Jan. 3, 1967 E. W. MORAIN 3,295,398

SELF-PUNCHING T FITTING

Filed May 11, 1964

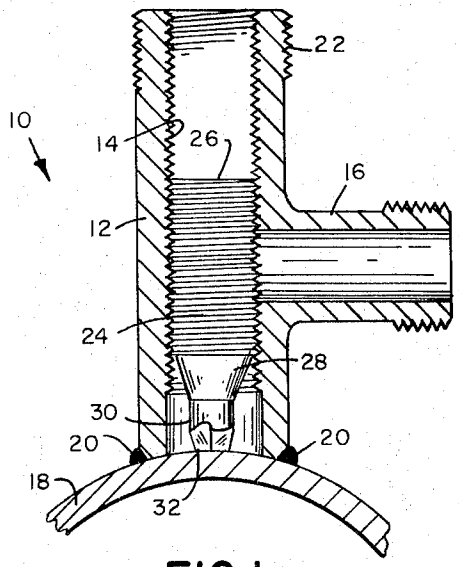



FIG. 1

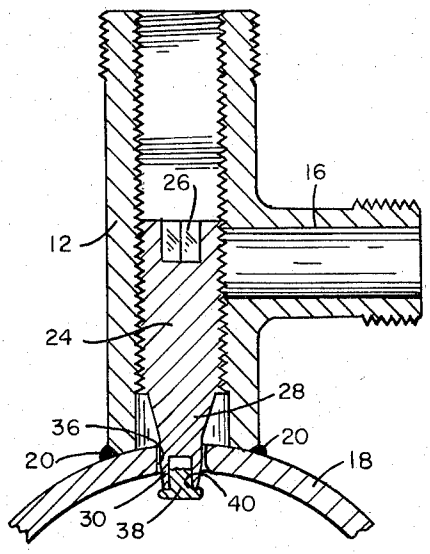



FIG. 2

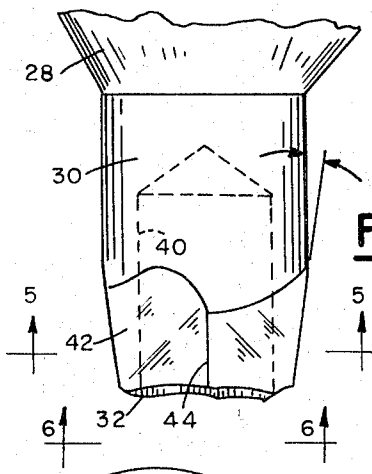



FIG. 4

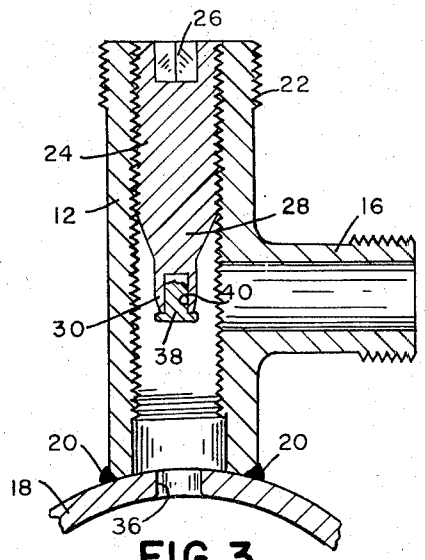



FIG. 3

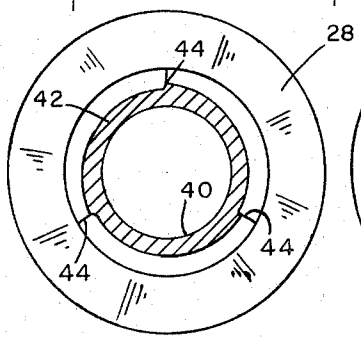



FIG. 5

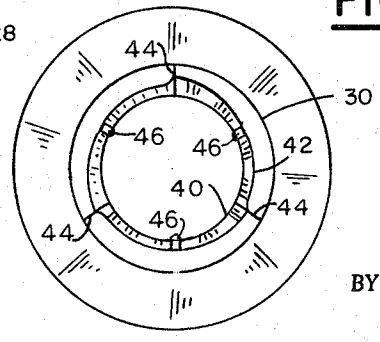



FIG. 6

INVENTOR.
ELDON W. MORAIN

BY

Head & Johnson

ATTORNEYS

United States Patent Office

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# SELF-PUNCHING T FITTING

Eldon W. Morain, 9710 E. 4th Place, Tulsa, Okla. 74128

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This invention relates to self-punching T fitting. More particularly, the invention relates to an improved self-punching T fitting for punching a pipe, the improvement characterized by the provision of a punch having means whereby a slug or coupon is formed in the wall of the pipe being punched and including means whereby the coupon is grasped by the punch and, as the punch is withdrawn, the coupon is withdrawn by the punch, thereby preventing the coupon from being deposited in the interior of the pipe.

