edges directed toward and away from said face, those projections directed toward said face adapted to cooperate with said shoulders upon relative axial movement between the band and strip, and releasable means connecting said ends of said band.

3. A collar as in claim 1 wherein said face comprises the outside face of the band.

4. A collar as in claim 1 wherein said face comprises the inside face of said band.

5. In a stop collar for use with a well casing, the combination of a flexible interrupted circular band having confronting end portions and a pair of axially spaced circumferentially extending annular shoulders formed on a face thereof, a flexible wedging strip disposed adjacent said face and extending substantially from one end of said band to the other and having a width such that its marginal edges extend past the respective shoulders, said edges being scalloped to provide projections directed alternately toward and away from said face, those projections directed toward said face adapted to cooperate with their respectively adjacent shoulders upon relative axial movement between said band and strip and apply force tending to move the strip radially away from said face, and releasable means connecting said ends of said band.

6. A stop collar as in claim 5 wherein said strip is resiliently biased toward said face.

7. A stop collar as in claim 5 wherein said face comprises the inside face.

8. A stop collar as in claim 5 wherein said face comprises the outside face.

9. A stop collar as in claim 5 wherein said releasable means comprises members connected with the respective ends of the band, said members having inter-engaging finger portions apertured to form a continuous passageway parallel with the axis of said band, and a split elongate pintle extending into said passage, the pintle being put diagonally to the long axis thereof whereby to provide confronting edge surfaces at an angle with said long axis.

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