The use of self-punching T fittings is well known particularly in the gas distribution industry. The construction and application of a self-punching T fitting is set forth in United States Patent No. 3,094,137. Whereas this issued patent discloses a self-punching T fitting of the type producing no coupon, the invention set forth herein provides a self punching T fitting to punch a hole in a pipe by producing a coupon but in a manner to prevent the coupon from being deposited in the pipe.

The primary advantage of the coupon producing punch is that under normal conditions a larger opening may be formed in a pipe of a given wall thickness than is practicable with the no coupon punch as set forth in the above mentioned Patent No. 3,094,137. This statement is not intended as a derogation of the subject matter of Patent No. 3,094,137. When a smaller diameter hole is acceptable, or on thin wall pipe, the punch of this patent has and will continue to function advantageously. When a larger diameter hole is required, or when thicker walled pipe is punched, it is frequently desirable to use a coupon producing punch, several types of which are commercially available. A difficulty which has existed, however, in the use of the coupon producing self-punching T fittings is that normally the coupon which is punched out of the wall of the pipe falls within the interior of the pipe. This coupon can be carried along by gas or by fluid flow and can interfere with the function of regulators, and so forth, and in general represents a source of potential trouble.

Therefore, an object of this invention to provide a punch for punching a hole in a pipe, or the like, of the type which punches a coupon in the pipe but in a manner wherein the coupon is retained by the punch.

This basic object, and other more particular objects of the invention may be understood, and a better knowledge of the invention had by referring to the following description and claims, taken in conjunction with the attached drawings in which:

FIGURE 1 is a cross-sectional view of a self-punching T fitting of this invention affixed to a pipe. This figure shows the punch member advanced to initial engagement with the pipe preparatory to forming a hole in the pipe.

FIGURE 2 is a similar cross-sectional view of that shown in FIGURE 1 showing the punch having been rotatably advanced to form a hole in the pipe. A coupon has been punched in the pipe by the punch and is retained by the punch member. In this figure the punch member is shown in cross-sectional.

FIGURE 3 shows a similar cross-sectional view as shown in FIGURE 2 showing the punch withdrawn to permit free communication between the interior of the pipe and the branch outlet and showing the coupon retained by the punch.

FIGURE 4 is an enlarged plan view of the punch and portion of the punch member.



FIGURE 5 is a cross-sectional view taken along the line 5—5 of FIGURE 4.

FIGURE 6 is an end view of the end of the punch member as seen along the line 6—6 of FIGURE 4.

This invention may be described as an improved punch. More particularly, but not by way of limitation the invention may be described as a self-punched T fitting adaptable for affixing to a pipe whereby fluid communication may be provided with the pipe, comprising a tubular body member having threads formed in the internal surface thereof, a tubular branch member engaging and integrally formed with said body member intermediate the ends thereof whereby the interior of said tubular branch member communicates with the interior of said body member, and a cylindrical punching member having external threads formed thereon threadably engaging said internal threads of said body member, said punch member terminating in a reduced external diameter tapered concentric tubular punch end portion, said tubular punch end portion terminating in a punching face, the tapered external surface of said punch end portion defined by at least one radially relieved longitudinal cutting edge.

Referring now to the drawings, and first to FIGURE 1, a self-punching T fitting is indicated generally by the numeral 10. The T fitting 10 consists basically of an elongated tubular body member 12 having threads 14 formed in the interior surface thereof. Integrally affixed to the tubular body 12 and extending substantially perpendicularly therefrom and intermediate the ends thereof is a tubular branch connection 16. The interior of the branch connection 16 communicates with the interior of the body member 12.

Body member 12 is adaptable to be affixed at the lower end thereof to the wall of the vessel to be punched, such as a pipe 18. Typically, in an application of the invention, pipe 18 is a gas main to which it is desired a connection be made to provide a branch outlet. The body member 12 may be affixed to pipe 18 in a variety of ways, such as by use of a saddle connection (not shown) or by the illustrated method of the use of welding 20.

The upper end of body member 12 is preferably provided with external threads 22 to receive a cap member (not shown).

Threadably positioned within the interior of body 12 is an elongated cylindrical externally threaded punch member 24. A means such as a hexagonal socket 26 is provided in the upper end of punch member 24 to receive a tool for longitudinally positioning the punch member internally of the body 12 by the threaded rotation thereof.

Punch member 24 has an intermediate tapered portion 28 and terminates in a lower punching portion 30. The essential novelty of this invention is in the configuration of the punching portion 30. The punching portion 30 terminates in a punching end face 32 which engages and forces its way through the wall of pipe 18 as the punch member 24 is threadably advanced in body portion 12.

Referring to FIGURE 2, the punching member 24 is shown as advanced through the pipe 18 forming an opening 36 in the pipe. It is noted that in the formation of opening 36 a coupon or a slug 38 is produced. The production of such a coupon 38 is not new within itself. The punch end portion 30 is tubular or hollow, that is, a recessed opening 40 is provided. This recessed opening 40 augments the formation of slug 38 and, in fact, receives a portion of the slug as it is formed. The provision of such a tubular punch end portion is also not new with itself.

FIGURE 3 shows the punch member 24 withdrawn to the upper portion of body member 12. In this withdrawn position, communication is freely provided between the interior of pipe 18 through opening 36 with

the interior of branch connection 16. It is noted that in the withdrawn position, the coupon 38 is retained within the grasp of the punch end portion 30 of the punch member 24 rather than being deposited into the interior of pipe 18.

Referring to FIGURE 4, an enlarged plan view of the punch end portion 30, the essential novel features of this invention are best shown. The punch end portion 30 is substantially cylindrical and tubular in the lower portion thereof, that is a recess 40 as previously described, is provided. The lower portion of the punch end portion 30 is externally tapered at 42. The lower tapered portion is defined by at least one longitudinal cutting edge 44.

The cross-sectional view of FIGURE 5 and the end view of FIGURE 6 shown the provision of three such cutting edges 44. These cutting edges are preferably formed by radially relieving the tapered wall of the punch member, that is, cutting a radial relief is the preferred method of forming each of the longitudinal cutting edges 44.

As the punching member 24 is advanced through the wall of the pipe the cutting end face 32 forces its way through the pipe in a swaging type operation forming a coupon 38. In the known type of coupon forming punches, not having the tapered portion 42 having at least one cutting edge 44, the exterior circumference of the coupon 38 is substantially equal to or slightly greater that the opening 36 formed in the wall of the pipe so that as the punch 24 is withdrawn the enlarged lower portion of the coupon engages the sides of the opening and is pulled from the hollow opening 40 of the punch to drop into the pipe. The improvement of this invention is the provision of tapered portion 42 having longitudinal cutting edges 44, which enlarge the opening 36 formed in the pipe as the punch member 24 is threadably advanced, so that when the punching member is subsequently withdrawn the external circumference of the coupon 38 does not engage the wall opening 36 and the coupon is thereby retained by the punch.

As the punch is rotated the threaded advancement forces a hole in the pipe and at the same time forms the coupon 38. A portion of the coupon 38 extends within the hollow portion 40 of the punch. As the tapered slides 42 are forced through the pipe some external swedging or deformation of the tubular punch end occurs. This deformation causes the punch to grasp the slug 38. Such deformation and grsaping is, in many cases, only slight but when the punch is properly designed is sufficient to carry the slug with it as the punch is withdrawn.

To further insure that the separated coupon will remain in the punch internally extending teeth 46 (see FIGURE 6) may be provided. Such teeth are easily formed in the punching end face 32 intermediate the longitudinal cutting edges 44. As the punch is rotated teeth 46 cut threads on the exterior of the coupon 38. When the punch is then withdrawn the teeth 46 serve to firmly grasp and retain the coupon.

The number of such longitudinal cutting edges 44 is optional, but at least one is required and between two and six are preferred, although a greater number may be utilized.



Each of the cutting edges 44 preferably lies substantially in a plane of the tubular axis of punch end portion 30 however deviations therefrom will produce acceptable results.

The rate of taper of the lower tapered portion 42 will vary according to the type and thickness of the material being punched and the diameter of the punch end portion 30. Although not limited thereto the rate of taper is preferably between three quarters inch and three inches per foot.

Although this invention has been described with a certain degree of particularity it is manifest, that many changes may be made in the details of construction and the arrangement of components without departing from the spirit and scope of this disclosure.

What is claimed is:

1. A punch for forcing a hole in the wall of a pipe comprising:

a substantially cylindrical threaded shank terminating in a reduced diameter tapered concentric tubular punch end portion, said tubular punch end portion terminating in a punching face, the tapered external surface of said punch end portion defined in part by at least one longitudinal cutting edge extending inwardly from said punching face.

2. A punch for forcing a hole in the wall of a pipe according to claim 1 including at least one integral tooth extending internally of said tubular punch end portion adjacent said punching face.

3. A self-punching T fitting adaptable for affixing to a vessel, such as a pipe, whereby fluid communication may be provided with said vessel, comprising, in a combination:

a tubular body havng threads formed in the internal surface thereof;

a tubular branch member engaging and integrally formed with said body member intermediate the ends thereof whereby the interior of said tubular branch member communicates with the interior of said body member;

and a cylindrical punching member having external threads formed thereon threadably engaging said internal threads of said body member, said punch member terminating in a reduced external diameter, tapered, tubular punch end portion, said tubular punch end portion terminating in a punching face, the tapered external surface of said punch end portion defined in part by at least one longitudinal cutting edge extending inwardly from said punching face.

4. A self-punching T fitting according to Claim 3 including at least one integral tooth extending internally of said tubular punch end portion adjacent said punching face.

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FRANCIS S. HUSAR, *Primary Examiner.*

WILLIAM F. O'DEA, *Examiner.*

D. MATTHEWS, *Assistant Examiner.*